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A comparative analysis of dry port developments in developed and developing countries: an implication for Myanmar dry ports

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WORLD MARITIME UNIVERSITY

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A Comparative Analysis of Dry Port Development in Developed and Developing Countries

An Implication for Myanmar Dry Ports

By

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Myanmar

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2019

Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature) : 

(Date) **: 2019. 09. 24**

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Supervisor's affiliation **: PM**

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Abstract

Title of Dissertation: **A Comparative Analysis of Dry Port Developments in Developed and Developing Countries - An Implication for Myanmar Dry Ports**

Degree: **Master of Science**

With the continuous growth in container transport, the role of inland freight distribution system has become critical for the development of the maritime gateway since sea flow could create almost proportionally the hinterland flow. Consequently, dry ports have appeared in order to help seaport congestion by serving most of the seaport functions in the hinterland for the seamless container transportation and the links of the seaports with their hinterland becoming vital for the seaports' functions. Dry ports, which are also known as the intermodal inland terminals, have been implemented in many countries. Although there might be differences in dry ports implementations in developed and developing countries depending on the governance, stakeholders, geographic conditions and the economics conditions. It was found that dry ports and rail infrastructures play an important role for the port regionalization process. The purpose of this study is to investigate the current condition of seaport congestions and dry ports implementation in Myanmar in order to give recommendations for the further development of dry ports by reviewing the best practice from selected dry ports all over the world. It was investigated that efficient dry port implementation could help to reduce the congestion at the seaport gates and hinterland area. However, the infrastructural and institutional inefficiencies are the biggest challenges for the efficient dry port implementation and further development for the dry ports in Myanmar. Therefore, private and public cooperation, collaboration and partnership for the clear rules, infrastructure investments to avoid monopolistic market of rail infrastructure by public sector and the efficient use of the inland waterway transport were recommended in this study.

KEYWORDS : Myanmar, Dry port, Intermodal transportation, Congestions, Institutional, Infrastructure, Private, Public

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List of Abbreviations

AH	- Asia Highway
BOT	- Build, Operate, Transfer
CFS	- Container Freight Station
CO_2	- Carbon Dioxide
CREC	- China Railway Engineering Corporation
CY	- Container yard
DMA	- Department of Marine Administration
DWT	- Dead Weight Tonnage
EEA	- European Economic Area
EU	- European Union
GDP	- Gross Domestic Product
GRT	- Gross Tonnage
HDI	- Human Development Index
HHLA	- Hamburger Hafen and Logistik AG
HOB	- Hteedan Oil Berth
ICD	- Inland Clearance Depot, Inland Container Depot
IMF	- International Monetary Fund
ISPS Code	- International Ship and Port Facility Security Code
IT	- Information and Technology
IWT	- Inland Water Transport
JICA	- Japan International Cooperation Agency
JV	- Joint Venture
LA	- Los Angeles
LCL	- less-than-a-container-load
LOA	- Length Overall
MACCS	- Myanmar Automated Cargo Clearance System
MIP	- Myanmar Industrial Port

MIST	- Macarthur Intermodal Shipping Terminal
MoU	- Memorandum of Understanding
MPA	- Myanma Port Authority
PPPs	- Public Private Partnerships
RGL	- Resource Group Logistics
RITES	- Rail India Technical and Economics Services
RS	- Reach Stacker
SEZ	- Special Economic Zone
TAR	- Trans-Asian Railway
TEU	- Twenty-foot Equivalent Unit
U.N.	- United Nations
UN ECE	- United Nations Economic Commission for Europe
UNCTAD	- United Nations Conference on Trade and Development
UNDP	- United Nations Development Programme
UNESCAP	- United Nations Economics and Social Commission for Asia and the Pacific
USA	- the United States of America
VIP	- Virginia Inland Port

Chapter 1. Introduction

1.1 Background

Booming in international trade has been contributed due to open policies and advanced technology (Bernhofen et al. 2016). As a result, international seaborne trade has increased significantly with a rate of 4% within 5 years, especially in the container trade which has expanded fastest with an average rate of 8.1% annually between 1980 and 2017, which has increased from 50 million TEUs in 1996 to 148 million TEUs in 2017. This is because of the fact that containerization has become the way to produce, distribute and consume which will keep developing (Rodrigue & Notteboom, 2009). The United Nations Conference on Trade and Development (UNCTAD) projected that the global container trade will continuously increase corresponding to the growing global seaborne trade leading to the enhancement of the global economy (UNCTAD, 2018).

Consequently, it has made a huge impact on the capacity of transport infrastructure, creating the congestion problem, which leads to reduce efficiency. Therefore, to cope with the increased demand forcing the service providers with a speedy operation as well as low/reasonable prices, the dry port is the best way since it is crucial for the efficiency of the global logistics and supply chain function by coordinating and integrating among shipping lines, warehousing and inland transport (Bichou and Gtay, 2004; Miyashita, 2004). Rodrigue et al. (2006) mentioned the dry port as an inland port or terminal which has the same function, services and capabilities with a seaport where container movements between seaport and hinterland are connected by using different transportation networks (Rodrigue et al., 2006). Also, in North America, container handling services had been successfully moved to the hinterland by using dry port (Rodrigue et al., 2010). Roso, (2009) also highlighted that for the seaport terminal congestion, although the dry port implementation itself certainly is not a straightforward solution, it could be part of the solution. Slack, (1999)

highlighted that using a dry port and shifting several activities of container ports to the hinterland is a way to tackle the congestion. Furthermore, queueing time at seaport terminals should be avoided and the risk of accidents reduced with the implementation of dry ports by increasing terminal capacity and managing a lack of space or inappropriate inland access (Roso, 2009).

In Myanmar, due to the growth of economy as a result of trade growth, the economy has been growing steadily over the last two decades with average annual rate of around 10 % (Aye, 2012). According to the 2017's information, the World Bank and the Central Bank of Myanmar- The Gross Domestic Product (GDP) in Myanmar was worth 69.32 billion US dollars in 2017 and it is projected to trend around 80.00 billion US dollars in 2020 with an annual growth rate of around 6.80 % in 2020 in line with the Trading Economics global macro models and analysts' expectations.

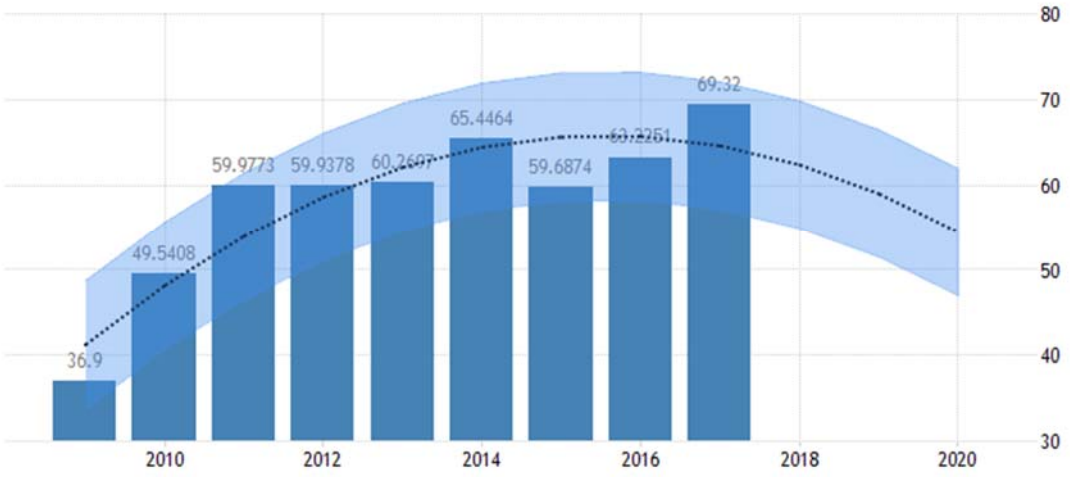


Figure 1:GDP of Myanmar (Source: World Bank, 2017)

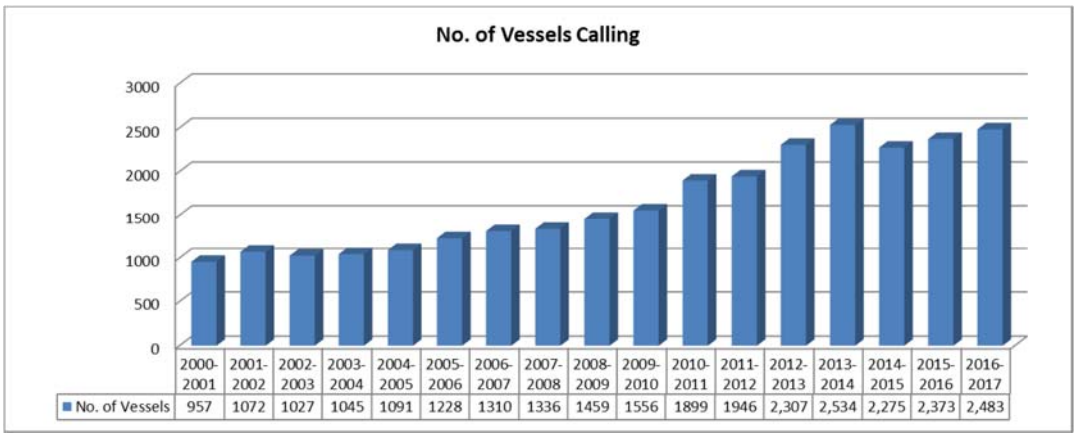
Figure 2:Annual GDP Growth Rate (Myanmar) (Source: Central Bank of Myanmar, 2017)

Moreover, as a consequence of the removal of restrictions on investment and trade by the new elected Myanmar government's market-oriented policy, many private companies were allowed to participate in domestic and foreign trade. As a result, many stakeholders are investing especially in the Special Economic Zone (SEZ) and Port sectors, since these are the major business of Myanmar and the majority of the country's income is from maritime transportation especially from Yangon Port which can handle approximately 90% of the normal import and export. During the recent decade, Myanmar's cargo throughput has been increasing significantly mainly in containerized cargo with an annual growth rate of about 16% (Black et al., 2017). Consequently, it creates a severe congestion throughout the seaport terminals and the roads connecting to the city centre leading to make delays of the process and financial loss for carriers. Therefore, dry port implementation could be a solution to solve the concerning issues by enhancing efficiency such as port capacity and productivity for more vessel calling.

1.2 Problem Statement

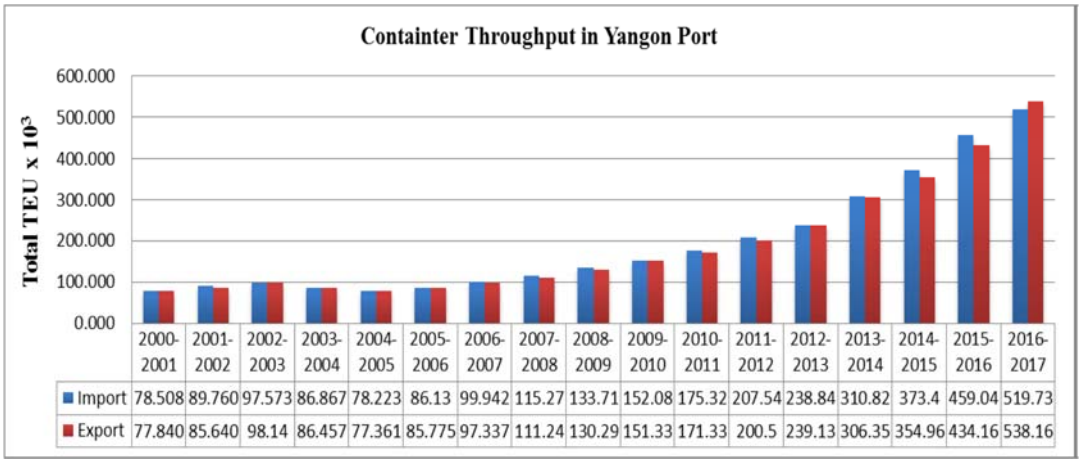
Myanmar is one of the South East Asian countries which has largest land area of 677,000 square kilometres, with a long coastline of 2,229 kilometres in the South-West of the country. Actually, more than 85 per cent of the nation's trade is served by

maritime transportation which contributes about 80% of country's economy. Yangon Port is the major port and the cargo throughput using Yangon Port has been increasing significantly every year (From MPA Data, 2017/2018). With reference to the maritime trade statistics information provided by Myanma Port Authority (MPA), the number of vessels calling to the Yangon port: Figure (3) and container throughput of the Yangon port (including Thilawa port): Figure (4), have shown an increasing trend of maritime transportation from 2000-2017.



	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
No. of Vessels	957	1072	1027	1045	1091	1228	1310	1336	1459	1556	1899	1946	2,307	2,534	2,275	2,373	2,483

Figure 3:Number of vessels calling Yangon Port (2000-2017) (Thein & YANG, 2019, March)



	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Import	78.508	89.760	97.573	86.867	78.223	86.13	99.942	115.27	133.71	152.08	175.32	207.54	238.84	310.82	373.4	459.04	519.73
Export	77.840	85.640	98.14	86.457	77.361	85.775	97.337	111.24	130.29	151.33	171.33	200.5	239.13	306.35	354.96	434.16	538.16

Figure 4:Container Throughput in Yangon Port (2000-2017) (Thein & YANG, 2019, March)

Moreover, Yangon main Port area is situated near the city centre and most of the container terminals are located in downtown area resulting so that the shippers save transportation cost compared to the terminals in the Thilawa Area; most shippers' prefer to choose these downtown terminals. Consequently, the congestion problems emerging directly impact on the container transporters and also the surrounding downtown area. In addition, due to the increasing population and the use of numerous private cars, this also enhances the congestion problems. Furthermore, since Yangon Port is a river port, vessels require to wait for the tide to arrive as well as the departure which causes delay for the berthing process resulting in hindering the process of vessels calling and enhancing congestion problems. Moreover, some factors such as the insufficient number of X-Ray machines for all terminals and lack of co-ordination among Port and Custom Department for custom procedures, delay the custom inspections and impede the port performance by creating port congestion.

An additional problem for the Yangon port is the very limited space for expansion and certainly not enough space for the amount of container cargo that is planned in the next decade. However, the storage area is crucial for port; which means land; is very limited and for the increasing demand, more resources, such as Human Resources, infrastructure and superstructure are needed. On the other hand, Rozic et al. (2014: p. 4) stressed that "the hinterland terminal implementation will enable enough space and organization possibility for additional logistic services with enhanced storage capacity". Therefore, the developments of the modern port in Myanmar, the best alternative way is moving of some seaports procedures to another hinterland area, which is the Dry Port; this might be a way in reducing the congestion problems. The Myanmar government proposed eight potential sites for the dry port and currently two dry ports; Ywa Thargyi in Yangon and Myitnge in Mandalay were chosen and started operation recently in 2018. However, there are many requirements for the efficient operation of the dry port.

Although there is much research and resources that can tackle the initiative for the implementation of a dry port such as choosing a suitable dry port location in Myanmar

and the critical evolution of Mandalay dry port, this research will concentrates on the development of dry ports in Myanmar by reviewing the examples of successful dry ports implementations and developments around the world in both developing and developed countries, with the belief that efficient dry port development could solve the current severe congestion problems occurring in Myanmar Container Ports efficiently and effectively, finally by facilitating the trade flow in Myanmar by giving some recommendations and best practices.

1.3 Research objectives

The research questions of this research are as follows.

1: What are the current roles of Myanmar dry ports and the impediments/challenges for the further development of Myanmar Dry Ports?

2. What are the possible recommendations for Myanmar Dry Ports operations and development?

Depending on these research questions, the achieved research objectives are as follows.

1. To review the current operations and management of Myanmar container ports system: dry ports, container seaports, multimodal transport and freight corridors,
2. To examine the opportunities and challenges that Myanmar Dry Ports are facing,
3. To recommend the best practice for the further development of dry ports in Myanmar by reviewing the previous selected successful dry ports all over the world.

1.4 Research Design

The research is designed in a way to improve the dry port efficiency in Myanmar by analyzing the challenges faced by Myanmar dry ports and the factors influencing the dry port implementation (Regulation, Land Use, Environmental and Infrastructure) as well as giving recommendations for the further improvement by reviewing the previous examples of case studies all over the world. Starting from the industrial literature review in Chapter (2) on Myanmar Ports and container terminals by analyzing and identifying the current bottlenecks encountered by the container transport between the seaports and hinterland destinations in Myanmar. This is followed by the conceptual literature review in Chapter (3) on the dry port concept with benefits of their implementation for involved actors in the transport chain as well as seaports operations with some examples of dry ports in practice. Chapter (4) is about the research methodology and Chapter (5) is about reviewing the dry port implementations around the world in order to learn the best practice. In Chapter (6), the Myanmar dry ports implementation is analyzed and their challenges and strengths are identified. In Chapter (7), the lessons learned by reviewing the dry ports from developed and developing countries' dry port implementations are identified in order to give recommendation for implications in Myanmar dry ports. Finally, the conclusion in Chapter (8) expresses some limitation, being considered in the dissertation for the development of dry ports in Myanmar to overcome existing congestion problems that the Myanmar Container Ports have been facing.

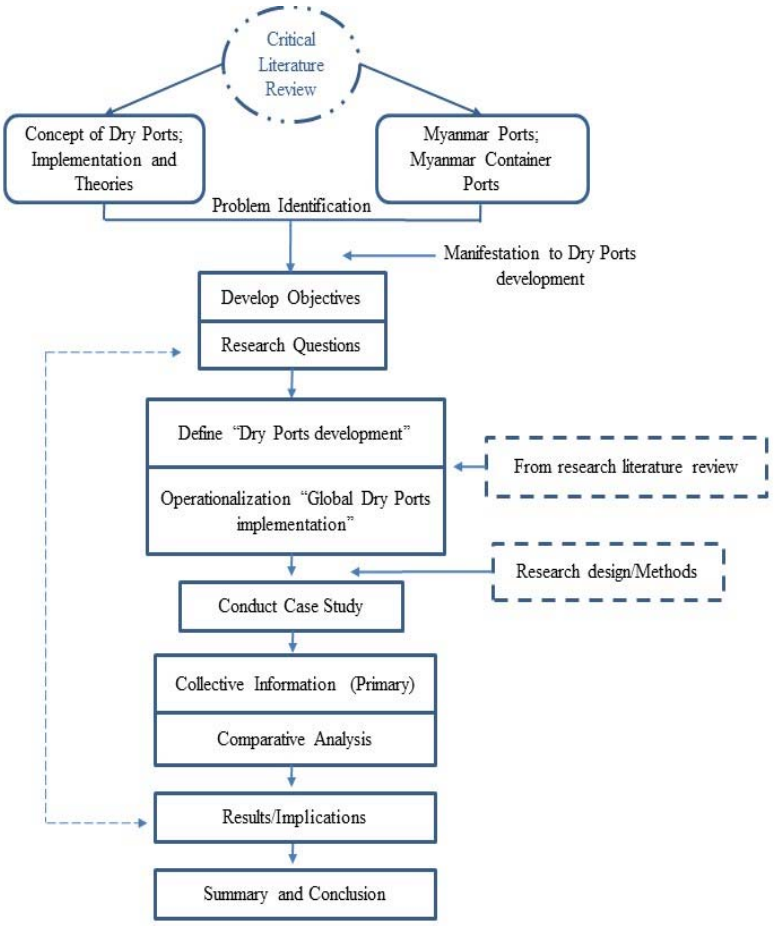


Figure 5:Research Diagram

Chapter 2. Review on Myanmar Ports

2.1 Myanmar Ports in General

Myanmar has a coastal line of over 2000 km which is one-third of the country's total perimeter, stretching along the Bay of Bengal and the Andaman Sea (Uranza, Ahn, & Kim, 2017). Along the coastal line, Myanmar has nine ports in total, supplying mainly its coastal and seaborne trade (DMA, 2018), four of these can handle international transport; Yangon, Pathein, Sittwe and Mawlamyine (Rasmus, 2013).

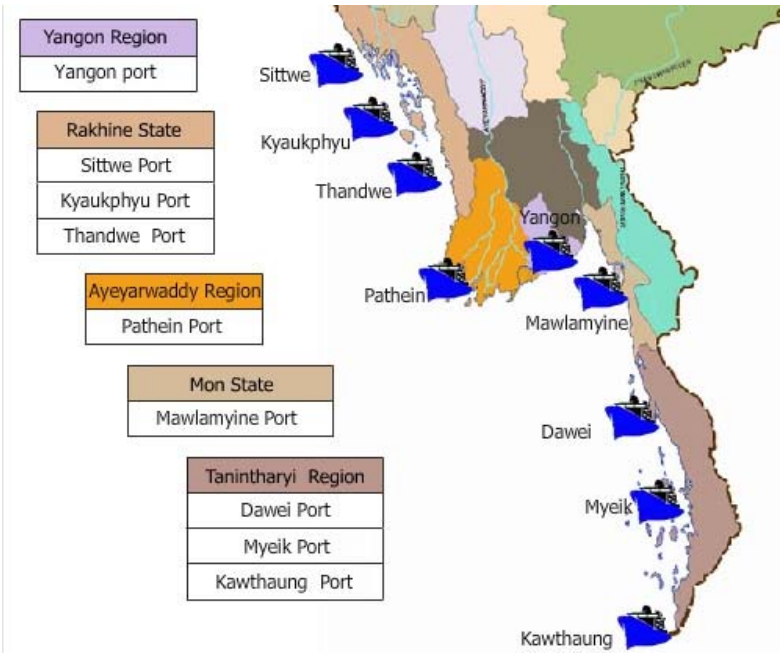


Figure 6:Myanmar Ports (Uranza, Ahn, & Kim, 2017)

Yangon Port

Yangon port is the premier port of Myanmar, handling about 90 percent of the country's imports and exports (MPA, 2018). Yangon port can be separated into two port areas; Main Port (Yangon Inner Harbor) and Thilawa port area (Thein & YANG, 2019). The Main Port is located at Latitude 16' 47" N and Longitude 96' 15" E which

is about 32 km inward from Elephant Point on the Gulf of Martaban where the Yangon River mouth (MPA, 2018) and Thilawa port area is located just half way between the Yangon river mouth and Yangon port (Thein & YANG, 2019).

The pilot station is located 32 km away from elephant point and from that station; pilotage is compulsory for all vessels calling at Yangon Port if it is over 200 GRT. Because of the nature of river port, navigation for all vessels calling at Yangon port and Thilawa Port is normally on flood tides and has to wait for the high tide to cross the inner bar and outer bar with sufficient water depth since the tidal range on average is about 19.3 feet (5.85 m) at spring tide and 8.4 feet (2.55 m) at neap tide. According to the accessible vessel information notice officially, Yangon Port can accept vessels of a maximum LOA 167 m, 9 m Draft and 15,000 DWT while Thilawa Port can accept up to 200 m LOA, 9 m Draft and 20,000 DWT (MPA, 2018).

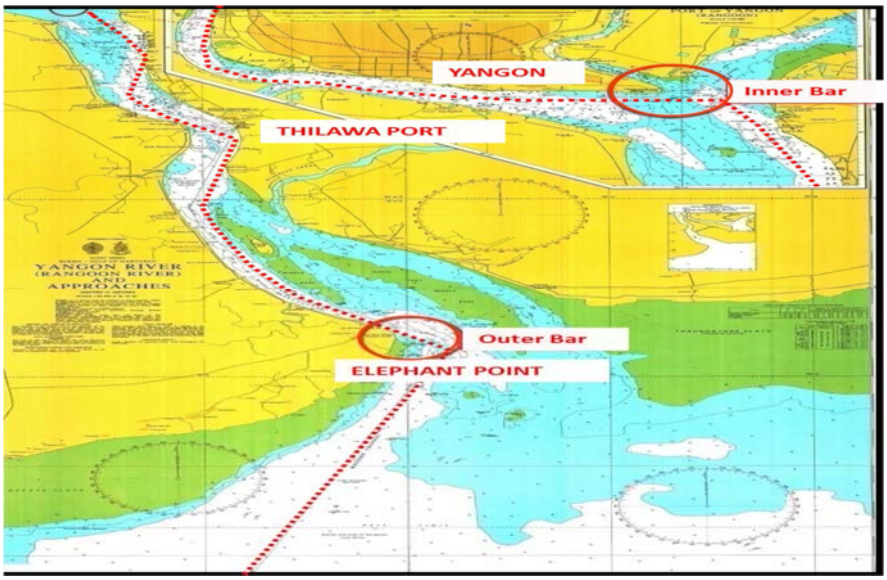


Figure 7:Yangon River Estuary and its approached channel (Thein & YANG, 2019)

Currently, there are 36 berths in Yangon port including the Thilawa port area where sea-going vessels can be berthed. Twenty-six of these are at Yangon inner harbor while ten of these, at Thilawa port area. At present, 70 percent of the total quay lengths of

port are private terminals owned by foreign and national investors (MPA, 2018). (Data from MPA)

Yangon Inner Harbor

Table 1:Yangon Inner Harbor Terminals and their specifications (JICA, 2019)

No.	Yangon Inner Harbor	Cargo Type	Length (m)	Draft (m)	Burth Numbers	Max. DWT	Current Situation
1	Hteedan Port Terminal (Phase 1)	GC, CTNR	366	9.0	1	15,000	Operation
	Hteedan Port Terminal (Phase 2)	GC, CTNR	69	9.0	1	15,000	Operation
			181	9.0			Under Planning
2	Asia World Port TML No.1 Wharf	GC, CTNR	198	9.0	1	15,000	Operation
	Asia World Port TML No.2 Wharf	GC, CTNR	156	9.0	1	15,000	Operation
	Asia World Port TML No.3 Wharf	GC, CTNR	260	9.0	1	15,000	Operation
	Asia World Port TML No.4 Wharf	GC, CTNR	238	9.0	1	15,000	Under Planning
3	Ahlone International Port TML (1)	GC, CTNR	600	9.0	3	15,000	Operation
4	Myanmar Industrial Port	CTNR	310	9.0	5	15,000	Operation
	Myanmar Industrial Port (Phase 1)	CTNR	450	9.0		15,000	Operation
	Myanmar Industrial Port (Phase 2)	CTNR	1,000	9.0	5	15,000	Under Planning
5	Myanmar Sule Terminal	GC, CTNR	545	9.0	4	15,000	Operation
6	Sule Pagoda Terminal No.5	GC, CTNR	168	9.0	1	15,000	Operation
	Sule Pagoda Terminal No.6	GC, CTNR	162	9.0	1	15,000	Operation
	Sule Pagoda Terminal No.7	GC, CTNR	148	9.0	1	15,000	Operation
7	The Myanmar Terminal	GC, CTNR	457	9.0	3	15,000	Operation

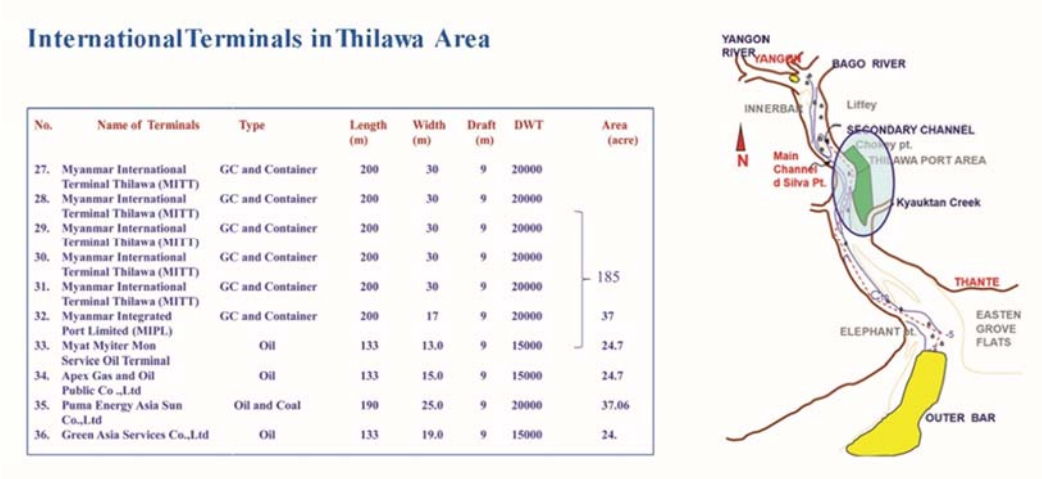
Note: GC stands for 'general cargo' and CTNR 'container'

As shown in Table (1), ports and terminals located in the Yangon inner harbor area are Sule Pagoda Wharves, Bo Aung Kyaw Street Wharves, Asia World Port Terminal, Myanmar Industrial Port (MIP), Hteedan Oil Berth (HOB), Hteedan Port Terminal, Ahlone Int'l Port Terminal, Myanmar Naing Group Oil Terminal, Htoo Trading Terminal and Yu Za Na Terminal (MPA, 2018).

Thilawa Port Area

Since 1998, cargo throughput has considerably increased because of the maritime trade growth under the market oriented policy allowing investments of foreign and local private investors in the country's economy and the optimal capacity limit of Yangon port reached and Thilawa area has been allocated for expansion of port (MPA, 2018).

Table 2:Terminals in Thilawa Area and their specifications (JICA, 2019)

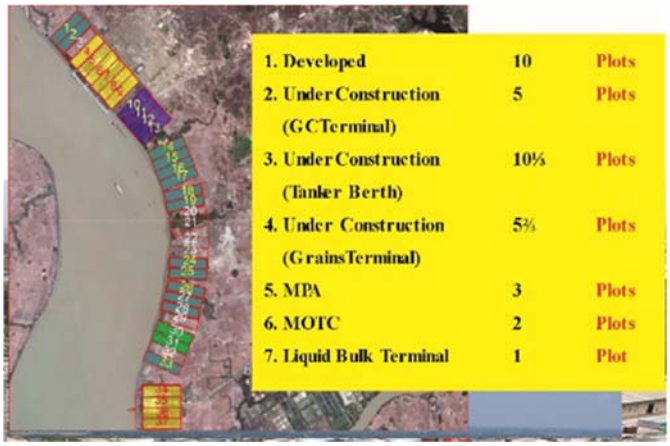


International Terminals in Thilawa Area

No.	Name of Terminals	Type	Length (m)	Width (m)	Draft (m)	DWT	Area (acre)
27.	Myanmar International Terminal Thilawa (MITT)	GC and Container	200	30	9	20000	
28.	Myanmar International Terminal Thilawa (MITT)	GC and Container	200	30	9	20000	
29.	Myanmar International Terminal Thilawa (MITT)	GC and Container	200	30	9	20000	
30.	Myanmar International Terminal Thilawa (MITT)	GC and Container	200	30	9	20000	
31.	Myanmar International Terminal Thilawa (MITT)	GC and Container	200	30	9	20000	185
32.	Myanmar Integrated Port Limited (MIPL)	GC and Container	200	17	9	20000	37
33.	Myat Myiter Mon Service Oil Terminal	Oil	133	13.0	9	15000	24.7
34.	Apex Gas and Oil Public Co .,Ltd	Oil	133	15.0	9	15000	24.7
35.	Puma Energy Asia Sun Co.,Ltd	Oil and Coal	190	25.0	9	20000	37.06
36.	Green Asia Services Co.,Ltd	Oil	133	19.0	9	15000	24.

The remaining 36 ports are located in the Thilawa area and are Myanmar Int'l Terminals Thilawa, Myanmar Integrated Port Ltd, Myat Myiter Mon Oil, Apex Gas & Oil Terminal, Puma Energy Terminal, Green Asia Oil Terminal (MPA, 2018).

The waterfront land area of 37 plots, each of which has 15 hectares with uniform quay length of 200 m and 750 m land ward, were allocated for developing of port. Figure (8) shows the recent development of the commercial port which was implemented in terms of JV and BOT by foreign investors in the Thilawa area (MPA, 2018).



1. Developed	10	Plots
2. Under Construction (GC Terminal)	5	Plots
3. Under Construction (Tanker Berth)	10½	Plots
4. Under Construction (Grains Terminal)	5½	Plots
5. MPA	3	Plots
6. MOTC	2	Plots
7. Liquid Bulk Terminal	1	Plot

Figure 8:Recent development of commercial port in Thilawa Area (MPA, 2018)

All ports in Myanmar are under the administration of MPA (Myanma Port Authority) and are managed by the Ministry of Transport and Communications (DMA, 2018).

2.2 Myanmar Container Ports

In Myanmar, the main ports or terminals which mainly handle containers are Myanmar Industrial Port, Asia World Port Terminal and Myanmar International Terminal, Thilawa. According to the Statistics of MPA, the tonnage of cargo and container throughput handled and number of vessels calling have been increasing in every year (MPA, 2018) and the volumes of containers handled by Yangon Port from only the container handling ports are given in Table (3) (JICA, 2019) and Figure (9) (Thein & YANG, 2019, March).

Table 3:Container Volume in Yangon Port including Thilawa Port Area (JICA, 2019)

unit:TEU

Name of Terminal		2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Asia World Port Terminal (AWPT)	Import	144,520	107,308	110,562	93,144	98,166	110,214
	Export	134,421	101,619	102,940	84,846	84,007	106,240
	Total	278,941	208,927	213,502	177,990	182,173	216,454
Hteedan Terminal (HPT)	Import	0	51,069	88,650	127,576	117,218	108,961
	Export	0	49,471	80,501	127,750	104,712	105,850
	Total	0	100,540	169,151	255,326	221,930	214,811
Ahlone International Port Terminal (AIPT)	Import	—	—	—	—	3,465	23,008
	Export	—	—	—	—	2,437	29,781
	Total	—	—	—	—	5,902	52,789
Myanmar Industrial Port Terminal (MIP)	Import	46,731	70,500	97,027	131,654	205,550	176,456
	Export	49,373	75,037	98,613	132,977	199,450	193,538
	Total	96,104	145,537	195,640	264,631	405,000	369,994
Bo Aung Kyaw Terminal (BSW)	Import	14,854	2,850	8,958	14,893	7,684	15,220
	Export	15,669	3,244	11,497	13,589	8,395	17,769
	Total	30,523	6,094	20,455	28,482	16,079	32,989
Myanmar International Terminals Thilawa (MITT)	Import	1,435	7,110	5,625	9,815	22,048	84,907
	Export	1,040	9,755	7,796	8,649	28,980	84,907
	Total	2,475	16,865	13,421	18,464	51,028	169,814
Total	Import	207,540	238,837	310,822	377,082	454,131	518,766
	Export	200,503	239,126	301,347	367,811	427,981	538,085
	Total	408,043	477,963	612,169	744,893	882,112	1,056,851

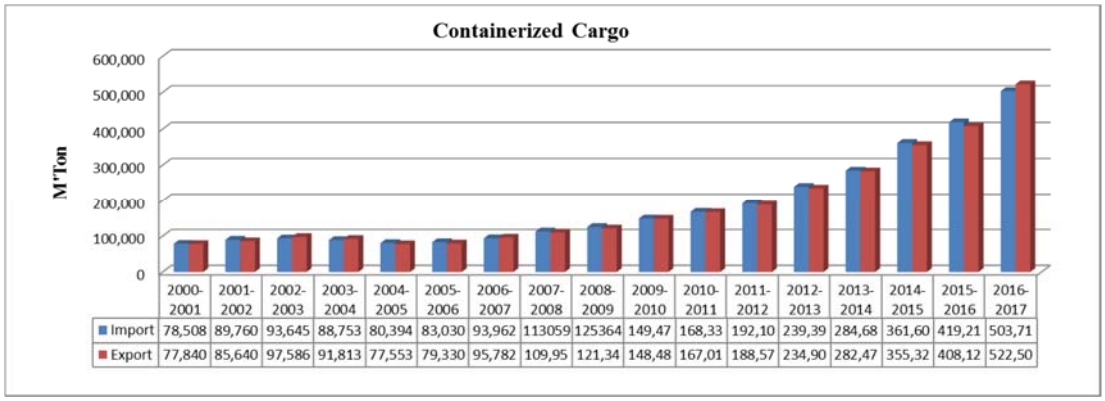


Figure 9:Containerized Cargo Volume (Yangon Port) (2000-2017) (Thein & YANG, 2019, March)

Japan International Cooperation Agency (JICA) assessed the container forecast by using the GDP growth data from International Monetary Fund (IMF)and established two scenarios; low case and high case for Myanmar. It was forecasted to increase continuously in both cases as shown in table (4) which accounted for both the GDP/capita and TEU/capita (OOSTERWEGEL, 2018, June).

Table 4:Forecast of Container Throughput by JICA for whole Myanmar (TEU/year) (OOSTERWEGEL, 2018)

Case	2011	2015	2020	2025	2030
High case	335.000	892.000	1.986.000	4.014.000	8.100.000
Low case	335.000	853.000	1.700.000	3.064.000	5.500.000

2.3 Congestion as a Main Problem

Dwelling Time of Container in yard

Table 5:Current Container Dwelling Time in Yard (JICA, 2019)

Type of Container		Average Dwelling Time	
		Targeted Dwelling Time	Present Dwelling Time
Import	Full Container	8	8～10
	Empty Container	14	14～15
Export	Full Container	7	7～9
	Empty Container	14	14～15
Reefer Container		4	4～7

At present, container dwelling time of terminals is extremely lengthy at the Yangon and Thilawa port areas. For example, in the Asia World Port Terminal, it takes 8 to 10 days of dwelling time on average for import containers while export containers take 7 days. In Myanmar International Terminal Thilawa, the mean dwelling time is 11 days for the total import and export (JICA, 2019).

Due to these lengthy container dwelling times, the container handling rate cannot catch up with the rapid emergence of the demand and leads to the port's congestion. Although the logistics service providers have reported typically long custom clearance times of 10 days the cause of lengthy dwelling time, limited port capacity, extensive pre-customs clearance processes in order to get required compliance and permit and inadequate equipment are also contributing to that problem (World Bank Group, 2016).

In Myanmar, the regular customs procedure for import containers consists of five stages and the major issue in the custom procedure is the existence of two different authorities in the same custom department: port customs and head office in Yangon, each exercise independent authority based on the conditions and circumstances. The head office makes the screening of documents and evaluation of import tax while the port custom executes the checking of documents and cargo inspection. Due to those kinds of double checking of documents, it takes a long time for the custom clearance

mainly in port, hampering seriously the logistics process in ports and making Myanmar custom procedures not to meet International standards (JICA, 2019).

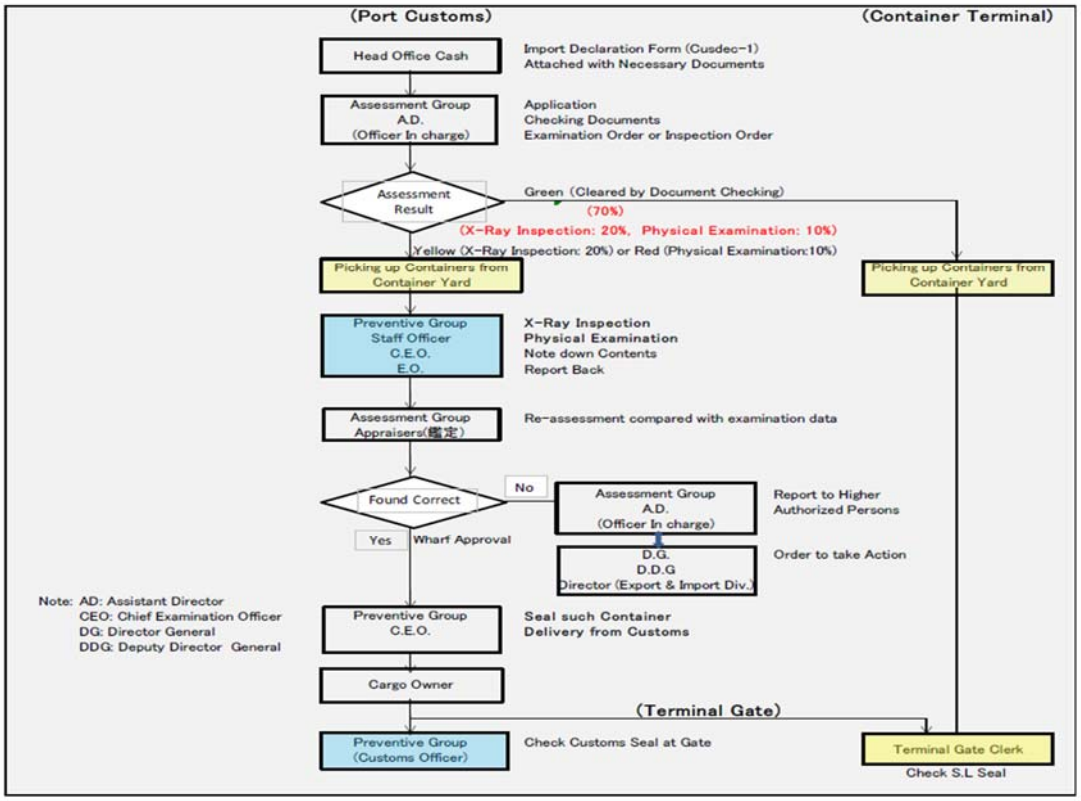


Figure 10:Inspection Process for Import Container (Current Process) (JICA, 2019)

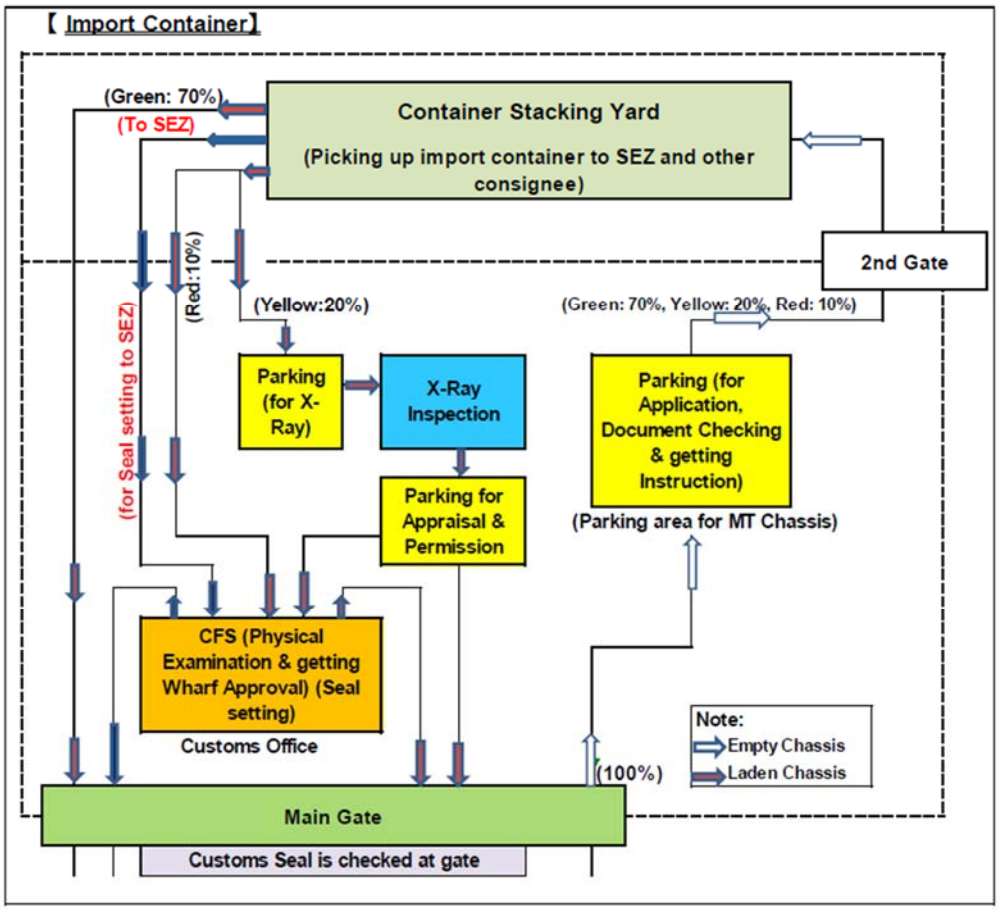


Figure 11:Truck & Container Flow Chart for Customs Inspection (Import Container) (JICA, 2019)

In the process of Container Freight Station (CFS) (port) custom inspection, three categories are included; green, yellow and red, which the importer is instructed to follow. Green category means the cargoes are cleared only by document assessment. For Yellow one, X-ray inspection is needed in addition to document assessment. The Red category needs inspection by physical examination at the CFS by physical examination and document assessment. Currently, over 30% of import containers are in the Red category and the Myanmar customs is trying to reduce this proportion to 10% by the Myanmar Automated Cargo Clearance System (MACCS) which started to operate in 2016. The expected categories' proportions for import containers in the near future are Green 70%, Yellow 20% and Red 10%. The customs procedures for import container cargo are shown in Figure (10) (JICA, 2019). The importer then can proceed

to the next step after the procedures in each category. However, for the import containers related to Thilawa SEZ, bonded transportation can be applied by the cargo owner and custom seals are set by CFS (Port) custom on the container door. Therefore, cargo inspection is exempted from the port customs. Truck Flows within the terminal during the custom inspections, including the X-ray inspections, terminal gate, physical examination in CFS and truck parking areas arranged by the importers are illustrated in Figure (11) (JICA, 2019).

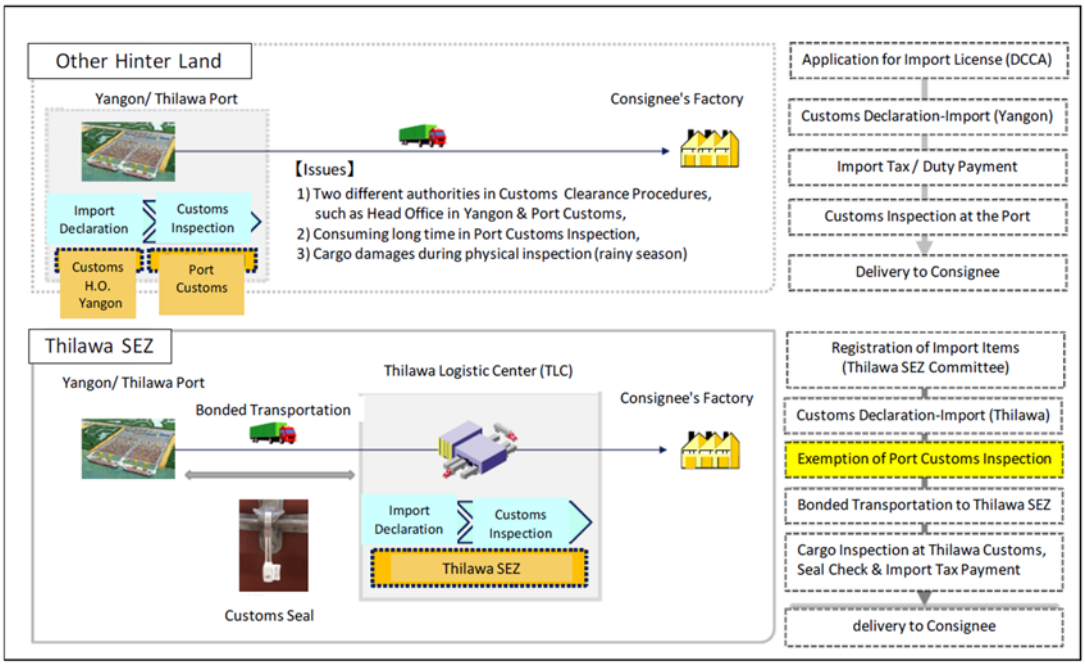


Figure 12:Comparison of Import Cargo Flow between Thilawa port and Thilawa SEZ and between the City Terminals and respective other Hinterland Area (JICA, 2019)

Figure (12) compares the logistics and customs procedures flow of import container cargos between city terminals and their hinterland industrial zones and Thilawa port and Thilawa SEZ (JICA, 2019).

Custom Inspection procedures for Export container cargoes

In the port custom procedure for export container cargos, the same three categories are included as in the import procedures. Currently, around 90 percent are under the

Yellow category while 10 percent are under either the Green or Red Categories. After finishing the processes of each category, CFS customs sealed containers are sent to the stacking yard area. The seal is then checked again by the custom when loading. The detailed procedures of export inspection at the terminals are shown in Figure (13) (JICA, 2019).

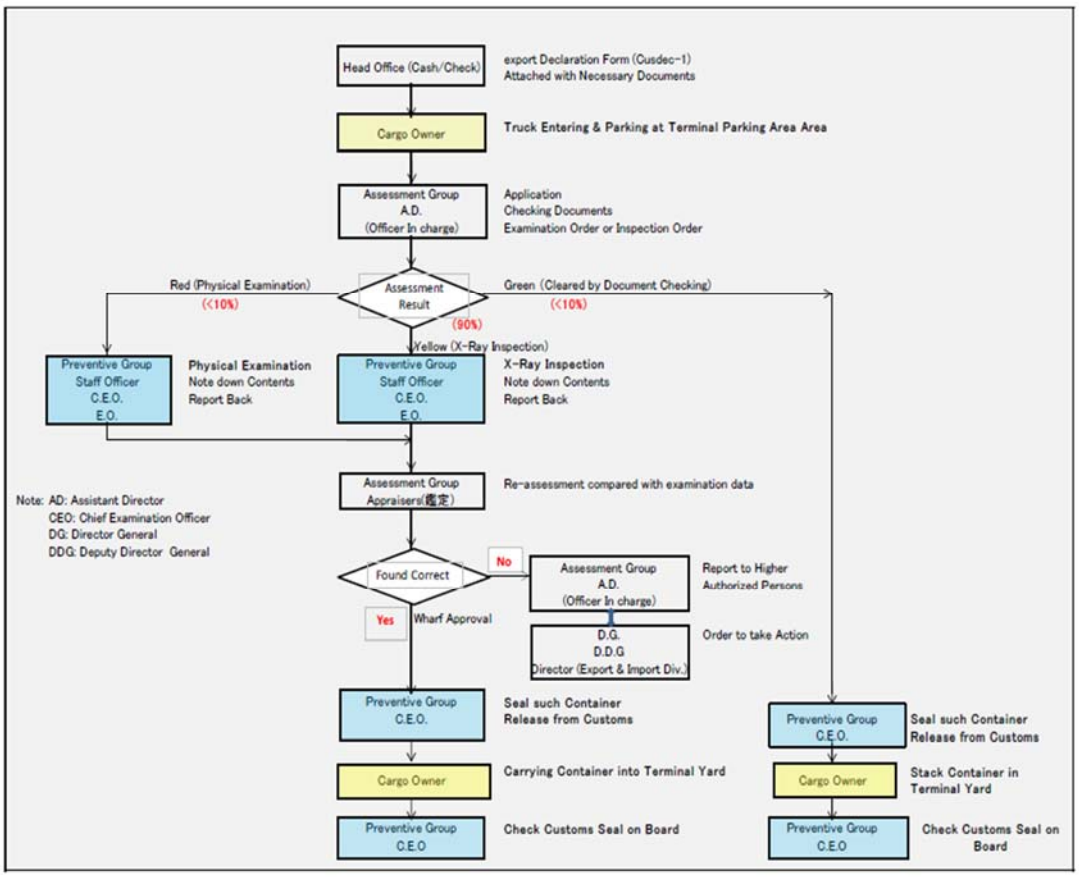


Figure 13:Inspection Process for Export Container (Current Process) (JICA, 2019).

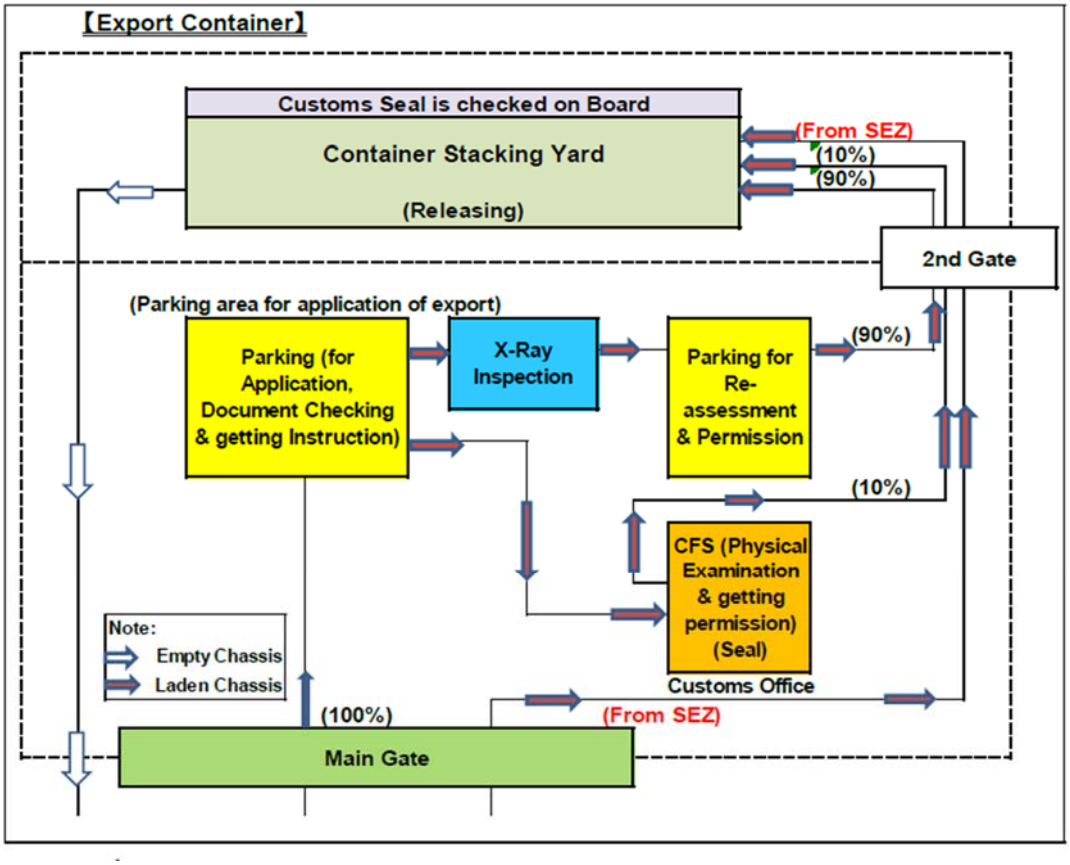


Figure 14:Truck & Container Flow Chart for Customs Inspection (Export Container) (JICA, 2019).

Truck flows for export container customs inspection in the terminal are illustrated in Figure (14).

Furthermore, the lack of handling ability of less-than-a-container-load (LCL) shipments also drives the port congested problem. Currently, despite several shipments are being encouraged to clear at once, the importers who share a container with multiple shipments can make a clearance of their cargo at any time as they desire. For those LCL containers, the port has to fetch the container from the yard location to the CFS in order to clear the cargo and to take out the shipment by the importer. Then, the port operator has to close the container again with an ordinary lock and bring it back to the original location yard. This causes the operation not only to be inefficient, but also the handling cost to be accumulated and breaches the Custom integrity; this means

no recourse is accepted for removing cargo without clearance after the clearance of first shipment has been made (World Bank Group, 2016).

Another main cause of the port congestion problem for the container ports in Myanmar is the road traffic. In Yangon Main Port, locations of container terminals in the downtown area with limited narrow space where the city functions interfere the terminals (port function) creates the traffic congestions. On the other hand, the road traffic, generated by the five container terminals in the Yangon Main port area, spreads over the narrow port land areas enhancing the severe road congestion. For those severe road congestions, although the Thilawa area was supposed to be an option for the relocation of container terminals, all of the plots (37 plots) have already been allocated to private operators by BOT contracts except plots 22 to26 where MPA is the owner. Therefore, Thilawa area has no extra space for Yangon Main Port's container terminals relocation (JICA, 2019).

In addition, using the ports as a warehouse by the importers, results in the increase in space constraints for the port. Since the importers have no space for their cargo or container storage with their own facilities, and the generous port demurrage policy of 7 days free and the cheap storage price of container ports makes the importers to keep their cargoes in the port premises as long as possible (World Bank Group, 2016). In Myanmar, long time storage in the seaport terminals is very common with some containers having more than 365 days, compared to the standard period of 7 days free for empty containers and 3 days free for fully container loads.

Another reason is the empty container issue because of the trade imbalance. In Myanmar, imports are four times higher than exports and the majority of export containers are empty containers (MIP, 2018). Moreover, the lack of sufficient hinterland connectivity and the lack of port infrastructure development also lead Myanmar container ports to be congested (UNESCAP, 2018). For the increase container throughput, Myanmar does not have enough infrastructures, especially transport infrastructure such as rails and roads and storage areas which result in the

congestion problems (MIP, 2018). The lack of developed industrial roads or expressways in order to enable heavily loaded vehicle operations (container trucks) leads to traffic congestion (UNESCAP, 2018).

Chapter 3. Review of Dry Port Implementations

3.1 History of the Dry Port development

The increase of economic activity with population growth made an increase in maritime container transport causing the land transport of freight to grow (Kovaca et al., 2008). Since inland intermodal terminals are major nodes in the network of transport, seaport inland access is becoming a critical aspect for an efficient transport chain which increases continuously in maritime containerized transport (Roso, 2007). Moreover, due to the rapid growth of container transport volume, the seaports today are facing a lack of space and increase congestion on the access routes within the hinterland. According to the findings of Parola and Sciomachen, 2005, the reason of the congested road traffic is the imbalance of transport modes since growth of the sea port flow causes the road flow to increase proportionally. The strategic solution would be railway implementation, or inland intermodal terminal improvements for seaports and one of the successful and feasible solutions is the Dry Port (Dadvar et al., 2011).

Furthermore, for the container ports, in order to facilitate the future evolution and the solution for the conflict between environmental considerations, capacity expansion and community restrictions, logistics functions and the continued embedding of freight transport is the dry port concept which is emerging in practice and in literature more often (Cullinane et al., 2012). Intermodal transport through dry ports which act as an advanced intermodal terminal enables the container transport chain with the most appropriate transport mode by combining the road flexibility and rail efficiency for inland access to and from seaports (Kovacs et al., 2008). Moreover, nowadays, seaports compete in the quality of inland access in addition to the tariffs and capability of transshipment. This also leads the seaports to focus on the inland transport links and on the region developing outside the immediate market and on the service demand in the traditional hinterland (Notteboom et al., 2004). (Roso, 2013) stated that seaport's foreland and hinterland are strongly interdependent particularly in intermodal transportation. The problems are arising because of the increase flow of containers is

best approached by joint perspectives by hinterland and seaport in a concept of well applied dry port by shifting the volumes of freight from roads to more energy efficient modes with less environmental impact, relieving the congestions of the seaport cities, and more efficient goods handling in the seaports by facilitating the logistics solutions in the hinterland of port for the shippers (Roso, 2013).

3.2 Concepts of the Dry Port and its definitions

Behind the dry port concept, the basic idea is the seaport's interface movement with the shift of the container flow from road to rail to reduce road transport from the seaport. Different terms are used in characterizing dry port facilities such as inland ports, inland logistics centers, inland freight villages, inland terminals, inland hubs, inland container depots, inland clearance depots and intermodal freight centers (Roso, 2013).

Woxenius et al., (2004) defined that "the dry port concept is based on a seaport connected directly by rail with inland intermodal terminals and the shippers can collect and or leave their goods in intermodal loading units (ILU) as if directly at the seaport". The dry port can act as the inland extended gate of the seaport and dry port implementation in the area of the seaport's immediate hinterland increasing the terminal capacity of the seaport as well as productivity by allowing bigger container ships to call at the seaport (Roso, 2007).

An intermodal road-rail terminal can also be defined simply as a place which is prepared for the storage of ILUs and for the transshipment between road and rail transport. Transshipment between different traffic modes is the major characteristic activity for intermodal terminal classification even though it can be classified as basic functions like transport modes and geographical location.

Furthermore, due to the need to connect seaports with inland conurbations, a specific class of terminals has developed by the transport industry with different names

according to the offered services and the different roles. However, from the legal view, the provision of custom services is of particular importance (Roso et al., 2004).

Hanappe (1986) has defined dry port as "multifunctional logistics center where various firms are operated which resembles to the freight villages concept of European commission (2001), in which neither the connection to the seaports nor the services ranges at the terminals are not emphasized" (Roso et al., 2010).

However, according to the dry port survey in Africa by Beresford and Dubey (1990), the dry port definition corresponds to the Inland Clearance Depot definition of the United Nations Economic Commission for Europe (UN ECE) (1998), which regards specifically to the service and ownership, particularly custom clearance without connection type specification to a seaport. Further, they highlight the dry port as a common user facility, promoting goods transfer from origin to destination by neglecting the intermediate examination of customs, namely, through the transport concept (Roso et al., 2010).

In 1998, the UN ECE defined the dry port as an Inland Clearance Depot (ICD) which is a common user inland facility with the status of public authority, equipped with fixed installation, offering handling services and temporary storage of all kinds of goods as well as container carried by any applicable inland transport mode under custom transit, placed under customs control where customs and other competent agencies for clearance of goods for warehousing, home use, re-export, temporary admission and temporary storage for export and transit. Therefore, the function matches a classic free port and it is also mentioned by UN ECE that the definition applies to synonyms such as Inland Clearance Terminal and Dry Port.

In 1993, India introduced Inland Container Depots(ICDs) and the above mentioned Inland Clearance Depot definition of UN ECE is based on the Indian Customs (2004). However, the definition restricts it to containers and India also uses CFS to strip and stuff the containers. The function of CFS might be added to ICD since CFS collects

the individual consignment into the container while ICD acts as the consolidation node which is normally located outside the port towns (Woxenius et al., 2004).

Europe has been focusing on the business areas with various logistics services and Cardebring et al., (1995) explained an Intermodal Freight Centre as an economically independent companies' concentration, supplying freight transport and services in a designated area and the place where the transshipment of ILUs between different transport modes can be made. Further, the European Commission, (2001) finally defined a dry port as an inland terminal directly connected to a maritime port. Based on the broad meaning of this definition, the notion of dry port might be used by the above mentioned facilities because of their links to seaports (Woxenius et al., 2004).

A more precise and operational dry port concept is therefore, defined by Leveque and Roso (2001), that "a dry port is an inland intermodal terminal which is connected directly to seaport(s) by transport mean(s) with high capacity where customers can pick up or leave their standardized units as if directly to a seaport" (Woxenius et al., 2004). Roso et al., (2009) again modified the dry port definition by specifying the high capacity traffic modes with the preferable one as rail in the previous definition.

According to Slack, (1999), four essential functions at freight terminals are the transfer of cargo between two modes, transshipment; freight assembly in preparing for transfer; freight storage awaiting pickup; and delivery and logistical control of flows. Services like container maintenance, custom clearance and other value added services could be made at a dry port corresponding to the need of customers (Roso et al., 2009). Moreover, the terminal performance is determined in the quality of the access to a dry port and the quality of the rail/road/waterway interface. Therefore, reliable, scheduled and high capacity means of transport, to and from the sea port, is essential. However, the inland access quality depends on the various actors' behaviors who are involved in the transport chain such as transport operators, terminal operators, freight forwarders, and port (Roso et al., 2013). In addition to the reliable and scheduled connections of rail, security at the dry port is also critical in the seamless seaport inland access

particularly if to perform custom clearance. Furthermore, the International Ship and Port Facility Security (ISPS) Code implementation contains the changes in port area's security physical design and adjoining facility as well, but it also needs to change the general activities of the port (Roso et al., 2010).

Therefore, in order to improve the situation caused by the increase of container flow, dry ports are much more consciously used than inland terminals, and the security and control is focused by using information and communication systems (Roso, 2009).

3.3 Benefits of Dry Ports implementation

Types of Dry Ports and their Benefits

Generally, dry port implementation benefits in reducing the congestion of seaports by improving the access of a seaport inland and finally, in increasing the seaport productivity. Roso stated that emission of Carbon Dioxide (CO_2) should decrease with the reduction of congestion both seaport terminals and seaport city roads and the road accidents risk should be reduced with the help of dry port implementation. Moreover, the dry port concept gives the seaports a possibility of throughput increase by extending the seaport gates inland, without site expansion physically. However, seaports are not generally involved in their hinterland connections development if they are not exposed by congestion or competition (Roso, 2013).

Furthermore, with the dry port implementation, it could create a smooth flow of transport with one interface in the dry port concept form regardless of two; one at the seaport while another one at the inland destination as illustrated in Figure (15) (Roso et al., 2009). Nevertheless, all the involved actors are required to coordinate in order to create effective seaport inland access (Van der Horst and De Langen, 2008).

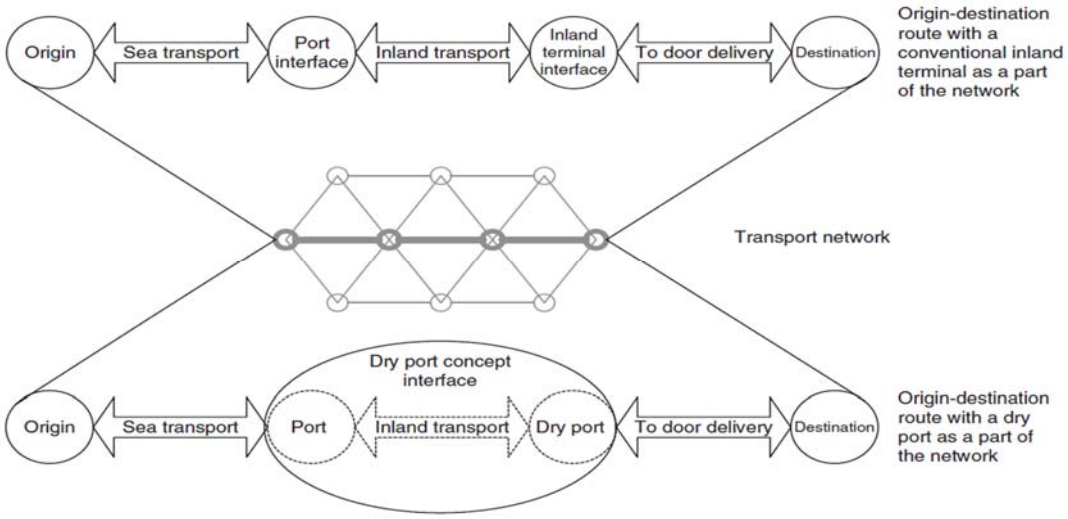


Figure 15:Dry port concept with and without a dry port illustrated on a transport network (Roso et al., 2009).

According to Roso et al., (2009), dry ports can be classified into close, midrange and distant dry ports based on their location and function, by highlighting on the intermodal transport promotion and environmental benefits. Close dry ports are located relatively near the seaport in the hinterland (Roso et al., 2010) while mid-range dry ports are generally covered by road transport (Roso et al., 2009).

Distant Dry Port

The distant dry port has the longest history and is the most conventional one, the main reason of which is to make rail or barges viable from the perspective of strict cost by the distance and flow size. This, so that intermodal terminal fixed costs can be shared among more transshipment by adding dry port flows. Figure 19 shows the implementation of distant dry ports in a seaport.

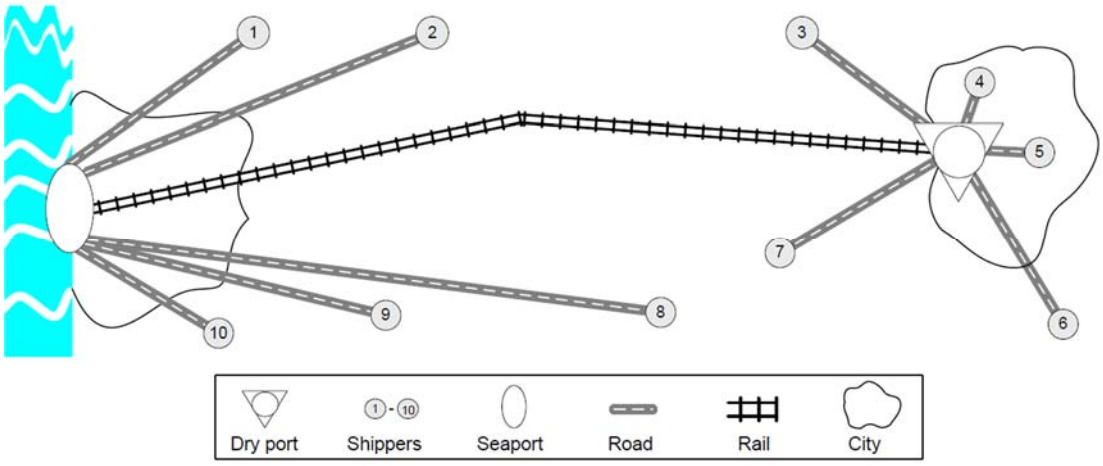


Figure 16:A distant dry port implementation in a seaport

Figure (16) shows the distant dry port, and the shippers around the dry port; 3, 7 and 6 can be served by the dry port and can increase the rail competitiveness over road by the more structured approach. A wider hinterland, being secured to offer high quality services with low cost to shippers, is the main reason of engaging a distant dry port by the seaport. One of another benefit is that since a train can be substituted by 100 lorries in the United States (US) and about 40 in Europe, that modal shift to rail from road can reduce congestion not only at the seaport, but also in the surrounding areas resulting in the reduction of external environmental impacts along its route. This can bring benefits for the environmentally conscious shippers who want to decrease environmental impacts of their products and less congestion leaves the valuable seaport and surrounding city to use for other purposes.

Since the aim is to move container flow from road to rail, the road operators are not benefiting directly even though they still involve in the chain of intermodal transport. However, since shorter waiting time at the seaport gate due to congestion reduction, they can get a better total revenue with shorter hauls. On the other hand, rail operators mainly benefit by distant dry port due to increase in their role in the transport chain. With the train transport, the economies of scale can also be a benefit and can make continental services (Woxenius et al., 2004).

Mid-Range Dry Ports

A mid-range dry port is normally covered by road transport as mentioned in Figure 17.

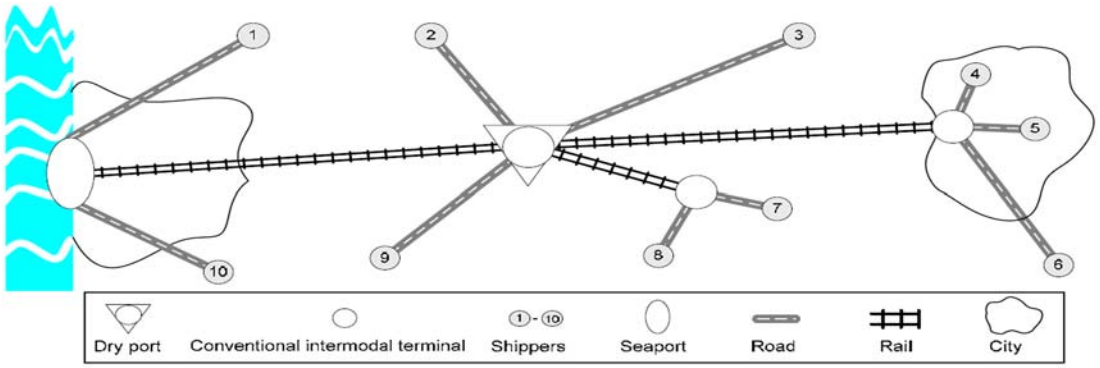


Figure 17:A mid-range dry port implementation in a seaport

The mid-range dry port is equipped with technical equipment and administration for sea transport, and acts as a consolidation point for various rail services. For instance, for security, x-ray scanners and custom inspections are only needed to be installed in the dry port away from the seaport (Roso, 2009). The container loading from container vessels to dedicated trains can be facilitated by the high frequency due to consolidation flows with relatively short distances. Therefore, the dry port can help to relieve the stacking areas of the seaport by serving as a buffer. Other benefits are a bit similar to distant dry ports (Woxenius et al., 2004).

Close Dry Ports

Dry port implemented in the immediate hinterland of the seaport enables to increase the seaport's terminal capacity, and manages the space lacking problem or inappropriate inland access problem (Woxenius et al., 2004). The close dry port serves as a consolidation point of road transport to and from the shippers who are outside the city area and connect them with the seaport by offering a rail shuttle service from the dry port to the seaport, resulting in relieving port gates and city streets.

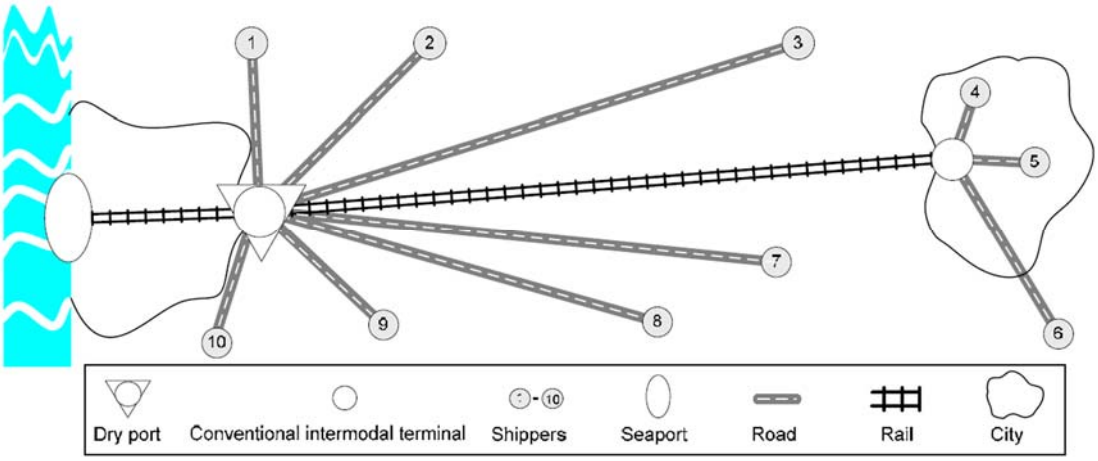


Figure 18:A close dry port implementation in a seaport

Based on Figure 18, the seaport only has rail transport to the dry port without any road connection between them and with other shippers as well. A close dry port offers greater possibilities of container buffering than other kinds of dry port by loading on rail shuttle in sequence to harmonize with loading to ship in the seaport. In this case, very reliable rail service is essential in order not to increase risk of dwell time for vessels and a dedicated track for shore distance is a prerequisite at the start. For the long run, direct transshipment can be implemented between trains and ships like in Hamburger Hafen and Logistik AG (HHLA) or rail-sea transshipment can be implemented only for full container terminals (full containers only) as in Ashar. Hence, road transporters might lose a market share marginally. However, they can benefit from the speedier operation with shorter waiting time at the dry port. Moreover, the close dry port is also an alternative way for the cities which do not allow long or polluting road vehicles by replacing them with less polluting ones or splitting the road vehicles up (Woxenius et al., 2004).

Table 6 shows the summary of the benefits got from different types of dry port implementation.

Table 6:Advantages of different types of dry port for the actors in the transport system (Roso, 2009).

	Distant	Midrange	Close
Seaports	Less congestion	Less congestion	Less congestion
	Expanded hinterland	Dedicated trains	Increased capacity
	Interface with hinterland	Depot	Depot
		Interface with hinterland	Direct loading ship-train
Seaport cities	Less road congestion	Less road congestion	Less road congestion
	Land use opportunities	Land use opportunities	Land use opportunities
Rail operators	Economies of scale	Day trains	Day trains
	Gain market share	Gain market share	Gain market share
Road operators	Less time in congested roads and terminals	Less time in congested roads and terminals	Less time in congested roads and terminals
			Avoiding environmental zones
Shippers	Improved seaport access	Improved seaport access	Improved seaport access
	"Environment marketing"	"Environment marketing"	
Society	Lower environmental impact	Lower environmental impact	Lower environmental impact
	Job opportunities	Job opportunities	Job opportunities

The concept of a fully implemented dry port

Figure 19 shows the comparison of the combination of three dry port types with the original one without a dry port implementation. The distant dry port is linked directly with the seaport. With mid-range and close dry ports, coordinated with ships by dedicated trains, act as the consolidation points which can be connected by a shuttle with the distant dry ports and the same principles can apply between mid-range and close dry port if the latter acts as a consolidation point.

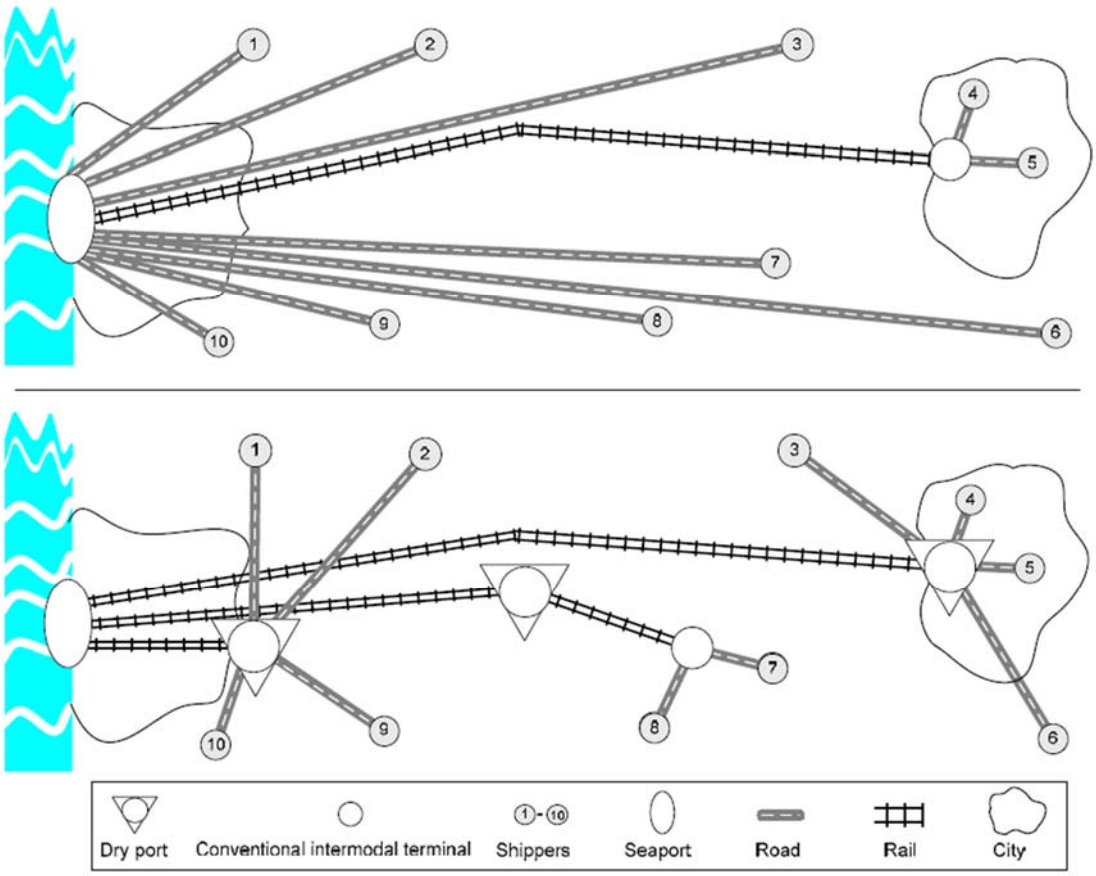


Figure 19:Comparison of conventional hinterland transport with an implemented dry port concept (Woxenius et al., 2004)

Nowadays, in the real world, several ports are introducing dry ports. Although their immediate reasons may be different, a mutual dominator is the role of rail transport as an intermediate mode between road and sea traffic modes. In implementation, costs and benefits must be evaluated and distributed carefully among the actors (Woxenius et al., 2004).

3.4 Dry Ports in Practice

Practical use of Distant Dry Port

Isaka Dry Port in Tanzania is one of the examples of a distant dry port which previously was the conventional intermodal terminal and later acquired Dry Port status

in 1999. All the customs documentation can be done at the Isaka dry port instead of the previous procedures in Dar es Salaam Port which is some 800 km away. Therefore, both shippers and importers can now accomplish all customs and port clearance at the dry port. Before the dry port, shippers had to make a port and custom clearance at the sea port (Dar es Salaam Port) and to send a container to the seaport, it took one week where now it takes only two days. The dry port also connects to Rwanda and the North Eastern Democratic Republic of Congo by providing a convenient interface. Moreover, it is very beneficial due to the increase in container exchange with neighboring land-locked countries like Burundi and Rwanda (Woxenius et al., 2004).

Practical use of Mid-Range Dry Port

An example of the mid-range dry port is the Virginia Inland Port (VIP), located at Front Royal which is about 330 km away from Hampton Roads, providing full custom services for shippers and services as a "US customs designated port of entry". For the transport of containers to and from the Port of Virginia, the VIP dry port offers the interface between lorry and rail.

Another example served by barge (waterway transport) is the Edouard Herriot Port in Lyon which is 300km from the Port of Marseille and connected by both barge and rail shuttles between them in which the barge is more important. Moreover, it provides various services and hosts an office operated by the Port of Marseille. (Roso et al., 2004).

Practical uses of the Close Dry Port

The Alameda Corridor, which is 32 km long, connects the ports of Los Angeles (LA) and Long Beach to intermodal terminals near the city center of LA; it can be mentioned as a close dry pot example because previously, containers were trucked or used small degraded railway lines between the ports and terminals. After being run the tracks in a trench, 200 street-crossings were eliminated resulting in a significant reduction in the congestion, and speeding up container movement into more than doubled. Twenty

percent of the construction cost which is 2.4 billion USD, is carried by the port and the rail operators are supposed to pay it by user fees (Woxenius et al., 2004)

Chapter 4. Research Methodology

4.1 Introduction

In this chapter, the methodology used in this study will be discussed. A research methodology or strategy is a tool and techniques for the investigation of the nature of the research and the subject Walliman, (2011), whereas Remenyi et al., (1998) described it as: "..…. *indicates the logic of development of the process used to generate (create) theory that is procedural framework within which the research is conducted*". Moreover, Rajasekar et al., (2013, p. 5) expressed research methodology as "the procedures by which researchers go about their work of describing, explaining and predicting phenomena". In this study, the method used is mixing the qualitative in general and the case study as the main one.

4.2 Types of Methodology and Applied Methodology

The qualitative approach is a multifaceted research method which includes all typical examples of qualitative data of observation notes, interview transcripts, literary texts, and minutes of meetings, historical records, memos and recollections (Denzin &Lincoln, 2011). This approach relies on human interpretation and using in depth interviews for the purpose and enables to develop a holistic picture of the phenomenon in question by the authors (Gentles et al., 2015). Therefore, qualitative research is a form of social action that focuses on words rather than numbers, which makes sense of peoples' experiences on their day to day life (Walia, 2015).

In addition, Lancaster (2005: p.26) and Crowther, D., and Lancaster (2008: p.1) have noted that "the quantitative method espouses positivist approach and it usually adopt deductive method and the role of scholar is restricted to data collection and interpretation through objective approach and the research findings are observable and quantifiable." Moreover, (Rovai et al., 2014) described quantitative research is a deductive approach and researchers consider the world as being outside of themselves

and that there is "…an objective reality independent of any observations". Consequently, the quantitative approach based on statistical and theoretical data that is gathered demands that study designs are more structured, rigid, fixed and predetermined in their use on how accurate the data is and which data can be generalized by using it creatively and effectively.

However, when in-depth and holistic analysis is required, the case study is ideal. Feagin, Orum, & Sjoberg, (1991) and various investigators have used it, especially in the study of sociology, but also to increase its use in instruction. According to Yin, (1993), these are Explanatory: sometimes as a prelude for social research, Exploratory: used for casual investigation and Descriptive: which require to develop descriptive theory before the project starts. Later, Stake, (1995) added three more which are Intrinsic: if the researcher is interested in case, Instrumental: if more understanding is needed more than it is meant to observer and case study is used, and Collective: if the study of cases group is required. All of these can be applications of single or multiple cases.

Furthermore, case studies are analyses of multi perspectives that the researcher can consider relevant actors group and their interaction in addition to the perspective and voice of actors. The case study is also regarded as a triangulated strategy of research where there are six primary sources for the evidence of the research of the case study: documentation, interviews, archival records, direct observation, physical artifacts and participant observation (Yin, 1994).

It is not essential to use all resources, however, resources are important to be well established and reliable (Stake, 1995; Yin, 1994). In this research, the sources are documents. According to Tellis, (1997), the documents could be memoranda, letters, agendas, study reports, or any other items, added to the data base; validity is critical.

Although the approaches of the quantitative and qualitative are well established in case studies, the standards of quality differ and concern applicability, truth, neutrality and consistency; in this approach they are difficult to codify. Actually, the case studies'

first generation started around 1900 within anthropology's discipline, and it ended in the Chicago School of Sociology. After influencing the science philosophy by the logical positivism of the Second World War, quantitative and positivism methods were favored since they were considered as scientific while at the same time qualitative methods were criticized by the social scientists due to not being scientific. Then, the second generation emerged in the late 1960s with two types in it: the first methodology was the Grounded Theory of Glaser & Strauss, (1967) with the aim of making methods to explicit (Johansson, 2007).

If a case might be given and studied by an intrinsic interest, the researcher focuses only on the understanding and has no interest on his or her findings' generalization. The generalization of the finding is done via naturalistic generalization by the audiences. In this study, the alternative of the intrinsic which is purposefully or analytically selected case study, is a used case study, in which the case is selected purposely and has an interest in finding the generalization.

Generalizations are analytical in cases and are based on the reasoning and the three principles exist in reasoning: deductive principle, inductive principle and abductive; those three can be used by combining in generalization. The procedure of the deductive is alike to an experiment in which formulates a hypothesis and derives the testable consequences by making a deduction. Deduction is the way to prove something must be true. Therefore, it is a necessity for a conclusion to be true from a rule and a case. By the inductive theory generation or conceptualization, it can be concluded based on the facts in the case that if a rule is actually operative then in similar cases, probably it is operative.

Abduction is an unexpected fact facing and by applying some rule which might be already known or created intentionally for the occasion, resulting in posit a case that may be. Peirce indicated the two types of abduction. One is if a case is reconstructed or created by an abductive reasoning process such as historical clues or data, another one is operative in which generalizations are done with known or familiar cases and

are used and applied to the situation of an actual problem by appropriate comparisons and also known as naturalistic generalization (Stake 1995). Various generalizations are often combined in a case study (Johansson, 2007).

Here, naturalistic generalization is used by making comparative case study analysis because of the fact that Myanmar dry ports were just in the booming stage since the operation started recently in 2018 and the sufficient data could not be available to figure out the operationalization. Therefore, comparative case studies through literature reviews have been carried out so as to achieve the purpose. In addition, secondary sources were used such as reports, internal documents and web pages. Cases are chosen purposely from developing, rapid developing and developed countries, to be balance in order to see the differences of the implementations of dry ports so as to imitate the best practice for the development of the dry port, especially in the sustainability and environmental perspective.

The idea behind the study is, partially, to learn from the best and apply locally. Therefore, the research starts with a brief literature of the intermodal transport, intermodal terminal and the concept of dry port. Subsequently, case studies on the chosen dry ports around the world in developing and developed countries are described at first then analyzed and compared to each other the dry port implementation processes why the dry ports are successful or fail. Finally, the lessons learnt from the comparative analysis were concluded in order to imply for Myanmar dry ports with recommendations and suggestions.

Chapter 5. Examination of Dry Port Implementations in Selective Countries

5.1 Introduction

According to the United Nations Development Programme (UNDP), the country classification system is calculated by the Human Development Index (HDI) which is an index composing three indices: education, longetivity and income with recognition in other development aspects of personal security and political freedom. Based on this system, countries in the HDI distribution's top quartile are defined as developed countries, whereas the remaining countries are the developing countries (UNDP, 2013).

In making a sampling of the dry ports, purposive sampling was used. Purposive sampling can be applied to case studies, preliminary studies, cultural practice comparison, and when the population is not enough for random sampling. It is useful in both qualitative and quantitative research and the sample can be taken from previous studies' knowledge. Without free from bias, collected data by purposive sampling still is valid and more efficient than randomization in practice since random members may not be as observant and knowledgeable as informants of an expert. In particular, this method is useful for the case with insufficient funds and so on. And it can be more realistic by means of the time, cost and efforts required in the informants finding (Tongco, 2007).

5.2 Dry port implementations in developed countries

The seamless connections with the hinterland are becoming vital for the competitive advantage of the seaports since the volume of container transport has grown continuously in European ports. Moreover, in EEA (European Economic Area) member countries, road transport influences the inland transportation of freight with a 76 % market share with a road share increase of about 5 %, while the rail share has

decreased by 4 % in the hinterland transport (European Union Road Federation, 2008 cited in Roso et al., 2009). In the EU (European Union), the transport sector is the most energy consuming one with around 70 per cent of which is consumed by road transport. This results in the external environmental effects like noise, emissions, congestions, both at seaports and further inland which affects road accidents as well (Roso, 2009). Different levels of transport policies indicate barge and rail as the most sustainable mode compared to road. Therefore, inland advanced intermodal (dry ports) implementation, which uses more energy efficient transport modes rather than road has a less environmental impact that would make the efficient handling of goods, becoming critical, both for efficiency as well as efficient inland access for the seaport (Roso et al., 2009). Moreover, a wide range of policy focuses congestion as a main environmental and social cost of urban transport in addition to the personal costs such as time loss, indirect stress, effects and additional maintenance costs for vehicles. The shift the transport mode to rail from road is a political objective where CO_2 emissions would be lowered by using electric rail. Therefore, the main features of a dry port are summarized as an intermodal terminal, which is situated inland, must have rail connections to a seaport and offers services which are available at the seaports like container storage and maintenance, depots, forwardings and customs clearance (Roso, 2009).

Azuqueca de Henares Dry Port

Azuqueca de Henares Dry Port is owned jointly by the state and the private sector and started operations in 1995. It is located 30 km from Madrid and has daily rail connections to the ports of Bilbao (400 km), Barcelona (600 km) and Santander (400 km). The facility offers services including container maintenance, customs clearance, consolidation, transshipment between road and rail and road haulage. There was significant improvement made in 2007. This increased TEU handling 3000 TEUs in 2006 to 18,000 TEUs (Roso et al., 2010). The benefits from this dry port are better customer service, increased volume, new job creation and new customer establishments. In addition, finally reduced environmental impact. The main

impediments were the existing rail infrastructure's condition and the regulations due to the monopoly of rail, however, those were overcome eventually (Roso et al., 2010).

Dry Port Madrid in Coslada

Due to the joint efforts and interest of the Spanish Port Authority, the Madrid and Coslada municipalities, the Spanish Ministry of Development and the Spanish national rail operator, RENFE. Although the idea came in 1995, and the terminal operation started in 2000 and gained the dry port status only in 2003. The advantages of it are rail use increase resulting in the lower transport cost with increased volume, and lower seaports congestions as well as the lower impact to environment. Moreover, competitive advantages to the seaports and new business investments are also by the dry port consequently, creating new jobs in the area. The major owners of the dry port today are 4 Spanish ports which are Algeciras at 660km, Bilbao at 400 km, Barcelona at 600 km and Valencia at 360 km from the dry port. On the 14-ha area, the dry port handles 60,000 TEUs per year by using 3 reach stackers and 3 forklifts. It also provides forwarding, storage, depot and customs clearance services as well. The same problems are encountered as in Azuqueca de Henares Dry Port; regulations and rail infrastructure (Roso et al., 2010).

Minto Terminal

Twenty years ago, the terminal began as a truck company and started intermodal solution in 2002 by cooperating with a rail operator and after realizing the importance of rail transport, Macarthur Intermodal Shipping Terminal (MIST) bought the rail company. Therefore, now, the MIST owns and operates the Minto facility with the aim of using rail for container transport to the seaport and with the agreement with the seaport. However, container transport to and from the seaport on rail on route was started by using its own investment. This route was previously run only by trucks for container transport. Although the terminal is totally private owned, it is not intended for the certain customers and is for the public. It is an intermodal precinct and has daily rail shuttle service to and from the Port of Botany which is 45 km from the facility.

Besides, there are also rail connections with the other inland terminals in order to fill the empty containers from the seaport with grains for export at the inland terminals. The Minto terminal handles 40000 TEUs in 2007 on 12.5 ha. Future track extension is also available to 600m instead of the current 390 m, consequently, longer trains will be able to be accommodated making rail volume to increase. However, due to the issue on free slots of rail, it will not be easy to increase the rail shuttle frequency on a shared rail, and the expansion of terminal is the best answer for capacity problems. The main function of the terminal is the transshipment of road and rail (Door to Door) service and container haulage. It also provides services such as warehousing, storage, containers maintenance, customs clearance, reefer storage, quarantine and packing/unpacking. The MIST facility offers advantages such as new jobs creation at the terminals and surrounding area, significant reduction in the delays and congestions at the seaport terminals, and because of modal shift from road to rail, a lower carbon emission. Moreover, the terminal is working to implement gas injected diesel instead of current diesel usage for trains for the target of lower emission by 25% (Can emphasize for environmental sustainability). The biggest impediments of the dry port here were the arrangement of transshipment from ship to train directly and administrative works. The manager of the terminal identified the institutional and regulations impediments as the most vital for the terminal. Customers are not using the customs clearance service from the terminal mainly because of changes in insurance compared that of the seaport, although the MIST facility provides quarantine and customs clearance, securing with cameras, high fence and dogs. This may be due to a lack of administrative works and awareness as well as resistance to change by the customers (Kovacs et al., 2008).

Enfield Terminal

Due to the road congestion with the trucks growth on the roads and in order to move larger portion of container by rail, Sydney Ports initiated the Enfield project in order to minimize road congestion. Since around 85 % of containers originate or are bound to destination around 40 km of Botany Port, close dry ports were chosen to be built in

Sydney's metropolitan area. However, the project was delayed for 10 years due to politics and bureaucracy. During the period of elections, local politicians went along with residents in that area and project was hindered because of a fear to the road traffic increase through the area since the port already created road traffic in that area next to the main roads. The main concern of the residents about the Enfield project was the environmental impacts, generated from road as well as rail. After making assessments on the environmental concern of the effects of rail and road traffics, the project was confirmed in 2007 for building an intermodal terminal with a 300,000 TEU capacity despite 500,000 per year (Oláh et al., 2018).

Falköping terminal

The custom inspection and clearance procedures are very expensive and a lot of space and time consuming activity as well and only a few ports have adequate resources and space to carry out these to an extent or level of satisfaction. This problem can be relieved by shifting those activities of the seaport to a dry port by guaranteeing safe transport to the port by geo fencing. This kind of development example correspond to the rail shuttle system of Scandinavia which can be seen in the Falköping dry port which is located 130 km from the Port of Gothenburg which has been intensely emphasized in this development (Bergqvist et al., 2011). Therefore, the purpose is to move customs procedures from the seaport to the dry port by rail shuttle services since there is insufficient space to carry out everything at the port. It is also time consuming.

Falköping terminal is jointly owned by a municipality and commercial actors are involved in the transport system. The proposal of an intermodal terminal was submitted for the area at a 124 km rail distance from the Port of Gothenburg to the Falköping municipality in early part of the year 2000 because transporting the existing container volumes by trucks. Since then, there has been the very first expected problem of finding suitable terminal location rather than usual financial problem. In 2006, Stora Enso, the biggest forest products company in Sweden became interested to establish the terminal in the area and tangible terminal construction started. However, in 2007, once being chosen the location of the terminal was built. This was followed by

unexpected problems of volume deficiency, issues with future development, collaboration with the Port and competition with other terminals in the area.

Between the Port and the Falköping terminal, the rail shuttle service runs four times per week in both directions, handling up to 11,000 TEUs annually. Volume increase is expected after future development and rail siding extension; hence, one more shuttle service in every week should be launched (Roso et al., 2009). At that time in 2009, the available services were transshipment between road and rail, container storage and road haulage with the future plans; the development of the terminal from conventional to the dry port by offering services such as container maintenance, customs clearance, warehousing, and some services for the company of forest products. The author mentioned that since physical inspection is normally not a mandatory except special cases, the customer office is no need to be placed in the area and so the service is feasible and extra security measures is a must to provide in the terminal (Roso et al., 2009).

The average container storage time at the Port of Gothenburg is 5.5 days and this might be dominated by shifting the storage to the inland closer to final consumer so as to leave the valuable sea port terminal's space. With this way, even if it would not be eliminated, container storage time could possibly be shortened because of faster administration at inland. However, on the other hand, at the seaport gate of the Port of Gothenburg, the congestion problem and potential delays have not yet arrived to its critical point and the port has sufficient volume with no severe competition and it does not struggle to expand its hinterland. Due to these facts, the development of inland is not invested by the port as long as the other members in transport system: rail operators, corresponding municipalities and terminal operators' eager to do. Nevertheless, the role of the port is to support when inland terminals and rail shuttles are come by those actors (Roso et al., 2009). According to the survey on the customers of the Falköping terminal, well-functioned IT (Information and Technology) system is regarded to be the most important followed by the sequencing, container stripping

and stuffing and consolidation. The major recognized attributes by the customers, however, are reliability and service price (Bigsten, 2012).

Eskilstuna Dry port

The very first intermodal terminal in Sweden using the dry port term as the official name is the Eskilstuna Dry port. The dry port was cooperated between two rail operators and the Eskilstuna municipality. In 2002, the idea of terminal development came when being promised by the municipality to construct a terminal with the aim of attracting the Swedish largest apparel manufacturer to the area. The dry port started operation in 2003 by handling 45,000TEUs per year and it has daily rail connections to the Port of Gothenburg 380km and to the port of Malmo 550km from the dry port. Eighty percent of the container transport is by rail. The available services at the dry port are transshipment with 2 reach stackers, dangerous goods handling, custom clearance, depot and storage and road haulage. The operator pointed out the biggest benefit got from the dry port implementation as the attractiveness for new activities to the area, consequently, new business establishment and new job opportunities. Moreover, the shifting of transport mode from road to rail for a large volume of containers made to reduce seaports congestions, lower impact to environment along the route and improvement of seaport inland access (Roso et al., 2010).

Hallsberg Dry Port

The municipality and rail operators were the jointly owned Swedish Dry Port Hallsberg. There was no obstacle in implementation. However, since the start from 2003, the dry port has been owned and run by Hallsberg kombiterminallen AB. It has a daily rail shuttle services of a distance of 260km Port of Gothenburg, 470 km Malmo port and 500km Trelleborg port. The dry port provides services such as container storage and depot, transshipment with 2 reach stackers, customs clearance, container maintenance, forwarding, cross-docking and road haulage on an area of 6.2 ha, handling 65,000 TEUs every year. With the dry port, the biggest advantage is attracting new business establishment of the region resulting new job opportunities

rather than improved customer service. Furthermore, the seaports' capacity and volume increased because of the rail transport, in addition to the inlan. Finally, it led to causing a decrease in the seaport terminal congestions and environmental impact (Roso et al., 2010).

5.3 Critical Analysis of dry ports in developed countries

All of the reviewed dry ports in developed countries have daily rail connections to the seaports. Dry ports in Madrid; Azuqueca de Henares Dry Port and Dry Port Madrid in Coslada had impediments concerned with regulations and rail infrastructure due to the monopoly of rail although the former is joint owned by the state and is private whereas the latter is owned by the seaports' owners. The main advantages of the dry port implementations are better customer services, lowered transport cost with increased volume, lower seaports congestions, reduced environmental impacts, seaports competitive advantages and new business investments, creating new jobs in the area.

In Australia, dry ports were implemented with the aim of giving intermodal solutions to reduce the road congestions by using rail for container transport to the seaport. Both reviewed dry ports; Minto and Enfield are private owned however, it is intended for all customers which means public and private. In Minto, in addition to the daily shuttle rail services to the seaports, it has rail connections with other inland terminals for export filling at there. New job creations, delays, congestions reductions and the lower carbon emission are the main benefits of dry ports. Infrastructural impediments due to the shared rail for future track extension, institutional or regulations impediments are the main problems for dry ports. In Minto Terminal, due to the lack of clear regulations, customers do not use the custom services offered in the terminal and they prefer the customs clearance at the seaport which impedes the efficient dry port operation. The Enfield project was delayed for a decade also due to the politics and bureaucracy with the main concern of the environmental impacts of the residents about the project and it is one of the rare terminals which experienced environmental issues and land use that the older terminals have not faced during their implementation.

Currently, Australia dry ports are focusing on the environmental sustainability and Minto is trying to replace gas instead of diesel for 25% lower emissions.

Most Swedish inland terminals are owned either totally by municipalities or jointly by sharing with commercial actors in the system of transport like shippers or rail operators. Many Swedish municipalities view the dry port to attract business to the region and those intense dry ports and intermodal terminals establishments have taken place in parallel to hinterland transport system developments. Dry ports and rail shuttle services will ultimately still include as a vital role in the future for the competitiveness and sustainability of logistics systems in coping with the imminent challenges. The Scandinavia port shuttle system has developed into an efficient, large scaled combined transport system in a very short time with a lot of benefits by means of cost reductions and efficient environmental transportation which has been and still is greatly happening (Bigsten, 2012).

However, in Falköping terminal implementation, the aim was to move administration works related to customs from seaport to dry port. It has faced with unexpected problems of volume deficiency, issues with future development, collaboration with the Port and competition with other terminals in the area. This because of the fact that the Port of Gothenburg, which is located outside the city center with a sufficiently and large storage area, extra expansion area and the container storage, significantly generates revenue for the Port. Also, since the Port had no influence neither financially nor initiatives in the Falköping terminal implementation, moving the storage away to the dry port is the way of losing profit. Therefore, this is usually not a solution for a big container port to use a dry port as a depot for space lacking problem (Roso, 2008) and the port was not financially involved in establishing the Falköping terminal. Nevertheless, this terminal implementation could reduce the waiting time at the Port of Gothenburg by avoiding the long queue (Roso, 2007), especially at the peak hours and reduces the risk of road accidents (Roso et al., 2009) and the seaport would serve better in terms of time and financial savings. Furthermore, if 70 per cent of potential goods can be handled by the terminal in the region as expected, approximately 2,200

tons of CO_2 emissions would be reduced annually. In addition to the common basic services offered, other value added services might also be offered by the terminal with more affordable value for end customers to be done at the terminal than at port which might lead to the unnecessary competition by overlapping the services between the seaport and the dry port if there is no cooperation and collaboration between them (Bigsten, 2012). For the remaining reviewed Swedish dry ports; Eskilstuna and Hallsberg Dry port, there were no big obstacles in implementation with the benefits of attracting new activities to the area, attracting new business establishments of the region resulting in new job opportunities, improvement of seaport inland access, increased seaports' capacity and volume, the seaport terminal congestions and the environmental impact are reduced.

It is expected the vital role of close dry port in the future as a result of rail shuttle system expansion. With increase in coordination between rail shuttle services and expansion, the close dry port would get the chance to utilize shuttles by using the same main rail line system from the distant dry port in Sweden (Bergqvist et al., 2011).

5.4 Dry port implementation in developing countries

A whole range of administrative activities would be shifted from the seaport to inland via the dry port implementation, particularly those concerned with trucks related paperwork. Physical activities such as container storage would take less time, and some might entirely decrease, for example; queueing at the gates of the seaports. In this way, dry port could create seamless inland intermodal access for the seaport that means a smooth flow of transport (Roso et al., 2009).

Isaka Dry Port in Tanzania (Africa)

Isaka Dry port in Tanzania is mentioned above as an example of a distant dry port, initially it had only a railway station for a long time as a facility and started to develop into a freight terminal in the late 1980s to respond to the freight transport increase to its neighbor Rwanda. In 1999, it gained dry port status by offering custom clearance

which has direct daily connections by rail to some 800km away Dar es Salam seaport and provides services, the same as the seaport except seashore transshipment. Tanzania Railways owns and operates the facility, handling about 13000 TEUs annually on a 11ha area with 2 reach stackers and 4 fork lift trucks. This dry port is also critical for its neighboring land locked countries; Burundi, Congo and Rwanda. With the dry port, the benefits are improved customer services particularly cargo safety, lower cost of transport with faster delivery. Furthermore, the seaport congestion has been significantly reduced with a decrease in its delays (Roso et al., 2010).

Matsapha Dry Port in landlocked Swaziland

Matsapha Dry Port started operations in 1993 so as to respond to the growth in the containerized exports of the country with financial support by the Swaziland Railway. It is connected by a daily rail to the 400km distant Richards Bay Ports in South Africa, the 500 km-distant seaport of Durban, and the 200 km-distant Maputo Port in Mozambique. The main focus of the dry port is on customer clearance for faster throughput and it provides other services like tracking, transshipment by a reach stacker) (RS), depot and storage, and road haulage. Since the inception of a dry port is better customer service, the main benefits are the reduced cost of transport with reduced delivery times and as a result, the area becomes to be more attractive to new customers and business. Although the main hindrance was financing, it was solved by foreign investments (Roso et al., 2010).

Riyadh Dry Port in Saudi Arabia

The Riyadh Dry Port started operations in 1982 which is owned by the Saudi Port Authority and run by the Saudi Railway Organization on 92 ha of land. It is connected by rail to King Abulazia port in Dammam which is located 400 km away from the dry port. It offers services such as transshipments by reach stackers, gantry cranes and forklifts, reefer storage, container maintenance, custom clearance, forwarding and road haulage. Improved customer service is the main advantage of that dry port (Roso et al., 2010).

Birguni Dry Port in landlocked Nepal

The Birguni Dry Port has been operated since 2005 and it is privately owned with financial support from the World Bank. Despite the initial idea since 2000, because of problems such as appropriate bidder appointments and financial proposals evaluations, it was delayed until 2005. After completing the terminal, the next problem was the service agreement with the Indian Railways. The terminal is connected to the Port of Kolkata which is situated about 700 km away by fixed scheduled rail connections. The dry port has an area of 38 ha with 3 reach stackers, one of which for empty containers. The dry port also provides simplified documentation, reduced tariffs and increased frequency of rail services to attract more customers (Roso et., al 2010).

Faisalabad Dry Port in Pakistan

Faisalabad Dry Port is, by means of value and volume, the largest privately owned dry port in Pakistan. The operation started in 1994 by a trustee board with the aim of local textile industry export facilitation. The dry port is connected with Karachi Port by both daily rail and road connections and handles approximately 7000 TEUs (import) and 33000 TEUs for export with 4 reach stackers and forklifts. The major advantage of the dry port implementation here is the significant development of trade and industry in the area. It also contributes to better customer service by giving storage and customs clearance, and lower transport costs (Roso et al., 2010).

Brazil

According to the spatial configuration of the state of Sao Paulo's dry ports linked to the main port of Santos's parallel evolution, the theory may vary from practical use in the spatial pattern of development of port. It was pointed out in the Brazil case that the relatively lack of intermodal transport systems especially in the rail use, concentrating continuously only on the ports' freight flow especially in Santos, by decentralizing the inland freight facilities' flow such as dry ports (Cullinane et al.,2012). It was also argued in the Brazil case that in the developing countries, it is common that the

existence of institutional inefficiencies, leading to misrepresentation of outcomes expected (Padilha et al., 2011).

India

Due to the realization of public monopolization which caused dry port inefficiencies by the India government, it has caused the participation of the private sector in the rail sector and dry ports. As an immediate effect of the short-term and as a result of the new dry port sector investment, a surplus in supply has been created over the demand of the market by under-utilizing the resources, putting unsustainable prices and profitability pressures considerably in the high competitive market and finally leading to non-level playing field competition between the private and public sector. It was suggested that since the operation and production are related closely to efficiency and by applying this in the operation of the dry port, intangible factors should be provided the same as the tangible aspects. Consequently, carbon emissions were advocated as the negative inevitable but undesirable output from the dry ports' productive activities and take into consideration and represent some measures of efficiency with eco or social efficiency. However, the Indian government as public sector has not delivered the incentives and objectives concerned with the environmental perspectives since there is a head-to-head competition with the private sector dry ports concerned with the minimization of cost and maximization of profits (Cullinane et al., 2012). Moreover, the existing regulations do not imply a penalty for carbon emission minimization like carbon tax or better fuels usage resulting in the difficulty for consideration of carbon emission as a measure for dry port operational efficiency by the operator. Consequently, whenever trying to improve a dry port's efficiency with throughput increases this means the CO_2 emission increases automatically at the same time (Chandrakant, 2011).

5.5 Critical Analysis of dry ports in developing countries

The reviewed dry ports in developing countries are private or state owned with rail connections with the seaports. The main advantages are improved customer service

particularly cargo safety, lower transport cost with faster delivery, reduced seaport congestion and delays, more attractive to new customers and business by giving storage and customs clearance. The main purpose was to facilitate the cargo throughput and export flow by serving the customs processes in the dry ports instead of seaports. The main common obstacle is the financing for the developing countries which mostly can be solved by private investments.

Matsapha Dry Port in landlocked Swaziland's financing hindrance was solved by foreign investments. Birguni Dry Port in landlocked Nepal was faced with impediments of appropriate bidder appointments and financial proposals evaluations making delays for 5 years and the next problem was the service agreement with Indian Railways.

However, in the special issue of Brazil, one of the world's fastest developing countries, the dry ports' role plays more than simple provision of a route for higher competitiveness of ports by hinterland access improvement. It shows that the existence of institutional inefficiencies, lead to the misrepresentations of outcomes expected and proved the economic and political importance of dry ports in the regional development and integration which is vital for the developing economies context.

In the Indian case, the non-level playing field competition between private and public sector was resulted; this due to the surplus in supply/over-capacity. And the lack of participation of the Indian government; the public sector in the incentives of environmental perspectives due to head-to-head competition, concerned with cost minimization and profits maximization with the private sector dry ports. Therefore, it is difficult to pursue with the lack of strict environmental regulations and with the development of national economy via the export-led growth strategy rests as priority.

Chapter 6. Implication for Myanmar Dry Ports

6.1 Myanmar Dry Ports

Due to the continuous increase in the port of Yangon's cargo throughput and its location in the Yangon city down town area with limited space, the seaport terminals in Yangon has been facing severe congestions not only at the seaport terminals areas but also the surrounding roads in the seaport city as mentioned in the literature review. Therefore, it is very clear to choose Yangon as a feasible location of dry port implementation. Mandalay was chosen because of the following reasons.

Mandalay is the second economic capital city of Myanmar, located 716 km by road from Yangon, which naturally has good inland waterway access with the Ayeyarwaddy, the longest river of Myanmar. It is also the critical point for land transportation since it is situated on the Asia Highway (AH1 and AH14) and the network of Trans-Asian Railway (TAR) in the future. Therefore, upper Myanmar, Mandalay serves as an economic hub by means of its location, road, inland waterway and rail access and commerce. The location of Mandalay also makes it to be a distribution hub of cargo from the border trade with China and India. Furthermore, approximately 80 per cent of the Myanmar's whole border trade volume is with China and all export to China passes through Mandalay while most imports from China are distributed in Mandalay. Nevertheless, for the middle and upper Myanmar, Mandalay is the center of the region from numerous respects such as local industrial zones, agricultural cultivation, and a distribution center. All these situations drive Mandalay to be a vital logistics hub for upper Myanmar both regional and domestic border trade as well as for the national and international trade. Therefore, Myitnge Dry Port is used by two cargo types; border trade cargo exported from and imported to Mandalay while another one, the international cargo exported from and imported to Mandalay through Yangon seaports (Aye, 2012).

Between Yangon and Mandalay, it takes about one week to transport cargoes by the Inland Water Transport (IWT) while approximately 24 hours have to be spent by road transportation and approximately 15 hours by train. Among them, IWT is the cheapest transportation with lower freight rates than road and rail transport. Therefore, IWT is the dominant inland waterways network provider for freight transport and is a state enterprise of the Ministry of Transport and Communications. Approximately 2,400 km of 5,00km Myanmar's navigable waterways are used for inland waterway including the Ayeyarwaddy River, on which Mandalay Region is situated. Five million tons of freight were handled by IWT in 2011 which is around 50% more than those carried by rail service. The major constraint is lacking in the budget resources for dredging and facilities for navigation since for river system, dredging is needed to be repeated and extensive for effective communications and navigation facilities. In addition, Myanmar river ports are just like the landing beaches and loading and unloading are done by a simple gangplank, some of which have specialized handling facilities only for bulk commodities (Black et al., 2013).

Myitnge Dry Port (Mandalay)

Myitnge Dry Port, is constructed on 35-acres land area which currently is available for 1,100 TEUs container storage, 4600 m^2 for a bounded warehouse, and another 4,600 m^2 for a general warehouse and 16 reefer points. The facility comprises Container Freight Station, General cargo area, Container yard (CY), Customs clearance area, Customs office, Railway terminal, Operator's office, Parking area and Maintenance workshop. As for the land transportation service, 24 -forty feet tractors with maximum capacity of 30 tons each provide last mile delivery service, door-to-door pick up services, long and short haul deliveries and offers tracking truck locations according to request.

The main purpose of the Myitnge dry port is to facilitate the severe congestions in Myanmar seaports, which cause not only delays and blockings on the road but also financial loss for the carriers, and to increase the capacity of seaports resulting in an increase in productivity, consequently enabling the ports to call at more container

vessels (Aye, 2012). A well-functioning distant dry port could provide significant improvement in customer service, especially lower transport costs with the safe and faster delivery of cargo. It should go much safer and faster with a well-functioned rail shuttle service between Yangon and Mandalay than road transport and IWT. As in the case of Tanzania, which took over a week for transport and container clearance for the distance of 800 km Dar es Salam seaport before dry port implementation, it now takes only 2 days to Isaka Dry Port (Black et al., 2013). Finally, Myitnge dry port could support regional development by providing the logistics solutions in the area, consequently, attracting more new industries and investments there while creating more new opportunities for employment for the citizens.

Ywa Thargyi Dry Port (Yangon)

Ywa Thargyi Dry Port offers services on 40 acres of land which includes services for 4200TEUs container storage, 3000 m^2 container freight station, 10000 $m^2$for bounded warehouse, 20000m^2 for general warehouse and 20 reefer points. Currently, among the total 40 acres, only 26 acres of them were used for the Ywa Thargyi Dry Port. Therefore, the dry port has an ability for expanding an extra 14 acres according to the growth of the business.

For rail shuttle services, between the rail stations of Ywa Thargyi and Myitnge, both FREIGHT and FUEL train transportation are available, served by 11 to 15 wagons in one trip, of which, each has 32 tons of maximum loading capacity. Overall, the dry ports offer services such as customs clearance and inspection, container storage and handling, breakbulk and bulk cargo storage and handling, stuffing, unstuffing, container light repairs, forwarding service, consolidation of cargoes and banking services (Zaw et al., 2011).

The dry ports in Myanmar have been initiated with a contract between Hong Kong based Kerry Logistics company and the Ministry of Rail Transportation as part of the plan of the Government for a dry ports network construction across Myanmar under the initiative of the United Nations(U.N.) since the U.N. believes Myanmar will gain

advantages from dry port developments by making more efficient cargo transfers by the combination of sea, road, rail and waterways. It is also expected for Myanmar citizens to be offered 250 jobs through the projects. Then, the dry ports in both Yangon and Mandalay will be completed under the Build, Operate, Transfer (BOT) through the partnership between Kerry logistics and a local company, Resource Group Logistics (RGL) and the freight trains which are run by RGL. Both the companies hold an equal number of shares of the 80-acre site at Ywa Thargyi in Yangon whereas in the case of the 80-acre site at Myitnge in Mandalay, the number of shares held by Kerry Logistics is slightly larger (KERRY Logistics, 2016). In November 2018, Ywa Thargyi Dry Port was officially launched and Myitnge Dry Port, in January, 2019 by Karry Logistics. However, operations started in 2018 in order to transport cargo between two dry ports with a shuttle rail service once a week; the train leaves from Ywa Thargyi Dry Port every Sunday. Before that dry ports were launched officially, freight trains had to be operated between Myitnge Dry Port and the Warden jetty near Ywa Thargyi Dry Port on a trial basis which was then moved to Ywa Thargyi station. Therefore, before dry ports the railway freight line was Warden-Paleik and it became Ywa Thargyi-Myitnge after both of the dry ports were finished according to Myanma Railways. However, currently, there is no rail connections directly linked to seaports; both the Yangon and Thilawa port area and trucks are the only way that is used widely between Ywa Thargyi Dry Port to seaports and other final destinations and Industrial Zones (Hnin, 2018).

In accordance with Myanma Railways, between November 2018 and early May 2019, Ywa Thargyi Dry Port has already handled over 50,000 tons of cargo. For the period between November 2018 until the end of January 2019, 18 rounds of trains have run, carrying 5,994 tons of cargoes in total, nine of which from Myitnge to Ywa Thargyi, carrying 3152 tons during that period (Eleven Myanmar, 2019).

The project is expected to generate a profit in the next six years. The general manager of KM Terminal and Logistics Ltd told that the dry ports implementation at Yangon and Mandalay will help in the export and import trade operations, by making to reduce

travel time as well as to reduce changes of transport by computerized control system implementation. At present, the Ministry of Transport and Communications is making a feasibility study in Monywa to develop a dry port in partnership with a Korean Company. Another aim of the dry ports is to facilitate the freight flow between lower and upper Myanmar. In the future, it is expected to run the freight trains across the route of Myawaddy, Maesout and Muse as well as to create a network of trade with neighboring countries such as China, India and Thailand. The provision of transit services between countries is under way for preparations (Hnin, 2018).

6.2 Opportunity Cost of Myanmar Dry Ports

Before discussing the opportunity cost of dry ports implementation in Myanmar, definitions of the congestion cost, problems, costs and benefits, price, direct and indirect cost should be explained as follows in order to further understand the efficient opportunity calculation of a dry port.

In expressing traffic congestion, it is more natural to use the term traffic congestion cost rather than traffic congestion problem. This is because if congestion is called a problem, that must be fixed, although as a cost, it may accept to have a certain congestion amount compared to involved costs in eliminating, that means tradeoffs are involved. And for the implication of costs, it can quantify the impacts which are measurable and comparable with other impacts whereas problem cannot express its quantity. Moreover, costs imply the tradeoffs among resources, which may consist of time, land, money, or opportunity loss for enjoying a benefit. And there is a relationship of the mirror image between benefits and costs since cost is a reduction in benefits and benefit means costs reduction. For instance, the unnecessary delay time spend on container transportation is a cost if this time could be used beneficially in other ways (Litman, 2009).

Price

Despite the often narrow definition of price as monetary costs, it can consist of impacts of nonmarket users as a risk and time since they have an impact on the decision of consumption. This is called a generalized travel cost by transport planners. Furthermore, prices are required to reflect the entire goods production costs which give actual market signals for the economic efficiency (Litman, 2009).

Direct or Indirect Costs

Between an activity and the ultimate level of its outcomes, several steps exist and have some indirect impacts such as social, economic and environmental costs. Even though the impacts may not be easy to measure a particular contribution of a vehicle-mile to those costs, it should not be neglected or ignored as they have cumulative significant impacts. By using a 'with and without test', it can be determined whether an activity has indirect cost or not, for instance; the difference of environmental impacts with and without a dry port implementation. Some analysis of economics only uses the easily quantified and common accepted costs without intangible, difficult quantify impacts such as environmental, social impacts, leading to the bias decision making in numerous ways. This underestimation leads to damages of environment and society in practice. For instance, carbon emissions (Litman, 2009).

Opportunity Cost of vehicle and cargo

As mentioned above, Yangon port, Myanmar's main port, has been facing severe congestion because of a lack of space and poor performances in activities of container loading and unloading, creating a long waiting time problem. Inappropriate custom inspection procedures are the main cause of congestion in Myanmar ports. Consequently, a long delay has been created in the seaports. Therefore, shifting the custom facilities to the dry port could reduce the congestion at the ports and borders since most formalities can be cleared at the dry port instead of ports or borders, by allowing vehicles to bypass the queue in the dry port resulting the fast lane.

According to the benefit-cost analysis on the value of travel time calculated for truck and cargo based on the assumptions. The customs clearance inspection at the dry port will be carried out only for 5 per cent of container cargo volumes per year. The value of travel time for a truck driver is assumed to be 170 per cent of an hourly average wage. Concerning with the cargo value; value for carrying the cost of inventory is 1.78 US$ per hour and the user cost for delaying cargo is 2 US$ per hour and the average wage for a truck driver is assumed as 0.63 US$ per hour. And it is assumed that 2 hours save for customs inspections for each vehicle and cargo in making the custom inspection at the dry port (Aye, 2012).

The result is shown in the table below. (Aye, 2012)

Table 7:Opportunity cost of vehicle and cargo through time (Aye, 2012)

Year	With case					Without case					Benefit
	Customs clearance time	Vehicles	Time value	Cargo value	Total value	Customs clearance time	Vehicles	Time value	Cargo value	Total value	
2016	1	566	600	2,139	2,738	3	566	1,799	6,416	8,215	5,476
2017	1	621	658	2,345	3,003	3	621	1,973	7,036	9,010	6,006
2018	1	675	716	2,552	3,268	3	675	2,147	7,657	9,805	6,536
2019	1	748	793	2,828	3,622	3	748	2,379	8,485	10,865	7,243
2020	1	803	851	3,035	3,887	3	803	2,554	9,106	11,660	7,773
2021	1	876	929	3,311	4,240	3	876	2,786	9,934	12,720	8,480
2022	1	967	1,025	3,656	4,681	3	967	3,076	10,969	14,044	9,363
2023	1	1,040	1,103	3,932	5,035	3	1,040	3,308	11,796	15,104	10,070
2024	1	1,132	1,199	4,277	5,476	3	1,132	3,598	12,831	16,429	10,953
2025	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2026	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2027	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2028	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2029	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2030	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2031	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2032	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2033	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2034	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660
2035	1	1,205	1,277	4,553	5,830	3	1,205	3,830	13,659	17,489	11,660

Logistics Cost Savings

Related to the logistics cost savings, customers of dry ports such as transport operators, shippers, forwarders and other logistics operators who use the dry port will get an advantage because of saving time in the documentation and the process of business. One-hour time saving is assumed to be incurred. Based on the result of this, saving logistics costs is 3.78 US$ per hour for container cargo while 1.89 US$ per hour for a conventional one. (Aye, 2012).

6.3 Challenges encountering Myanmar Dry Ports

In the dry port implementation, four major impediments exist; regulation, land use, environmental and infrastructure. The land use and environmental is very closely related. This means that the nearer the dry port is to the city area, the higher the demands and the price concerned with environmental impacts.

Since Myanmar dry ports are located near to the industrial zone and is far from the metropolitan area and has sufficient area for future expansion, land use and environmental impediments have not been suffered by the dry ports implementation. However, the infrastructure problem is common in both developing and developed countries especially because of the shared rail infrastructure of freight and passengers, with higher priorities for passengers (Kovacs et al., 2008). This is also the biggest challenge in Myanmar with inadequate infrastructure for rail and water transportation which disturbs the efficient operation of a dry port. At present, road transport is the most common transport mode and rail is a minor traffic mode for local cargo transport due to the limited rail infrastructure. There is also the monopoly of the rail transport market in Myanmar by the Ministry of Rail Transport management and in freight transport and rail transport mainly acts only as the bulk carrier and for the container transportation, it is still under the testing stage and implementation although there may be more developments in the future. Moreover, compared to the size of the country, only one rail route mile for each 71.5-miles square area exists; with a total length 3652.52 miles of railways with 926 train stations. Furthermore, in Yangon, only one circular railway line is available for the city. (Aye, 2012). The width of the rail track

used is one meter in Myanmar (Aye, 2012) while most neighboring countries use the standard gauge of 1435 mm, resulting in some difficulties to link with the standard rail connection. Moreover, for railway connections with other countries, there are three missing links in Myanmar with other countries along the TAR network which are explained as follows.

Between Myanmar and India (Kalay- Tamu)

The missing link in the Myanmar Territory between Tamu and Kalay is 135 kilometers and the feasibility study was made in 2004 by Rail India Technical and Economics Services (RITES). It was reported as unviable economically. Therefore, in January 2013, construction of the new railway line between border point and termination station was discussed by the India and Myanmar Joint Working Group on Railways. The new one will be 127.4 km in Myanmar territory from Kalay (Termination Station) to the border, Tamu and it was agreed to cooperate on both sides in the detailed report preparation for the project.

Between Myanmar and China (Muse-Kyaukphyu)

For the rail transport between Muse and Kyaukphyu under the Build Operate Transfer agreement, China Railway Engineering Corporation (CREC) and Myanmar Ministry of Rail Transportation signed a Memorandum of Understanding (MoU) on 2011. The project is 808.8km in Myanmar Territory and passes from Rulei, China to Kyaukpyu through Muse, Lashio, Mandalay, Magwe, Minbu and Ann in Myanmar. However, due to the unclear issues, in 2013, the MoU expired and was extended, signed and then expired again in April 2014. Currently, it is under progress for the third Addendum to MoU after December 2014, being the second Addendum to MoU.

Between Myanmar and Thailand (Three Pagoda pass and Namtok (Thailand))

This rail between Namtok, Thailand to the Three Pagoda Pass, Myanmar was a branch from the project of Singapore-Kumming Rail Link. The feasibliliy study was

conducted between 2005 and 2007 by Republic of Korea. However, due to the dam construction in Thailand, some areas of the rail were flooded. Since the new alignment was too costly and there was a low demand with more time, in 2012, Thailand submitted a new line of Dawei – Kanchanaburi despite the Three Pagoda Pass – Kanchanaburi.

Overall, currently Myanma Railways is facing a large demand and lack of infrastructure and rolling stocks. And due to the existing poor rail infrastructure, the freight train can only run up to 48 km/hr. (Ministry of Rail Transportation Myanma Railways, 2015) In addition to this, Myanmar has suffered financial and technical hindrances in order to upgrade the existing railway lines to suit the TAR network's technical guiding principles as regard to the TAR Agreement signing.

In concerned with the inland water transport, many of the routes are not able to provide sufficient depth of water for safe operation of vessels during the period of low water season between November and May.

Moreover, with regard to the Myanmar dry port development, the lack of an appropriate legal environment is one of the major challenges. Since there are no regulations, policies or rules designed exclusively for the dry port in Myanmar, more general regulations and law related to customs, trade, land, environment and transport, and more general policies appropriate to the country's transport and logistics have addressed the issues concerned with the operation and development of the dry port in Myanmar. (Aye, 2012).

Chapter 7. Findings and Discussion

7.1 Lessons to be learnt

The basic facilities and services provision is more general in developing countries although in developed countries, complex and larger ones are usually provided which sometimes in some cases, duplicate with their city functions with necessary inducement and components for agglomeration and concentration (Padilha et al., 2012).

(Rosa, 2005) stated that for the place with a high demand concentration of a wide range of customized solutions and specialized services, the solution might be the divergence of logistics services at various canters in the same urban area, in order to harmonize with the real demand. For a well-positioned small dry port or intermodal facility, it might attract industries, service providers and other facilities for storage to its vicinity area whereas for a large dry port which might develop over the service clusters formation, causing to replicate some of its facilities with city functions, attracting a pool of labor, creating conditions for spillovers of knowledge and sharing inputs within the facilities. Sometimes, dry ports were implemented for hinterland market expansion as a part of port strategies for the cargoes competition with the nearby port. However, there is also a risk of excessive capacity concentration in one facility or numerous facilities within an area. Therefore, in order to avoid unnecessary mistakes and to find the right balance of capacity, it is required to involve both private and public sector in the dry port implementation which means; to invest in the facilities, private sector required institutional guarantees while in planning and regulation, the public institutions' support is required for the potential impact on the public infrastructure. For example, supporting the rail services implementation might require the intervention of the public where it might be significant for the welfare of the public (Padilha et al., 2012).

Padilha et al., (2012) argued that countries with developing economies may not apply to the spatial evolution in the development of a dry port as in the case of developed economies due to the significant existence of infrastructural and institutional impediments. However, the role of the dry port concept is critical in different ways for both types of countries whereas the functions and role of the dry port can differ. Nevertheless, for developing countries which have the previous mentioned bottlenecks are more prevalent, dry ports' functions are often for the promotion of the regional development and integration rather than only for the purpose of ports expansion.

Moreover, many researchers have suggested that local, national institutional factors often affect the patterns of dry port development in developing economies. Indian dry ports studies showed that in deciding the competitiveness and spatial characteristics of dry ports, the institutional effects could be essential. In the decision for the developing economies with red tape and poor institutional environment are quite common, bureaucracy would be more significant (Padilha et al., 2012). In the case of India, the over-supply of the infrastructure investment makes it emphasize the environmental impact. However, cost minimization and profit maximization is priority and the government did not deliver initiatives for environmental concerns. Therefore, institutional inefficiencies are important for development of dry ports. It is totally opposite with the view of European countries as in Sweden, where the policy makers see the congestion as the main cause of environmental and social impacts and shifting the transport mode to rail from road is a political objective for reducing CO_2 emissions by electric rail.

Another case of the institutional inefficiencies leading to the lack of cooperation between the public and private sectors, that in developing countries can also be seen in the Brazil example. According to Padilha et al., (2012), the Brazil experience research identified three major problems affecting the Brazilian dry ports efficiency; the distribution of fragmented policies and interest conflicts by the different public agencies' regulations, the inadequate legislation supports for the dry ports and seaport relationships causing failure in clear rules provision concerning the cargo transit

between them; and the existing legislation failure for the creation of cooperation incentives resulting to compete dry ports and ports for similar functions and services, especially storage revenue and customs clearance. Therefore, congested ports are used as the facilities of the storage often creating the port difficulties or imposing surcharges, consequently, undermining the effectiveness of dry ports operation. Moreover, concerning with their legal status, dry ports have encountered substantial uncertainties (Padilha et al., 2012).

By considering the institutional issues as the main cause of the bottlenecks to transport infrastructure, some key policy recommendations are clear rules and integrated planning is needed to encourage the investment and institutional gridlock elimination; legislation should discourage the usage of ports as a storage area by the shippers while encouraging ports and dry ports cooperation; sufficient planning should also build the foundation to deploy the dry port as strategically positioned ones with rail connections, creating the economic agglomeration environment with the use of efficient inland logistics-infrastructures to result in the environmental and economic benefits (Garnwa et al., 2009). On the other hand, those policy changes in developing countries are not easy to implement and the so called deep-rooted vested political forces and interests (Cullinane et al., 2012).

Moreover, the ability of the dry ports for concentration and agglomeration development is highly dependent on the extent of which their facilities can integrate different transportation modes, mainly road and rail and access with rail corridors with a high capacity. A successful example could be seen in the case of Swedish dry ports. These intense dry ports and the intermodal terminals have appeared in line with the hinterland transport system development. Sweden is the country which encourages rail transport rather than any other transportation with sufficient rail infrastructure and is one of the top countries which implements electric trains successfully, and with increased coordination between rail shuttle services and expansion, the close dry port would play an important role into utilizing shuttles by using the same main rail line system from the distant dry port. However, in Sao Paulo, rail connections are only

available in a few dry ports and even container transportation by rail was still inchoate with most networks, being used for the mineral and agricultural commodities. The main problem is that rail operators desire to carry large and regular volumes of commodities for long distances although the majority of containerized cargo shippers are of medium or small sized which are far to meet the expected thresholds. This results in moving most containers still by trucks. Furthermore, the shared railway lines use of passengers with cargoes, limit the operators' ability to increase the capacity (Padilha et al., 2012). Therefore, although the potential savings by shifting the activities of customs clearance from the seaport to the dry ports are significant. However, this facilitation of improved customs at the dry ports will then be of little help if connections of railways between dry port and seaports remain insufficiently (Cullinane et al., 2012).

Additionally, in the case of Falköping intermodal terminal, it was not the right choice in the perspective of space problem since Port of Gothenburg has sufficient space for expansion and storage, therefore, seaport has not collaborated in this project. Even though the dry port support as inland extension for some seaports, it might not be necessary for the ones which have sufficient space for operation and business in their immediate area. However, the dry port can help to save financial and time by eliminating long queue and congestions at the seaport gates. Finally, it can also reduce accident risks by avoiding congestions.

However, in Myanmar, road transportation is the only widely used transportation mode rather than other traffic modes and there is no railway connection between and dry ports and seaports. Actually, Myanmar has good natural resources such as waterways, and the real need is to use them effectively and efficiently. The problem is the poor and lack of infrastructure development. Even though there are some existing railway networks between some ports and in some inland container depots in Botahtaung, Yangon, because of the government policy, not currently allowed to operate and blocked to use and not being updated as the freight railway lines. Furthermore, Myanmar has technical, institutional and financial problems for the development of

sufficient railway infrastructure. Since Myanmar is a developing country and suffers from its financial losses by the shipper due to the severe congestions and especially because of the custom processes, moving customs inspections to a dry port and promoting other transport modes rather than road, transport facilitation and attraction of new investment and customers for new employment creation are prioritized than the reduction of the environmental impact. However, the environmental impact should be considered as an important indirect impact.

Nevertheless, despite the difference in size and handled volume, all of the reviewed dry ports have common features of daily shuttle service connections to and from the seaports. Container storage, transshipments and customs clearance are the services which are commonly offered by the dry ports. Furthermore, container maintenance, road haulage and haulage are the extra services at most of dry ports. More value-added services are provided by some dry ports based on the needs of their customers. According to Roso et al., (2009), the dry port's features are seamless points of transshipment and transport, equipped to handle standardized units, scheduled and reliable rail shuttle services with the seaport, and offering services such as customs clearance, transshipment between the rail and road, container maintenance and storage for both long and short periods (Roso et al., 2009).

7.2 Recommendations for Myanmar Dry Ports

Three main reasons to establish dry ports around the world are; the constant need of inland transport efficiency improvement, ever growth of congestions in the surrounding land areas of the main port and the conversion of shipping to the wider logistics operations' integral component (Door to Door service) instead of port to port activity (Garnwa et al., 2009). The Myanmar case matches with the second reason. Vandervoort et al., (1999) observed that a dry port must suit into a system which is complex where the required supporting infrastructures; rails and roads are in place, maintenance is made to assure and the regulatory, legislative and the institutional systems are designed properly so as to optimize the private and public sector

involvements. This might be the solution of the reason whether an implementation of a dry port succeeds or fails (Roso, 2009). Furthermore, according to Cullinane et al., (2012), for the development of the dry port, the major common features are; it is not necessarily required for a dry port to be initiated, owned, controlled or operated by the port or ports with which it is connected and linked except in the case of the concept of extended gate; in every aspect of implementation and development of dry port, there is room for both public and private sector participation and in practice cooperate, collaborate or even partnership between the public and private sector is most applicable; although dry port development's justification may be pure financial which is the maximization of profits or economics, which is the maximization of social welfare based on the objectives which drives the initiative. Considerations of environmental issues are needed to exert in both cases as a growing influence in the dry port implementation concept; regardless of the direct involvement of the government, it is important to formulate suitable policy and regulatory control in development of dry port facilitation and promotion at the same time by bringing the environmental goals; the institutional impediments and or insufficient regulatory and policy regime which disturbs the effective and efficient dry port operation, can decide the failure or success of project of dry ports (Cullinane et al., 2012).

Encouraging other transportation rather than Road transport

Padilha et al., (2012) mentioned that although the environmental benefits and costs advantages of rail and barge surges over the road transport at a distance, these modes normally need large regular transport volumes while trucking is more flexible and preferable for short distances in particular. Nevertheless, for the urban areas with significant environmental and severe congestions problems, additional justifications for barge and rail are needed to be considered. Furthermore, although for the inland freight distribution systems development, trucking might be adequate at the initial stage, at a certain activity level, it needs to consider the diminishing returns such as energy consumption, congestions and the movements of empty containers as strong incentives for inland terminals establishment as the next step of regional freight

planning. Moreover, in the continuous development of intermodal transport and containerization, the inland freight distribution evolution can be regarded as a cycle. In shaping for developing, the regional inland access capacity and availability of transport modes, based on the geographical characteristics, are critical. Therefore, no specific strategy exists for the preferences of transport modes since the regional effect remains fundamental. Hence, individual inland ports and dry ports still exists as the outcome of the transport geography considerations relate to the availability and the efficiency of transport mode, intensity and function of the market and the governance and regulatory framework (Garnwa et al., 2009).

Based on these, in considering the Myanmar case for the transportation modes, it might not be easy to substitute all road transportation with rail transports due to economic and geographical conditions. However, it will be efficient to reduce the road transportation steadily by encouraging the inland waterway and rail transportation as well as minimizing the road usage to the minimum distance which means by the optimum usage of combining all transport modes. Currently, the use of IWT is limited since it cannot be used for some reasons because of the insufficient water depth and the continuous dredging that is necessary. Moreover, it has not enough facilities for container transportation. Therefore, for the waterway transportation, investments are required for the continuous maintenance like dredging as well as in the container handling facility and for the domestic jetty as well. Moreover, the specific area should be made for the disposal of dredging or planning for the recycling of those disposals should be made since the current dredging process in Myanmar is not efficient due to the lack of the area specified for disposal and the cost due to frequent expensive dredging process. Furthermore, in all of the reviewed dry ports, there are at least rail connections with the seaports. In Myanmar, rail transportation for containers is only available between the Dry Ports and using the shared railway line with the priority for the passengers and for the bulk commodity. Therefore, for the efficient dry port process, the rail infrastructure with the dedicated track is a necessity to invest in so as to facilitate the freight flow especially between the Thilawa area and the dry ports and between Yangon Ports and dry ports, and finally, between the industrial zones and dry

ports which means between Ywa Thargyi Dry Port and the industrial zone around it, such as Shwe Pyi Thar Industrial Zone as well as to Thilawa Special Economic Zones and between Myitnge Dry Port and the Industrial Zones in Mandalay. Moreover, there is also a need to upgrade the existing railway lines into the standard ones so as to connect with the neighboring countries via the TAR network and for faster rail transportation. However, for these investments, financing is becoming a serious problem to be considered and the best way to solve this is the Public Private Partnership which could help not only the financial issue but also the institutional inefficiencies for Myanmar.

Public Private Partnerships (PPPs)

In the aspects of infrastructure development, private involvement in PPPs is important for existing or new infrastructure services and which traditionally are provided by the government; public sector. For Myanmar, in order to eliminate the monopoly of rail transport market by the Ministry of Rail Transport management, private rail operators should be invited in order to implement a better rail infrastructure by creating the level playing field between the private and public sectors. With the aim of offering infrastructure services at a fee, PPPs are long-term schemes with agreements or contracts within the private and government sectors. By engaging the private sectors with well-defined responsibilities, it will broaden the government's options in providing better services and can diversify the risks at the same time. Successful PPPs would need policies of pricing as regard to the average long run cost pricing, with the recovery of the full cost by both sectors, eliminating the unnecessary centralization and subsidies, and finally, establishing the level playing field between private and public involvements.

Moreover, Chandrakant, (2011) mentioned that defining the clear roles for different agencies and departments for the regulations and legislations could also improve the coordination of various government agencies involved in the dry ports developments and making them to be familiar with the regulatory and institutional environment. This would help the developers of the dry port to get the necessary approval by following

the prescribed necessary processes. For the institutional insufficiencies of Myanmar, clear rules and integrated planning are required, legislations of encouraging dry ports and ports cooperation, by discouraging the usage of ports as storage facilities, sufficient planning for strategically positioned dry ports with rail connections by creating the environment with economic and social benefits although those changes in policies are challenging for the developing countries to implement. Moreover, by seeing the successful rail implementation in Sweden, the balance between dry port and hinterland transport system developments could be seen. Therefore, to implement an efficient dry port system in Myanmar, it should be a parallel development between the dry ports and transport infrastructure by eliminating the centralization of one of them.

Chapter 8. Conclusion

8.1 Summary

By discussing many different dry port development issues from a number of selected countries in developing and developed countries under different political backgrounds will give the policymakers a better understanding of the relevant issues (Garnwa et al., 2009). In this research, the comparative study of the dry port implementations in a developed and developing case study, points out the different issues of dry port development based on their different background conditions such as ownership, geographical conditions and governance structure. After the comparison of ownership, governance and regulation of dry ports, strength and weaknesses, opportunity and threats, so as to describe how both developed and developing countries can develop an effective dry port. Although approaches might not be the same for the development of the dry port because of a different economy and infrastructure development, the dry ports play in major roles for management in the supply chain and transport.

For the challenges of congestion, several seaports have many problems concerning the inland consolidation and distribution of goods, the concept of dry port is a feasible solution which can also benefit rail transportation improvement resulting in the situation with a better environment. Even though dry port implementation could give advantages in many ways for the involving actors, it depends heavily on the existing infrastructure and its future development, institutional systems as well as regulations and the attitudes of customers and collaboration. Moreover, due to the difference in nature and conditions of infrastructures and different conditions of the country between Myanmar and almost all of the other reviewed dry ports or inland ports, the rail connections between the seaports and dry ports cannot be implemented yet. However, in a common way, dry ports can be regarded as distribution or consolidation nodes for local goods and may reduce the overall vehicle distance travelled (kilometer) and as a result the global trade will be better.

Furthermore, with yearly information and the statistics of Myanmar and analyses, comparative analyses have been taken to summarize the conclusion. Nevertheless, the main implication of this research is to identify the major strengths and weaknesses, and to find out the way how to facilitate the dry ports in Myanmar.

8.2 Contributions

This article contributes to the overview of selective dry ports around the world by analyzing and examining the different approaches of implementation as well as the way of implementation and the challenges they have encountered in their implementation and development processes by reviewing the literatures. Moreover, the recommendations for the dry port in this study is intended to contribute to the policymakers and different stakeholders in Myanmar such as MPA and rail operators in considering the efficient dry port process implementation. However, it is also recommended for the relevant ministries or departments to participate in the implementation.

8.3 Limitations

The discussions in this issue are in some way related to the dry ports and seaports interactions, which may not be appropriate to the landlocked countries' dry ports where it is very far between dry ports and seaports and where the trade opportunities with land transports with each other rather than preferring to use seaports (Garnwa et al., 2009). Since Myanmar dry ports are in the starting stage, sufficient data is not available. Furthermore, this research was carried out under a limited scope due to insufficient information and the large uncertainty of economic benefits estimation because of the large number of assumption in addition to carrying out in the limited time frame. Moreover, as mentioned previously, for implying in reality, there could be a lot of considerations to be considered since recommendations are based on analyzing countries with different background conditions.

As for the further studies suggestion, if the exact operational data could be available in the future, the quantitative and qualitative analyses can be suggested in order to analyze and identify the realistic view of the different stakeholders by making interviews or via questionnaires and using the exact data in order to know the actual efficiencies of dry ports so as to increase the accuracies in further studies, and finally by giving more effective and efficient recommendation for Myanmar dry ports.

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