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Inland Container Terminal Development to Increase Seaport's Competitiveness in Bangladesh

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ABSTRACT

In the last decade, the growth of container port throughput of Bangladesh especially in the principal seaport Chittagong is increased significantly. This paper aims to examine the potential benefits of ICT development in the hinterland to support seaports for increasing port competitiveness against the continuous growth of port throughput. To involve in the container direct delivery activities due to poor inland intermodal connectivity, the port is facing problems in terms of congestion of vessels and containers in the port protected area and less than 5% of intermodal containers are handled in two RICTs and one rail ICD nearby the capital city Dhaka. Overall, inland freight transportation is dominated by local trucks and covered vans that resulted in congestion at the main road transport corridor Dhaka-Chittagong highway. This research is followed the conceptual model "Outside-In: Inside-Out" to develop inland freight transport network between seaport and ICT through intermodal also quantitative data analysis and site visits were performed in getting the future demand for constructing more ICTs to the hinterland of seaports. The major findings and originalities of the works are stated that intermodal freight transportation is not sufficient for sending/bringing intermodal containers to/from the final destination. The practical impact of this research will make interest the stakeholders, port authorities, government of Bangladesh and foreign investors in building ICT to develop the freight transport industry of Bangladesh.

1. Introduction.

In the last decade (2010-2019), the growth of container port throughput of Bangladesh especially in the principal seaport Chittagong is increased significantly. Maximum import containers are unstuffing at port premises or nearby off-docks in the port city Chittagong. To (Saha, 2015: Munim and Haralambides, 2018) involve in the container direct delivery activities due to poor inland intermodal connectivity, the port is facing problems in terms of congestion of vessels and containers in the port protected area and managing intermodal containers efficiently. According to the port throughput of Chittagong port (Chittagong Port Authority-CPA, 2020), less than 5% of intermodal containers are handling in two RICTs (Riverine Inland Container Terminals) and one Rail ICD (Inland Container Depot) nearby the capital city Dhaka. Overall, inland freight transportation is dominating by local trucks and covered vans that resulted in congestion at the main road transport corridor Dhaka-Chittagong highway. This research is followed the conceptual model based on two notions **"Outside-In"** and **"Inside-Out"** to develop inland freight transport network between seaport and ICT (Inland Container Terminal) as a part of the spatial development of freight infrastructure. In addition, a quantitative research method is used for port throughput data analysis of seaports and ICTs in getting the future demand for constructing more ICTs to the hinterland of Bangladeshi seaports.

The study reveals on the seaport's competitiveness, inland container terminal development process, the role of intermodal to bridge between seaport and inland terminals and expansion of hinterland for developing integrated freight transportation system in Bangladesh. The model was sightseen by Saeed *et al.* (2015) for introducing the innovation of a firm for increasing performance and Williams *et al.* (2016) for searching em-

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ployee happiness. For freight transportation system development, this model was introduced by Wilmsmeier *et al.* (2011). The conceptual model's first part **" Outside-In"** emphasized on the port competitiveness of Chittagong port and how this port will increase port productivity and efficiency by developing port facilities and container terminals. Similarly, second part **"Inside-Out"** had experienced that industrialization, introducing SEZs (Special Economic Zones)/EPZs(Export Processing Zones), manufacturing industry and offering transit / transshipment to the neighbors, together, the necessity of ICTs is growing concern for connecting to seaport importantly. However, bidirectional approach (Wiegmans *et al.*, 2019)) is the best way to develop integrated freight transport system where seaports and ICTs are working in the same freight transport network and covered the inland intermodal transportation timely and economically.

The major findings and originalities of the works are stated that intermodal freight transportation is not sufficient for sending/bringing intermodal containers to/from the final destination. Also, dry port facilities are absent, limited operations of rail ICD and new rail ICD construction work is postponed. Moreover, private ICT development initiative is not geared as private RICT is not getting users as per their estimation and unable to attract the port users for completing shipping activities in ICT instead of going to the seaport. Findings reveal to upkeep development of ICT because of less inland penetration of intermodal containers compared to seaport's throughput that is increasing significantly. The practical impact of this research will make interest to the stakeholders, port authorities, government of Bangladesh and foreign investors in building ICT to develop freight transport industry of Bangladesh. This paper aims to examine the potential benefits of ICT development in the hinterland to support seaports for increasing port competitiveness against the continuous growth of port throughput in the last decade.

2. Research Methodology.

The research methodology is important to design the research, investigate the research problems, how to collect data and analysis, compare and contrast, extract the major findings and furnish some recommendations to work in future. Newman (2011) suggested to follow a general research method qualitative or quantitative or mixed to conduct the research in a systematic manner. To follow the standard conceptual model of strategic management, Wilmsmeier *et al.* (2011) applied **Outside-In: Inside-Out** model in getting the relation of seaport and inland terminals that also further described by Wiegmans *et al.* (2019).

The basic concept of **Outside-In: Inside-Out** model is to explore the concentration of business and fixed the center of business for developing the strategy of the organization and bring competitive advantages over its competitors. In terms of freight transport management, the seaport is the pivot point of import and export and doing international trade that also modified and forwarded to the SEZs in 2010 from warehouse forwarding in 1950 as found in the research of Notteboom *et al.* (2017). This research is followed the **Outside-In: Inside-Out** model for understanding the requirements of the ICT to improve the port competitiveness of Chittagong port and develop inland intermodal connectivity that also examined by quantitative data analysis especially container port throughput of Chittagong port statistically.

Furthermore, site visits were performed to get the prospective places inside Bangladesh for constructing ICT (Rail, road and river). Emphasize was given to convert the existing land ports into dry port to serve nationally and internationally as because of regional demand of Bangladeshi seaports in developing regional connectivity in South Asia and Southeast Asia that also investigated in the study of Munim and Haralambides (2018).

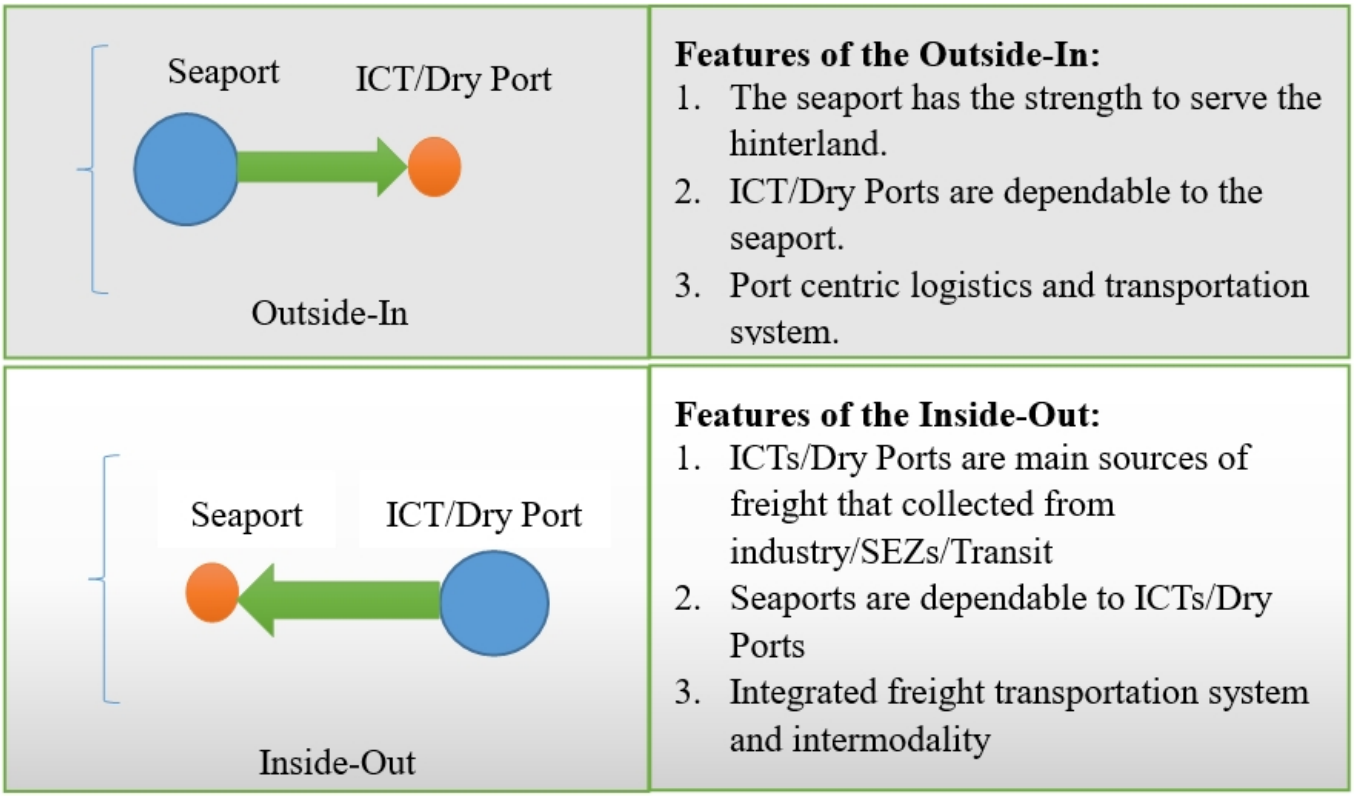
Decently, this research is faced limitations in data collection (Actual port throughput data separately imports and exports in years), site visits (Like, the land port authority not permitted to enter into the operational site and disclosed data accurately) and summarized the outcome of the model (Unable to test at the field) fully. However, this is a process of starting new research on port hinterland development by ICT/dry port/SEZ and improve the seaport connectivity for reducing the pressure of seaport by intermodal connectivity and increasing seaport's efficiency as well as port competitiveness of principal seaport Chittagong of Bangladesh.

3. Seaports and Inland Container Terminal of Bangladesh.

The principal (CPA, 2020) seaport of Bangladesh is Chittagong port is managed by the Chittagong Port Authority (CPA) and serving the nation and active in the national development process. To meet the global requirements and national demand, CPA (2020) is trying to improve the port efficiency and offer affordable costs to the port users also have the vision to set the port as a regional hub and addressing problems areas and took sustainable reforms initiatives through bold steps and directives. Proudly, Lloyd's List (2019) ranked Chittagong port as 64^{th} busiest container port of the world because of record container port throughput 2.9 mTEUs (Million Twenty-Feet Equivalent Unit). The port is well connected to the 19's off-dock in Chittagong as small scale intermodal by road mode, one rail ICD in Dhaka by rail mode and two RICTs (Riverine Inland Container Terminal) by river mode. However, Lee *et al.* (2018) emphasized on the port infrastructure and connections for performing as a globalized hub and ensure inland connections and value-added function as a logistics center in developing a fifth-generation port. It is essential to develop this port as the fifth-generation port and need to increase the number of functions for acting globalized and logistics hub in Asia.

In addition, Mongla port (MPA-Mongla Port Authority, 2020) is the 2^{nd} busiest seaport in Bangladesh who situated 71 nautical upstream of the Bay of Bengal and depend on the river tide for managing port operations. The port is striving to increase the container handling at port premises and calling more container vessel due to inadequate handling equipment and inland transport network. However, JOC (2020) reported that the Mongla port has initiated a project from increasing container handling

Figure 1: "Outside-In: Inside-Out" based on Wilmsmeier et al. (2011).

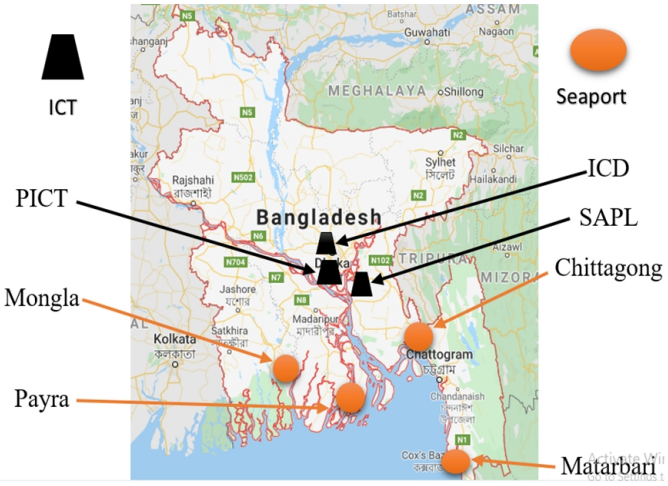


Source: Author.

capacity from one mTEUs to four mTEUs by constructing two container terminals, container yard and other facilities. The government (PPA-Payra Port Authority, 2020) of Bangladesh is introduced third seaport Payra in 2013 for modernizing port services especially transport services to the hinterlands through river routes and aimed to serve not only for Bangladesh but also neighboring countries by using its geographical advantages and hinterland connectivity in South Asia. Finally, Bangladesh (The Financial Express, 2019: Shawon, 2020) is going to construct a deep seaport in Matarbari, Cox's Bazar with the help of Japan for facilitating the continuous growth of Bangladesh as support the region by providing port transportation facilities.

As per Figure 2, there are two RICTs and one rail ICD in Bangladesh. The Dhaka rail ICD is started in 1987 and performing well to manage Dhaka bound containers only. After inaugurating the first RICT named PICT (Pangaon Inland Container Terminal) in 2013 by the government in Dhaka, another RICT named SAPL (Summit Alliance Port Limited) as first private RICT started its operation in 2016 for forwarding shipping activities from Chittagong to Dhaka and increase the sphere of intermodality after rail intermodal. There are no pure dry port facilities in Bangladesh for serving by road and rail mode and connect to the seaport. As stated earlier, three ICTs are connected to the Chittagong port and performing pure intermodal and less than 5% (Details are in the Data Analysis Section) of Chittagong port's container port throughput. The rail ICD is situated in Dhaka and handled approximately 95,000 TEUs in

Figure 2: Seaports and ICTs in Bangladesh.



Source: Author-Map. Google (2020).

2019 as the full capacity of the ICD in the first time as reported by The Financial Express (2020).

Among the three seaports (Figure 2) in Bangladesh, the principal seaport is Chittagong port who is playing a vital role in managing maximum international trade. Beside, Mongla port is active but not in a dynamic position as like Chittagong port. Greatly, Wilmsmeier *et al.* (2010) brought the mega-hub concept that is only possible by constructing deep seaport also

reasoned by Munim and Haralambides (2018). The government introduced third seaport Payra in 2013 in the aim of serving as a deep seaport. Recently, the government declared to set first deep seaport in Matarbari Chittagong that will also act to serve South Asia and Southeast Asia especially landlocked countries Nepal and Bhutan also landlocked parts of India and China. In addition, one private port is under development in the name of PPP (Public-Private Partnership) to expedite the private port services for all. Jeevan *et al.* (2020) witnessed the transformation of seaport from traditional to modern: isolated to network seaport: mere interface locations to commercial and logistics hubs that developed generation to generation irrespective of periods, throughput volume and competitiveness. Overall, the derived demand of the nation. Similarly, Chittagong port developed and constructed new terminals, general birth to container terminals, expanded port areas and built container yard. But not sufficient as per demand and became congested and unable to accommodate container and other vessels. As per the investigation, this happened due to poor inland connections and networking facilities.

4. Problem Statement and Scope of the Work.

The growth of container port throughput is showing the significant development of international trade and port performance but it is stagnant in the port cities due to poor intermodal network. Statistically, less than 5% of containers are moving in the pure intermodal networks. A small scale intermodal is operating in the port city Chittagong but not helping to reduce the uses of trucks and covered van that is creating congestion in the road and highways also unhealthy to the environment. Container handling at off-docs under Chittagong port is increased dramatically from 0.899 mTEUs to 1.463 mTEUs (Details are in Table 2) but it is not the ultimate goal of intermodal.

There is no dry port facilities in the country and a limited number of ICTs and not fully functional due to poor infrastructure, inland connectivity, high passage time and inefficiency in rail transportation. Furthermore, the overburden of Chittagong port due to easy connectivity and trust of users, on the other hand, underutilization of Mongla port due to inland transport connectivity and poor handling performance of container and vessel, overall, port transportation is lagging behind the standard and expectations. Malaysian (Jeevan *et al.*, 2020) seaports are accommodating larger volumes of the container within a limited seaport capacity by introducing a dry port system to the hinterland. Besides that, Bangladeshi seaports are yet not oriented dry port facilities. Only three inland container terminals (Two RICTs and one rail ICD) are interconnected with seaport Chittagong. The second-largest seaport Mongla has no connection with any ICT. In a limited intermodal scale, Chittagong port has the spoke connections with 19 off-docks in addition of three ICTs. Being a hub of 32 inland connections, Chittagong is helping to construct 3^{rd} seaport Payra also deep seaport in Matarbari, Chittagong

The general framework of this study had developed to see the interconnectivity of seaport and ICT that circled by the intermodal freight transportation system. Greatly, international (Roso *et al.*, 2013) freight flows are driving by hinterland connection between inland ports and seaport as a growing concern or motivation on the efficacious dynamics of shipping function globally.

The main objective of this study is to develop an inland intermodal connection between seaport and inland container terminals to accommodate the containers to the hinterland and remove the pressure to seaports by scattering the freight and manage in the inland terminals. This will help to change the traditional container handling and its cargo management by using trucks and covered as well as reducing road congestion in the Dhaka-Chittagong highway. However, the scope of the works are as below:

1. To construct and develop seaports as per international standard where intermodal container terminal will be connected to the ICTs of the hinterland. In addition, priority should be given to the rail and river intermodal system to protect the environment.

2. To construct and develop ICTs in the hinterland as a center of EPZs/SEZ/Industry/Transit/Transshipment and develop a smooth connection to the seaport for providing seamless services to the port/terminal users.

3. To develop an integrated intermodal freight transportation system by mixing the mode of rail, river and road for less utilization of trucks and covered van.

4. Port service marketing and assist to expand the hinterland and do port transport business with the neighbors by providing transit or transshipment facilities as a part of regional connectivity.

Overall, this paper aims to make a relation between seaport and ICT of Bangladesh for smooth handling of containers timely and economically.

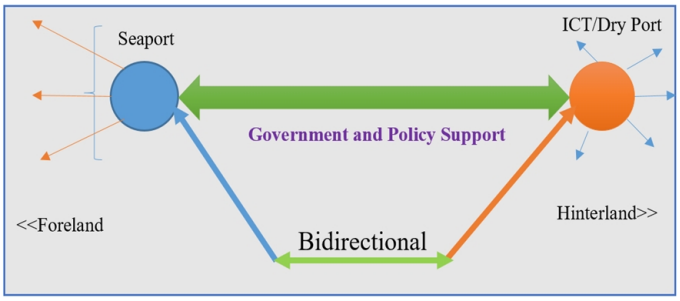
5. Literature Review.

The start-up phase of "Outside-In: Inside-Out" model was described by Wilmsmeier *et al.* (2011) to develop inland terminals as well as a dry port for forwarding seaport activities to the hinterland and promote intermodal system instead of cargo stuffing and delivery activities at the port or nearest off-dock. Furthermore, the growth phase is illustrated by Wiegmans *et al.* (2019) where they added bi-directional model to create smooth connectivity between seaports and inland terminals (Figure 3).

Figure 3 demonstrated the bidirectional model that has common features to set the integrated freight transportation system. In this model, seaport authority developed the networking system for increasing hinterland through inland terminals and offered port transportation services to the users up to the foreland strategically that required policy support of the government. In addition, this model helps to develop integrated inland distribution networks and an opportunity for last-mile delivery easily in the banner of the intermodal freight transportation system.

Vaggelas (2019) investigated the missing link of port performance that is the inclusion of the user's perception. In most cases, port users are ignored in measuring port effectiveness, fulfilling the want of customers and stakeholders also satisfaction. Wilmsmeier *et al.* (2011) argued for spatial development

Figure 3: "Bidirectional" model based on Wiegmans et al. (2019).

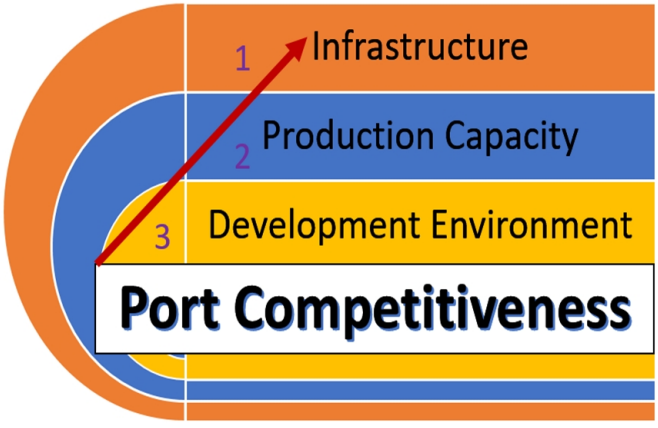


Source: Author.

for connecting ICTs as well as inland transport network development in addition to the port developed that contended by the research of Saha (2015) context Bangladesh. In doing so, emphasize has been given to the port users and port authority is in practice to learn and know its customer. To upgrade a port, port (Mou *et al.,* 2020) authority has to consider sustainable development, reliable transformation and inland connectivity as per potentiality for getting port competitiveness.

In terms of freight transportation system development, Wilmsmeier *et al.* (2011) modified and exercised **Outside-In: Inside-Out** model in the freight transportation system exclusively for intermodal in developing inland terminals and integrate with the seaports. Tang *et al.* (2020) evaluated the port competitiveness and selected three main indicators for knowing the situation of a port to serve efficiently. The main indicators are infrastructure, production capacity and development Environment that in Figure 4.

Figure 4: Indicators of port competitiveness (Tang et al., 2020).



Source: Author.

Traditionally, economic (Wilmsmeier and Monios, 2016) development had transformed by material mobility that exploded in the wake of containerization and globalized the maritime logistics system. Next, van der Horst (2016) viewed that shipping lines are crazy to see the hinterland connections (like to see large hinterland), port facilities and tariffs, feeder connectivity, intermodal facilities, inland terminals and environmental hazard for selecting seaport. Merk and Notteboom (2015) stated in a discussion paper that port competitiveness is prompting to participate in the development of trade corridors that will set integrated multimodal system of a port in order to improve market access, the flexibility of trade and connection to the industrial networks. Grushevska and Notteboom (2016) emphasized on the river-based intermodal system that will allow to reduce the inland transport cost and reliability of the services for doing international maritime trade with special attention to environmental sustainability.

Witte *et al.* (2020) examined that inland ports are the expansion of maritime port that developed to pay attention to the importance of geographical context also moving forward to land in developing the international shipping connectivity safely. Gonzalez-Aregall and Bergqvist (2019) argued to consider effective and efficient design and structure of inland port to maintain cost efficiency and service quality also manage the risk mitigation strategies for acting as an alternative of maritime ports. Vaggelas (2019) emphasized on the port strategies as a vital part of port competitiveness to understand all peculiar characteristics of each port, needs and requests. Monios and Wilmsmeier (2013) found that terminal operators have successful investment records in the inland terminal to manage their container port throughput strategically. This is making a good relation between seaport and inland terminal and create easy communications and connectivity that also lucrative for port users where they can accomplish the maritime port activities in the inland terminal.

Table 1: Port competitiveness indicators.

SL#	Indicator	Focused by Tang *et al.* (2020)	Context Bangladesh	Remarks
1	Infrastructure	Length of the birth Number of berth Storage area Number of handling equipment	Length of the birth Number of births Permissible draft Number of handling equipment Hinterland's connectivity Inland transport infrastructure	CPA (2020) has a plan to construct new container terminals
2	Production Capacity	Cargo or container Throughput	Container throughput Actual handling capacity Average handling record	Stable growth of all seaports
3	Development Environment	GDP (Gross Domestics Product) Foreign trade volume	Number of EPZs/SEZs/industry in the port perimeter Number of export-oriented industry GDP is good Foreign trade volume	GDP growth is above 8%

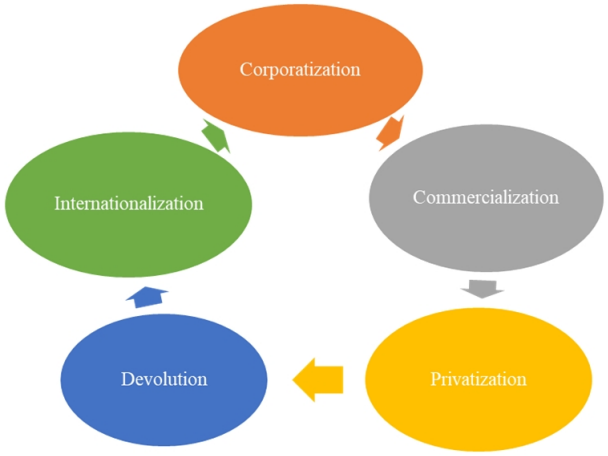
Source: Author.

Wilmsmeier and Monios (2016) examined that intermodal inter-linkages of a seaport had fostered the international trade and transport as well as changed the geography and structure of international shipping and emphasized on the industrial production and regional integration. However, the container (Wilmsmeier and Monios, 2020) shipping is passing a bad time and struggling with ambiguity. The possible reasons are the mainline alliance, overcapacity, low trends of international and seaborne trade. They also explored the role of shipping and spatial transport cycles along with industry cycles behind this uncertainty but potential to carry the maximum freight of the international trade by container and need to emphasize on the intermodal to avoid any hassle in the passageway. Monios and Wilmsmeier

(2013) explored the role of intermodal transport in selecting regional port and recognized the theory of port regionalization by Notteboom and Rodrigue (2005).In this connection, Monios and Wilmsmeier (2013) addressed port regionalization concept that identifies and examined the role of intermodal transport that has the relevant infrastructure, integration among the users and pure connectivity from the origin to the destination.

Wilmsmeier and Monios (2016) discovered the new role of port authorities where they have become intermediaries and facilitators of inland freight network development including inland terminal development as a part of hinterland expansion. Jeevan *et al.* (2020) examined that the collaboration of dry port or ICT with seaport improves the transport, logistics and administration functions of the users and helps to reduce container dwelling time in both terminals including cost and passage time. Overall, it has a role to develop shipper connectivity with ICT or seaport towards the hinterland. Intermodalism (Ge *et al.,* 2020) became popular as an international transport mode due to its operational efficiency and cost-effectiveness compared with unimodal or road transportation system. They found the waves of intermodal transportation worldwide currently and seaports are constructing a logistics platform for upgrading intermodal based terminal facilities and inland intermodal connectivity. On the contrary, intermodal (Binsbergen *et al.,* 2014) had received huge attention by the users and government and obtained many innovations to boost the market share of international freight transportation but materialized few of them due to infrastructural problem, capital shortage and involvement of too many stakeholders.

Figure 5: Global phenomena in port operations.



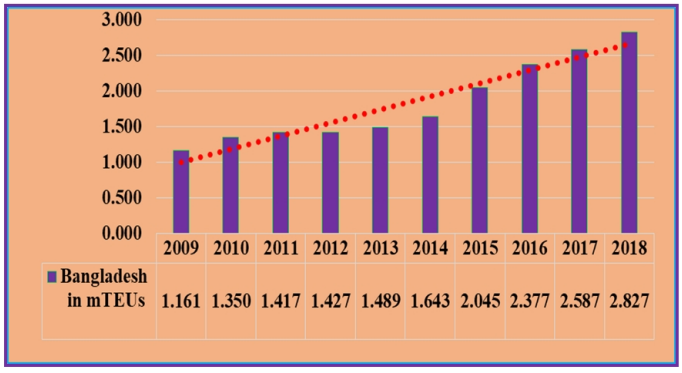
Source: Wilmsmeier and Monios, 2016.

Figure 5 demonstrated the global phenomena in port operations in the changing geography and structure of port management. Wilmsmeier and Monios (2016) faced new challenges in port development, maritime network development and balancing demand-supply due to geographical shifting of manufacturing, distribution and consumption comprehensively. Roso *et al.* (2013) argued for inland port development as it is a process for adding value to the economic development, reducing the bad impact to the environment also to the goal of sustainability and contributing to the performance of supply chain incredibly. Agbo *et al.* (2017) stated that Synchromodality is one more step ahead of intermodal that has cost efficiency and reliability of world port transportation system with the ability to switch between modes with real-time transport information during maritime-hinterland transportation. Alons-Hoen *et al.* (2019) tested the maturity level of the intermodal and extracted the function of synchromodal that will help to complete the full logistics of the container transport system.

Besides the handling of container vessels and containers in the port protected area, Wilmsmeier and Monios (2016) found that ports are being involved in market developments by their institutional efficiency and expand the hinterland. Like this Chittagong port is developing inland terminals in the hinterland and promoting the port services for doing port transport business nationally, regionally and internationally. Port (Saha, 2015: Chudasama and Kota, 2016) development is a part of infrastructural development of a country that attracts industries and others to set business entity in the hinterland. Earlier, port development was benefitted to the coastal regions but now it exceeded cross-border even to other regions due to intermodalism as discovered by Chudasama and Kota (2016). Furthermore, the port (Chudasama and Kota, 2016) and inland terminal development is an economic and political objective that helped to grows relation and trade of a country by bilateral, multilateral and international contract also expedite by regional forums like BBIN, BCIM and others. Lastly, Bucak and Esmer (2019) accentuated on the proper logistics conditions by port and inland terminal authorities to keep up or upgrade port performance to users effectively.

6. Data Analysis.

Figure 6: Container port throughput of Bangladesh in mTEUs (2009-2018).



Source: Author.

This section analyzed the quantitative data to understand the business trends of Bangladesh and Chittagong port also its inland partners RICTs and rail ICD. In addition, container ports throughput of transport nodes are illustrated in Table 2. In this connection, Lee *et al.* (2018) brought the active role of inland

port or terminal or container terminal to the fifth generation port concept model where ICTs are acting as a part and parcel of the seaport that is a key element of global supply chain system. United Conference on Trade and Development Statistics (UNCTADStat, 2019) summarized the container port throughput and stated that Bangladesh has a significant growth in container transport. Figure 6 demonstrates the dramatic growth started in 2015 and exceeded the trend line in 2016 and keeping the same up to 2018.

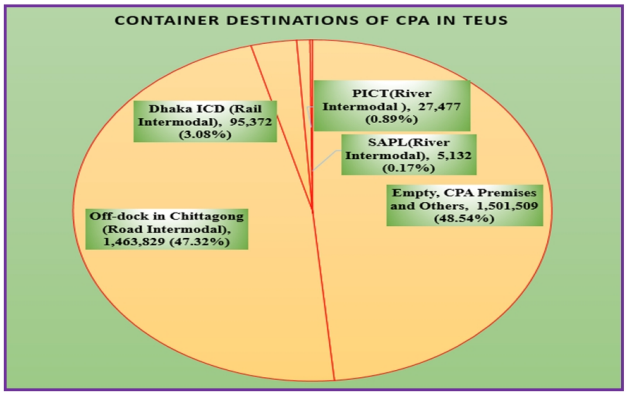
Table 2: Container Throughput of Bangladesh in Different Nodes (2010-2019).

SL #	Year	CPA	Off-dock	MPA	Dhaka ICD	PICT	SAPL	Remarks
01	2010	1,343,448	437,612	19,604	64,369			Physical data collection from CPA, MPA, Dhaka ICD, PICT and SAPL. PICT and SAPL started their operations in 2013 and 2016 respectively
02	2011	1,392,104	444,091	31,206	69,723			
03	2012	1,406,456	484,004	34,451	67,010			
04	2013	1,541,517	590,978	44,773	56,447	358		
05	2014	1,731,219	655,625	43,724	60,886	984		
06	2015	2,024,207	722,528	44,891	69,087	1,247		
07	2016	2,332,892	795,826	31,087	70,363	4,212	2	
08	2017	2,667,202	878,331	33,810	74,907	25,719	435	
09	2018	2,903,996	899,696	54,144	83,960	22,508	1,418	
10	2019	2,965,338	1,463,829	60,083	95,372	27,477	5,132	

Source: Author.

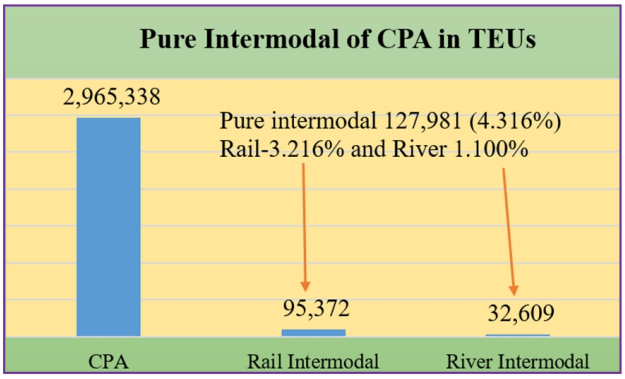
Merk and Notteboom (2015) advised to the port authority for interfacing between maritime trade and economic activities of the port and inland terminals through intermodal structures and connections. Accordingly, Figure 7 is showing the low performance of inland terminals and intermodal share is not up to the mark but Chittagong port is increasing the number in each year. Mention that intermodal (Agbo *et al.,* 2017) is a part of the multimodal freight transportation system that opened the door of synchromodality in the freight transport management with co-modality and full management of the cargo from the origin to the destination. Unfortunately, the number of ICTs and containers are not sufficient to handle this big volume that resulted in vessel congestions and disruptions in the container supply chain.

Figure 7: Chittagong port's container distribution to the final destinations.



Source: Author.

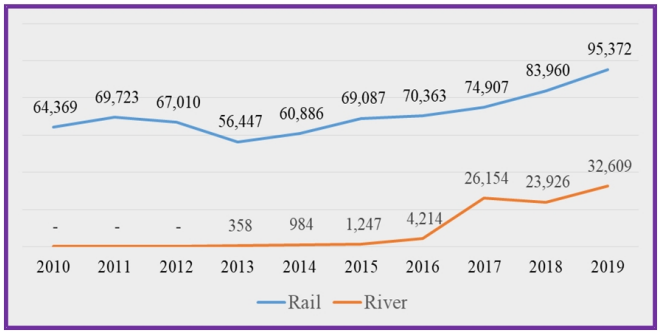
Figure 8: Chittagong port receiving in 2019 and intermodal to ICTs in TEUs.



Source: Author.

Figure 8 is showing the intermodal share against the Chittagong port receiving and it is decreasing as it was near 5% in 2010 to near 4%. After 2013, two RICTs are introduced but intermodal share falls significantly. Binsbergen *et al.* (2014) identified that transport industry is very competitive but lower profit margins and intermodal systems required the collaboration of many operators and stakeholders also a huge capital investment for terminal development and handling equipment purchase. This analysis is indicating to set ICTs in the hinterland for increasing intermodal share as soonest as possible.

Figure 9: Trends of rail and river intermodal against Chittagong port (2010-2019).



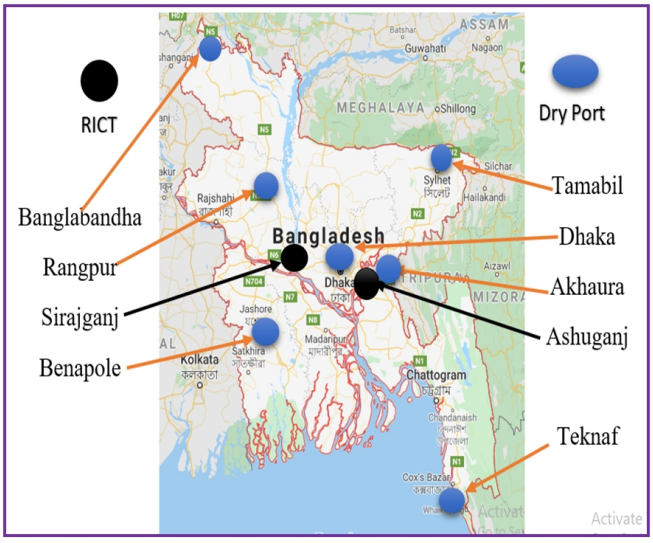
Source: Author.

Figure 9 is viewing the continuous growth of rail but river intermodal is underutilized. Lee *et al*., (2018) revealed that the port industry is facing multifaceted contemporary issues as core challenges to sustain where hinterland management is a factor to operate without the help of inland terminal operators. In the empirical analysis and during site visits of RICTs, it was explored inland transport network from/to RICTs is poor and users are not interested to use RICTs because of passage time from Chittagong port to RICT is higher. The mindset of the users are reasons behind to go Chittagong port for doing shipping activities nationally.

7. Prospective Places for Inland Container Terminal Development.

To identify prospective ICTs inside or cross-border of Bangladesh, the author had visited land ports, river ports and industrial places to cover EPZs, SEZs, and other industry also developing hinterland facilities for the neighbors as transit or transshipment facilities. The government of Bangladesh is planned to establish 100 SEZs (The Dhaka Tribune, 2020) and offer transit/transshipment facilities to the neighbors. To get the prospective ICTs at the inside of Bangladesh, the researcher had visited the potential places of Bangladesh to propose ICTs in connecting to the seaport based on the cargo source as well as locations of the EPZs/manufacturing industry/proposed SEZ/others. Promptly, Chudasama and Kota (2016) examined that corridor development is the best way to increase the inland accessibility by inland terminals to stimulate inland distribution system. Also visited land ports for converting into dry port or cross-border corridor and connect to the seaports of Bangladesh.

Figure 10: Prospective Places for Inland Container Terminal in Bangladesh.



Source: Author.

Figure 10 demonstrated the prospective ICT nodes for connecting to the seaports of Bangladesh especially Chittagong port for serving nationally, regionally (India, Nepal and Bhutan) and internationally (China and Myanmar). There are two RICTs which are available in nearby Dhaka city. In the aim of getting dry port and inland container terminals besides rail, road and river, site visits were performed. The first visit was performed to the land port Tamabil Sylhet (Figure 10) and succeeded by Banglabandha, Benapole and Akhaura. Mention that Bangladesh has 24 land ports but this research selected 4 land ports to get the viability to convert into a dry port for national and regional requirements to act as corridor at the cross border.

Furthermore, targeted river ports and visited several places but identified two as potential for RICT only. Grushevska and Notteboom (2016) examined that the development of river-based transport chain will help to develop regional load center network. Particularly in Bangladesh, the river facilities are the main strength to promote intermodal also freight transport network especially connecting the main part of India to the simple landlocked part of India via inland river terminal PICT, Ashuganj, Sirajganj and others actively.

Table 3: Connectivity of proposed ICTs with seaports.

Name of the proposed ICT	Type	Mode	Connecting Seaport	Coverage	Remarks
Banglabandha, Panchagarh	Dry port	Rail and Road	Chittagong and Mongla	National, regional and international	Existing land port and nearby India, Nepal, Bhutan and China
Tamabil, Sylhet	Dry port	Rail and Road	Chittagong	National and regional	Existing land port and nearby India, and Bhutan
Teknaf, Cox's Bazar	Dry port	Road and River	Chittagong	National, and international	Existing land port and nearby Myanmar
Benapole, Jessore	Dry port	Rail and Road	Payra, Mongla and Chittagong	National and regional	Existing land port and nearby India.
Akhaura, Bramhanbaria	Dry port	Rail and, Road	Chittagong	National and regional	Existing land port and nearby India
Dhaka	Dry port	Rail and, Road	Mongla and Chittagong	National	Also viable for river connections for domestic's uses.
Rangpur	Dry Port	Rail and Road	Mongla and Chittagong	National	Feasible for domestic's uses.
Ashuganj	RICT	River	Chittagong	National, regional and international	Existing land port and nearby India.
Sirajganj	RICT	River and Rail	Chittagong and Mongla	National	Feasible for domestic's uses.

Source: Author.

Table 3 listed the proposed dry/port and ICTs for connecting to the seaports for increasing the port competitiveness to attract neighbors for using seaport facilities from Bangladesh and develop an integrated intermodal transportation system in Asia as argued by Saha (2019). Alons-Hoen ***et al***. (2019) found that transport efficiency is volatile and always under pressure due to increased traffic in the passageway that is causing traffic jams at the road and taking unreliable travel times. So, it is urgent to increase the number of ICTs to avoid the uses of trucks and covered van and open the direct container transportation from port to ICTs.

8. Major Findings and Discussions.

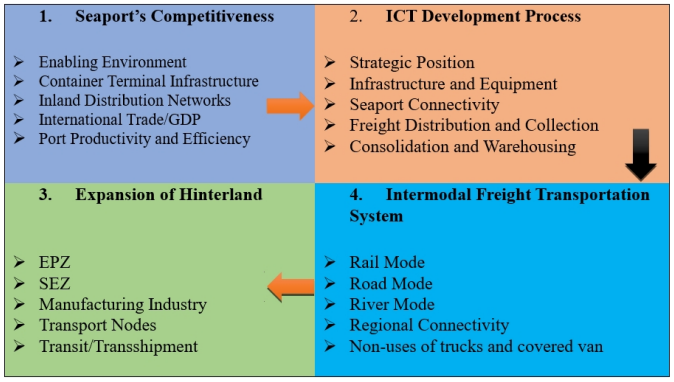
There are many factors behind the growth of economic development are foreign remittance, RMG (Readymade Garments) trade promotion, and industrial transformation in Bangladesh. In addition, well agricultural production and exposure of service industry brought the dynamic economic development of Bangladesh. All of those activities and continuous infrastructural development had created such an environment for the import-export trade that is looking to the container port throughput of principal seaport Chittagong port that tripled in the last 10 years (2010-2019). Mou *et al.* (2020) noted that port development potential is completely different from the port competitiveness, it started from capability and further transformed into competitiveness. With much talk, van der Horst (2016) perceived that containerization affected the management, operations and products of the seaport worldwide and most of the ports are trying to adapt with the new technology of automation and quick forwarding of cargo and containers to the inland terminals of the hinterland.

The most important factor is the hinterland development and contribution of the seaport from a distant place and ensures

the port service through inland terminals or dry port. Wilmsmeier and Monios (2020) discussed the maturity phase of the containerization and found a vertical integration in terminal and inland operations that affected the entire supply chain. Considering this integration, the connections of Bangladeshi seaports and inland container terminals are poor and not in a standard position to support seaports to absorb the excess pressure of receiving containers and send to the hinterland terminals. The study also found the policy matters in taking the decision by the government for providing scope to take the delivery of container from inland container terminals instead of port premises or nearest off-dock. This is a big problem in reducing the vessel and container congestion at the port that experienced in 2020 during the COVID-19 exposure time.

The continuous GDP growth as above 8% (The Dhaka Tribune, 2020) and container port throughput increment are the clear indication of economic development as well as the country have enabling environment. On the contrary, seaport services are not up to the mark because port services are limited in the port city Chittagong and intermodal is not performing fully to send the freight up to the final destination due to improper inland connectivity and shortage of inland container terminals. Based on the conceptual model, quantitative data analysis and site visits, this research explored some findings and discussed in four kea areas as per below Figure 11:

Figure 11: Attributes of seaport?s hinterland development by ICT.



Source: Author.

Witte *et al.* (2020) categorized the port and inland terminal developments in three perspectives are national (focused on national development and its operation to serve restlessly), regional (To bring the economic impacts of the region and governance) and local (just spatial transportation and little localized impacts). The port of Chittagong has local and regional impacts as because of its performance in container handling and the role of developing inland terminals also seaport like Payra port (CPA, 2020). Mention that inland terminals are the main parts of a larger logistics system that will allow to complete the operations of last-mile delivery and inspire to develop the industry. Two aspects are important in constructing ICT are minimizing the local or national demand and another one to mitigate the demand for the region also sacred duties to serve the land locked countries or basic landlocked parts of a country. The traditional approach of managing own or national port and manage the freight is completely changed. Being the owner of a seaport, there are several examples of using other's port to get geographical advantages and reducing cost and time: the port of Rotterdam is featuring the same instance in the freight transport geography.

Fundamentally, container (van der Horst, 2016) is a physical infrastructure and convenient for all and efficient in the networks of road, rail and river (inland shipping) that increased international trade significantly and promoting intermodal in all modes of transport ominously. Bangladeshi (CPA, 2020:MPA, 2020) seaport's container port throughput is in a stable position and Chittagong port's productivity is remarkable in the last 10 years as showing 54.69% (See Table 2). In addition, Mongla port has initiated a plan for increasing container handling 4 times by new terminal, yard and others. This is the great approaches to increase seaport's competitiveness as per **Outside-In** model that will attract port users nationally, regionally and internationally and connect to the seaport economically and timely.

International (Wilmsmeier *et al.,* 2010: Wilmsmeier and Monios, 2020) container shipping is moving to the hub or regional port strategy to promote big vessel and ensure seamless connectivity to the inland terminals for increasing the hinterland of a logical regional port irrespective of the country. These trends are much more support to the geographical advantages port like Rotterdam. Fortunately, Chittagong port has the same geographical advantages to support South Asia and South-east Asia. However, this research explored the shortage of inland terminals for expediting transit or transshipment facilities to the neighbors. In here, it is essential to set or integrate intermodal modes between seaport and inland terminal and further connectivity to the cross border/ corridor to manage the international container in a region. The initiative (The Dhaka Tribune, 2020) of developing 100 SEZs by the government, the continuous growth of RMG industry and other industries including developing agricultural value chain are supporting Inside-out model that indicates significant strength of inland cargo sources to develop inland container terminals. Moreover, the regional derived demand for accessing Bangladeshi seaports is supporting to convert land port into a dry port for developing trade corridor and **Inside-Out** model for ICT development and intermodal transport network development

In the view of van der Horst (2016) and found in the literature review section, shipping lines are favor to the large hinterland in selecting a seaport in a geographical area where new EPZ/SEZ/ industry and opening transit and transshipment facilities are the way to expand the hinterland. But, constructing inland terminals are the best way to develop port hinterlands by attracting the investors for investing in EPZ/SEZ/ industry. Moreover, establishing dry port or ICT at the cross-border (Study explored to convert land port into dry port) and open the corridor or transit or transshipment facilities to the neighbors as an institutive to expand seaport's hinterland strategically. This will make an uninterrupted connection to seaports from dry port/inland terminals by intermodal services of all rail,

road and river modes.

In terms of container shipping management, Roso *et al.* (2013) examined that major port services are moved to the inland container terminals and added value services in the inland terminals especially to the environment by using intermodal services from/to seaports. In summary, seaport's competitiveness as **Outside-In** and industrial development as **Inside-Out**, together, indicating the application of the bidirectional model for freight transport network development of Bangladesh. The site visits, performance of pure intermodal (less than 5%) and number of ICTs (Only three no's, two RICTs and one rail ICD) against the seaport performance (Above 3 mTEUs container handling) are clear research outcome is to set more ICTs and secure pure intermodal in Bangladesh.

9. Future Directions.

The study explored the role of seaport and ICT in developing the freight transport sector. To expedite the growth of Bangladesh as well as developing freight transport, the below recommendations are detailed as per research findings, data analysis and site visits:

1. Port (Saha, 2019) development is essential in Bangladesh. The port authorities should take necessary steps for developing container terminals, intermodal connectivity and introduce automation in container handling and networking with ICTs to the hinterland.
2. Wilmsmeier and Monios (2016) argued for port privatization that has a combination of private investment & operations and public planning approval. The study is recommending PPP for port and ICT development locally and internationally.
3. Mou *et al.* (2020) advised to optimize resource allocation, economic efficiency, and investment quantity along with ensuring environmental protection to sustain in the port sector and enable health environment in the port premises and operational areas. Intermodal access to be constructed in the port protected areas and minimize the hinterland's container connecting time as lowest as possible.
4. Roso *et al.* (2013) advised the port authorities or management body in devising port policies and strategies differently and incorporate inland terminal activities, operating procedures and performances accordingly. The port authority has to contribute to ICT development and finance accordingly.
5. Ge *et al.* (2020) argued for institutional design and system regulation for developing rail intermodal and creating a business environment to offer standard services to the rail freight users. Need to emphasize on the rail intermodal development. In 2019, rail ICD exceeded its capacity to 95,000 TEUs. Now, it is essential to implement the plan for constructing new rail ICD as planned by Bangladesh Railway.
6. Vaggelas (2019) suggested to the port authorities for adopting a more extrovert strategy for knowing all details of freight industry even air freight industry as a part of the continuous development initiative. Seaports and airport authorities need to work jointly for common logistics support to the industry.
7. Research in freight transportation system is essential for understanding the demand and supply of port facilities and its further connectivity to the hinterland.

Conclusions.

Seaports are playing a vital role in doing international trade. As a maritime nation and developing country, Bangladesh needs to develop its inland freight transport network. This research adopted the **Outside-In: Inside-Out** model to understand the stage of the requirement of transport nodes and how to develop modes to offer integrated freight transportation system. Greatly, intermodal has big features to support container transportation system. Ports (Vaggelas, 2019) are the commercial entities but the quality is the most important factor to increase port competitiveness that will help to viable in a strongly competitive environment. The strategic position of Chittagong port in the Bay of Bengal necessitates a seamless intermodal freight transportation system for facilitating maritime transport facilities in the inland container terminals and handle the cargos of hinterland efficiently.

Wilmsmeier and Monios (2020) expected a new cycle in the container shipping and inland container terminals will play a pivotal role to distribute and collect cargo for receiving/sending a full container from the seaport as a full-pledged intermodal system. It also features as a sustainable freight transportation system in reducing carbon emissions at the inland transportation in a geographical area. Moreover, introducing the mega container vessel and container line alliance are inspiring to develop inland intermodal connectivity to avoid the congestion of port-hinterland traffic. The efficiency (Bucak and Esmer, 2019) and performance of hinterland transport by seaports always depend on the transport mode and inland terminal performance. Therefore, it is the high time for Bangladesh to design, construct and operate sufficient inland container terminals for easy connection to the seaports.

In data analysis, it was found that less than 5% of containers are moving to the intermodal network. The performance of off-docs in Chittagong are doing well but not adding value as trucks/covered vans are taking cargo from the nearby Chittagong port and congesting the roads and highways. In addition, the research explored the prospective places for ICTs but government's cooperation and polices are appreciated to make compulsory container movement to ICTs as per nearby final destination of cargos also the same for export cargo. On the other hand, the number of ICT is not sufficient to serve all industries including new SEZs and port services to the neighbors.

Infrastructural development, industrialization and tremendous RMG industry growth of Bangladesh had developed the manufacturing and distributions of containerized cargo all over the country. In contrast, containerized cargo's inland transportation is performing by trucks and covered van that is unhealthy and nor favoring the carbon reduction commitment to

the SDGs. Lastly, three important issues that need to consider are the improvement of seaport services by intermodal facilities, constructing sufficient inland container terminals inside the country to support industry/EPZs/SEZs/Transit/Transshipment and develop integrated intermodal transport connectivity between seaport and ICT.

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