INTERMODALITY: CREATION OF NEW MARKETING OPPORTUNITY FOR BANGLADESH

Ph.D. THESIS

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بسم الله الرحمن الرحيم

IN THE NAME OF ALLAH

THE BENEFICENT, THE MERCIFUL

DEDICATED TO

My beloved parents

LATE MD. MOJIRUL ISLAM

And

MRS. MOHIBUNNESSA KHANAM

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CERTIFICATE

This is to certify that the thesis entitled "Intermodality : Creation of New Marketing Opportunity for Bangladesh" submitted by Md. Ziaul Islam, to the University of Dhaka for the fulfilment of the requirements of the degree of Doctor of Philosophy (Ph. D). The work carried out under our supervision is an original piece of research work and has not been submitted previously in part or full for any degree or diploma of Dhaka University or any other Universities.

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I do hereby declare that this thesis entitled "Intermodality: Creation of New Marketing Opportunity for Bangladesh" submitted by me to the University of Dhaka, Dhaka, Bangladesh for the degree of Doctor of Philosophy (Ph.D) are of my own work. This thesis has not been submitted anywhere before for any academic degree.

MD, ZIAUL ISLAM
FEBRUARY, 2011

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ABSTRACT

Title of Dissertation: **Inermodality : Creation Of New Marketing Opportunity For Bangladesh.**

Inermodal transport means carriage of a consignment of goods using more than one mode of transport, such as rail, road and sea. Intermodality has significantly altered the conventional nature of transport competition. Intermodal transportation has brought about a major challenge, as well as opportunities for shipping lines involved in the container trade. As intermodal movements grow in volume, shipping companies have felt the need to expand their operations beyond their traditional responsibilities. Although intermodal transport is growing, its share is still relatively low and the big breakthrough of intermodal transport has still to come.

Intermodality can be considered as a problem, challenge, or tool depending on one's perspective. It is a problem if one consider the difficulties of transferring goods between vehicles operating in different mediums, such as between inland water transport and rail cars or between inland water transport and road transport. The challenge of intermodality is to keep good moving, reducing delay when goods must be transferred from one mode to another.

Intermodality is a tool of inestimable value to shippers. It gives shippers great choice of routings, especially in time when markets change quickly. It has lowered costs by enabling shippers to select carrier combinations and vehicles that offer the most efficient, least expensive service. It has forced carriers, especially in a deregulated environment, to lower costs through rates and improve service to remain competitive.

For intermodal freight transportation, competition has at least three basic areas. They include customers of intermodalism's products and services, suppliers of those product and services, and potential suppliers and customers from other industries or related fields who want to enter the intermodal transportation field and be competitive. The arena in which all three participate is called competition.

In true sense, intermodality or multimodality has not been studied extensively in the context of Bangladesh. This is a modest attempt to fill this gap. From the review of existing literature and theoretical underpinnings, this study identified following specific objectives for investigation: to analyze the existing multimodal transport systems with special emphasis on inland water transport system in Bangladesh, to analyze the supply chain integration through multimodal transport in Bangladesh, to evaluate the importance of Chittagong and Mongla ports, to outline the inland waterways in the selected APEC countries, to assess transportation in regional efficiency in Bangladesh, to examine the potential of container transport by inland waterways, to evaluates the necessity for establishing an inland clearance depot (ICD), to evaluate the demand and requirements for and ICD, to determine the right way to manage and operate the ICD, to identify the current and future bottlenecks in intermodal transport networks, including the identification of capacity needs and requirements also further standardization of infrastructure, equipment and services.

While compiling this dissertation attention has been focused on intermodality and searching for a new marketing opportunity for Bangladesh with aforesaid context. The present study is basically a qualitative approach- a subjective assessment of the intermodality system in Bangladesh. It is basically an exploratory in nature which describes the transport system and

identifies opportunities and threats. The study also describes the facts of intermodality for creating a new marketing challenge. The first chapter is concerned with the introduction, problem statement, nature of the problem, describes the rationale of the study and identifies objectives. Chapter two review the theoretical concepts and existing literature on intermodality with special reference to Bangladesh, Chapter three outlines the research methodology. Chapter four examines the nature and development of inland water transport in Bangladesh and to identify the constraints in its development. Chapter five analyses the supply chain integration through multimodal transport in Bangladesh. Chapter six evaluates the importance of Chittagong and Mongla port in the context of globalization and also analyses the economic benefits which can be derived from mega port development. Chapter seven presents the secnario of inland waterways in the selected APEC countries. The role of transportation in regional economic efficiency in Bangladesh is presented in the chapter eight. It presents an elaborate analyses of the significance of accessibility in the efficiency of regional production with respect to Bangladesh, identify and assess the need for investment in improving accessibility and its spatial distribution. Chapter nine presents the finding of the opinions of experts interviewed, which review identified several conceptual categories that might influence the successful development of a multimodal transport system in Bangladesh. Thus a new marketing opportunity through intermodaliy could be created for Bangladesh. The concluding chapter ten gives the summary and conclusions. Policy recommendations are also made in this chapter.

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ISP	Integrated Service Provider
IMC	Intermodal Marketing Companies
IWAI	Inland Waterways Authority Of India
IWT	Inland Water Transport
ICT	Inland Container Transport
ICD	Inland Clearance Depot
JAFZA	Jebel Ali Free Zone
JIT	Just in Time
JICA	Japan International Co-operation Agency
LAD	Least Available Depth
LDC	Least Developed Countries
MIDAs	Maritime Industrial Development Area
MPPM	Maritime Policy Planning Models
MTO	Multimodal Transport Operator
NVOCC	Non-Vessel Operating Common Carrier
NWP	National Water Plan
OECF	Overseas Economic Co-operation Fund
PBUH	Peace Be Upon Him
SCTL	Shanghai Container Terminals Ltd
SEZ	Special Economic Zone
SFYP	Sixth Five Year Plan
SIPG	Shanghai International Port Group
SPA	Shanghai Port Authority
SPCCDC	Shanghai Port Container Comprehensive Development Company
SWOT	Strength, Weakness , Opportunity and Threat
TEU	Twenty-Foot Equivalent Unit
UNCTAD	United Nations Conference on Trade and Development
VAL	Value Added Logistics
WMU	World Maritime University
3PL	Third Party Logistics

CHAPTER- ONE

Introduction

1.1 Statement of the Problem

Intermodality has significantly altered the conventional nature of transport competition. Intermodal transportation has brought about a major challenge, as well as opportunities, for shipping lines involved in the container trade. As intermodal movements grow in volume, shipping companies have been faced with the need to expand their operations beyond their traditional responsibilities.

Intermodality can be considered a problem, challenge, or tool, depending on one's perspective. It is a problem if one considers the difficulties of transferring goods between vehicles operating in different mediums, such as between inland water transport and rail cars or between inland water transport and road transport. The challenge of intermodality is to keep goods moving, reducing delay when goods must be transferred from one mode to another.

Intermodality is a tool of inestimable value to shippers. It gives shippers great choice of routings, especially in times when markets change quickly. It has lowered costs by enabling shippers to select carrier combinations and vehicles that offer the most efficient, least expensive service. It has forced carriers, especially in a deregulated environment, to lower costs through rates and improve service to remain competitive.

For intermodal freight transportation, competition has at least three basic activity areas. They include customers of intermodalism's products and services, suppliers of those products and services, and potential suppliers and customers from other industries or related fields who want to enter the inter-modal transportation field and be competitive. The arena in which all three participate is called competition.

With the chronic financial problems of Bangladesh like many other developing countries, adoption of intermodal requirements along the entire transport chain is in its infancy. The country is lagging behind considerably in its adoption of the earlier phase of development containerization. Efforts to join the containerization era were primarily concentrated on improvements to its seaports, Chittagong and Mongla.

Furthermore, its network cannot afford new investments in facilities and rolling stock and cannot switch from labor-intensive industries to capital-intensive industries. The line of unemployed people in the country is very long. The segregated transport industry and unimodal transport services are still the dominant organizational structure in Bangladesh.

To get an idea about modal share, adequate statistics were not available in the past. In 1996-97, a World Bank team estimated freight transport output and modal shares by conducting an origin-destination survey. However, the survey included all origin and destination points, not only to/from maritime ports.

Table 1 presents an overall transport output estimation with respect to the three mechanized modes of surface transport, together with their percentage shares for 1984-85, 1994-95, 2004-2005 and 2007

Table 1: Freight transport output and modal shares

Year	Total Freight T-Kms (Billion)	Modal Distribution (%)		
		Road	IWT	Rail
1984-85	4.8	48	35	17
1994-95	8.3	63	32	05
2004-2005	13.0	71	21	08
2007	18.0	77	16	07

Source: *Bangladesh Planning Commission, October, 2009*

Road transport continues to the most dynamic mode of transport development in Bangladesh. With the shrinking of navigable waterways due to siltation and the Bangladesh Railway's inertia of the monopolistic era and in consequence its inability to gear itself and function in the changed real-world transport market environment, the share of road transport has increased sharply. Furthermore, with the opening of Jamuna Bridge in 1998, road transportation increased significantly.

The Mongla Port Authority does not maintain any statistics about the shares of goods by different transport modes into and out of port to and from inland points. The Chittagong Port Authority only maintains the statistics of clearance of dry imports by different modes of transport which can be seen from the table 2.

Table 2: Clearance of dry imports (figures in metric tons)

Commodity	1993-94			2007-2008		
	Rail	Road	River	Rail	Road	River
Food grain	265	287	141	699	1254	345
Cement	-	35	323	-	51	350
Fertilizer	5	47	75	4	254	102
Other Cargo	70	2,312	144	95	4442	89
Coal	1	6	2	-	12	3
Total	**341**	**2,687**	**685**	**798**	**6,013**	**889**

Source: *Yearbook of Chittagong Port Authority, 2009*

From the above observation, it is clear that there is a certain degree of competition between rail, road, and water transport because all these modes of transport should be capable to carry containers. Competition arises when all systems are suited to carry the same cargo between the same points of origin and destination.

From the shippers' point of view, this type of condition is most favorable because they have several alternatives to fulfill their demand. Co-operation and co-ordination among different modes aims at using the advantages of all systems and avoiding their disadvantages.

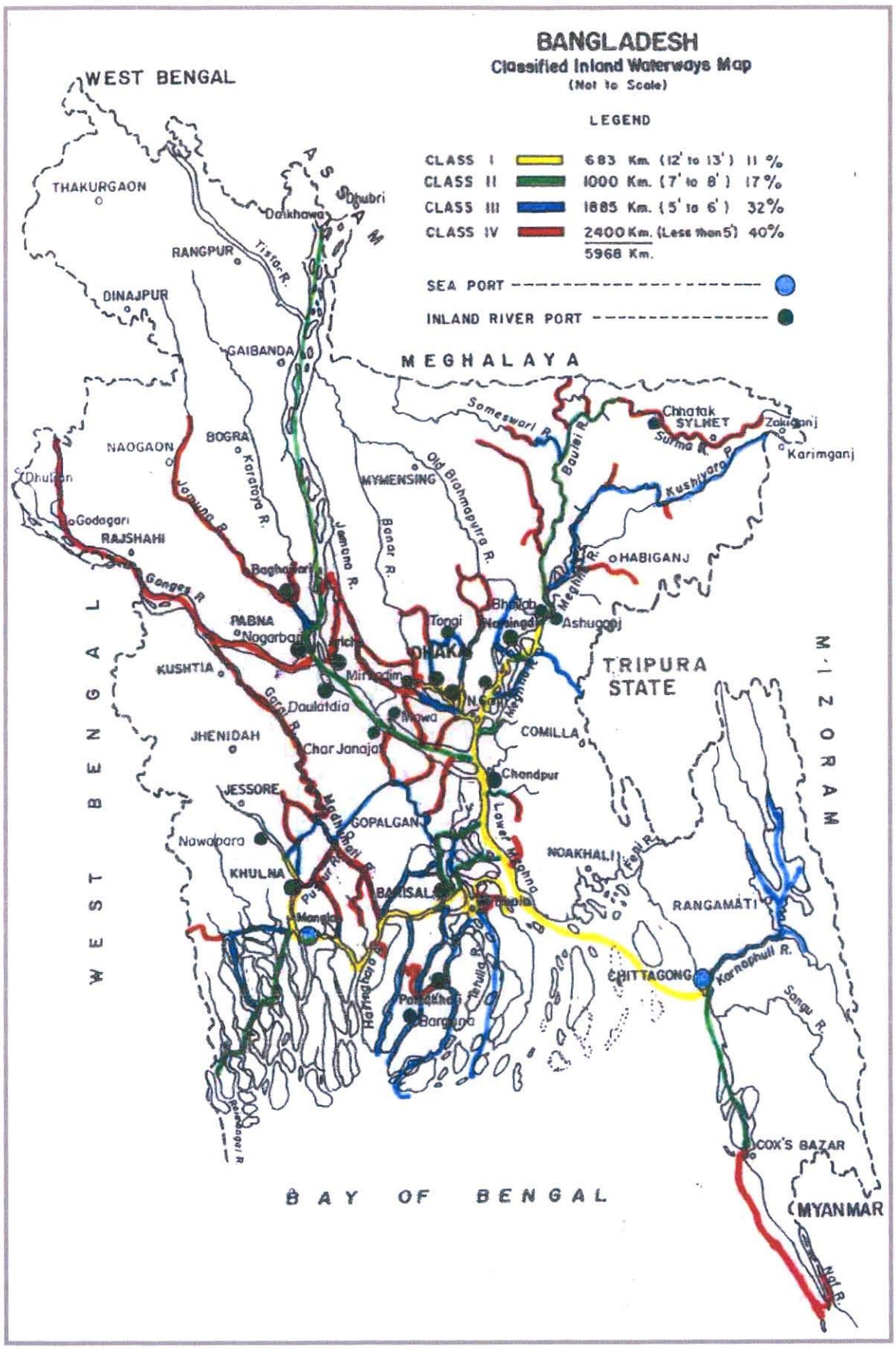
The basic advantages and disadvantages of various inland transport modes can be seen in Table 3:

Table 3: Comparative advantages and disadvantages of different inland transport modes

Quality of transport	Road	Rail (wagon load)	Rail (unit train)	Inland waterway
Speed	Very high	Low	High	Low
Door-to-door capacity	Very high	Low	Very low	Very low
Reliability	Very high	High	Very high	High
Security	Very high	High	Very high	High
Safety	High	Very high	Very high	Very high
Flexibility	Very high	Low	Low	Low
Availability	Very high	Low	Low	Very low
Ecological friendly	Very poor	High	High	Very good
Energy efficiency	Very low	High	High	Very high

Source: *Multimodal Transport Handbook, 1995*

Figure 1: Map of Bangladesh showing major seaports and inland river ports



Source : *Hydrography Department BIWTA*

A number of studies conducted by Japan International Co-operation Agency (JICA) and Bangladesh Inland Water Transport Authority (BIWTA) during recent years regarding this project. It was recommended that by using such natural waterways, establishing a riverside container terminal at the river port of Dhaka, an attractive container transport system by waterway-economical, simple and environment-friendly, could be created.

Under the above circumstances, the Government of Bangladesh (GOB) decided to establish a riverside ICD at Dhaka, and the Overseas Economic Co-operation Fund (OECF) of Japan, agreed to finance the foreign currency portion of the project. As a result, the Development Project of a Container Terminal at Dhaka was launched in 1994 and was scheduled to be completed by 1999-2000. Unfortunately, the OECF has withdrawn their fund. Finally this project is scheduled to be completed by June 2011 under self financing of BIWTA, the total cost is estimated around US$ 25 million.

Development emanating from international trade and investment in many developing countries is impeded by the inland freight systems that restrict multimodal transport. Increasing international trade may raise gross domestic product, generating increased demand for internal containerized cargo movements, but the requisite transport infrastructure is lacking in Bangladesh. The volume of international trade of Bangladesh trebled between 1971 and 2010 as did the number of vessels calling at the port of Chittagong, but port capacity increased much less quickly due to inadequate and inefficient containerized transport operations. In true sense, intermodality or multimodality has not been studied extensively in the context of Bangladesh. This study is a modest attempt to fill this gap.

1.2 Research Objectives

From the review of existing literature and theoretical underpinnings (discussed in chapter two), this study identified following specific objectives for investigation:

1. to analyze the existing multimodal transport systems with special emphasis on inland water system in Bangladesh;

2. to analyze the supply chain integration through multimodal transport in Bangladesh;
3. to evaluate the importance of Chittagong and Mongla ports;
4. to outline the inland waterways in the selected APEC countries;
5. to assess transportation in regional efficiency in Bangladesh;
6. to examine the potential of container transport by inland waterways;
7. to examine the necessity for establishing an inland clearance depot (ICD) ;
8. to evaluate the demand and requirements for an ICD;
9. to determine the right way to manage and operate the ICD.

1.3 Nature of the Problem

From the discussions with experts in intermodality, it is understood that the issue is very much ambiguous to many, which requires a detail assessment of the multimodal transport system in Bangladesh. Thus the present study is basically an exploratory in nature which describes the transport systems and identifies opportunities and threats.

1.4 Organization of the Study

The study is consisted with ten chapters. Chapter one describes the rationale of the study and identifies objectives. Chapter two reviews the theoretical concepts and existing literature on intermodality with special reference to Bangladesh. Chapter three outlines the research methodology. Chapter four examines the nature and development of inland water transport in Bangladesh. Chapter five analyses the supply chain integration through multimodal transport in Bangladesh. Chapter six evaluates the importance of Chittagong and Mongla ports. Chapter seven presents the scenario of inland waterways in the selected APEC countries. The role of transportation in regional efficiency in Bangladesh is presented in chapter eight. Chapter nine presents the findings of the opinion surveys. Chapter ten concludes the study.

CHAPTER- TWO

Intermodality: Concept and Review of Literature with Special Reference to Bangladesh

2.1 An Overview of Concept

Intermodal/Multimodal transport is a type of service where a multimodal transport operator (MTO) assumes a contractual responsibility to move goods from a point of origin in one country to a destination in another under a transport contract, for an agreed price with possibly a time limit for the delivery [United Nations Conference on Trade and Development (UNCTAD), 1994]. Multimodal transport is often used loosely and interchangeably with the term intermodal transport from origin to destination (United Nations Economic and Social Commission for Asia and Pacific, 2005).

Although the concept of intermodality is at the heart of modern transportation systems, there are various views on the exact meaning of this term. In addition, there are many concepts used to cover the same (or similar) issues, such as combined transport and multimodal transport. Intermodal transport refers to the characteristic of a transport system that allows at least two different modes to be used in an integrated manner in a door-to-door transport chain. The intermodal transport system consists of the physical subsystem (infrastructure and transport equipment) and the intermodal service subsystem. The focus is on freight transport. Interconnectivity and interoperability are important issues determining the quality of intermodal transport. The general objective(s) of intermodality, interoperability and interconnectivity are to establish a framework for an optimal integration of different transport modes so as to enable an efficient and cost-effective use of transport system through seamless, customer-oriented door-to-door services whilst favoring competition and quality between transport modes.

The requirement to offer reduced delivery costs and times and improved services in competitive international markets has stimulated integration not only of transport activities, but also of all activities in the supply chain. MTO's exploiting information technology developments in North America and Europe have applied the principles of logistics to manage the flow of products and information throughout supply chains.

Globally, economic growth and development depends on functioning international supply chains characterized by efficient multimodal freight transport systems (Organization for Economic Co-operation and Development, 2001). Many least-developed countries (LDCs), defined by a per-capita gross domestic product (GDP) of US $ 600 (in 2010 US $) or less, a share of manufacturing in total GDP of 10% or less and an adult literacy rate of 20% or less (United Nations, 2005), are excluded, lacking the transport and communications infrastructure necessary for a fully integrated multimodal system.

Often only piecemeal transport services, which may include elements of multimodal services, but efficient international flows, require an effective multimodal transport system. In this context, competitive international flows rely on government assistance to facilitate trade procedures by removing unnecessary administrative processes, which may cause customs delays. Government is further involved if it owns or manages transport or port infrastructure and services.

In many developed economies, containerization revolutionized transport technology and cargo-handling systems (Hayuth, 1987; Eno Transportation Foundation, 1999; Muller, 1999) and in newly industrialized areas including, ASEAN members have begun to develop such systems (ASEAN Working Group, 1998). Multimodal transport, which facilitates the origin-to-destination freight transport service under a single operator's responsibility using more than one mode of transport, is a natural extension of containerization (Hayuth, 1987; D'Este, 1996; Muller, 1999).

However, the inland transport system element of international freight transport impedes international trade in many LDCs [United Nations Conference on Trade and Development (UNCTAD), 1994]. Manufacturers, exporters and importers face many logistics-related barriers, including inadequate cargo tracing at terminals, inadequate transport infrastructure, and the unavailability of transport services (Ta et al., 2000; Gulyani, 2001; Islam and Gray, 2002).

Road infrastructure often suffers from low maintenance and limited funds (Heggie, 2003). The transformation from a traditional fragmented freight transport system to a multimodal system requires appropriate technology, government support and an application of conformity theory. As multimodal freight terminal developments in developed countries are becoming increasingly interwoven with complex marketing channels and telecommunications networks (Wiegmans et al., 2001), the local economic effects or any barriers to development are likely to be amplified.

Many LDCs are gradually integrating into the global economy as their exports of low value labor-intensive products such as readymade garments compete for US and European markets. However, they may be earning less even though trading more [United Nations Conference on Trade and Development (UNCTAD, 2002].

Apart from intense competition, the smooth flow of cargo is impeded by transport, customs, business practices, knowledge and skills of logistics management, information technology, and banking and insurance [United Nations Conference on Trade and Development (UNCTAD), 1994].

The present chapter examines some transport and logistics issues related to multimodal development in Bangladesh. It begins by considering aspects of international trade and freight transport in Bangladesh, before considering multimodal transport. Consideration of the inland transport system in Bangladesh inevitably raises issues that present barriers to efficient international trade and investment. A brief discussion of the practical

difficulties involved in collecting primary data locally in Bangladesh explains the decision to adopt a modified Delphi-type survey of a panel of experts drawn from local industrialists engaged in managing multimodal developments.

2.2 International Trade and Freight Transport in Bangladesh

The value of Bangladeshi internationally traded goods more than trebled in between 1971 and 2010, with rapid growth in tonnages exported, and it has been forecast to continue to grow rapidly. Containerized cargo handling in Chittagong Port, which handles 83% of Bangladesh's international trade, averaged 15% annual growth between 1995 and 2008. Although still at modest levels by international standards, these could treble in a decade

Although the value of Bangladesh international trade has fluctuated in recent decades, some notable trends are apparent. Some products including petroleum are exclusively imported, whereas others, including sugar, wheat and rice, are domestically produced but imported when deficiencies arise.

Rice imports have reduced in the move towards food self-sufficiency. Overall, the import proportions of primary goods fell substantially, capital goods remained constant but other goods rose substantially. Regarding exports, the early reliance on jute and jute products has been replaced by ready-made garments and knitwear as more value has been added locally to products before export and competition in frozen food and leather has also decline. Average annual growth in international trade tonnage was 3% in the decade preceding 2005.

The transportation of raw jute is mainly in break-bulk form, but jute products employ both break-bulk and container transportation. An important share of raw jute is exported to India mostly in break-bulk form by conventional truck, but jute products are exported to US and European markets by container, as are tea, garments and knitwear.

Imports of garments from Asian countries from India, China, Singapore and Korea are in containers, except for border imports from India. Bangladesh has imposed a ban on imports of cotton from India by overland transport and now imports cotton and cotton fiber by sea. Overall, demand for international transportation is shifting from break-bulk to containerized transportation, as seen in containerized cargo handling throughputs in Chittagong Port.

Table 4: International trade of Bangladesh

Year	Value (US $ millions)		Volume (ktonnes)	
	Exports	Imports	Exports	Imports
1984-1985	939	2647	971	8949
1990-1991	1718	3472	1476	8187
1995-1996	3882	6881	2189	10993
1996-2006	7302	1284	7302	1297

Source: *Government of Bangladesh, Ministry of Finance (1998, 2001, 2003 and 2008)*

Table 5: Forecast container movements through Chittagong port

Year	International trade tonnage (ktonnes; Bangladesh combined imports and exports)	Port of Chittagong (kTEU)
2002-2003	16000	560
2005-2006	26000 estimated	872 estimated
2016-2017	43000 estimated	1678 estimated

Source: Mott MacDonald (1998).

2.3 Intermodal Transport in Bangladesh: Review of Literature

Bangladesh is a resource poor economy covering 147 570 km^2, was populated by 162.42 million people in 2010, with a per-capita income of US $ 600 (World Development Report, 2010). Before independence in 1971, government policies tended to favor an open market economy, inclining

more towards socialism following independence and, since 1975, and a gradual movement towards a liberal mixed economy.

Although the private sector has always participated in international trade and transport, its involvement increased after 1976, with more trade liberalization and industrial deregulation in the 1980s. Despite this, heavily subsidized state bodies still own and operate all rail and port services, and a majority of Bangladesh shipping lines, providing key services in both international and supporting inland transport. By contrast, road freight services are almost exclusively provided by small private operators.

Table 6: Percentage of export and import value by commodity

Commodity	Exports		Commodity	Imports	
	1984-85	2000-05		1984-85	2000-05
Raw jute	16.2	1.1	Rice/wheat	18.8	4.0
Tea	6.5	0.4	Crude petroleum	8.5	2.9
Frozen food	9.3	5.7	Raw cotton	4.0	4.0
Other primary	2.0	0.3	Oil seeds	0.1	0.8
Total primary	**34.0**	**7.5**	**Total primary goods**	**31.6**	**11.7**
			Edible oil	3.0	2.5
Jute goods	41.6	3.6	Petroleum products	5.2	6.1
Leather	7.5	4.0	Fertilizer	5.4	1.4
Chemical products	0.8	1.5	Cement	1.0	1.4
Readymade garments	12.4	52.3	Staple fibers	0	0.4
Knitwear	0	23.1	Yarn	1.4	3.5
Other manufacturing	3.7	8.0	Total intermediate goods	16.0	15.3
Total manufacturing	**66.0**	**92.5**	Capital goods	26.1	25.6
			Other goods	26.3	47.4

Source: *Government of Bangladesh, Ministry of Finance (1998,2009).*

Two decades of liberalization and privatization created a consensus supporting structural reforms, but investment has declined (World Bank, 2008), with slow structural reforms reportedly denying up to 3% of

additional economic growth (Norwegian Agency for Development Co-operation, 2008; World Bank, 2008). Transport and logistics have achieved little privatization and deregulation (Temple, 2009).

Responding to local stakeholder pressure in the early 1990s, the Bangladesh Government acting as owner-cum-investor established an inland river container terminal development project in Dhaka, with Japanese technical and financial assistance and private operation of services such as terminal keeping. Foreign direct investment (FDI), often considered an engine for economic development (Hermes and Lensink, 2003), has been limited in Bangladesh.

In the late 1990s, following a shift in the government's role from owner-cum-investor towards governor and regulator, Stevedoring Services of America (SSA) proposed a private FDI project to construct container terminals at Chittagong seaport and Dhaka river port.

The government duly abandoned the half-completed Dhaka container port to encourage the FDI. However, Bangladesh Supreme Court order in May 2003 ruled that the government approval for the project was illegal due to, *inter alia,* insufficient competitive bidding, feasibility studies, transparency and misleading information submitted by investor.

Change is laborious, reflecting findings that decisions to attempt to turn around such state-run enterprise through reducing the numbers of workers and assets, or hiring new managers, adopting new strategies and seeking additional finance are more heavily constrained. Infrastructure development can be problematic.

In Bangladesh, state undertakings embrace ports in Chittagong and Mongla, shipping, rail, roads and inland water way sectors. Table 7 shows that throughout a series of 2 – and 5 – year planning periods since independence, the proportions of funding allocated to road have inevitably increased- with some overspend, with reduced spending on rail and water transport.

Over three decades, 13 000 km of roads has resulted (Government of Bangladesh, Ministry of Finance, 2003), but much is inadequate for containerized cargo movement. Commitments were made to upgrade road corridors to accommodate containerized overseas cargo movement from Dhaka-Chittagong, Dhaka-Northwest, Dhaka-Khulna, Dhaka-Sylhet and Khulna-Northwest (Government of Bangladesh, Planning Commission, 1998).

However, informal enquiries indicated that in early 2005, only Dhaka-Chittagong was operational to a limited extent. The route needs to be upgraded to four lanes.

In 1987, the government established a rail-dedicated inland clearance depot (ICD), later upgraded, situated in a congested area of Dhaka with restricted accessibility. It is owned by Bangladesh Railway and is operated by Chittagong Port Authority, both state-owned organizations. A private company undertakes container-handling operations and equipment maintenance but the depot is insufficient to meet the commercial needs of international trade, being capable of handling about 10% of container movements to and from Dhaka.

Table 7:Allocation and expenditure of the surface transport sector 1973-2007

Plan period	Allocation				Expenditure			
	Total	Percentage			Total	Percentage		
	US $ millions	Road	Rail	Water	US $ millions	Road	Rail	Water
1973-78	370	32.4	27.3	40.3	455	25.5	29.0	45.5
1978-80	262	42.0	30.6	27.4	222	45.6	54.1	0.3
1980-85	513	35.9	36.3	27.8	681	40.8	36.0	23.2
1985-90	890	49.6	29.9	20.4	882	60.1	24.0	15.9
1990-95	1577	73.3	13.7	13.0	1668	82.0	8.0	10.0
1995-97	1064	88.1	9.0	3.0	1061	88.3	8.9	2.7
1997-07	2008	63.3	23.4	13.2	-	-	-	-

Source: *Bangladesh Planning Commission, Government of Bangladesh, Ministry of Finance (2008).*

Restrictions imposed by customs authorities may impede trade, where door-to-door movement operations are sometimes restricted by customs clearance procedures and requirements for customs-authorized escorts for inland movements.

The clearance time for customs averages 5 – 7 days in Chittagong, and international trade movements undergo at least two sets of customs procedures. A simplified and effective procedure is required to encourage trade and investment.

2.4 Inland Freight Transport

Inland freight transport operations are dominated by road, although most companies own under ten vehicles of limited capacity and many are driver-owned or family operated. Table 8 shows that in recent decades, road's share of freight tonne-km increased at the expense of rail. Even so, containerized cargo movement was hampered by road infrastructure unsuited to handling full container loads, with inadequate design, weak bridges and poorly equipped vehicles

Most containers are filled or emptied within the Port of Chittagong and do not travel inland, generating over 1 (one) million truck movements each year between Dhaka and Chittagong, creating congestion and prolonged transit times (Asian Development Bank, 2003). The benefits of containerization are lost through multiple handling of containers at the port terminal.

In terms of conventional cargo handling, the Port of Chittagong has direct inland accessibility to its hinterland by all three surface transport modes, but containerized cargo is only accessible by rail and to a very limited extent by road close to the port, mainly to and from the Chittagong Export Processing Zone (EPZ). Recently, road infrastructure from Dhaka-Chittagong has been upgraded to enable containerized cargo movement, but feeder or connecting roads have not.

Railway movements of containerized cargo are frustrated by insufficient ways are navigable but not suited to container barge movement, lacking port systems are widely acknowledged as major impediments to development of a door-to-door multimodal service (Asian Development Bank, 2003).

Elsewhere, successful container ports have unitized heavily (Cullinane et al., 2004), require careful integration with inland systems (Loo and Hook, 2002), have been keen to open to global operators (Slack and Fremont, 2005) and adopt an appropriate governance structure (Panayides, 2002). However, in Chittagong port and Mongla port, delays arise during port operations and customs clearance. The costs of a container clearance from the ship out of the port is estimated at US $ 150-300 in neighboring countries, but US $ 600 in Chittagong (Asian Development Bank, 2003). Eventually, whether shippers choose to ship goods through Chittagong will depend on their market perceptions and historical experience of the level of service they receive from different ports in the region (Nir et al., 2003).

Table 8: Percentage modal share of freight tonne-km in Bangladesh, 1974-07

Modes	1974-75	1984-85	1996-07
Road Transport	35	48	82
Rail Transport	28	17	14
Waterways Transport	37	35	43

Source: *Government of Bangladesh, Planning Commission, 2008.*

Many factors impede door-to-door movement of containerized cargo in Bangladesh. The capacity of final customers to receive or store containers is limited. There is an urgent requirement to widen and strengthen the main road network, particularly Dhaka-Chittagong. It is essential to strengthen or replace road bridges on the main network and urban congestion indicates a need for bypasses around towns and cities.

Inland transport infrastructure must be developed to offer multimodal access to ports and inland terminals and enable direct transfers between modes. The volume of international trade of Bangladesh trebled between 1971 and 2009 as did the number of vessels calling at the Port of Chittagong, but port capacity increased much less quickly (Chowdhury, 2000).

Despite container movements through the Port of Chittagong, the port only recently ordered four gantry cranes, which are essential for efficient container movement. Due to a lack of specialized container terminals, presently more than 50% of containers are diverted to general cargo berths for handling.

Overall, port capacity is unsuited to meeting the demands of Bangladeshi export-import cargo, let alone any wider regional function serving eastern India. The only river port terminal capable of handling containers is the rail-dedicated ICD, which suffers from limited capacity and congested access roads associated with its central location in the capital city (Babul, 2000). Overall, current inland transfer and transport in inadequate for efficient containerized transport operations.

Perhaps because logistics is a relatively new concept in many LDCs (Banomyong, 2000), the existing infrastructure is often weak and inadequate. Such a situation impedes physical developments in Bangladesh (Razzaque, 1997). Efficient inland container terminals and logistics and freight centers are essential if a container port is to be fully integrated with its hinterland to enable development of multimodal transport (Cullinane et al., 2004).

If sufficient ICDs with adequate facilities are present, a multimodal transport service can serve destinations 300 km inland (European Conference of Ministers of Transport, 2001), implying that an efficient system around Dhaka could potentially offer a door-to-door service nationwide (Babul, 2000).

CHAPTER-THREE

Methodology of the Study

3.1 Introduction

Intermodal transport is one of the key topics in current many countries transport policy. One of the principal measures is to turn intermodality into reality and make it really competitive with road transport. This goes together with the aim to revitalize the railways and promote the use of short-sea shipping and inland waterway transport. This should contribute to an optimal integration of different modes so as to enable a more efficient and sustainable use of the transport system.

3.2 Problem Statement

Intermodality has not been studied extensively in the context of Bangladesh. This study is a modest attempt to fill this gap.

3.3 Research Approach

The present study is basically a **qualitative approach**- a subjective assessment of the intermodality system in Bangladesh. The study describes the facts of intermodality status and explores the hindrances for creating a new marketing challenge.

3.4 Review of Concepts and Literature

This is described in chapter two.

3.5 Objectives of the Study

This is outlined in chapter one based on the review of the literature.

3.6 Research Questions and Hypothesis

Generally research questions are prepared when the nature of study is conclusive. Since the present study is basically exploratory in nature, the author did not prepare any research questions and also not developed working hypothesis. However, some propositions were developed by examining the experts' opinions (presented in chapter nine)

3.7 Research Design

(a) Type of universe: all modes of transport communications with special focus on inland water modes.
(b) Sampling Unit: BRTA- where latest information is available.
(c) Source list: Published data and personal interview.
(d) Parameter of interest: Factors that delimit the growth of intermodality in Bangladesh.
(e) Sampling Technique: Non-probability- mainly judgment sampling is used.
(f) Collection of primary data: Researcher himself interviewed the 122 experts with a semi-structured questionnaire by using Delphi technique.
(g) Processing of data: Data were presented mainly in tabular forms.

3.8 Delphi Technique

The study presents first-person assessments and reports an exploratory investigation of the first-hand opinions of managers who are either potential operators or users of a multimodal system in Bangladesh.

In the absence of prior research, qualitative approaches were appropriate to explore the issues, problems and factors influencing freight transport multimodal development in Bangladesh. A toolkit of potential techniques comprised depth interviews, group discussion and a Delphi technique was

developed. The former posed difficulties in attempting to convene a group of experts at one location, who incur time and money costs in attending.

Once convened, an extensive range of opinions and judgments may be expressed, without any attempt to gain consensus, and results could become distorted by the interaction between respondent and interviewer, risking bias on either side. In group discussions some members may react negatively to the moderator, the environment or the topics being discussed and a strong personality may dominate or inhibit some participants.

If impersonal feelings develop, honest conversation is unlikely and participants who are neither numerous, anonymous nor selected at random may lack the confidence to participate fully. Delphi techniques avoid face-to-face interaction between panel members and researchers and solicit expert opinions and judgments inexpensively. One member cannot dominate others, peer pressure is removed, and opinions and consensus amongst a group of experts are generated anonymously.

Delphi techniques permit an interaction between individuals without the necessity to meet or know each other, which is particularly useful in some developing economies where the position, status or personality of panel members might engender hostility or distraction in face-to-face meetings. Powerful insights emanate from combining the knowledge and expertise of a selected group of experts by administering a series of statements and rounds.

Delbecq et al. (1975) identified Delphi techniques as being well suited for conducting exploratory research. They are particularly apposite because multimodal transport and logistics services are relatively new concepts in Bangladesh, prior work on local multimodal freight transport systems is sparse and local data collection presents practical difficulties. The technique adopted facilitated collection, aggregation and analysis of the judgments of a group or panel of experts on previously identified issues.

Linstone and Turrof (1975) defined the policy technique, a modification of the Delphi technique, as a method for structuring a group communication process, so that it is effective in allowing a panel of experts as a whole, to deal with a complex problem. The experts do not meet, but are provided with systematic feedback for comment (Czinkota and Ronkainen, 1997). The Delphi technique requires careful consideration of how panelists are selected, how questionnaires are designed, how feedback is provided and the number of rounds to be conducted (Yong et al., 1989).

The first-round questionnaire consists of statements based on a detailed literature review and subsequent rounds consist of statements prepared from feedback on the previous round. As the statements receive a diverse range of comments, it is essential to set a screening criterion to reduce data to manageable proportions, to draw conclusions and to make recommendations. The version of the Delphi technique used for this research seeks to achieve consensus from the group of experts.

A pretest of a preliminary questionnaire was conducted by email, following which further changes were made. Initially, some potential panelists successfully received files sent as email attachments, but were unable to open them locally. The solution was to incorporate questionnaire into the main text of the message. The pilot survey recorded a response rate of one in 15, even after follow-up requests, so that it was decided to sample all available 194 different potential respondents.

These were included within sampling frames incorporating Freight Forwarders Association of Bangladesh, and 32 in BdExport.com, an online platform for Bangladeshi export products and companies. Most are located in Dhaka and Chittagong, which are the main centers for production, consumption, and transport and logistics. Duplicated, missing and discontinued email addresses reduced the sample to 122. Selecting available qualified people as panel members is a prerequisite for a successful study, but opinions differ on the requisite level of knowledge and experience for selecting Delphi panel members.

With this in mind, it was decided to undertake two rounds of Delphi study involving Bangladesh transport and logistics service users including manufacturers, exporters and importers, and service providers including shipping lines, agents, freight forwarders, port or terminal operators.

Data collection in LDCs including Bangladesh is hampered by unreliable postal services, reducing the potential for using mail surveys, and time and cost limitations make personal interviews infeasible. Given that Bangladesh has one of the lowest telephone penetration rates in the world, with only four lines per 1000 people (Government of Bangladesh, Ministry of Finance, 2010), email was selected, supplemented by follow-up using fax, telephone, mail and direct contacts as required.

In many instances, emails did not arrive and the recipient name was not recognized. In some cases, repeated attempts were necessary simply to establish contact.

Exhaustive efforts established 13 Delphi panel members, in the first-round survey, comprising six senior, three middle and two junior managers and two others. The panel members, each representing only one company, were given the three options of 'agree', 'disagree' and 'no consensus' in response to each of 26 statements presented to them.

In the case of disagreement, the panelists were asked to provide their comments, which constituted a second-round questionnaire, eschewed by one trader panel member. Panelists comprised mainly service providers, perhaps because improved multimodal transport would benefit this group significantly. They also enjoyed good access to electronic communications. Panelists included six shipping line agents, three freight forwarders, two exporters, a terminal operator and a combined agent/freight forwarder. One exporter eschewed round two.

The limited representation of shippers and users, although not unusual, may reflect their employment in typically small organizations, lacking in resources such as a logistics specialist. Internet access and the time needed to

participate in research activities that offer no immediate reward. Given that Delphi studies typically recruit small panels, with, for example, Saldanha and Gray, (2002) reporting 11 members, the reliably of findings should be considered as indicative. They are exploratory rather than exhaustive.

To achieve general consensus, an average percentage of majority opinion is computed by summing majority agreements (144) plus majority disagreements (88), which is shown as a percentage of total opinions expressed (335).

Although consistent, this measure is arbitrary. Round one achieved consensus exceeding 70% on 13 statements with the remaining 13 statements and panelists' comments being input to round two. This comprised 46 statements responded to by 12 panelists, yielding 552 opinions expressed including 458 majority agreements, giving a consensus point of 83% achieved on 31 statements. Findings of the Delphi technique are presented in chapter nine.

CHAPTER- FOUR

Intermodality: Nature and Development of Inland Water Transport in Bangladesh

4.1 An Overview of the Statement

Bangladesh has over 24,000 km of rivers, streams and channels, most of which are part of the three major river systems of the country. The scope of this chapter is to highlight the nature and development of inland water transport (IWT) in Bangladesh vis-a-vis the environmental setting and to identify the constraints in its development.

Although water transport is slow, the physical environment provides ample opportunities to utilize the numerous distributaries' channels of the major rivers for the transport of the bulky commodities. The total length of navigable waterways during the monsoon is about 5300 km; but, if the tidal channels are included, IWT network length increases to over 8440 km.

The ports and landing stations are the nodal points in the IWT system, whose operational status depends upon changing conditions. Mechanized vessels have become increasingly important in the past three decades. Non-mechanized transport, however, is the backbone of the country's IWT system. Country boats account forever 60 percent of all employment in transport, and various estimates of country boats put the figure upward of 87,000.

IWT and road transport networks in Bangladesh are interdependent and complementary. IWT routes are generally oriented in a north-south direction, while the road network has a more varied pattern. The railway network became isolated after 1947, and the orientation then shifted toward the sea ports-Chittagong and Mongla.

In recent years, the three transport modes have shown different trends of development; the road mode has progressed ahead of the other two modes,

with the rail mode freight showing a decline and IWT registering only a modest growth.

The Master Plan of BIWTA has observed that the navigability of Bangladesh's waterways has deteriorated considerably over the past decades, resulting in severe development constraints. The identified causes of deterioration include progressive situation of river channels; decrease in the volume of water of the southwestern rivers due to reduction of trans-boundary flow; and an increasing abstraction of surface and ground waters in the dry season for irrigation.

A direct consequence of siltation and loss of navigational draft is the reduction in the total length of IWT routes. The Master Plan has identified several infrastructure projects with a view to improving waterways navigability and IWT services, which include dredging schemes for river sections that suffer from siltation and reduced draft. Despite the adverse circumstances faced by the Bangladesh waterways in recent years, they would continue to remain as principal arteries for internal commerce and wet season movement by virtue of the unique physiographic regime of the country.

Bangladesh, a land of many rivers, and since early times, inland water transport (IWT) had been the most important mode for internal trade in this country. The major rivers, together with their distributaries and feeder channels, provide and extensive natural highway for the movement of vessels ranging from large streamers to country boats of varied forms and sizes.

It is often argued that Bangladesh suffers more than most countries from environmental handicaps to transport development due to its territory being quartered by numerous rivers which also swell into huge wetlands during the rainy season. However, it is this inherent environmental attribute that has sets natural stage for the development of inland water transport in the country.

The scope of this chapter involves an attempt to highlight the potentials of the nature and development of IWT in Bangladesh vis-a-vis the environmental settings as well as to identify the constraints in its fuller utilization.

4.2 The Physical Basis of IWT Growth

An examination of the inland water transport system in Bangladesh calls for an understanding of the nature and behavior of the country's river regime. Similarly, the dynamics of fluvial environment are very vital in evaluating the navigational potential of the river network.

Bangladesh has over 24,000 km of rivers, streams and channels, most of which are part of the three major river systems, viz. the Ganges-Padma, the Brahmaputra-Jamuna, and the Meghna-Barak.

The three river systems are transboundary in origin, but combine to form a common outlet into the Bay of Bengal through Bangladesh. The total drainage area of these three rivers is nearly 1.75 million sq. km, of which only seven percent lies within Bangladesh (Ahmed et al., 1994).

The Ganges rises in the Himalayas at an elevation of 7000 meters, and after flowing eastward through northern India, enters Bangladesh near Rajshahi region and joints with the Brahmaputra (Jamuna) near Goalundo in Faridpur region. The Ganges and its maze of branches provide navigational facilities over a vast area of the southwestern part of the country, and it is estimated that nearly one-fourth (40 million) of the country's population is dependent on the Ganges river system.

The Brahmaputra rises in Tibet (China), traverses a long path – east, south and westward – and then enters Bangladesh near the regions of Dinajpur and Rangpur. The main channel flows southward as the Jamuna through a wide and braided course for about 250 km to meet the Ganges at Goalundo, and the combined flow continues in a southeasterly course to meet the Meghna at Chandpur.

The Brahmaputra system provides navigational potential in the north-central and north-western parts of the country. The headwaters of the Meghna–the Barak–rises in the hills of north-eastern India and enter Bangladesh through Sylhet region–flowing in a southwesterly direction to meet the Ganges or Padma near Chandpur.

South of Chandpur, the combined waters of the three major river systems empty into the Bay through an estuary. The navigational potential of northeastern Bangladesh is provided by the Meghna system. In fact, inland water transport facilities in about 86 percent of the country's total area are served by the three major river systems.

The complex and dense network of rivers, the abundant monsoon rainfall and the lack of sufficient relief make nearly 60 percent of the country flood prone, while about 20 percent of the land is inundated in the monsoon season even in a year with normal rainfall. Consequently, homesteads in many low-lying parts of the country often remain isolated by water for four to five months, and water transport is the only means of movement during this time.

The thousands of kilometers of rivers, streams, creeks and channels thus serve as the main arteries for the movement of passengers and goods for both long and short distances. And, many settlements, which have evolved along the numerous streams, are linked to each other only by a network of waterways.

4.3 Spatio-Temporal Evolution

Inland trade in the Bangladesh region was traditionally handled by inland water transport. During the Mughal period, the whole of Bengal was opened up to northern India, and a large part of inland trade from the Bangladesh region used to move up the Ganges river into Bihar and Uttar Pradesh (Ahmad, 1968).

Subsequent to the arrival of the Portuguese in Bengal in 1517, Chittagong was founded in 1536-37 at the mouth of the Karnaphuli river, although the local people already had considerable maritime experience for quite some time. Chittagong soon became an important port for the Portuguese owing to its proximity to the Meghna estuary and access to the wealth of the interior regions of Bangladesh.

By the end of the 18th century, prosperous trade was carried on between northern India and Bangladesh in terms of cotton, silk and tobacco. The commerce was handled mainly by the Ganges which served as the principal transport artery in this part of the subcontinent. Good roads in this region were few and river ports gradually flourished as commercial nodes.

Narayanganj, south-east of Dhaka, assumed the role of an important commercial post by virtue of its central location as well as its strategic sitting near the estuary. Later on, Narayanganj faced competition and change in status due to the rise of other inland ports like Chandpur, Barisal and Sirajganj (Ahmad, 1968).

The establishment of Kolkata as the premier port of the Bengal region during the British period underscored the need to explore a shorter water link with Dhaka and Narayanganj in order to develop the jute trade efficiently. The task was rendered easy by the unique combination of natural waterways in southwestern Bangladesh. Kolkata and Dhaka could be linked by the Madaripur Beel Route via Chalna-Madhumati river-Gopalganj–Madaripur-Narayanganj. The western section of this link was made up of water routes joining the rivers in Khulna with the Kolkata region–through the Sundarban.

The Madaripur Beel Route–a passage of some 64 km–connects the Kumar river at Madaripur with the Madhumati river to the west. This route links a series of beels or swampy depressions in the Gopalganj area, and through the Kumar and Arial Kha rivers, the link is extended up to the Padma. The construction of the Madaripur Beel Route was started in 1900, and it effectively shortened the water journey between Khulna and Madaripur by

over 150 km. In fact, it practically came to monopolize the entire volume of waterborne trade between Kolkata and Bihar and upper Assam in pre-1947 India.

The north-south alignment of rivers in the Khulna and Barisal regions favored an early development of water transport in south-western Bangladesh. Khulna had a steamer link with Barisal as early as the fourth quarter of the last century. As trade flourished and demand for more water transport services increased, other river ports gained in importance as IWT nodes.

Goalundo commands the water transport of the Padma and Jamuna. Narayanganj occupies a strategic location on the Sitalakhya river and is connected, through the Dhaleswari river, with the Meghna. It thus enjoys water links with Dhaka, Goalundo, Chandpur, Madaripur, Bhairab Bazar and Sylhet.

Although water transport is slow, the physical environment of Bangladesh provides ample opportunities to utilize the numerous distributary channels of the major rivers for the transport of bulky commodities. However, since 1971, public sector allocation in the different Five-Year Plan periods for water transport had been significantly lower than other modes, namely, road and rail.

As early as 1982, the World Bank had argued that the importance of IWT had not been reflected in government investment programs (World Bank, 1982). Public sector development expenditures in the year 1979-80 increased at an annual rate of 31 percent for rail transport, 25 percent for highways, but the increase in the case of Bangladesh Inland Water Transport Authority (BIWTA) was less than nine percent.

The funds allocated to the IWT sector were clearly not commensurable with its role and importance, and this trend continued through the eighties and nineties. Consequently, IWT in Bangladesh did not develop at an optimal rate despite the favorable physical framework.

4.4 IWT Network and Its Constitutes

Most rivers of Bangladesh demonstrate a high and a low water period synchronizing with the monsoon and the dry seasons respectively. The water level is the lowest in March and April, and during this period, navigational problems restrict water transport opportunities in many medium and smaller rivers.

The total length of navigable waterways during the monsoon is about 5300 km; but, if the numerous tidal channels (navigable by country boats only) are included, IWT network length increases to over 8440 km (Jansen et al., 1989).

However, in the dry season, the navigable length shrinks by about 1600 km. Bangladesh Inland Water Transport Authority (BIWTA)-which is responsible for the maintenance of waterways – classifies them into four categories: (a) the large rivers, e.g. the Ganges, the Jamuna and the Meghna; (b) the tributaries, e.g. the Surma, the Barak, the Atrai, etc.; (c) the distributaries, e.g. the Gorai, the Dhaleswari, the Lakhya, etc.; and (d) the tidal rivers like the Karnaphuli and the Pussur.

IWT waterways are specifically called routes which serve to interconnect or link various inland ports of nodes. On the basis of scale of operation and the least available depth (LAD) – which ranges from 90 cm to 3.6 meters – the IWT routes are grouped into three classes.

Class I routes include the main arteries of traffic flow connecting the five principal river ports, viz. Dhaka, Narayanganj, Chandpur, Barisal and Khulna as well as connecting them with the sea-ports of Chittagong and Mongla. The more important routes in this category are (i) Narayanganj-Chittagong via Chandpur; (ii) Narayanganj - Mongla via Chandpur, Barisal and the Sundarban channels; and (iii) Mongla - Khulna.

Class II routes are secondary routes which provide links between the principal river ports and the secondary river front centers. On these routes, dredging operations are often required in order to maintain navigability. Some of the notable routes in this category are (i) Chandpur-Goalundo (ii) Chandpur-Barisal and (iii) Narayanganj/Dhaka-Chhatak (in Sylhet) via Bhairab Bazar.

Class III routes are IWT links of regional importance connecting smaller commercial centers like Patuakhali, Bagerhat, Kushtia, Jhalakati, Chilmari, Chandraghona, etc. An additional category - Class IV - is also often recognized for such routes which are entirely seasonal and serve as feeder to the other three classes of routes.

4.5 Inland Ports as Nodes

The ports and landing stages (ghats) are the nodal points in IWT system. The general physical condition of river ports is dependent upon the difference between the dry and wet seasons. This variation is normally around six meters, though in coastal locations it may be greater due to tidal action.

The river bank gently slopes toward the thalweg (center line of the river bed), and the port often needs long piers to be constructed for serving vessels at greater depth. Most of the cargo from the vessels is transported by head load through the pier onto trucks on the river bank or storage sites.

Each river port generally has several piers along the bank, their number depending upon the volume of traffic in that port. Piers are simple structures constructed at a right angle to the bank. Most of them are very crude and primitive in nature, and in many instances, these are merely walking boards supported on bamboo poles.

However, in the busier ports, the pier may be a concrete marginal wharf built on piles, extending over the river bank to a point where vessels can moor at the lowest water level. Floating pontoons are also used in some ports which

are connected to the bank with a movable bridge. One of the most severe environmental problems that the river ports have to face is the washing away of landing stages due to sudden rise in water level following heavy and continuous rain.

In such circumstances, piers may have to be temporarily closed, and inland water transport in those swollen rivers becomes both irregular and unpredictable. The significant difference between the water levels of the dry and rainy seasons in Bangladeshi rivers, therefore, renders IWT network operations largely a function of the natural environment.

4.6 Types of Vessels

River craft have a wide variety in Bangladesh. They vary in shape, size, design and construction materials, depending on the purpose of their use and the depth of the channel. It is convenient to classify vessels on the basis of whether they are mechanized or not, and in each category, a distinction may be made between cargo and passenger vessels with further subdivision into pubic and private ownership.

Mechanized vessels have become increasingly important during the past three decades. These are operated both in the public and private sectors-the vessels in the former category are both old and inefficient in operation.

Mechanized cargo vessels include coasters, tankers and barges, passenger vessels-especially in the private sector-are comprised of launches of various capacities, depending upon the route and channel depth.

Non-mechanized transport, however, is the backbone of Bangladesh's IWT system. In this sector, country boats are the single most important mode and are particularly suitable for negotiating narrow creeks and channels as well as shallow, expansive water bodies. Country boats account for over 60 percent of all employment in transport, and various estimates of country boats by different agencies put the figure upward of 87,000. It is believed

that there are about 100 country boats in the country for every single mechanized IWT vessel (Jansen, 1989).

Although country boats are an essential means of passenger movement – especially in the rural sector–throughout the riverine areas of the country, their real importance lies in cargo carrying capacity. Food grains, salt and construction materials constitute nearly 70 percent of the country boat cargo volume, closely followed by jute and jute products.

However, in practice, almost all kinds of commodities originating from rural Bangladesh find a place in the list of commodities transported by country boats. During the past decade or so, country boats have undergone a significant change in their character, viz. their mechanization (or perhaps more appropriately termed motorization).

This involves the fitting of an irrigation pump engine for propulsion – thus dispensing with the need for masts and sails. The idea of motorization of country boats is fast becoming popular on account of its obvious advantage of speed over traditional sail boats.

IWT network services in Bangladesh are dominated by the private sector, which, in fact, is largely comprised of country boats and small mechanized vessels. The share of the private sector in IWT freight and passenger traffic was about 88 and 92 percent respectively during the Third Plan period – 1985-90 (GOB, 1990). The public sector activities in the IWT sector are generally confined to development and maintenance of waterways as well as landing stations, and operation of ferry services to complement road transport and larger vessels on arterial routes.

In pursuance of the government policy toward privatization, the private sector in IWT is expected to continue to grow. The Fourth Five Year Plan (1990-95) too, indicates a projected increase in IWT private sector investment by 112 percent over that of the previous plan. Besides operating vessels, the private sector is expected to gradually participate in the management of IWT infrastructure and facilities.

4.7 Water and Land Transport Interface

The physiographic and the changing political geography of the Bangladesh region have conditioned the development of a varied and complex system. The Padma, the Jamuna and the Meghna are formidable barriers to land transport. In fact, the Jamuna divides the country into two broad regions, with further subdivision made by the Padma and the Meghna. Besides, the numerous smaller rivers, streams and canals have made the construction of roads and railways very expensive.

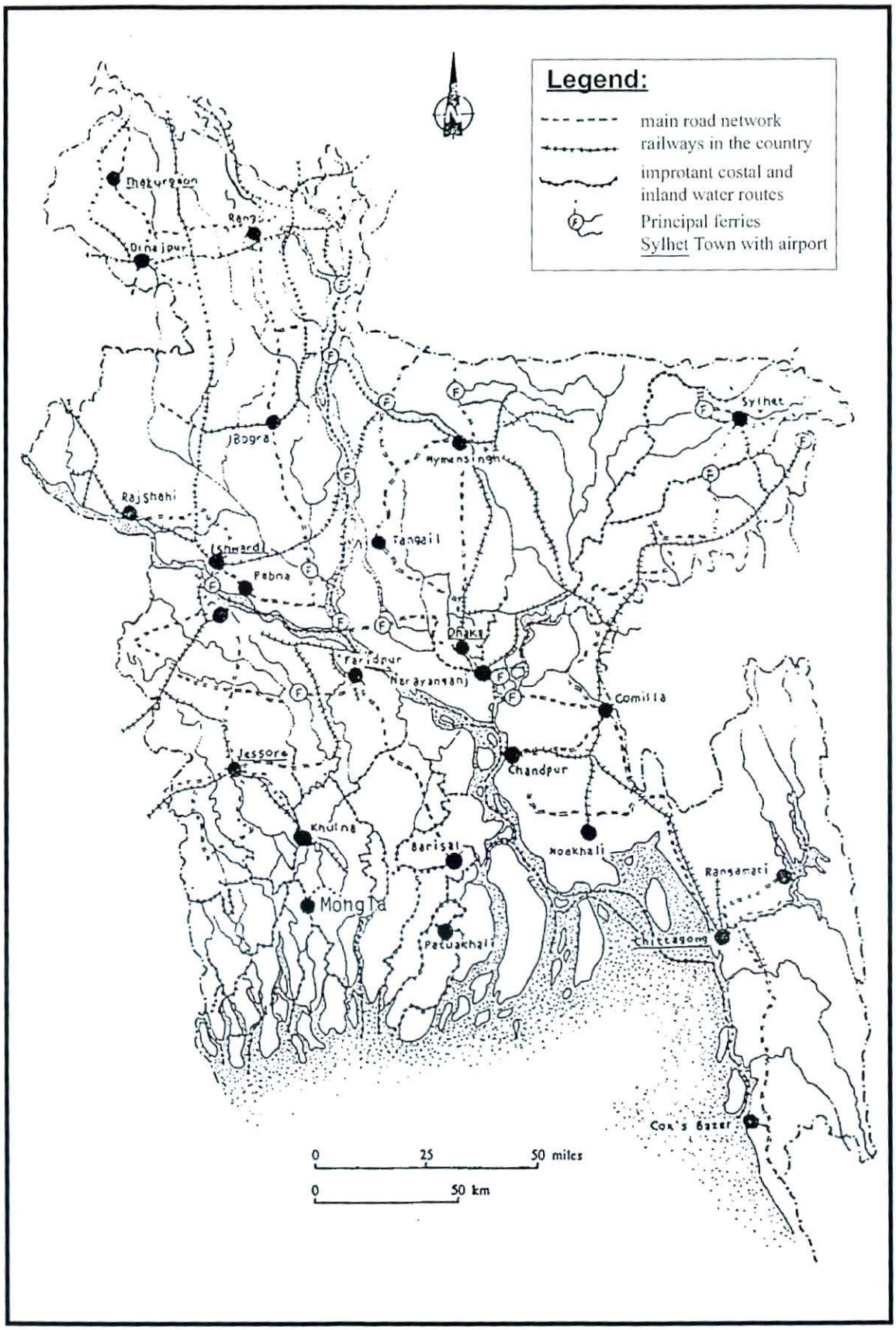
Transport modes are never independent of each other. Different modes are often in competition among themselves, while they may also complement each other in many instances. Since the rivers in Bangladesh have a general north-south flow, the land transport systems too tend to follow the same alignment. Besides, many parts of the country are served by all three modes, viz. rail, road and IWT, while certain areas are better served by one or two modes.

4.8 Water and Road Transport

A preliminary examination of the transport network map (Figure 2) of Bangladesh would show that IWT and road transport networks are interdependent and complementary. Although the IWT routes are generally oriented in a north-south direction, the road network has a more varied pattern. The rivers, which otherwise serve as natural barriers to road communication, provide ferry services for transhipment of passengers and vehicles.

The link between the national capital and several major regional towns can only be maintained through these ferry services. Until recently, only Mymensingh, Tangail and Jamalpur were the headquarters of greater districts with direct road links with Dhaka. However, the construction of the Meghna bridge has now provided links from Dhaka to Comilla, Noakhali and Chittagong without any ferry service.

Figure 2: Map of Bangladesh showing transportation network



Source : *Hydrography Department, BIWTA*

After the completion of the Jamuna bridge in 1998, ferry services has also become unnecessary for links between Dhaka and the towns of north-western Bangladesh like Rajshahi, Pabna, Bogra, Dinajpur and Rangpur. Currently, IWT serves better than road transport only along the routes from Dhaka to south-western regions of Barisal and Patuakhali-including the offshore islands.

The reasons behind choosing a particular mode of transport-for freight or passengers-are diverse. Factors which influence the selection of transport mode between IWT and road are time, comfort and safety. Freight transport by road has increased significantly since 1976; 74 percent of the increased traffic was taken by road transport, while 24 percent was absorbed by IWT.

However, between 1980 and 2010, the proportional increase in the total volume of goods handled by IWT was significantly greater (41 percent) than those handled by the road sector (27 percent) (BBS, 2010). In terms of freight rates, IWT is the least expensive for any distance, while the road mode is the most expensive for distances greater than 100 km. At a distance of 300 km, the road freight rate is about 150 percent higher than IWT freight rates.

A comparative analysis of five selected links or routes (Dhaka-Chittagong; Dhaka-Khulna; Dhaka-Sylhet; Dhaka-Rajshahi; and Dhaka-Rangpur) reveals that, except for the Dhaka- Khulna route, on all other routes or links, the road mode has a commanding edge over IWT, the reasons being savings in time, and better and more accessible services.

4.9 Water and Rail Transport

The railway network of Bangladesh became isolated after the partition of the Indian subcontinent in 1947. The orientation of the network shifted toward the major port, Chittagong, and subsequently, also toward the other sea port, Mongla. The barriers of the three major rivers are overcome at specific points by means of bridges and ferry crossings operated by the railways. The

two major railway bridges are the Bhairab Bridge on the Meghna and the Hardinge Bridge on the Padma.

The former connects north-eastern and south-eastern Bangladesh with the rest of the country. Railway link between the eastern and western parts of the country is hindered by the Jamuna where transhipment of passengers and freight is provided by the railways. The railway was traditionally looked upon as a preferred mode on account of its safety, reliability and regularity of operation. But, in recent years, lack of schedule maintenance, poor service, overcrowding and ticket less travel have lowered the image of the railway.

As regards freight rate, the rail mode is in an intermediary position between the most expensive road mode and the least expensive IWT. Passenger fares in railways, in the cheapest class, compare favorably with IWT, but widespread ticket less travel negates the value of this attribute.

In recent years, the three transport modes have shown different trends of development; the road mode has progressed ahead of the other two modes, with the rail mode freight showing a decline and IWT making only a modest growth. In terms of passenger movement, IWT has registered a significant gain in links with the southwest, along the coastal routes and in more riverine parts of the country.

Special mention should be made about the potentials for an integrated inter modal transport network through the development of container traffic at the ports of Chittagong and Mongla – the former handling nearly four times the cargo handled by for containers at Pagla, near Dhaka. But, the real potential for container traffic development lies in linkage with railways.

The Inland Container Depot (ICD) near the Dhaka railway station has close links with port and ocean traffic. Since 1987, it enjoys the status of a Bill of Lading destination for containerized cargo. It, thus, saves stripping costs of break bulk cargo for road transportation and reduces the risks of cargo damage as well.

4.10 IWT Development Constraints

Ironic as it may seem, it is nevertheless true that while Bangladesh is favored with environmental features conducive to inland water transport (IWT) development, the country also faces severe environmental constraints in the IWT sector – some of which are relatively recent and anthropogenic. The constraints in respect of IWT development are the result of physical changes in the river system and waterways.

The complex regime of the river system in Bangladesh is dominated by three great rivers of the sub-continent, and changes in them will inevitably affect the regime in different ways. River instability is a serious bottleneck in IWT development in Bangladesh. Both the Padma and the Jamuna show high rates of lateral migration. The Jamuna – a braided channel – is characterized by numerous islands within the channel and sand bars.

In fact, on the Jamuna, which may reach a width of over 13 km in the rainy season, the navigable channel varies from one year to another. Apart from washing away or eroding entire villages and agricultural lands, seasonal channel shifts also require the movement of ferry terminals. Besides, the strong current in the Jamuna in the flood season precludes riverine traffic with sailboats, when boats fitted with diesel engines are the major means of water transport.

The Master Plan of BIWTA has recognized that the navigability of Bangladesh's waterways has deteriorated considerably over the last decades which acted as severe development constraints. Sample studies of waterways in various regions of the country through a comparison of gauge readings and least available depth (LAD) data between the present conditions and those of the 1960s identified the following causes of deterioration.

4.10.1 River Siltation:

Progressive siltation of river channels, including the off takes of distributaries in particular, make them shallower and unfit for navigation. It is estimated that the rivers of Bangladesh carry an amount of over two billion tons of sediment every year (Miah, 1988). Since the river gradient within Bangladesh is very low, a significant amount of that sediment load is deposited within the channels causing deterioration in navigability.

Siltation seems to be a more or less continuous process in the central and south-western regions of the country affecting the flows in the Old Brahmaputra, Dhaleswari, Gorai and other adjoining rivers. The causes of accelerated siltation are diverse, have increased very significantly on account of massive deforestation and poor land use management in the upper catchments regions of northern India and Nepal. Thus, the induced increase in the amount of sediment far exceeds the capacity of the rivers to transport it-causing channel aggradation's and reduced navigability.

4.10.2 Reduction in Trans-boundary Flow:

Navigability of the rivers in the south-west has been adversely affected in the past two decades owing to reduction of trans-boundary flow in the dry season. The volume of water in the Ganges in the low flow season (January-May) has sharply fallen since the upstream withdrawal of waters at Farakka (India). Several important routes in south-western Bangladesh, once open to mechanized vessels, have had to be abandoned.

Prior to the upstream diversion of Ganges waters, the river could be navigated by large steamers in the dry season. Now, due to low flow in the dry season, the river can be crossed on foot near the Hardinge Bridge for almost one-half of the year. The Gorai river, the principal distributary of the Ganges (Padma), has suffered from siltation and

shoaling to such an extent that its off take point is almost detached from the Ganges, and is unfit for navigation for a long stretch in the dry season (Rasheed, 1993).

4.10.3 Abstraction of Surface and Ground Water:

Progressively increasing abstraction of both surface and ground waters in the dry season for irrigation purposes has resulted in reduced stream flow, especially in many tributary rivers of the country. The National Water Plan (NWP) apprehends a further deterioration of this phenomenon in the north-eastern, north-eastern and south-eastern rivers. In river reaches that are subject to back water effect, the impact of the expected stream flow reduction will be less severe.

Hence, a suggested remedial measure may be to extend the influence of the back water by selective dredging. For a long term solution, the construction of a barrage on the Ganges-downstream of the Gorai off take-may improve the navigability of the south-western rivers as well as of the rivers in the southern part of the north-western region.

A direct consequence of siltation and loss of navigable draft is the reduction in the total length of IWT routes. The actual scenario takes several forms; former perennial water ways have become seasonal; water ways fit for mechanized vessels earlier can now be used by shallow launches and country boats only; and some channels turn into dry sandy beds in the dry season.

In short, the prospects of many of the smaller draft water ways in Bangladesh are not too bright. Processes are underway that adversely affect the navigational conditions, including greater water abstractions. The NWP estimates that, of the gross water demand in March, nearly 36 percent is required for navigation (including fishery and salinity control) (MPO, 1996).

However, around the beginning of the next century, increased demand / use for agricultural purposes would significantly deplete water supply for navigation. This underlines the need for a balanced and rational development plan for Bangladesh's waterways, based on priorities within the NWP framework of competitive interests and users.

The Master Plan of the BIWTA has identified several infrastructure projects and technical studies with a view to improving water ways navigability, institutional capacity and IWT services. One major development siltation and reduced draft. Also recommended in the Master Plan is a scheme for providing navigational aids with beacons and light buoys at appropriate locations-according to international safety standards. Projects are also envisaged for river training, guaranteeing access to importance river ports, and new cargo handling facilities.

In the final analysis, one has to argue that, despite the process of clogging of Bangladesh waterways in recent years, they would continue to remain as principal arteries for internal commerce and wet season movement by virtue of the unique physiographic regime of the country.

Rivers and water ways are natural assets, while anthropogenic forces are effecting changes in them which might diminish, and have in fact diminished, the intrinsic value of some of them. Hence, it is imperative that the factors contributing to adverse impacts on the waterways potential are identified and halted, and corrective measures are implemented. Human efforts are now essential to salvage and maintain this environmental resource.

CHAPTER-FIVE

Supply Chain Integration through Multimodal Transport in Bangladesh

5.1 An Overview of the Concept and Methods

Recent literature pertaining to multimodal transport has typically targeted mainly developed economies comprising highly integrated supply chain systems in which modeling and optimization of some system component is required ahead of further development (Luo and Grigalunas, 2003). Other approaches have considered the performance of some element, perhaps a port, in a multimodal network (Haralambides et al, 2001) or adopted the stance of particular stakeholders, where, for example shipping lines may attempt to vertically integrate their service provision though offering intermodal services (Heaver, 2002).

However, these approaches often overlook the concerns of developing economies perhaps at the weaker end of complex supply chains, but nevertheless seeking to engage in international trade and ensure their continued participation, survival and growth in an interdependent global economy. In seeking to contribute to these oft-neglected aspects of multimodal transport, this chapter should also appeal to supply chain managers charged with executing a holistic end-to-end approach to supply chain integration.

The role of an efficient transport system in providing a catalyst for national economic growth is well-rehearsed (Hayuth, 1987), as transport and logistics service quality influence both the demand for products and services and delivery cost and time (Coyle et al, 2003). Pressures to raise the productivity and efficiency of freight transport also increase as manufacturing and service sectors adopt logistical concepts including just-in-time and supply chain integration accompanied by globalization and electronic data interchange (EDI).

As mode-specific transport solutions have become increasingly less able to satisfy the needs of shippers and manufacturers, containerization and multimodalism have transformed the freight transport systems servicing international supply chains (OECD, 2001).

To develop a normative model for efficient goods movement promoting supply chain integration in developing countries, we first examine the influence of containerization and some benefits and limitations of multimodalism. After reviewing the trend towards supply chain integration, the roles of intermediaries and shippers or manufacturers are considered.

Barriers to supply chain integration in developing economies are presented, within the context of a case study in Bangladesh, and its particular transport problems which affect the scope for multimodal transport. Multimodal freight transport is then considered as a catalyst for removing trade barriers, providing a model for achieving supply chain integration.

5.2 From Containerization to Multimodalism

International freight transport involving maritime transport may be classed as port-to-port, port-to-point or point-to-point (Coyle et al, 2003). Port-to-port refers to goods transport between two ports, port-to-point between a port and final inland destination and point-to-point from shipper's door to customer's door. Point-to-point transport is characteristic of multimodalism. Historically, containerization improved the performance of modal transfers of general cargo at ports and terminals but being segmented; it was insufficient in time-and cost-sensitive markets demanding an integrated reliable system from origin-to-destination.

Containerization transformed freight transport systems, stimulating demand for multimodalism (Hayuth, 1987). When container movement dominates general cargo transport, the multimodal transport network becomes more effective and expands (ECMT, 2001). Containerization or utilization precedes a multimodal transport system with reducing instances of intermediate cargo transfers reflecting increasing degrees of multimodalism.

The transition from containerization to multimodalism involves a transition from technical requirements towards an integrated systems approach until interoperability is achieved. Typically, utilization is replayed by the systems concept and standardization by management and co-ordination.

Control over cargo supersedes cellular ships. Mergers replace roll-on/roll-off vessels. Gantry cranes are supplanted by multimodal companies, straddle carriers by modal integration and specialized terminals by through rates and billings. Ship-to-shore productivity is superseded by information systems, terminal back-up land by physical distribution and militate structures by deregulation.

Multimodal transport includes carriage by at least two different modes and international multimodal transport covers the door-to-door movement of goods while under the responsibility of a single contract. Intermodal freight transportation has been defined as 'co-ordinated, seamless, flexible, and continuous from door-to-door on two or more transportation modes' (Muller 1999), while unimodal transport undertakes carriage involving only one mode, perhaps truck, and one or more carriers.

Intermodalism 'usually concentrate [s] on operational aspects and transport infrastructure. However, successful intermodal transport also requires a conducive administrative and legal environment and efficient interchange of information' (D Este, 1996). A multimodal transport operator (MTO) is 'a carrier who offers a package including not only transport, handling, and storage of goods, but also full responsibility from the origin to destination on the basis of a single multimodal transport contract' (UNCTAD, 1990).

The terms multimodal, intermodal and combined transport are sometimes used interchangeably to describe the transport of cargo by two or more modes often incorrectly. The term 'intermodal', associated more with the US and increasingly Europe and Australia, implies achievement of a more integrated system. The European Conference of Ministers of Transport (ECMT) defined combined transport as 'Intermodal transport where the

major part of the European journey is by rail, inland water ways or sea, and any initial and / or final leg carried out by road is as short as possible' (IWTGS, 2003).

In a multimodal transport chain, road transport often links a port terminal with an inland terminal or logistics or load center and the origin or destination (ECMT, 2001). Large loads carried over long distances make multimodal transport services cost-effective and attractive, offering decreasing costs per unit load while terminal handling and other fixed costs remain unchanged.

For trucking company sometimes creates a buffer between market demand and multimodal options and may compete with rail or waterways. In large countries including the US, India and China the potential for developing multimodal transport systems to serve domestic markets is greater than in small countries. In Europe, for example the potential for offering multimodal transport services increases where efficient transport services can deliver a smaller transport haul with no intermediate loading or unloading.

Multimodalism is an integrating tool for offering shippers a greater choice of cost control, flexibility, competition, reliability, and one-top service. It has reduced costs by enabling shippers to select combinations of modes that offer efficient and lower costs services, compelling carriers to reduce rates and improve service (Muller, 1999). To raise efficiency and reduce transport and logistics costs demands managerial control and structured cargo flows.

Multimodal transport serves trade, guiding freight efficiently and cost-effectively across oceans, along coastal and inland waterways, through ports and terminals, on rail and by highways, stimulating economic growth (OECD, 2001). Motor carriers and rail roads have formed partnerships in the US for long distance shipments to meet shippers' demand for low cost and speedier services, and multimodal intermodal marketing companies (IMC) solicit multimodal traffic from shippers for rail (Coyle et al, 2003). In Europe, multimodal transport is enticing traffic from congested roads to rail and water, but the extent of potential transfers appears.

Not all commodities are technically or economically suited to international multimodal transport which favors long-distance routes with high traffic volumes. Goods transfers at seaports and multimodal terminals are capital intensive using skilled labor to man containerized ports and special terminals with back-up facilities. Non-standard container sizes and reluctance to co-operate among carriers may present problems.

5.3 Towards Supply Chain Integration

Supply chain management involves integration of individual logistical functions such as procurement, inventory control and transport (Waters, 1999) creating new logistical relationship involving 'nets' 'webs', 'virtual organizations' and 'demand satisfaction networks' (Hewitt, 2002). Increasingly, these relationships demand joint problem solving by supply chain partners because all costs contribute to the price paid by final customers, rather than simple corporate competition, or cost transfers upstream or downstream to achieve cost reduction and profit maximization.

Global competition now pits supply chain management when inventory is managed in an inter-firm co-ordinated pipeline, instead of being focused on one firm, and goods flow visibly and seamlessly between firms. Information and risks are shared between organizations, to optimize final consumer price, rather than being controlled by one firm. Planning involves supply chain teams adopting a systems approach, and inter-organizational relationships shift from one firm focused on low-cost operation to a partnership focused on landed cost (Coyle et al. 2003).

Processes involving other entities in the pipeline including suppliers, manufacturers and intermediaries such as distributor, retailer and logistics service providers must be linked and co-ordinated. Interfaces between organizations which could create barriers to co-ordination and collaboration, present opportunities for transport or logistics service providers to improve physical link at such interfaces while retaining the independence needed to maintain such relationships. As integration and collaboration increases, so

does supply chain competitiveness. Service providers must ensure the best possible customer-oriented service for a well-balanced price/quality ratio (Weigmans et al. 2001). Survival hangs on gaining access to a competitive market sensitive to time and cost-ensuring delivery of the right product, at the right price, time and place (Christopher and Towill, 2001).

As intermediaries intervene in bringing a consignment to the final customer, a seller is rarely the manufacturer of goods and the buyer is rarely the final customer. The management of a sophisticated and expensive goods flow creates high demand for quality transport services. Intermediaries create efficiency and value improvements for integrating a supply chain perhaps through importing or exporting a large variety of items on behalf of wholesalers and retailers or providing third party logistics (3PL) services (Thorby, 2003) typically comprising management and execution of transport and warehousing functions.

Such services allow shippers to outsource logistics activities and concentrate on their core business. Focused on meeting customer demand with reduced cost and high-quality service, 3PLs often innovate with new forms of transport and services including arranging customs clearance of imports, warehousing and managing transport haulage including sea freight via non-vessel owing common carriers.

A freight forwarder is not usually a carrier but an intermediary between cargo interests and the carrier, who arranges goods carriage from origin to destination, but does not undertake carriage or accept liability as a carrier. Traditional sea carriage involved port-to-port transport hauls, but now-a days, sea carriers often offer multimodal services in competition with NVOCCs and 3PLs, incorporating carriage and transhipment, the traditional business of freight forwarders, who in turn also offer multimodal transport services.

Forwarders do not own vessels but take responsibility for the origin to destination transport haul by procuring services through other carriers,

emulating NVOCCs. Forwarders offer consolidation and multimodal services, expertise in trade transactions and they influence transport mode selection. However, legal frameworks may need updating to recognize the status of forwarders in modern multimodal operations.

Control, response, tracking and tracing, and responsibility for cargo are important issues in multimodal transport systems with third-part non-equity participants like NVOCCs, IMCs or freight forwards managing increasing shares of through-transport services. Less-than truck load shipments are best served by consolidation services offered by logistics companies or freight forwarders.

Insufficient ICDs coupled with spatially fragmented production, restrict door-to-door transport services for these shippers, but concentration of high-volume trunk lines between logistics centers and major market centers allows deeper hinterland penetration and introduces direct competition among terminals or logistics centers and transport operators.

Main line operators offer volume discounts for large shipments, but freight forwarders may offer services at less-than-full load rates to shippers of limited volume. A freight forwarder collects small shipments ex-factory, consolidates them into full loads for onward carriage. At destinations they are broken down into consolidated loads in individual shipments and delivered to consignees. Forwarders gain from the rate difference and small shippers enjoy reduced transit times and a better pick-up and delivery service, at reduced cost.

5.4 Shippers' Role in Supply Chain Integration

Traditional cargo owners and shippers were primarily concerned with production unless there was a customer complaint. However, supply chain managers must now procure transport or logistics services and understand the total supply chain. Production patterns have moved from extraction of raw materials and intermediate production of traditional low value-added

products to high technology, high value-added light-weight products demanding high care and speedy movement. Developed country imports include low-cost high-volume consumption items such as garments or food items from developing countries.

Transport mode choice still includes cost, but increasingly includes transit time, reliability, distance and shipment size, value of cargo, volume-weight ration, time constraints, product fragility and perishability (Rushton et al, 2000; Coyle et al, 2003, Christopher, 1998; ETF, 1999).

Quicker materials delivery, which facilitates reduced inventory level through shorter lead times, may increase transport costs but just-in-time approaches trade-off cost against speed and reliability.

Multimodalism offers choice of routes, ports of call and modes of transport, reducing the shipper's influence with routes and modes increasingly determined by a MTO, freight forwarders or large shippers. Forwarders and 3PLs mainly provide service for small and medium shipments and thus influence their choice of route and mode.

Major freight forwarders, shipping lines, transport operators, and other logistics service providers compete to control door-to-door transport chains. Competition may threaten an integrated supply chain reliant on co-operation between members sharing common interests or collaborating by working together for mutual benefit, but the relationship of shippers and others outsourcing or forming partnerships with carriers shapes the accessibility to the logistical services.

5.5 Barriers to Supply Chain Integration in Bangladesh

Bangladesh faces barriers to international trade which also impede supply chain integration. Impediments to the smooth flow of cargo include transport, customs, business practices, knowledge and skill on logistics management information technology, banking and insurance. Despite a liberal economic policy in recent decades, many port, terminal and rail services are offered by government bodies incurring financial losses (Ministry of Finance, 2002).

Growing exports and imports shifted trade towards manufactured and finished goods rapidly increasing movements of containers through Chittagong Port to and from Dhaka, the main load center. Although containerized cargo volumes between these two points are theoretically sufficient to support multimodal services, investment in port and inland terminals handling equipment and facilities has not kept pace.

The international competitiveness of Mongla port is reduced by high ship turnaround times in port which increase transport costs, transit times and unreliability. Limited inland transport infrastructure by road, rail and waterway serving both ports has developed to accommodate door-to-door movement of containers. Ship delays in Chittagong are directly related to insufficient and inadequate port facilities and a fragmented inland transport system (Cookson and Ahmed, 2000).

Corruption in the form of toll collection on the inland leg of international transport may exacerbate delays. Seaports inaccessible to door-to-door containerized cargo movement present the greatest barrier to all efficient and integrated transport system.

Too few logistics centers or ICDs have been developed close to load centers, restricting freight forwarders' ability to offer door-to-door pick-up and delivery services. With the regulation to govern freight forwarder operations, few are equipped with information systems reporting freight rates and transit times. Shippers or consignees are unable to find information about

consignments because of inadequate modern communication technology, particularly EDI. Many shippers lack knowledge of EDI or its potential benefits.

With some transit time separating major cargo centers, road transit has the potential to contribute to an integrated and efficient door-to-door service by performing the inland leg of international multimodal transport. Bangladesh has regularly spent about 15% of its development budget on surface transport (Planning Commission, 2009), yet users cannot access door-to-door services.

The Dhaka-Chittagong road corridor is adequate for container movements, but feeder roads are not, denying locations set away from the main corridor any multimodal transport by road. Owing to scarcity of wagons, locomotives, handling equipment, insecurity of cargo, infrequent services, non-availability of containers and suspicion of a commercial attitude, main line operators do not encourage door-to-door movement of containers by rail.

Inland shipping is considered a low-cost mode, which like road, suffers insufficient inland container-handling facilities and container terminals. The inland transport infrastructure hampers both trade and investment.

There are few origin-to-destination transport and logistics services, denying integrated, efficient, reliable door-to-door transport, raising logistics costs and adversely affecting the competitiveness of products in the global market. Change towards efficient containerization and multimodal transport is hampered by delays and confusion arising from multiple ministries involved in administering transport services and multimodal development.

Bangladesh's trade with neighboring countries is increasing, particularly with India, but is asymmetric, dominated by movements from India along formal and informal channels, widening the trade deficit. Exports from Bangladesh to neighboring countries involve a narrow product range,

hampered by limited liberalization and higher tariff and non-tariff barriers in India (Pohit and Taneja, 2003).

Until Bangladesh diversifies and expands its export base, trade imbalances will exacerbate empty running causing higher costs and unreliable services. Such inefficiencies translate into higher commodity costs and reduce the trading credibility and status of the country in the regional and international market. A regional strategy would ensure effective and efficient transport corriders (Subramanian and Arnold, 2001).

The success of transport corridors is constrained by documentation and procedural inefficiencies. Protocols restrict cross-border movement of trucks and route choice (Subramanian and Arnold, 2001). Gaps in physical infrastructure include incompatible physical transport links or facilities at border crossings including warehouses, parking and storage and terminal facilities.

Natural barriers comprise hundreds of rivers, with about 80 river gaps, lacking bridges on the road network requiring ferries. These rivers restrict road and rail transport in the rain season through flooding, even where there are bridges. Unlike road, rail does not require transhipment at border crossings, but has not attracted substantial traffic. Five rail routes operate between India and Bangladesh, with both governments owing rail-operating organizations.

It is not known whether scale economies could be achieved by closing routes which generate inadequate social or commercial returns. Rail could capture some medium-value cargo but requires an integrated network. Rail needs to acquire adequate compatible rolling stock, cargo handling equipment, rail cars and locomotives, and any service must be capable of offering an efficient door-to-door containerized transport solution.

Inland waterway incurs longer transit times and little cargo is available. As road haulers do not have the right to carry cargo on the roads of neighboring

countries, they require transhipment at border crossing. With a dozen border crossings, road will dominate in the transport of higher-value goods between Bangladesh and India. Potentially, road could offer combined transport, with short haul collection and delivery services for rail or waterways on longer hauls.

This needs 'prioritized co-operation to develop an integrated transport system and infrastructure through collective action' (Khan, 2001) with equipped logistics centers or inland terminals. Increased with neighboring countries may also improve relations between private parties engaged in trade.

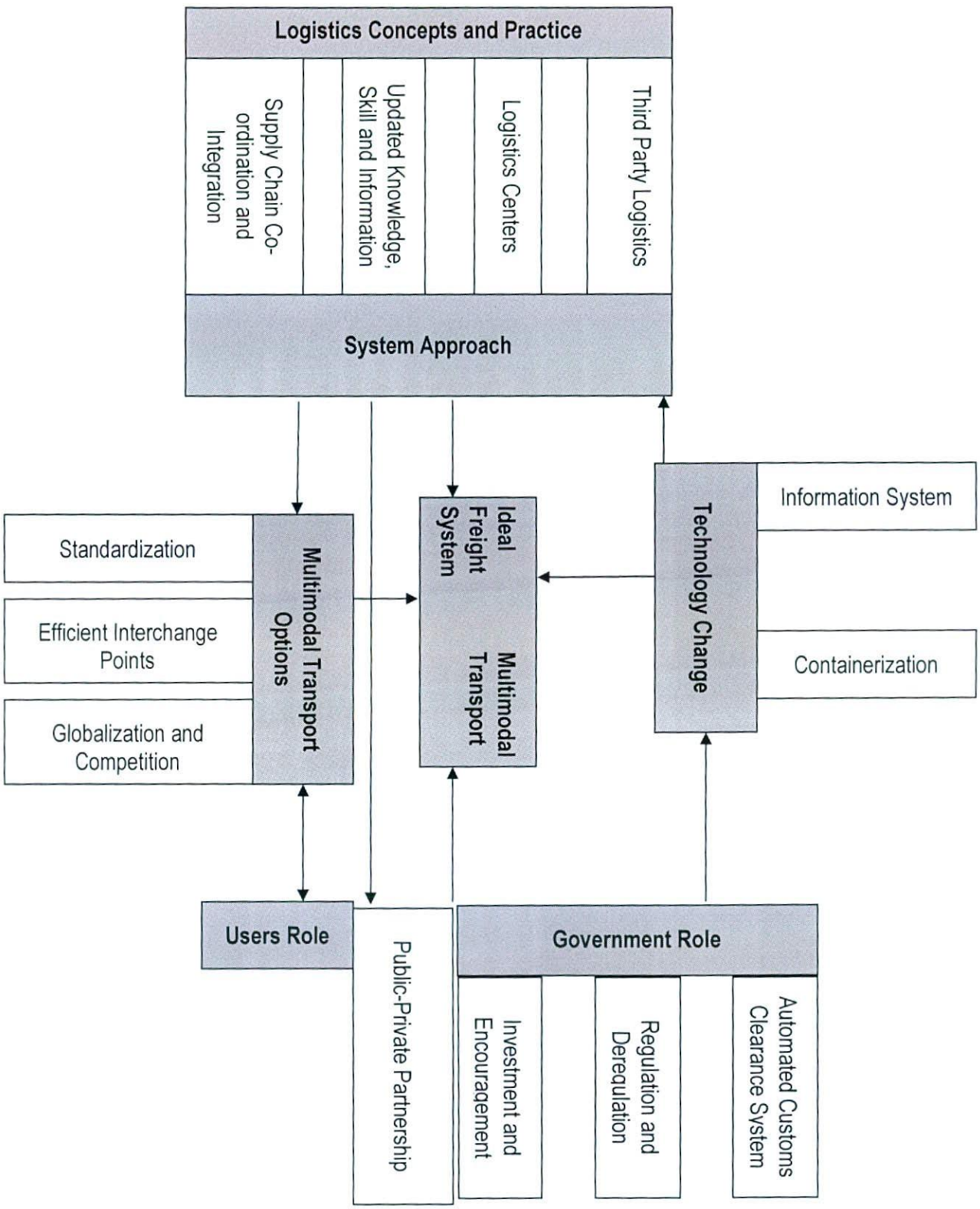
5.6 Multimodal Freight Transport: A Catalyst for Removing Trade Barriers

Through interfacing with other organizations in supply chains, freight transport service providers can assist in integrating supply chains. In an ideal multimodal freight transport system (figure 3) government's role is clear. A deregulated environment promotes public-private partnerships, often associated with successful multimodal developments in Europe (Wiegmans et al, 2002) and developed economies (Hoffmann, 2001).

The system embraces technological change and modern logistics concepts in a national economy that interfaces openly with the global economy. Transport infrastructure is adapted to shift heavy cargo, carrying full container loads. Interchange points equipped with facilities to handle containers efficiently attract MTOs.

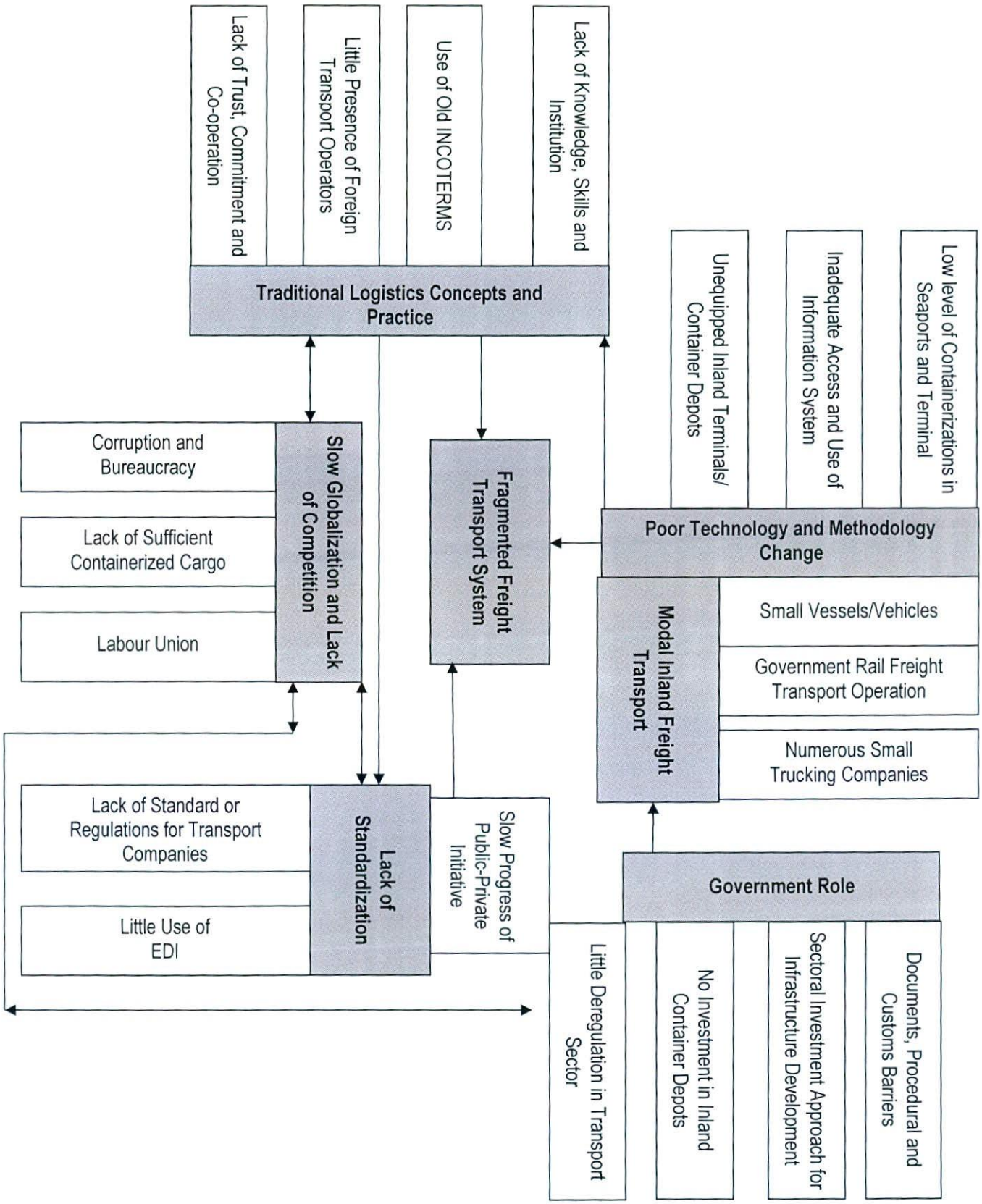
Figure 4 summarises the present, fragmented, freight transport system in Bangladesh involving multiple ministries and departments responsible for policy making. There is insufficient investment in infrastructure, slow progress in public-private initiative and an adequate inland transport network and technology for containerized cargo. Logistics concepts and practices are outdated. Competition is hampered by limited deregulation.

Figure 3: An ideal multimodal freight transport system



Source : *Authors Own Contribution*

Figure 4: The current fragmented freight transport system in Bangladesh



Source : *Authors Own Contribution*

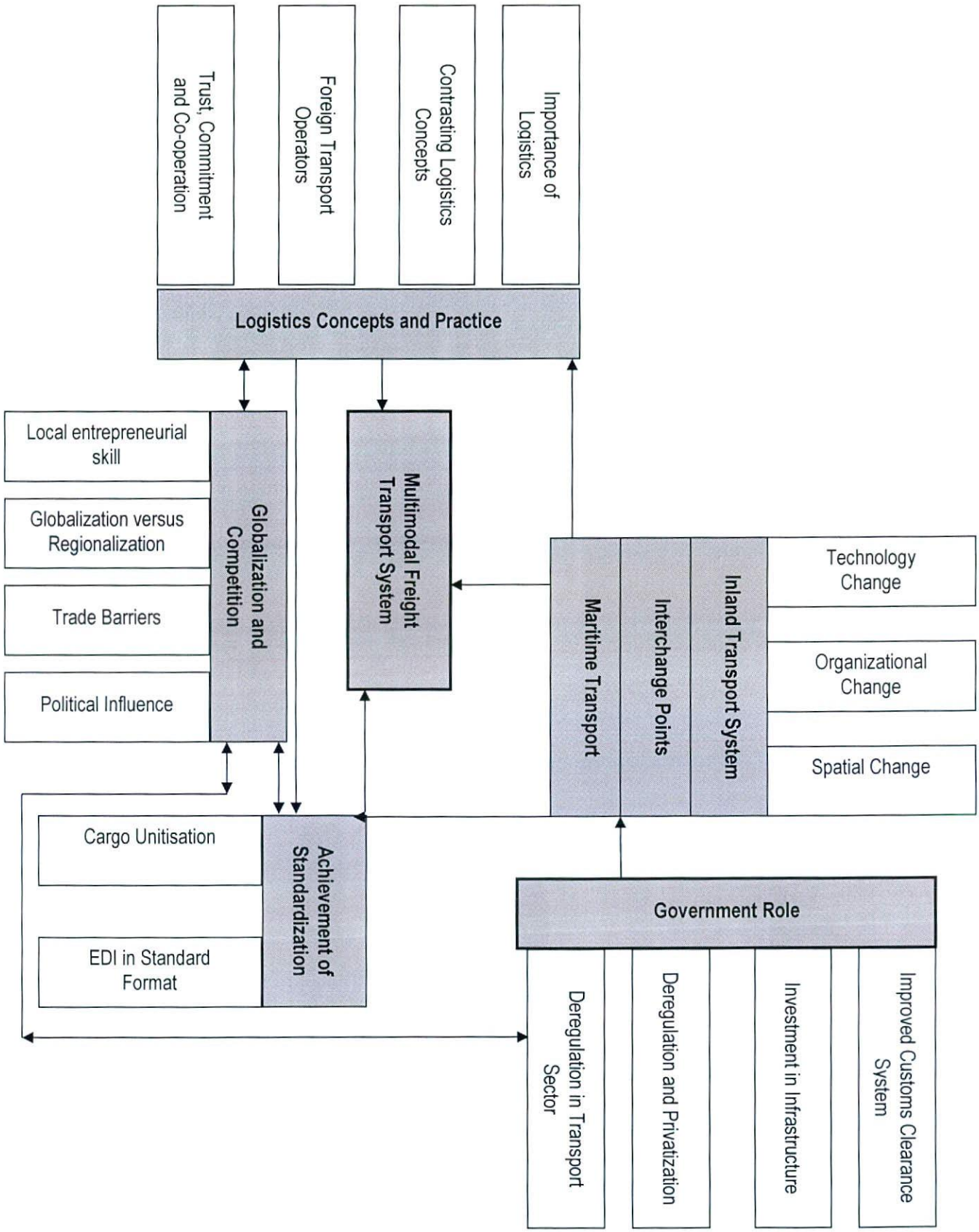
Generally, as in Bangladesh, the fragmented freight transport system in developing countries hampers international trade (Figure-5). However, multimodal transport systems are progressing in many developing countries, including newly industrialized countries such as Malaysia and South Korea which have adopted US practices.

The potential for multimodal transport systems to stimulate development again requires transformation of the role of government (Figure-6), the inland transport system, technology, use of modern logistics concepts and practice, acceptance of globalization and competition and standardization.

Figure 7 presents an idealized multimodal transport system for an integrated supply chain in which all shippers and consignees have access to door-to-door service from factory premises to port or through inland clearance depots. En route, intermediaries normatively offer value-adding services. Small and medium sized shippers and consignees typically receive load aggregation and knock-down services, customs clearance and documentation services through freight forwarders and other agents using inland clearance depots.

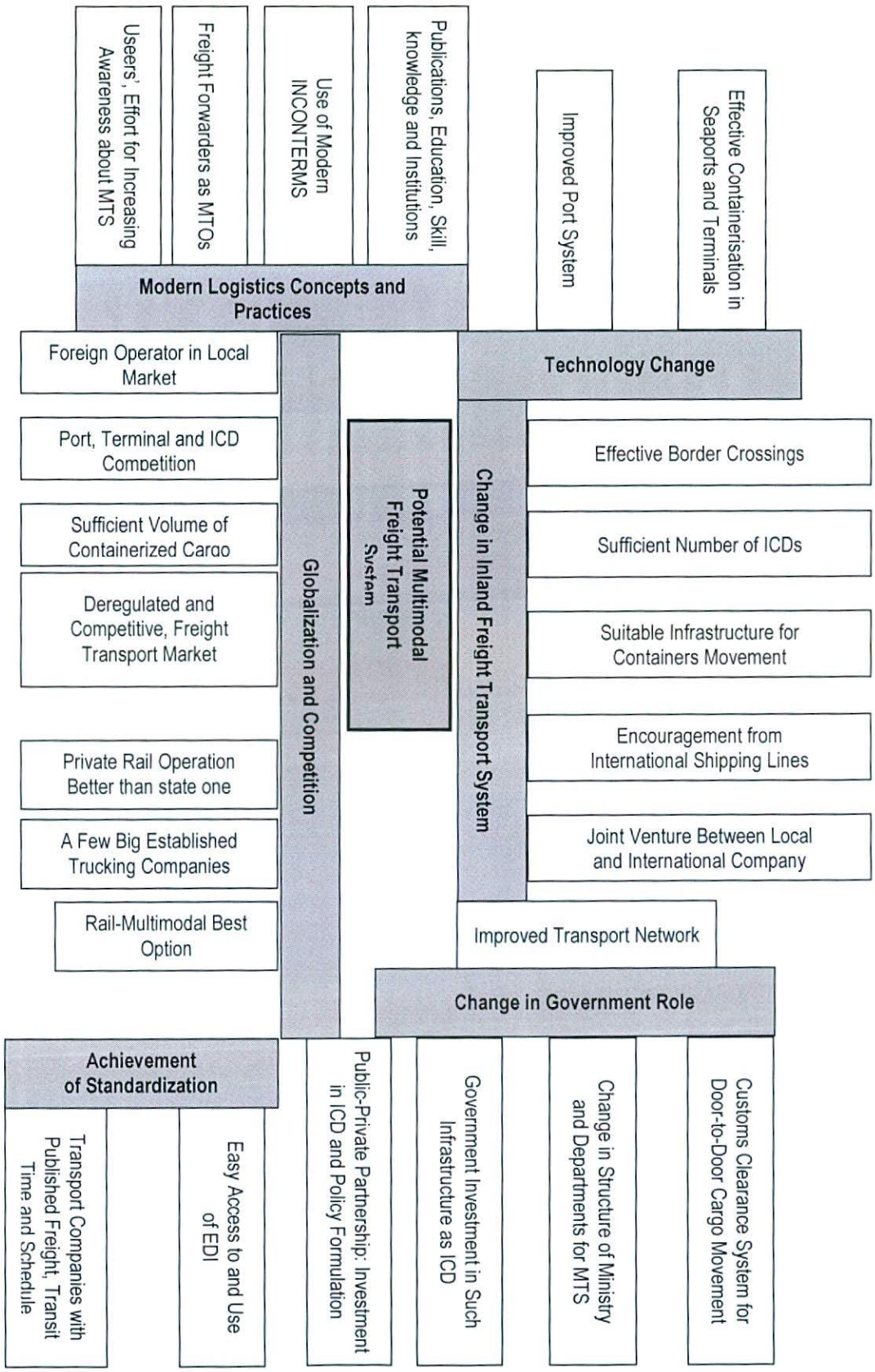
Larger shippers and consignees with in-house expertise are less dependent on freight forwarders' specialist expertise because large shipments offer them direct access to logistics manager and main line carriers. Where they are proximate to ports, opportunities arise to exploit specialist pick up and delivery services available at port terminals under a multimodal freight service of using inland depots. Full integration into the international supply chain is only possible when all shippers and consignees have been empowered to access multimodal door-to-door services.

Figure 5: Freight transport multimodal development in developing countries



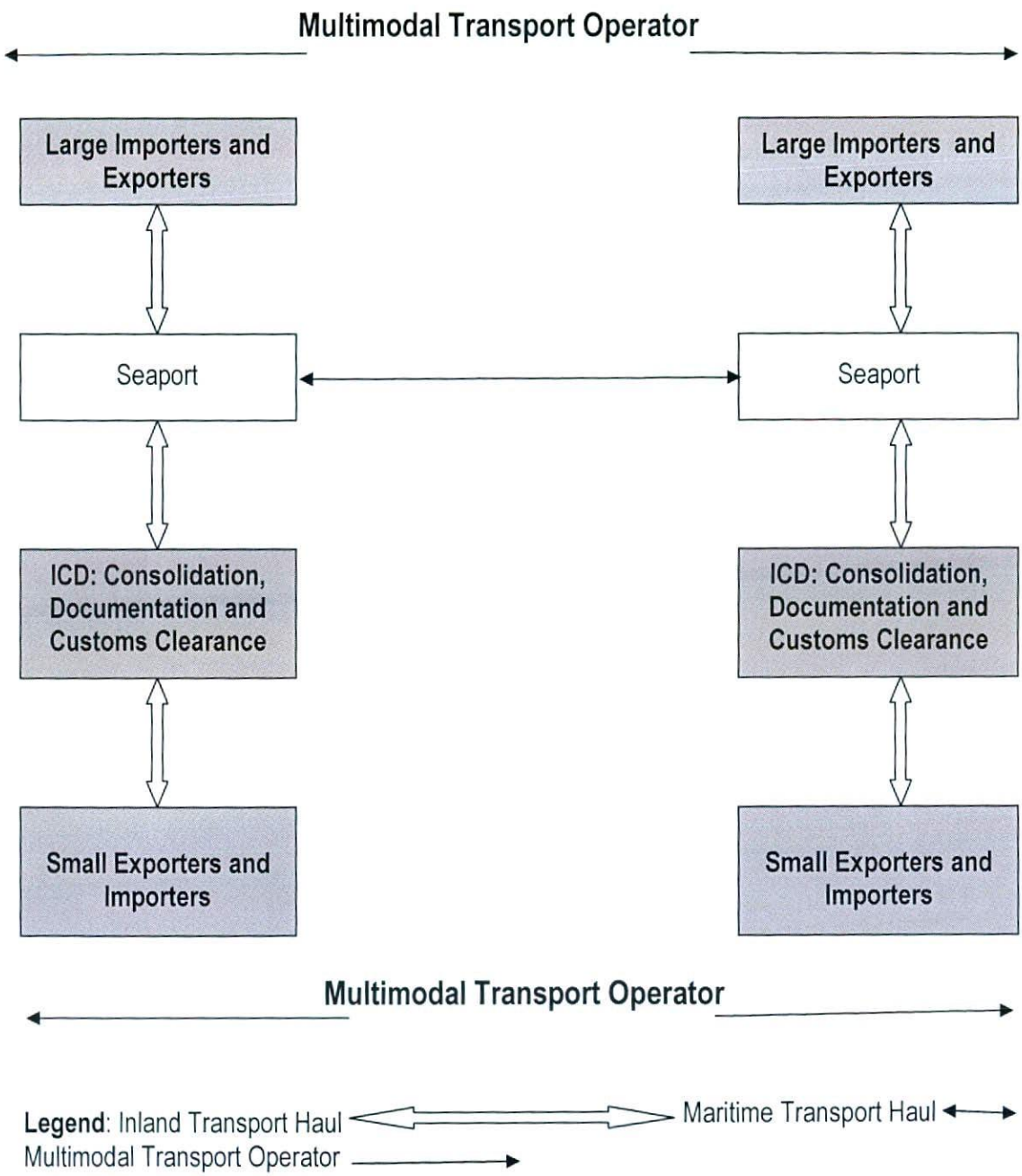
Source : *Authors Own Contribution*

Figure 6: Potential freight transport system in Bangladesh



Source : *Authors Own Contribution*

Figure 7: An ideal multimodal freight transport system for supply chain integration



Source : *Authors Own Contribution*

To promote multimodal freight transport demands co-operation between parties. Governments must encourage investment and training in relevant modern information technology. They must retain responsibility for identifying and promoting potential load centers given that multimodal transport poses significant risks in investments favoring large load centers with long containerized goods hauls offering scope for low unit costs per load, with high terminal handling and other fixed costs.

The potential for developing multimodal systems is limited in countries like Bangladesh by short hauls and domestic markets with limited total purchasing power, but increases where transport services are efficient with no intermediate handling.

CHAPTER-SIX

The Rise of Hub and Mega Ports: Importance of Chittagong Port

6.1 Introduction

This chapter examines the importance of mega ports in the context of globalization and also analyses the economic benefits which can be derived from mega port development. The chapter is divided into two sections. Section-I describes the importance of Chittagong port and Section-II provides some lessons for Bangladesh from the experiences of UAE and China.

Section-I

6.2 Globalization and the Importance of Chittagong Port

In an era of economic globalization, ports are evolving from being traditional interfaces between land and sea to providers of complete logistics networks. The momentum of this trend is creating a port shakeout, leading to the development of a sharply delineated hierarchy on a global scale. Ports are being increasing differentiated by their ability to handle the latest generation of container ships coming on stream.

With the trend toward even bigger container ships, fewer ports are becoming capable of handling them. As a result, the flexibility of the world sea-borne flow is becoming increasingly constricted-particularly in the event of a natural or man-made crisis or disturbance. Trends in Maritime Transport and Port Development in the Context of World Trade Structural change in international trade and the evolution of maritime transport have a direct impact on port growth and expansion. Therefore, these elements and their recent characteristics must be examined.

These factors also determine future port development. Globalization, or the expansion of markets and hence of the economic prospects of societies, is taking place not only because of the supra-national nature of market, but also because of the flow of foreign investment and the strategies of multinational enterprises. These multinationals today account for two/thirds of global exports of goods and services and nearly 10% of domestic sales worldwide.

In this environment of increasing interdependence in the world, the international division of labor is changing as a result of structural changes in trade and unprecedented mobility of international capital. However, while the integration of goods and services and capital is progressing at a rapid pace, integration of the labor market is much slower.

In addition, ever more sophisticated technologies are being disseminated, in a framework of spectacular streamlining in communications and telecommunications. The development of information technology has, in turn, boosted productivity and in many cases, worker income.

In general, electronic transactions and communications technology have been the necessary complement to full internalization and globalization and their major impact on production and world trade.

6.3 Fragments of Maritime History

It is commonly claimed that the wheel is the greatest invention in history. Water transport with a history of more than 5,000 years is an integral part of civilization itself, and the world of shipping has a unique place in the history of mankind. Without it the world might have been nothing more than a quilt of isolated tribes confined to survive on whatever local resources they could find. It is difficult to even imagine that science and knowledge could develop very far in a world without water transport.

The first development of major sea routes on a regular basis took place during the Renaissance and expanded rapidly during the industrial revolution. Shipping was not only for adventures and traders. It attracted the

interested of Kings and Emperors, of philosophers and intellectuals. What Adam Smith (1776) did for four understanding of markets and industry late in the 18th century, Richard Hakluyt (1589) had done for trade and shipping two centuries earlier. His monumental "The Principal Navigations, Voyages, Traffiques and Discoveries of the English Nation" (1589-1600) was written to be useful to merchants and entrepreneurs and to influence the direction and nature of public police and indeed played a significant role in 16th century England.

Shipping was seen as much more than a means of transport, and was linked to broader concepts of technology and growth. Francis Bacon (1605) observed in Advancement of Learning "The proficiency in navigation and discoveries may plant also an expectation of the further proficiency and augmentation of all sciences".

Almost three centuries later (1870), Emerson, the American poet and philosopher, expressed similar thoughts: "The most advanced nations are also those who navigate the most". The fragments of maritime history remind us that there is something so profoundly fundamental about maritime transportation that it has no direct parallel in other industries.

Shipping has shaped and formed not only entire economies and world trade, but also cultures and co-operation between peoples. Merchant shipping developed and existed for centuries as a political, military and economic instrument.

After World War II there came a period when shipping appeared to be on the decline. Following tile introduction of commercial jet aircraft in the late 1950s, proud ocean liners were soon eclipsed by air travel.

The merchant marines of most western countries declined and as ports moved away from city centers, ships literally disappeared from view. Yet shipping was there all alone and rather than being displaced by the emerging globalization, it contributed in a major way to make globalization possible.

6.4 Shipping as an Agent of Change

Globalization is said to be the collapse of time and space. Today's communication systems allow instant contact between businesses around the world and intermodal transport has so reduced the importance of freight charges for manufactured goods as to practically eliminate the effect of distance.

As a result, major shifts have taken place in the global location of manufacturing. This trend accelerated with the opening of China and its Special Economic Zones (SEZ) in the 1980s. These zones are no longer called 'special' as practically all of China turns into one giant factory.

The new industrial giant that China has become is often compared to 19th century United States. An almost inexhaustible supply of labor keeps wages low yet falling prices keep demand high and growing at the present time there is even talk of the possibility of global deflation and invariably China's enormous industrial capacity is mentioned as an important contributing factor to that possibility.

Developing countries have gone from being exporters of raw materials and inexpensive handicraft to becoming manor players in world markets for manufactured goods. In 1980, 42% of merchandize exports from such countries in Southeast and East were manufactured goods. By 2008, this share had nearly doubled to 82%, the same level as in high-income countries.

When Malcom McLean introduced highway containers in water transport on a limited scale in the 1950s, nobody could foresee the impact this would subsequently have on the structure of world trade. This new form of intermodal transport did much more than simply, change the way of carrying industrial goods.

Starting in the 1970s, maritime containerization became a logistics tool that dramatically affected location of manufacturing industries around the world. What camels and clippers had done for silk and spices during the Middle Ages, and bulk carriers did for raw materials during the first half of the 20th century, container vessels are now doing for manufactured goods.

Historically, countries traded with their neighbors and only a small part of world trade was over long distances. Most goods could simply not justify the high cost of long distance transportation. Two developments have, contributed towards making long distance trade possible in manufactured goods on a large scale.

First, value added marketing, the use of lighter materials and miniaturization of many products have resulted in higher product value per cubic foot or unit of weight. This is as true for cellular phones as for coffee pots.

Second, there has been a dramatic leap in the productivity of maritime transport services for manufactured goods. Containers move 'seamlessly' from factory floor to port, across the ocean, and then inland at destination, continuing all the way to the customer's warehouse.

This represents an enormously simplified operation compared with the old-fashioned break-bulk systems, which required individual packaging, handling, stowing etc. of each item shipped. The transition from traditional break-bulk operations in pre-container times to multimodal through transport can be compared with the transition from forge to factory or from 'job shop' to 'flow shop'.

Not all regions and countries have benefited equally form globalization and containerized ocean transport. For both goods transport and telecommunications, volume, not distance is the key. The large container routes of the world are the global highways-a true interstate system of the oceans-but these routes are limited to a few strategic corridors, which call generate enough traffic to support large capacity intermodal systems.

6.5 Changes in Container Terminal Operators

With the expansion of the container industry, the structure and organization of terminal operations have changed. Today there are three categories of container terminal operators: (i) port authorities that have decided to become directly involved in handling containers, such as the public ports of Singapore and the Virginia Port Authority or the private ports or freeport. However, this category has been on the decline with the emergence of port corporations; (ii) private port terminal operating companies involved in a process of concentration, including stevedoring. Some operators have expanded their activities outside of their ports of origin, associating themselves with large stevedoring groups (e.g. PSA Corporation, Hutchinson, ECT, P&O Ports, and SSA); and (iii) the shipping lines that have decided to control and manage their own container terminals.

This decision was made for two main reasons. The first was for strategic reasons, because these global transporters are involved in hub and transhipment ports and therefore need to control their operations, including docking priority and guaranteed availability of equipment for use. The second was to reduce costs, i.e. for savings, based on economies of scale and better control of terminal expenses.

6.6 Bangladesh the Historical Perspective of Regional Integration

Prior to 1947, the region comprising, the North-East of India had substantial economic and social intercourse with the neighboring countries. East Bengal (later called East Pakistan and ultimately Bangladesh) was well integrated with the North-East. There is evidence that trade and migration into territories today comprising Tibet, Myanmar, Yunnan province of China, Nepal, Bhutan and Sikkim were important to the economy of the region.

However, partition and independence ended whatever remained of this intercourse. The partition transformed the region at the crossroad of emerging Asia, into a landlocked outpost of a large continental economy.

The huge landmass comprising the seven states (Assam, Arunachal, Manipur, Meghalaya, Mizoram, Nagaland and Tripura), approximately 225,000 sq. km., was now cut off from its hinterland by the creation of Bangladesh.

Linked by 37 km. wide Siliguri corridor with the rest of India, it soon lost its natural advantage as its integration with economy in the south and the west was disrupted by trade and industrial policies pursued by independent India.

It needs to be emphasized that the physical infrastructure for facilitating trade and economic links between the North-East Indian states and the neighboring countries is lamely absent.

Indeed, one can argue that the links are weaker today than they were in 1947. The Stilwell Road is now a mere muddy track and the rail links with Bangladesh stand severed. Infrastructure bottlenecks and delays at border points add substantially to the transaction cost in international trade.

6.7 The Environment of Chittagong and Mega Port Development

The role and significance of ports has changed dramatically during the past decade and today they have a much higher profile both economically and technically in maritime and international trade. Not only is the port a link in international transport chain, but also many of the major ports such as Rotterdam, Singapore and Hong Kong have become trading center.

The development of the free trade zone situated in the port environs offers to international entrepreneur a range of industrial and marketing benefits which are difficult to find elsewhere. These include: unrestricted international exchange of goods, free of custom duty or examination until leaving the area, excellent distribution access to the port's global/regional maritime services and overland infrastructure systems.

The vision was rightly explained by Professor Mohammad Yunus as "Mega-port at Chittagong is the key to making Bangladesh the cross-road of the

region. With the economy of the region growing at a sustained high speed, demand for the access to a well equipped well managed port will keep on growing. A region, which includes two giant economies, will be desperately looking for direct shipping facilities to reach out to the world. Chittagong will offer the region the most attractive option. Even today despite the problems of present Chittagong port, Kunming is requesting permission to utilize this facility. With global competition becoming more fierce shorter and shorter lead time for delivery will become magic formula to attract business. An efficient mega port at Chittagong will be in high demand. This port can be built and owned by national or international company with government participation in equity. It can contract out the management of the port to a professional part management company".

A key effect of economic globalization is the continuing increase in maritime trade and traffic. While the new economy that helps fuel globalization is knowledge-based, the fact is that knowledge needs to be transformed into goods and services.

These goods and services need to be transported internationally. While personnel may travel by air, most goods can travel economically only by sea. If globalization indeed results in an increase of world trade and cross-border networks and flows, it will necessarily result in an increase in maritime traffic.

In the coming years Bangladesh should strive for a surge of foreign private investment in power, as telecommunications services and ports. Gas, telecommunication, transportation and port facilities would support the accelerated growth of industry and agriculture.

Private participation in these sectors is just starting and Bangladesh needs to provide credible assurances to investors that their efforts will not be thwarted by bureaucratic process, lack of adequate resolve in implementing declared policies or regulatory stranglehold. Quick, effective implementation of port reforms could help mitigate a major constraint for the export-led growth which Bangladesh wants to pursue.

Section-II

6.8 Managing Maritime Infrastructure: Lessons from UAE and China

Ports play a significant role in the development of a country since it links the domestics economy with the rest of the world and thus help in promoting international trade. As a result, port development becomes a major issue for policy making and ongoing economic development liberalization. It is well known fact that the port development and macro-economic development are closely related.

On the one hand macro-economic development necessities port development as part of infrastructure development. On the other hand, port development itself facilities import-export and attracts industries to its hinterlands, which in turn create a forward and backward linkage with the rest of the economy. It is generally conceded that coastal regions have always benefited from the development of a port.

However, the benefits have changed with the passage of time, due to the evolutions in industry, technology and in the general nature of trade. The transition from an intermodality system to the integration in production – distribution chain has impacted the way in which a port organizes itself. Arising from this evolution in the role of a port, the objectives and the characteristics of port have been driven to change.

This section intends to focus on port development / management aspects, because experience has shown that port development does not always live up to expectations. The following analysis will attempt to pinpoint some of the aspects of managing maritime infrastructure by analyzing the successful port operators worldwide and particularly reviewing the port operations of Dubai in UAE and Shanghai in China, which can help to resolve some of the obstacles of port development in Bangladesh.

6.9 Significance of Maritime (Port) Infrastructure

Port is not a single entity. It comprise of many sub industries and enterprises. These include stevedores, road and rail freight forwarders, warehouse operators, container terminal operators, containers repairers, custom agents, dockworkers, ship chandlers, bankers, lawyers etc.

The port infrastructure also stimulates shipping industry, ship building-repair-breaking industry, maritime equipment industry, dredging and offshore industry as well as fishing and aqua culture industry. According to Kindleberger (1996) port development is an epitome of changing economic, political and technological circumstances on various scales aided by outward orientation of an economy.

A port grows by virtue of the trade, which it can attract. Its growth is a function of not only the technologically related supply facilities but also of the economic and political objectives of an economy that determine the demand for port services. Both classical economists like Adam Smith (1766) and the pioneers of development economics like Myrdal (1957) and Hirschman (1980) mentioned that port based development strengthen the classic sequence of specialization → division of labor → productivity → transport infrastructure → extent of market.

Most ports are multimodal and serve as the combined gateway for several forms of transports, most typically, maritime, road, rail, often mix of bulk and containerized traffic. In addition to the main function as interface, storage and distribution points, efficient ports also functions as growth poles attracting new industries and stimulating trade. Ports offer particularly attractive locations for distribution-intensive enterprises.

Apart from the obvious direct contribution to GDP growth, the indirect contribution of ports is also substantial, given the importance to the competitiveness of the country's export/import industries.

Developing as well as developed economies are using "Growth Pole" argument to justify the development of basic port infrastructure, with the rationale that investments in port assets have strong direct and indirect multiplier effects on the entire national economy.

Port represents a mix of public and private goods. They generate direct economic benefits (private goods) through their operations as well as additional indirect benefits (public goods) in the form of trade enhancement, second order increases in production volumes and collateral increases in trade-related services.

Table: 9 Characteristic of Ports

Dimensions	Factors	Measuring Tools
Port Location	Distance to the industrial agglomeration.	Referring geographical information.
Port Infrastructure and Superstructure	Berth number, Berth depth, Crane type, Yard area.	Accommodation of latest generation ships.
Port Service	Load and discharge speed, Pick up and delivery services, Information availability, Ancillary services, Provide customized service.	Referencing to International Benchmarks, Surveying shippers, carriers and forwarders.
Port Charges and Costs	Port charge of cargo Port charge of ships.	Referencing to International Benchmarks.
Carrier Service in Port Connectivity	The calling frequency The freight rates.	Referencing published data.
Hinterland Accessibility	Intermodal operation time consumed, Intermodal operation cost, Custom clearance procedure,Cargo tracing service.	Referencing to International Benchmarks, Surveying carriers and Lead Logistics Providers.
Distribution Center (DC)	Total area of distribution center,The equipments and information system of distribution center and service scope.	Referencing statistical data, Requirement of supply chain management.

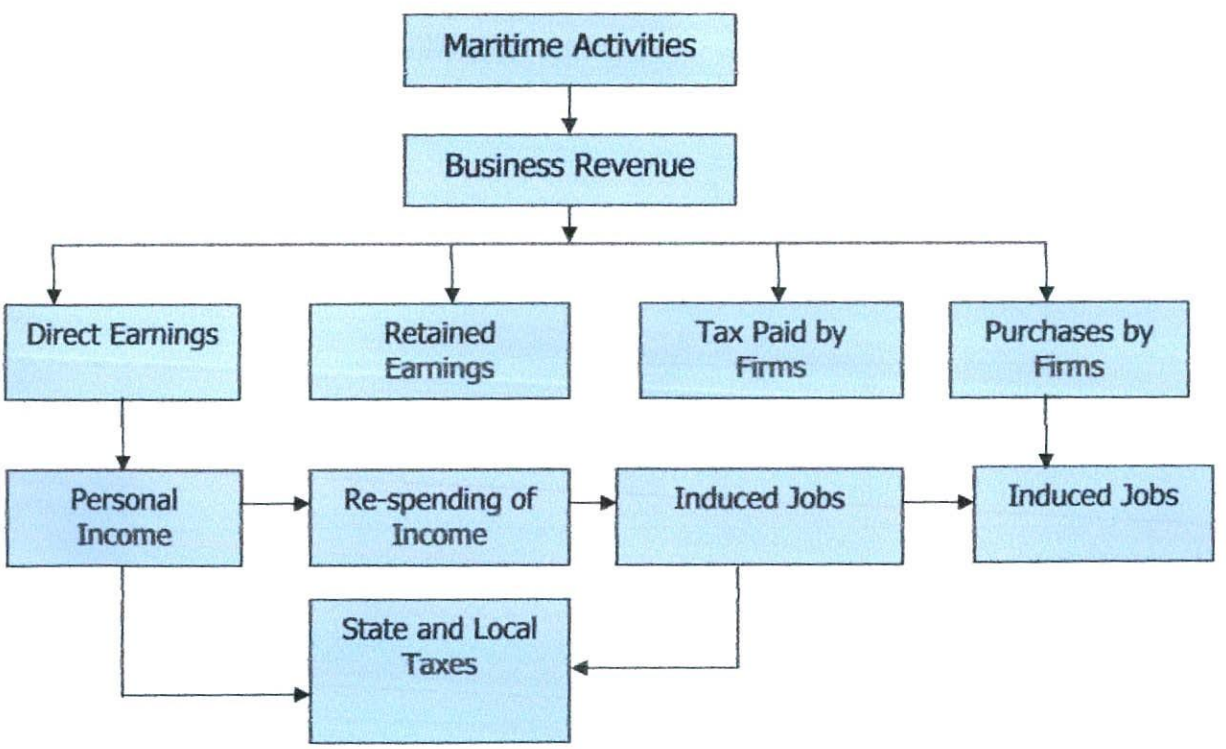
Source: *Song (2002), UNESCAP.*

6.10 Economic Impact of Maritime Infrastructure on Economy

An efficient port raises the productivity of other factors of production (labor and capital) and profitability of the producing units thereby permitting higher levels of output, income and / or employment for most of the developing economies of world. The impact of port infrastructure on local and regional economy is direct or primary.

It consists of the initial round of spending and employment generated by port related activities. A major part of direct impact arises from local port user industries. The local port user industries may be dependent on the port; in the sense that port's existence is assumed to be the major factor in the initial decision of the firm to locate near it. The secondary or the (induced/ indirect) impact is generally defined as all activities in the region, which are economically dependent on the primary activities.

Figure 8 : Flow of Economic Activities Generated by Maritime Infrastructure.



Source: Author's own contribution.

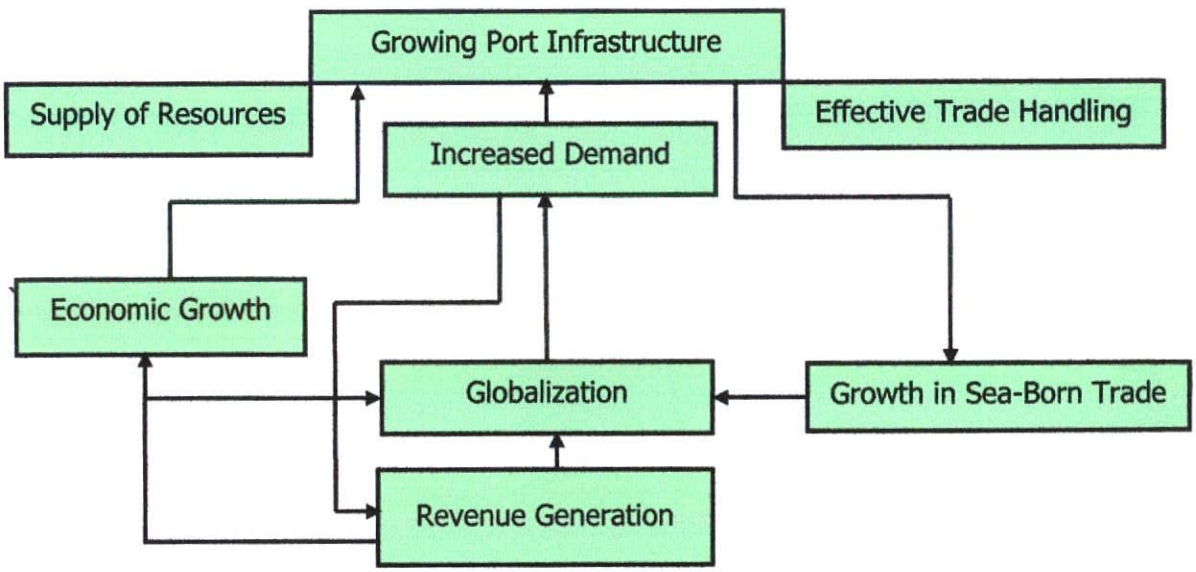
In other words these impacts consist of multiplier effect generated in regional economy by the activities included in the primary impact of the port.

6.11 Globalization and Developments in Maritime Sector

Globalization is a major contemporary trend that has initiated economic reforms in many countries. Haralambides (2000) described globalization as an increase in cross-boarder interdependence and more profoundly, integration, which has resulted from the greater mobility of the factors of production and of goods / services.

The significant advances in transport and communications technologies have increased the speed and efficiency of transport and had decreased the communication cost (Deshmukh Atul; 2003). As key players in international transport, it necessitates the ports to adapt to the increasingly competitive environment. This confronts ports to continuously improve the operational performance to serve the rising volume of world trade.

Figure 9 : Development of Port Infrastructure & Possible Access to Globalization



Source: *Author's own contribution.*

Most developing countries are now well aware of the tremendous potential benefits from the opening up of their internal markets and the liberalization of their external trade and as a result the world output and volume of merchandize trade has increased tremendously.

During the second half of the 20th Century, globalization and improvements in transport facilities led to a significant expansion of international trade. The growth of international trade, in turn, led to the growth in maritime services since more than 3/4th of world trade volume is carried by sea transportation through ports.

The year 2006 witnessed robust growth in the world economy and vigorous trade expansion. Global gross domestic production (GDP) growth accelerated to 3.7%, the second best performance since 2000. The strong global macro-economic situation in 2006 provided a favorable framework for the expansion of international trade. In 2006, world merchandise exports grew in real terms (i.e. at constant prices) by 8.0%, compared to 6.5% in the preceding year.

It is estimated that approximately 330 vessels with capacities of 6,000 TEU and would be deployed on routes to and from Asia by the year 2006 and this will grow to over 470 by 2011. Approximately 130 of these would be of 10,000 TEUs or above.

Table11: World Feet Size by Principal types of Vessel
(Figures in '000's of DWT)

Principal Types	2003	2004	2005
Oil Tankers	304 396	316 759	336 156
Bulk Carriers	300 131	307 661	320 584
Ore/Bulk/Oil	12 612	12 110	9 695
Ore/Bulk	287 519	295 551	310 889
General Cargo Ships	97 185	94 768	92 048
Container Ships	82 793	90 462	98 064
Other types of Ships	59 730	47 324	48 991
Liquid Gas Carriers	19 469	20 947	22 546
Chemical Tankers	8 027	8004	82 90
Ferries and Passenger Ships	5 495	5 561	5 589
Other	25 833	11 865	11 565
World Total	844 235	856 974	895 843

Source: *Compiled from UNCTAD (2006), Lloyd's Register-Fairplay Ltd. (2006).*

As key players in international transport, it necessities the ports to adapt to the increasingly competitive environment. This confronts ports to continuously improve the operational performance to serve the rising volume of world trade.

6.12 The Challenges of Port Development

In terms of size, type of activities carried out and employment generation, the port industry has always had significant economic and social repercussions in the regions and urban complexes where it has been established. In this context, port expansion creates new opportunities of economic growth and employment generation, designed to benefit the areas linked to port activities.

These are vitally important factors given that, up to recently, the local impact of maritime ports has decreased substantially. There is not now guarantee that the economic and employment benefits generated by a port will be restricted to the port area as was the case in the past.

Apart from the well-known effects of intermodality, information technology, automation and the substitution of capital for labor in port production, it can also contribute in reducing local impacts. It should be noticed that, today, the concepts of economic wealth and employment generated by a maritime port are perceived quite differently and in a much less tangible manner than in the past.

That is because the broad spectrum of activities brought about by the ports operates with different motives generally focusing on economies of scale in terms of mechanizing the operation process.

The liner shipping has undergone a major transformation in recent years and these changes have impacted strongly the port sector. This enhances the strategic nature of the role played by port terminals and other segments of the logistics chain. These segments must be efficiently organized to serve the larger players who have negotiating leverage and increasingly complex operating requirements (Sletmo, 1999; Heaver et al, 2001; Petters, 2001).

A new philosophy is emerging from these developments. The port is not longer considered in an isolated manner, like a series of infrastructures and territory, but is recognized as a complex set of functions that interact with the life of the local community and which, at the same time, is optimized within a broader port network strategy, with very solid regional roots, but open to national and international perspectives not only with regard to traffic and trade relations but, above all, in terms of organization and financial matters.

6.13 Port Development World Wide

6.13.1 "White Elephants" in Port Development

During its early years, the container terminal of the Port of Damietta in the Arab Republic of Egypt was often cited as a "white elephant" in port development. The terminal was constructed and fully equipped in the 1970s to handle anticipated container transhipment requirements in the Eastern Mediterranean. Yet, for various reasons, the terminal was without any business for years.

Only when the shipping company Scan-Dutch decided to change its Eastern Mediterranean port of call from Cyprus to Damietta did throughout start to increase. Today, more than 20 years later, Damietta is one of the leading container ports in the region competing with terminals in Italy, and on Malta and Cyprus. During 1960s, major ports such as Rotterdam, Antwerp and Marseilles developed large industrial sites near their port facilities. These sites became centers for refineries and petro-chemical industries.

In view of the apparent success of ports becoming industrial centers, the Dutch Government created three regional ports to support the ailing economies of their respective regions. Two of these ports – Flushing and Terneuzen – developed fairly well. They are located along the River Scheldt in the vicinity of their large neighbors: Antwerp and Rotterdam. The third port was built along the River Eems near Germany in the Northern Province of Groningen.

Despite modern port facilities and large government subsidies, the Port of Eemshaven never became a success. It was too isolated and lacked an industrial hinterland. It struggled on for years to gradually develop a few niche markets. The case of Eemshaven shows that the creation of a new port, as such, does not guarantee success when there is not natural hinterland generating significant cargo flows and when the port does not attract large-scale hub traffic.

6.13.2 "Interaction with Port Cities"

Ports and the cities of which they are a part interact across many dimensions: economic, social, environmental and cultural. Any port reform process should take into account the linkages between port city objectives and port objectives. Transport integration – the smooth transfer of cargo and equipment from land to water-borne systems – is an essential port function; but it does not take place in isolation.

A seaport node within a multimodal transport system is frequently associated with the development of an urban center and generates substantial employment, industrial activity and national and regional development.

Many big cities trace their roots to the establishment of a port. This does not mean, however, that the port will be extended at the place where it was originally founded. Antwerp and Rotterdam are examples of ports that developed relatively close to the cities' central cores. Over time, however, they shifted operations away from city centers. The underlying reason was the increase in ship sizes (requiring deeper drafts and longer berths).

Another reason contributing to the weakening of links between port and city centers is the rapid mechanization and specialization of port work and the accompanying increase the operational scale scope. This leads to increased storage space requirements and makes ports very space-intensive.

Another factor is the rapid industrialization of most developed country cities. The new industries emerging after World War II required large tracts of land, preferably close to deep water, which often could not be found within the original port borders.

Therefore, Maritime Industrial Development Areas (MIDAs) were located at some distance from old city centers. Technological changes and consequential port re-location have left substantial areas available for redevelopment for other purposes. Such areas are often located near city

centers, since that is where the port (and city) began. Therefore, land values are potentially high, although probably depressed prior to redevelopment because of the presence of decaying port facilities.

6.14 Port Administration Models

A number of factors influence the way ports are organized, structured, and managed including:

- The socio-economic structure of a country (e.g., market economy).
- Historical developments (e.g., former colonial structure).
- Location of the port (e.g., within an urban area, in isolated regions).
- Types of cargos handled (e.g., liquid and dry bulk, containers).

Four man categories of ports have emerged over time. They can be classified into four main models:

- Service Port.
- Tool Port
- Landlord Port
- Fully Privatized Port.

These models are distinguished by their characteristics such as:

- Public, private or mixed provision of service.
- Local, regional or global orientation.
- Ownership of infrastructure (including port land).
- Ownership of superstructure and equipment (in particular ship-to-shore handling equipment and warehouses).
- Status of dock labor and management.

Table 12: Basic Port Management Models

Type	Infrastructure	Superstructure	Port Labor	Other Functions
Public Service Port	Public	Public	Public	Majority Public
Tool Port	Public	Public	Private	Public/Private
Landlord Port	Public	Private	Private	Public/Private
Private Service Port	Private	Private	Private	Majority Private

Source: *World Bank (2000).*

Service and tool ports mainly focus on the realization of public interests. Landlord ports have a mixed character and aim to strike a balance between public port (Port Authority) and private (port industry) interests. Fully privatized ports focus on private (shareholder) interests.

Table 13: Strong and Weak Points of Port Management Models

Public Service Port	
Strength	Superstructure development and cargo handling operations are the responsibility of the same organization (unity of command)
Weakness	There is no or only a limited role for the private sector in cargo handling operations. There is less problem-solving capability and flexibility in case of labor problems, since the port administration also is the major employer of port labor. There is lack of internal competition, leading to inefficiency. Wasteful use of resources and under-investment as a result of government interference and dependence on government budget. Operations are not user-oriented or market-oriented. Lack of innovation.
Tool Port	
Strength	Investments in port infrastructure and equipment (in particular ship/shore equipment) and decided and provided by the public sector, thus avoiding duplications of facilities.
Weakness	The port administration and private enterprise jointly share the cargo handling services (split operation), leading to conflicting situations. Because the private operators do not own major equipment, they tend to function as labor pools and do not develop into firms with strong balance sheets. This causes instability and limits future expansion of their companies. Risk of under-investment. Lack of innovation.

Landlord Port	
Strength	A single entity (the private sector) executes cargo-handling operations and owns and operates cargo-handling equipment. The terminal operators are more loyal to the port and more likely to make needed investments as a consequence of their long-term contracts. Private terminal handling companies generally are better able to cope with market requirements.
Weakness	Risk of over-capacity as a result of pressure from various private operators. Risk of misjudging the proper timing of capacity additions.
Fully Privatized Port	
Strength	Maximum flexibility with respect to investments and port operations. No direct government interference. Ownership of port land enables market oriented port development and tariff policies. In case of redevelopment, private operator probably realizes a high price for the sale of port land. The often-strategic location of port land may enable the private operator to broaden its scope of activities.
Weakness	Government may need to create a port regulator to control monopolistic behavior. The government (be it national, regional or local) loses its ability to executive a long-term economic development policy with respect to the port business. In case the necessity arises to re-develop the port area, government has to spend considerable amounts of money to buy back the port land. There is a serious risk of speculation with port land by private owners.

Source: *World Bank (2000).*

6.15 Strategies for Managing Maritime Sector

Liberalization of trade in goods and services, new integrated transport networks and information and communication technology (ICT) developments have created unprecedented business opportunities for the trade and maritime industry.

Manufacturing companies are thus taking a greater interest in managing the total supply chain from the multiple sourcing of raw material to the production and the final distribution of the finished product. Manufacturing companies are hinterlands, to improve their competitiveness by reducing inventory and raw material procurement costs, and by providing swift, customer-oriented just-in-time (JIT) services and value added logistics services.

Inland distribution is becoming a very important dimension of the globalization/maritime transportation/freight distribution paradigm. Observed logistics integration and network orientation in the port and maritime industry have redefined the functional role of ports in value chains and have generated new patterns of freight distribution and new approaches to port hierarchy.

6.16 Port Hinterland Development

The port's hinterland is the region from which the port's customers are drawn from. It is considered as the origin and destination area of port, i.e. the inner region provided by the port (Fageda, 2005). Port hinterland is the land space over which a port sells its services and interacts with its clients.

It is the market served by a port area and from where a port draws its cargo (UNESCAP; 2005). Broadly it can be said to be market reach of the port or the reach from which cargo originates, as well as the areas where cargo moving through the port is destined. Some ports will have hinterlands that

extended across many states, while other ports will have smaller hinterlands. The port hinterlands are composed of two kinds, the main hinterland and competition margin hinterland. The main hinterland is an exclusive are where port has a monopolistic position in drawing cargo. The outer region is a competition is where more than two ports compete for cargo.

A regional port (spoke port), is usually located within the port hinterland of main port and acts as an intermediate transport node. However, the development of intermodality makes the exclusive hinterland into a common hinterland where different ports share facilities.

The boarders of a hinterland between different ports depend on the development of intermodal transport corridors and not on the exclusive market area of each port. This places the geographically separated ports in direct competition with one and therefore the hinterland is directly influenced by port based activities.

Table 14: Basic Functions of Port Hinterland

Functions	Definitions
Container Freight Stations (CFS)	A warehouse where cargo is stuffed into the un-stuffed from containers. The place for container packaging and up-packaging activities to make Full Container Load (FCL) with Loose Container Load (LCL) cargo.
Storage and Refrigeration	A place to store cargo before it is delivered to final consignee. The place for storage of cargo before it is carried to port terminals for loading.
Consolidation and Distribution	The local where cargo is consolidated and stored to be distributed to regional storage warehouse or other markets.
Value Added Services	Additional activities such as assembling, processing, labeling etc. before cargo is transported to inland areas or shipped to other countries. This is a combination of logistics and industrial activities.

Source: *UNESCAP, Arthur D.L. (2003).*

6.17 Port Regionalization

Port Regionalization represents a new phase in the development of port systems. In this phase, port terminal systems, corridors and inland distribution becomes of foremost importance in port competition, favoring the emergence of land logistics poles.

The transition towards the port regionalization phase is a gradual and market-driven process imposed on ports that mirrors the increased focus of market players on logistics integration. Port Regionalization expands the reach of the port through the market strategies and policies linking it more closely to inland freight distribution centers.

The 'Any port' model developed by Bird (1963) discussed how port infrastructures evolve in time and space. Starting from the initial port site with small lateral quays adjacent to the towns, port expansion had been observed as a product of evolving maritime technologies and improvements in cargo handling.

The spatial relationships between the port and the urban center changes as docks are built further away from the central business district. In the later stages, the increased specialization of cargo handling, growing sizes of ships, increasing demand for space for cargo handling and storage, results into port activity being concentrated at regions far from the oldest facilities.

6.17.1 Port Terminal Systems and Port Regionalization

In an initial phase these terminals solely focus on accommodating flows. As the transhipment business remains a highly volatile business, offshore hubs might sooner or later show ambition to develop services that add value to the cargo instead of simply moving boxes between vessels.

The terminals in the port system have their role to play within the rich blend of liner service networks. In referring to the hub/feeder restructuring, Robinson argues that a system of hub ports as main articulation points

between mainline and feeder nets is being replaced by a hierarchical set of networks reflecting differing cost/efficiency levels in the market. High-order service networks will have fewer ports of call and bigger vessels than lower order networks. Increasing volumes as such can lead to an increasing segmentation in liner service networks and a hierarchy in port hubs.

6.17.2 Corridors and Inland Terminals in Port Regionalization

The corridor is the main paradigm of inland accessibility as it is through major axes that port terminals gain access to inland distribution systems. Since loading / discharging operations form fundamental components of intermodal transportation, regionalization relies in the improvement of terminals activities along and at either side of the corridors. This involves a higher level of integration with intermodal transporst systems, namely with on-dock rail transhipment facilities and the use of fluvial barges.

The new function of port terminals requires the elaboration of inland terminals to accommodate new port-inland linkages. The immense pressure on the collection and distribution networks caused by changes in the hierarchy of port systems has always demanded and promoted the development of inland terminals.

Variously called inland container depot, inland terminal or dry port the implementation of the concept has affected trade flows, the routings between ports hinterlands and some traditional port functions. With the expanding hinterlands, economic and logistic reasons emerged that justify the establishment of regional inland nodes that serve not only a local market, but a much broader region.

Inland terminals are established as part of a new concept in freight distribution and the changing role of the ocean carrier and other market players in the entire transport journey. The development of rail hubs and barge terminal networks in the hinterland is aimed at contributing to a modal shift from road transport to rail and barge and as such enhances the

regionalization phase in port and port system dynamics. Inland terminals might transfer a part of the collection and distribution function inland away from ports, thus preventing a further overcrowding of limited seaport areas.

6.17.3 Freight Distribution Centers in Port Regionalization

The development of inland terminals is not sufficient by itself to ensure an efficient port regionalization and inland distribution. Infrastructures servicing freight are required at a location of convergence of inland freight, a function assumed by distribution centers where vast quantities of freight are processed. Manufacturers increasingly outsource logistics manipulations to their products towards distribution centers located near consumer markets.

As such, a large part of the value creation in the supply chain is transferred to logistics service providers. These activities are referred to as value added logistics services (VAL) and they imply the integration of production and distribution parts of a supply chain. On top low-end VAL activities that add little value to the goods (e.g. labeling, insertion of manuals, etc.), logistics service providers are further upgrading the functional role of their logistics centers by developing high-end VAL activities.

The latter might even include postponed manufacturing activities like systems assembly, testing, software installation, etc. By doing so, logistics service providers take over an ever-larger part of the added value creation within the product chain. Freight distribution centers come to the fore as turntables for low-end and high-end VAL services and develop a strong orientation on short transit times.

Logistics platforms incorporate additional functions such as back-office activities, e.g. the management of goods and information flows, inventory management, tracking and tracing of goods and the fulfillment of customs and other formalities. While setting up their logistics platforms, logistics service providers favor locations that combine a central location (i.e.

proximity to the consumers market) with an intermodal gateway function. Seaports and sites along hinterland corridors typically meet these requirements.

6.18 Free Trade Zones

In line with global competitiveness, and to meet the demands of business, many countries have established or intend to establish special value-adding zones in port areas or within the reach of port with expectations of the economic benefits that these zones would bring. The zones are commonly referred to as free trade zones (FTZ).

Many countries introduced FTZs to develop their national economies by attracting foreign direct investment (FDI) into the FTZs. With limited amounts of investment funding available, most of the countries have selected this policy partly as it is easier to provide relatively will developed infrastructures in these small special areas than to establish good infrastructures throughout the whole country in a short period of time.

Most of all, FTZs, whether or not they are referred to by that name, have concentrated traditionally on manufacturing for export, and many of the more located along the coast or near sea transport routes to leverage international transportation.

6.18.1 Special Economic Zone (SPZ) or Free Economic Zone (FEZ)

A special or free economic zone covers a large area, including residential areas and hospitals, schools and other business and supporting facilities and infrastructures. It promotes FDI by providing a good business environment with several incentives, such as a global standard level of labor regulation, allowance of repatriation and reduction of taxation for foreign investment, all of which might not be controlled under domestic regulation but under specially designed regulation appropriate to the nature of the facility.

6.18.2 Export Processing Zone (EPZ)

An export processing zone can be seen as a traditional zone acting as a manufacturing / processing works for exports, and considered as outside of customs territory. Industry sectors within this type of zone are usually labor intensive and low skills industries such as producing garments, textiles, shoes, timber, plastics and electronic components using low cost labor. In general, domestic sales of products manufactured within this zone are limited.

6.19 Lessons to Learn from Success Stories

6.19.1 Shanghai Port-China

The Shanghai Port Authority (SPA) and Hutchigon Whampoa Ltd. (HWL) formed a joint venture between their subsidiaries Shanghai Port Container Comprehensive Development Company (SPCCDC) and Hutchison Ports Shanghai Ltd. (HPSL) to own and operate all of Shanghai's container port facilities. The contract was formalized August, 1993 when HPSL injected RMB 1 (One) billion in cash and SPCCDC contributed RMB 1 (One) billion in assets to the new company Shanghai Container Terminals Ltd. (SCTL).

It also has preferential rights to develop container terminals at Wai Gao Qiao in Podong and the proposed new deep water facility at Jin Shan Zui along Hanghouw Bay. During its first year of operation, the joint venture handled 25% more containers than had been channeled through Shanghai's container terminal during the preceding twelve months.

Thus the Shanghai Port Authority preferred to become a joint venture partner in its own container terminals including new BOT development. This approach had several benefits. It introduced new management expertise into existing operations. It provided immediate revenue streams to the development team and it reduced investment to be borne by the foreign partner. Finally, it ensured that the port authority would have a full (commercial) say in operations and performance.

6.19.1.(a) About Port of Shanghai

Shanghai International Port (Group) Co., Ltd. is the exclusive operator of all the public terminals in the Port of Shanghai. Incorporated in January 2003 by reorganizing the former Shanghai Port Authority, SIPG is a large-scale business conglomerate specialized in the operation of port and related businesses. In June 2006, SIPG was turned into a share holding limited company.

After listing as a whole company in October 2006, Shareholders of SIPG are: the municipal government of Shanghai with 44.23%, China Merchants International Terminals (Shanghai) Co., Ltd. With 26.54%, Shanghai Tongsheng Investment (Group) Corp. with 16.81%, Shanghai State-assets Operation Co. and Shanghai Dasheng Assets Co. with 0.44% respectively (shares that cannot be sold without certain conditions).

In total, Shanghai International Port Group (SIPG) operates 125 berths on a total quay length of around 20 kilometers, among which, 82 of these berths accommodate vessels of 10,000 dwt calss or above, QC. Except the container terminal, SIPG also owns public bulk, break bulk, specialized Ro/Ro terminal and cruise terminal. SIPG operates warehouses with a total area of 293,000m^2, storage yards with a total area of 4,721,000m^2, and owns 5,143 units of cargo handling equipment. In total, SIPG currently has 16 branch companies, 8 wholly-owned subsidiaries, 9 majority-owned subsidiaries, and 3 companies with equity participation.

6.19.1.(b) Shanghai Economic Zone: Supporting Shanghai Port-China

In 1990, China decided to open the Pudong New Area in Shanghai and other cities along that Yangtze River valley. Since its founding in 1992, the Shanghai Pudong New Area has made great progress in both absorbing foreign capital and accelerating the economic development of the Yangtze River Valley. The state has extended special preferential policies to the Pudong New Zone that are not yet enjoyed by the special economic zones.

For instance, in addition to the preferential policies of reducing or eliminating customs duties and income tax, common to the economic and technological development zones and certain special economic zones, the state also permits the zone to allow foreign business people to open financial institutions, and run tertiary industries.

In addition, the state has given Shanghai permission to set up a stock exchange, expand its examination and approval authority over investments and allow foreign-funded banks to engage in RMB business The Shanghai Zhangjiang Hi-Tech Park located within Shanghai Pudong New Area was established in July of 1992 as a national level park designated for the development of new and high technology.

In August of 1999 the Shanghai Municipal Government issued the Focus on Zhangjiang Strategic Policy to accelerate the park's development. The focus program also increased the park's are from 17 to 25 km^2. The park's two leading industries are information technology and modern biotechnology and pharmaceuticals. These developments boosted foreign trade activities form Shanghai port.

6.19.2 Dubai Port-UAE

Dubai Ports (comprising of Dubai Ports International 'DPI' and Dubai Ports Authority, 'DPA') owns, operates and manages container terminals and ports around the world. Dubai Ports Authority, which operates Port Rashid and Jebel Ali port, the biggest man made port in the world, won two top awards for the Middle East region as the Best Seaport and the Best Container Terminal Operator at the Thirteenth Asian Freight Industry Awards for 1999.

DPA facilities have a total of 102 deepwater berths, 23 container gantry cranes and four Super Post Panamax cranes, covering 10 container terminal berths. More than 100 shipping lines are served by DPA.

Mina (Port) Rashid was completed in 1972. By 1978 the number of berths was increased to 35- including five berths large and deep enough to handle

the largest container vessels. The construction of the world's largest man-made harbor at Jebel Ali was competed in 1979. Jebel Ali Port ranked alongside the Great Wall of China and the Hoover Dam as the only three men made objects that could be seen from space.

Port Rashid is situated in the city of Dubai and the port of Jebel Ali are situated 35 km south west to the city of Dubai. Jebel Ali Port and Free Zone merged with Port Rashid in May 1991 to form Dubai Ports Authority which led to a dramatic increase in throughout to cross one million TEU's. In September 2005, DP World has emerged from the corporate integration between Dubai Ports Authority and DPI Terminals, to become one of the largest global port operators to date.

6.19. 2.(a) Jebel Ali Free Zone (JAFZA-Dubai): Supporting Dubai Port-UAE

Jebel Ali Free Zone "JAFZA" aspires to consolidate its position as the international business hub of the Middle-East. The Government of Dubai has developed it as an ideal industrial warehousing and distribution base in the Middle-East. Initially encompassing 70,000 square meters of warehousing and 850,000 square of covered areas, JAFZA took nearly three years to be developed, transforming 25 acres of desert into a secure, dynamic working environment.

In 1985, port and industrial area, eventually extending to 750 acres, with the construction of office units and warehouses to provide ready built facilities to customers were developed. In 1990, JAFZA diversified into industrial center. Today's Jebel Ali Free Zone is a 135 sq. km commercial and industrial hub, which is home to 5,500 companies from over 120 countries.

DP World provides JAFZA clients with container handling, cool and cold stores, and storage areas. Companies can benefit from innovative services such as the container terminal management system (CTMS), covering a wide range of business requirements and facilitating an integrated inter-port transport of containers between Port Rashid and Jebel Ali; or the container freight station system (CFSS), which computerizes the entire operations of the station.

6.20 Summary

Policy makers should develop ports, FTZs or port hinterlands with an integrated approach. Ports, port hinterlands and FTZs should be developed together with master plan including transportation facilities, IT infrastructures, and industry complexes (e.g. industrial parks, EPZs or FEZs) from the outset.

Policy makers should also put efforts into promoting the domestic logistics industry, including third party logistics providers (3PL) through deregulation, incentives for logistics companies and the logistics outsourcing companies. A reserve of land to meet future demand for expansion should also be made.

Modal choice and smooth connectively between nodal points are important issues to in guaranteeing a seamless flow of goods between points. Consequently the role of the port sector has expanded to include inland areas in order to integrated services. Ensuring fluent and efficient movements of goods into an out of a ports hinterland enables and increases in capacity.

The traditional FTZ and logistics FTZ may be different in several aspects but they share one key common purpose, to attract FDI. FTZ are however not a panacea for creating nationwide economic development since they cover only relatively small amount of territory. FTZs remain one of several possible options among many policy tools for a country to adopt for its economic development.

Table 15 : Forecast of Port Container Outputs by Economy

(Base Case)* (Thousand TEU)

Economics	1999 (CIY**/Other sources)	2006 (ESCAP MPPM)	2011 (ESCAP MPPM)
Australia	2,651	3,550	4,061
Bangladesh	392	770	1,151
Brunei Darussalam	62	188	300
Cambodia	N.A.	64	103
China	12,004	28,466	46,219
Democratic People's Republic of Korea	N.A.	161	614
Fiji	47	94	136
French Polynesia	31	137	189
Guam	123	223	284
Hong Kong, China	16,211	19,678	25,322
India	2,186	4,216	6,410
Islamic Republic of Iran	340	510	774
Japan***	11,503	14,307	17,087
Malaysia	3,775	8,444	14,556
Myanmar	118	182	270
New Caledonia	52	75	104
New Zealand	845	1,374	1,808
Pakistan	697	981	1.323
Papua New Guinea	138	215	291
Philippines	1,696	2,716	3,761
Republic of Korea	7,473	16,516	22,772
Russian Federation (Far East)	125	289	481
Singapore	15,945	23,393	30,940
Sri Lanka	1,704	4,447	5,372
Taiwan Province of China	9,758	13,245	16,874
Thailand	2,892	4,328	5,808
Turkey****	687	1,051	1,347
Viet Nam	653	1,185	1,701

Source: UNESCAP (MPPM 2005).

Note:

* Domestic coastal traffic is excluded.

** Containerization International Yearbook.

*** If annual 2 (two) percent economic growth, which is the official target of the Japanese economic growth from 2001 through 2010, is applied to the model, the projection for the year 2011 would be 20-21 million TEU.

**** Figure includes statistics from the ports of Mersin and Izmir only.

CHAPTER- SEVEN

Inland Waterways in Selected APEC Countries

7.1 Introduction

Intermodal transport is one of the key topics in current many countries transport policy. One of the principal measures is to turn intermodality into reality and make it really competitive with road transport. This goes together with the aim to revitalize the railways and promote the use of short-sea shipping and inland waterway transport. This should contribute to an optimal integration of different modes so as to enable a more efficient and sustainable use of the transport system.

But there are also "Bottlenecks": An intermodal bottleneck is an actual or perceived negative characteristic of an intermodal door-to-door transport chain that makes intermodal transport less attractive than unimodal transport. The quality of intermodal transport is defined on several parameters: time, reliability, flexibility, staff qualification, accessibility, control systems, security, better price, best logistic structure, lack of services.

There have been made several recommendations to remove bottlenecks:

- □ Increase capacity of terminals
- □ Transport infrastructures for better access of terminals
- □ Investments in modern standardized intermodal equipment
- □ Harmonization of opening hours
- □ Harmonization of loading units

7.2 Inland Waterway Transport Overview

It is predicted that the cargo flows will grow further in the next decade. That really forms a challenge for the transport network. Clear is that the old way of transport can never cope with that challenge. Not logistical, not

economical, not environmental, not social, not for safety reasons, thus new solutions must be found. Only a clever clustering of transport flows can cope with these challenges. A network connecting the major hubs will be the solution. In that respect also choices in spatial planning is needed.

River basins are the backbones of social and economic development. River basins transform into logistic corridors. Inland navigation contributes to a sustainable development because it is a safe, efficient, reliable and environmental friendly mode of transport.

Growing freight flows and logistic demands require an increase in capacity and quality of inland navigation. Co-operation between river-basins and exchange of experiences creates mutual benefit public and private parties are invited to increase the co-operation and further develop and innovate the inland navigation system.

Successful Inland Shipping depends on integrated development of Waterways, Cargoes, Ships, Ports, Rules, Hinterlands, and People. Waterways need integrated management on navigability, markings, locks, dredging, vessel traffic systems, river information systems etc. Cargoes change from traditional Bulk into Roll on / Roll off and Containers.

Dangerous goods can safely be shipped via inland waterways (which are also used for fresh water collection) if classifications and rules are harmonized, shipments are accurately documented, adequate equipment is applied, rules are maintained and people are well trained. Ports adapt quickly to these changes, introducing larger cranes, all weather- and tri-modal terminals for efficient and fast tran-shipment and reduced vessel turnaround times.

Rules must be harmonized in an inland shipping region. EU strives for common rules and regulations on: dangerous goods, navigation rules and marks, access to the profession, free operations across borders, labor conditions, customs and liabilities. Proper rules and training guarantee safety, security and protection of the environment.

Inland shipping can only be successful and competitive to road or rail transport, if it is integrated in the total transport chain. Inland shipping works for clients, who request an Integrated Service Provider (ISP). This ISP should provide: overall responsibility, total chain control, on-time pick-up and delivery, short transit time, a large service territory, low price, billing accuracy, correct equipment, full tracking & tracing, and adequate claims processing.

Hinterlands need full capable Integrated Service Providers. They could make inland shipping a successful link in the total transport chain, competitive to other transport modalities. They could realize this by integrating inland shipping with other modalities. At the sea side: with short-sea shipping and river-sea shipping. At the land side: with multimodal inland distribution via distribution centers and providing value added services.

Full tracking & tracing requires also the integration of different ICT-supported information systems: port community systems, river information systems.

People- all these rapid changes and developments require a new generation of people with appropriate skills to manage, to operate, and to train inland shipping issues. These people must be well trained also to enhance safety, since almost all accidents are caused by human failure because of stress, fatigue, miscommunication and bad training. According to these aspects, the project will evaluate the status and role of international IWT in intermodal transportation.

7.3 The Advantage of Inland Waterway Transportation

Inland waterway transportation is the most economical and friendly mode in navigable area. Though inland waterway transportation is of disadvantages such as restriction from natural condition, long transportation period and difficulty for door to door transportation, it still has advantages inaccessible for other transportation modes.

First, inland waterway transportation has notable economic benefit. Inland waterway transportation has competitive transportation cost (economic/financial). Cost could have savings by increasing barge size, savings by direct shipping (saving of transhipment cost), savings time by reduction of ship lock waiting time. Firstly, the fuel efficiency of a vessel is superior to road or rail transportation. For every ton kilometer, inland shipping up to 5 times less fuel is consumed per ton kilometer when compared with road. 50% less fuel is consumed when compared to rail. Furthermore, due to the economy of scale of inland vessels, the actual total cost per ton kilometer is significantly less when compared with road transportation. This helps producers to be competitive in their market place. What makes us competitive and what is the true differentiator, are the supply chain costs. Transportation costs are a significant part of their supply chain costs. As such cost efficient transportation is an important factor in the viability of a chemical production plant.

Secondly, river transportation leads to reduced pollution. Studies have calculated that the socio-economic cost including incidents, congestion, noise pollution, air pollution and other effects on the environment are seven times less then that of road transportation.

Thirdly, river transportation has an excellent safety and environmental record, especially for dangerous goods, when compared with road transportation. Obviously vessels and terminals are required to comply with the most stringent of standards and regular tests by classification societies and shipping inspectors.

Fourthly, river transportation contributes significantly to the relief of road networks, especially in areas with high density of population. It also reduces the land use for roads.

Fifthly, unlike other modalities, that has limitations in capacity (how much road can you construct), inland navigation is reliable and has large capacity reserves. In many instances these advantages can be gained with little or no

improvement to existing waterways. In others, a modest level of complementary investment can significantly increase usability. On the major part of the network, traffic can take place 24 hours a day, seven days a week offering complete flexibility of travel.

Last but not least, many inland waterways have a lot of free capacity on its infrastructure. Inland waterway transportation can accelerate the development of remote communities in several countries of the region which is being increasingly recognized. For these reasons, promoting the development of IWT is benefit to global economy, society and well being.

7.4 Inland Waterways in The APEC Countries: Lessons for Bangladesh

APEC region is generously endowed with navigable inland waterways. Therefore, inland waterways can play a vital role in the economic development and welfare of inhabitants of rural remote areas of this region, by providing accessibility and transport at least cost. Some famous river systems like the Ganga-Jamuna-Brahmaputra, Lancang Mekong, Volga, Mississippi, and Yangtze have made enormous contribution to national and regional development.

Keeping in mind the various advantages of inland waterways such as cost effectiveness, relative fuel efficiency and importance for mobility besides welfare and development of remote countries, a number of countries are now taking initiatives to make better use of the existing capacity and making investments in IWT. Several development projects aimed at enhancement of IWT infrastructure and operations are underway.

7.4.1 Bangladesh

Out of an overall 24,000 km-long network of rivers, canals, creeks and bodies of water occupying about 11 per cent of the total area of the country, only about 6,000 km is currently navigable by larger mechanized vessels. Nearly all waterways are natural rivers, the navigability of which is affected

by river morphology and hydraulics. During the dry season from December to May, the major rivers such as the Jamuna and the Ganges recede and water depths are reduced substantially. It is the fact that 72 percent of the navigable length of the inland waterway system provides for vessel drafts of 0.91m or less during the dry season. In effect this means that navigation of the major part of the system is limited in the dry season to small vessels, of 100 dead weight tons (dwt)or below.

Inland waterways are estimated to carry approximately 14 per cent of the country's annual passenger volume and 35 per cent of its annual freight volume. Of the three surface modes, IWT has the lowest share of the passenger transport task and the second-lowest share of the freight transport task (with rail taking the lowest share of the latter).

However, there are a number of initiatives under way as a result of the recently concluded five-year plan of the Bangladesh Inland Water Transport Authority (BIWTA). In the Fifth Five-Year plan (1997-2002), IWT received a budget allocation of about US$ 104 million, or about US$ 21 million per annum, the lowest of any mode. The major share of this allocation is used to fund the annual dredging programme, which, owing to the siltation problem, involves the annual removal of more than 3.3 million m^3 of material from navigation channels and berth frontages.

Ongoing Project:

BIWTA is currently implementing a total of 10 (ten) projects of which 8 (eight) are under development budget through the Annual Development Program (ADP) of 2010-11 and the rest 2 (two) under self-financing of the agency. The list of the projects along with brief descriptions has been stated below:

Projects under ADP:

1. Introduction of circular waterways in and around Dhaka city (2nd Phase). (July 2007-June 2012).
2. Procurement of 2 dredgers, crane boats, crew house boats and tug boats with other accessories for maintaining the navigability of inland waterways. (January 2009-December 2012).
3. Salvage vessel procurement (January 2006- June 2013).
4. Establishment of river port at Nowapara, Bhairab-Ashuganj and Barguna. (July 2008-June2011).
5. Construction of port facilities in order to prevent unauthorized encroachment of the Buriganga river and its foreshore land. (July 2006-June 2011).
6. Extension of newly constructed RCC jetty at Guptachara, Sandwip. (July 2009-June 2011).
7. Development and Modernization of Barisal River Port (July 2009-June 2011).
8. Construction of RCC Jetty at Kumira, Chittagong. (January 2010 to December 2011).

Projects under Self-financing :

1. Procurement of 1 (one) dredger with accessories. (July 2008- June 2011).
2. Construction of Inland Container River Terminal (ICT), Pangaon. (July 2005- June 2011).

Future Programme :

To develop balanced and the least cost transport system in Bangladesh, it is imperative to improve IWT both form infrastructure and technological points of view. Due to geographical position and topographical condition of the country, rivers are becoming more and more narrow and thin by silation. As such, implementation of comprehensive capital dredging program is the

biggest challenge for the IWT sub-sector. Therefore, specific programs/actions are identified in the sub-sector are stated below:

- Introduction of modern techniques in hydrographic survey ;
- Improvement of the channel of the existing waterways through dredging ;
- Procurement of dredgers with other ancillary crafts and accessories;
- Improvement of day and night navigation of water crafts by providing navigational aids;
- Development of inland container river port (Narayanganj, Ashuganj and Baghabari);
- Development of river port handling facilities as well as storage facilities and introduction of mechanical equipment;
- Institutional capacity building;
- Introduction of E-governance.

Sixth Five Year Plan (2011-2015) :

To develop a balanced and least cost transport system in Bangladesh, it is imperative to improve IWT both from infrastructure and technological points of views. In spite of the development of infrastructure facilities in IWT sub-sector during the past plan period, BIWTA still suffers from (i) siltation problems in inland water crafts, (ii) day and night navigational problems of waterways, (iii) shortage of passengers and cargo handling facilities including transit shed at river ports, (iv) manual loading unloading of cargo at river ports, (v) underdeveloped rural launch landing stations, etc.

Moreover, for transportation of containers by inland waterways to and from sea-ports, the container handling facilities have not yet been developed.

The main objectives of the SFYP are as follows:

- To improve the channel of the existing waterways through dredging;
- To improve day and night navigation of water crafts by providing navigational aids;
- To develop inland container river port of transportation of containers by waterways to and from sea ports;
- To develop river port handling facilities as well as storage facilities and introduce mechanical equipment for handling cargo in order to save waiting time for berthing of vessels ;
- To develop rural launch landing stations by providing pontoon facilities for smooth embarkation/disembarkation of passengers cargo

7.4.2 China Inland Waterway Transport

China is the world's third largest trading country, in 2006 the total annual imports and exports of 1.7607 trillion U.S. dollars. The actual use of foreign direct investment reached to 69.47 billion U.S. dollars. China's openness to the outside world continued to deepen. Opening China needs the support of the intermodal transport system. China intermodal transport system effectively connecting with the world and the Asia-Pacific region intermodal transport system is beneficial not only to China, but also to China's trade partners as well. China factor continues to change the pattern of global container transportation. China is one of the most active markets in global container transport industry.

In the past ten years, global container cargo volume increased 10.5 percent annually; Chinese container cargo volume increased 28 percent annually, ranking top globally. The throughput of Chinese container ports kept growing with the high annual rate of 25 percent in the past 19 years, and ranked top globally in the past three years. Chinese container ports account for 20 percent of the total throughput of the world's container ports.

As the largest container cargo generating country in the world, China accounts for 67 percent of eastbound container cargo volume in transpacific trade and 63 percent of westbound container cargo volume in Far East/Europe trade.

China is rich in inland waterborne resources. Inland waterway is mainly in the Yangtze River and Pearl River, Songhua River and the Heilongjiang River. By the end of 2005, China inland waterway has navigable mileage 123,300 km, of which: 4th and above grade waterway 1530,000 km, and 5th and below grade waterway 107,000 km. Inland waterway port owns the production berths with 30,944, 10,000-ton berths and above 187. By the end of 2005, the National possession of river transport ship 195,800, the net tonnage of 44,814,900 tons.

In 2005, China's inland transport completed 1.057 billion tons of cargo, cargo transportation 262.6 billion tons, in the integrated transport as a proportion of 5.54%, 3.25%.

Most Chinese export container cargos cluster in Bohai Gulf Area, Yangtze Delta and Pearl River Delta. These three areas generate more than 90 percent of all Chinese container cargo. As the policy of National West Part Developing Strategy is gradually exerting its effects, mid-west regions are becoming the new growth point of Chinese container transportation and the Yangtze Valley is the key route way of the new round of development.

The Yangtze River has become the busiest inland river in inland shipping in terms of transport volume in the world. The River Yangtze has become the busiest and biggest river in terms of freight volume compared with all others in the world. The freight volume carried by the Yangtze is 0.7 billion tons in 2005, which is about 1.6 times that of 0.46 billion tons by the Mississippi and 2.3 times that of 0.31 billion tons by the River Rhine. However, compared to many developed inland waterway countries, such as The United States, Germany, the Netherlands, there is still a big gap between them.

Shipping industry on the Yangtze River keeps on developing rapidly since the period of "the Tenth Five-Year Planning". The cargo volume, turnover and handling capacity of the ports have kept a double-digit growth every year, which has exceeded that of Mississippi River and Rhine River. Therefore, the Yangtze River has become the busiest inland river in inland shipping in terms of transport volume in the world.

In 2006, the ports along the Yangtze River, excluding its tributaries, has handled total cargo of 780 million tons, of which 94 million tons of foreign traded cargo, increased by 19.4% and 20.6% respectively from the previous year. The total containers handled reached 3.8 million TEUs, increasing by 40.9%. 28,261 vessels used the pilot service, increasing by 10.1% comparing to that of 2005. Changjiang Shipping Corporation transported total cargo of 120 million tons, with a decrease of 2.9%, but the turnover of the cargo in km-ton increased by 26.8% reaching as high as 165 billion. The Port of Nantong, historically handled cargo of over 100 million tons and became the third largest along the Yangtze, next only to Suzhou and Nanjing.

It is estimated that the waterway transport volume on the mainstream of the Yangtze River will reach 1.3 billion tons by 2010. For example, transport volume of foreign trade cargo will reach 450 million tons, and the handling capacity for containers of the ports will reach 13 million TEU. The rapid economic and social development in areas along the Yangtze River has put forth an urgent request for further liberating the shipping potentials of the Yangtze River, improving the shipping service levels, as well as implementing the strategy of West developing, Central uprising, and East leading in modernization.

Promoting intermodal transport can reduce international trade logistics costs, can further enhance the geographical division of industries, promote economic development of China inland regions and make the benefits of economic globalization to benefit China inland residents. It is also conducive to the use of the China inland special geographical conditions and resources endowment to meet the diverse needs of the international market. The

development of China intermodal transport will provide transport services in a wider space and shorter period of time, thereby enhance the efficiency of economic operation.

The development of China intermodal transport can improve the efficiency of China's logistics system, improve the role of river transport mode in the intermodal transport system, reduce the negative effects and costs of highway jams, shorten the emissions of road traffic air pollutants and greenhouse gas and contribute to the world's sustainable development and human well-being. Today, in Mississippi and the Rhine region their intermodal transport system developed rapidly. In the need of economy and society, inland waterway transport will also play an important role in China intermodal transport.

Finally, the implementation of the project will help China to learn from APEC members' experiences in promotion of waterway transportation, promote China and its trading partners cooperate on modern logistics and intermodal transport, learn from each experience, and promote long-term development of intermodal transport.

At present, China intermodal transport has achieved great development, especially container transport. However, inland waterway transport system is still the weak link. Inland waterway development has obviously lagged behind in road and rail development. With the background of today's resource conservation and environmentally friendly, to accelerate the development of inland waterway transport is particularly urgent.

7.4.3 India

Although India has inland waterways with a navigable length of 15,544 km, only 37 per cent of this length (5,700 km) is currently used for navigation by mechanized vessels. Among these navigable waterways three have been declared national waterways: the Ganges River, from Haldia to Allahabad (1,620 km); the Brahmaputra river, from Dhubri to Sadiya (891 km); and the

West Coast Canal, from Kottapuram to Kollam, including the Chamakara and Udyogmandal canals (205 km). Regular hydrographic surveys, bandalling and channel marking are being carried out on these waterways in order to maintain navigability to a depth of 2 m.

The latest data available for this review indicate that 17.3 million tons of cargo was moved by inland waterway transport in 2001-2002. The corresponding transport task amounted to about 1 billion ton-km. This represented only 0.1 per cent of the domestic surface transport task of about 838 billion ton-km, as compared with 68 per cent for road and 30 per cent for rail. It is understood that the volume of cargo carried by IWT has been declining in recent years.

Constituted in 1986 the Inland Waterways Authority of India (IWAI) has a role to maximize the attractions that IWT movements can bring to this highly populated country. The government recognized ten of India's national waterways (which make up a majority of the country's 14,500 km water lane length) as having potential for declaration as "national" units. Three of these are being actively developed for shipping and navigation and together constitute 19 per cent of the national total navigable waterways (but 48 per cent of IWT surfaces capable of carrying mechanically propelled vessels). Two of these units are rivers (Ganga and Brahmaputra) while the third is an amalgam of canals (West Coast, Champakara and Udyogamandal). The first two named are physically linked to aid wider and or longer journey capability and service the north and north eastern part of the country.

7.4.4 Indonesia

Approximately two thirds of the 31,000 km length of Indonesia's IWT is navigable with the predominant "life line" uses in Sumatra and Kalimantan, where there is no rail system. IWT freight activity is anticipated to treble to 20 million tons during the current five year plan period part of which is due to natural resource development (predominantly coal) in Kalimantan.

Like other IWT serviced countries in this region, Indonesia suffers from a severe lack of navigation marks and appropriate charting of the rivers to permit greater time use of the system. This has been recognized and, together with ADB, the Government of Indonesia is addressing these issues. In addition, a large number of new and upgraded cargo handling facilities are being put in place.

IWT development needs for Indonesia were identified in a study (2004) funded by ADB. They include:

- The normalization and improvement of four channels in the Kahayan, Kapuas and Barito river systems of Central and South Kalimantan;
- The improvement of the berthing facilities of Lake Toba in North Sumatra;
- The installation of 8,760 river traffic signs throughout Sumatra, Kalimantan,
- Maluku and Irian Jaya;
- The construction of 60 river and lake quays and rehabilitation of another 17;
- The mapping of rivers and lakes for future development of navigation; and
- The purchasing and operation of service vessels in isolated and remote areas, especially in eastern Indonesia.
- Most of these projects were implemented during the Seventh Five Year Plan (2004-2008). It is expected that the remainder will be implemented during the current year.

7.4.5 Thailand

Of Thailand's 6,000 km of waterway, approximately 30 percent is capable of being navigated commercially, with a further 12 per cent reduction during the dry season. Inland navigation is mainly concentrated in four river systems: the Chao Phraya, Pasak, Thai Chinand and Mae Klong systems.

IWT is estimated to transport about 20 million tons of cargo annually, representing 4.5 percent of total inland cargo volume. This is better than rail, which has a share of only 1.9 per cent, but well below road, which has a commanding share of 93.6 per cent.

Passenger movements concentrate very much in and around Bangkok with 1.5 million people per week moving by this mode. Outside of Bangkok, very few passengers are transported on inland waterways. However, in a bid to relieve Bangkok's extreme and notorious road traffic congestion, the Government of Thailand and Bangkok Metropolitan Administration, in the early 1990s began to encourage the expansion of commuter services on the Chao Phraya River and on the main canals of the city. Three types of commuter service are provided: ferry services across the Chao Phraya River (about 60 piers are available); express boat services operating along the river between Bangkok and Nonthaburi (about 50 piers are available); and long-tail boat services along the canals (with about 30 piers available). Traffic on these services peaked between 1995 and 1997 at about 360,000 journeys per day, before dropping to the present level of about 300,000 per day. Commuters form a noticeable part of this figure as well as tourists.

7.5 The Greater Mekong River System

The Greater Mekong River System is one of the world's great navigable waterways, but has long been underutilized because of the lack of adequate infrastructure, navigational aids and lack of consistency in rules and regulations.

An Agreement on Commercial Navigation on the Lancang-Mekong River among the four Greater Mekong Subregion countries, China, Lao People's Democratic Republic, Myanmar and Thailand that was signed in 2000 is expected to promote substantial investment and river traffic growth. As part of the Lancang-Mekong navigation co-operation agreement, the four contracting parties - the Governments of China, Lao People's Democratic Republic, Myanmar and Thailand - have constructed a number of ports to support the emerging river traffic.

China has upgraded three ports, Simao (design annual capacity, 300,000 tons and 100,000 passengers; investment: about US$ 5 million; opened for operation in March 2001), Jinghong (design annual capacity, 100,000 tons and 400,000 passengers; investment, US$ 5.7 million; opened for operation in December 2002); and Guanlei (design annual capacity, 200,000 tons; investment, US$ 4.44 million; opened for operation in 2004).

Lao People's Democratic Republic set up a new economic development zone near the Golden Triangle area, which consists of construction of the Ban Mom Port, new urban area development and bank protection. The port infrastructure was completed in 2001 and others are scheduled to be completed in 2009 and 2011 respectively.

Myanmar has designated two ports for international traffic on the Upper Mekong River in the quadrilateral agreement, Wan Seng and Wan Pong. In addition, a port at Soploi has been built with the same scale as the Jinghong Port and opened for operation in 2002; and The Government of Thailand is building two ports in Chiang Saen (design annual capacity, 250,000 tons; investment: US$ 4.6 million) and Chiang Kong (design annual capacity, about 100,000 tons; investment: US$ 1.6 million), both of which are completed in 2003. The private sector of Thailand has built some terminals along the Upper Mekong River in Chiang Rai Province.

The river section within the territory of China has been improved for navigation of boats of 150 tons. Nine rapids and ten scattered reefs in the section bordering Lao People's Democratic Republic and Myanmar, which severely endanger navigation safety, were partially cut to open safe channel for boats of 100 tons. The Chinese funded project (US$ 5 million) was implemented under supervision of the Project Co-ordination Office composed of experts from the six riparian countries in the dry water seasons during the period March to April 2002 and December 2002 to April 2003.

In the lower Mekong, Vietnam is undertaking a large scale IWT project in the Mekong Delta with a total investment of US$ 84 million, of which US$

71 million is financed by the World Bank and US$ 13 million by the Government. The project will improve two waterway routes from Ho Chi Minh City to Ca Mau and Kien Luong respectively, a distance of 662 km, with dredging, building of shiplocks and sluices and bridges, bank protection and aids to navigation. In addition, the project will also upgrade the Can Tho Port through improvement of infrastructure and provision of new handling equipment. It was started in 2001and was completed in 2005.

Vietnam has completed a feasibility study on improvement to the access channel of the Bassac River, a major branch of the Mekong River, to increase capacity to accommodate sea-going ships of dead weight tonnage of 10,000. The estimated capital investment would be US$ 40 million with an annual maintenance cost of US$ 30million. The project will benefit transport for exporting rice in the Mekong Delta.

A package of projects on river improvement for navigation between Cambodia and the southern region of the Lao People's Democratic Republic, which includes dredging, regulation of shoals, installation of aids to navigation, port construction, navigation agreement and institutional strengthening has also been proposed. Cambodia has also proposed to undertake feasibility study to build six general cargo berths at Phnom Penh Port.

The Mekong River Commission, composed of Cambodia, Lao People's Democratic Republic, Thailand and Vietnam, is undertaking a study to formulate a comprehensive navigation strategy and program. The strategy and program will cover socio-economic analysis and planning, legal framework for cross-border navigation, institutional development, safety and environment, and promotion, co-ordination and information. The implementation of the program required US$ 42.5 million over a period of seven years. The study was completed in 2007.

7.6 America Inland Waterway

During the early years of trade in the United States, the nation's waterways played a major role in the transportation of goods from one location to another. With the development of automotive transport and super highway systems in the twentieth century, the use of the waterways took on less significance. At the same time, the United States population spread further throughout the country, with longer distances between city centers. The unintended consequence was an increase in roadway traffic, including the large trucks used by shippers to haul goods from one location to another.

Regularly used in Europe and China, the inland waterways have only recently regained favor in the US transportation industry because they remove cargo from the nation's highways, reducing traffic congestion and harmful pollutants released into the environment. In 2000, Osprey Lines pioneered a successful intermodal cargo delivery service along the United States Gulf coast and into the southern portion of the Mississippi River. Recent expansions by Osprey include twice a month service from New Orleans to Chicago. Although not as rapid, cargo transportation by river is proving to be more cost-efficient and environmentally friendly than other modes: one gallon of diesel fuel will move one ton of cargo 59 miles by highway, 202 miles by rail, and 514 miles by barge.

7.7 The Trend of International Inland Transport

International container transportation is expanding from ocean to land. It has been fifty years since the birth of container transportation. During this period, container transportation becomes more and more popular and the international trade business becomes more and more convenient. At present, the total throughput of all container ports in the world has reached 440 million TEUs, and the total value of the commodities involved ranks top globally. The cargo volume of container shipping industry amounts to 120 million TEUs, about 14 percent of global shipping industry, and the container shipping industry has become the second largest contributor of

global shipping trade. Container transportation has a necessary and important factor in the process of economic globalization, and is playing a great role in international shipping trade.

As economic globalization deepens further and the industrial division transfers from developed coastal area to low-cost inland area, container shipping is expanding from coastal ports to inland hinterland. Currently, 60 percent of the cargo from Far East to ports of US west coast is transited to inland area by trains; half of the cargo from Far-East to ports of North Europe is transited to inland area by barges and trains; more than 80 percent of the export cargo from Port of Shanghai comes from the hinterland of Yangtze Delta and the Middle and Upper Regions of the Yangtze River. It is the inevitable trend on the development way of container liner operators to provide more convenient business solutions of end-to-end container multi-modal transport for international trade clients.

To integrate inland water transport within intermodal transport systems to provide door-to-door services for the movement of domestic and international traffic, thereby responding to market demand for convenient and competitive service while optimizing the economic, financial, environmental and social benefits that can be derived from each mode in the entire transport chain.

- The Trend of international inland transport
- Increasing legislation on pollution
- Lower fuel consumption
- Increasing size of vessels
- Lightweight vessels
- More comfort on board
- Increasing safety demands
- River information services

7.8 Co-operation on International Rivers

Today international rivers form an increasingly important part of the geographic, economic and political landscape of our world (freshwater flows whether surface water or groundwater), and the lakes and wetlands that some of these flows may pass through, derive from, or terminate within are described, very loosely, in this text as "rivers." The term "international rivers" is used in the text to refer to freshwaters whose basins are situated within the borders of more than one state. About 40 percent of the world's population lives within the basins of international rivers, and perhaps even more significantly, over 90 percent of the world's population lives within the countries that share these basins. These rivers create national expectations - both within and beyond the borders of their basins-of the benefits they can bring. As populations and economies grow, and as less contentious national water resources become more fully exploited, an increasing share of the remaining development opportunities will be on international rivers.

Development of these rivers can elicit extremes of co-operation or dispute or can elicit reactions anywhere in between these extremes. Much recent literature exists on the imperative of cooperation between nations sharing international rivers, but little has been written on the practicalities of achieving it. Achieving international co-operation is always a long and complex journey, for which there is no single path and few short cuts. Instead, there are many routes that can be followed and many steps that can be taken, with various options to consider and choices to be made.

It is generally accepted that conflicting demands over international rivers will intensify. There is an active debate on whether this will lead to "water wars" or to unprecedented co-operation. Framing the debate in this manner, however, tends to cast the concept of co-operation as all-or-nothing, implying that "co-operation" is an extreme, in direct opposition to "war." This conceptual construct obscures the many practical levels of co-operation that states can undertake to their mutual advantage. It is important to recognize that it is entirely rational that states will always have a "national

agenda" for a river that they share with other states, and that they will co-operate if it serves that national agenda. In practice, there can be a continuum of levels of co-operation, from simple information sharing, to joint ownership and management of infrastructure investments. Furthermore, it may not necessarily be the case that "more" co-operation reaps "more" benefits in all river basins. There are many different types of benefits that can be secured through the co-operative management of international waters, with each individual basin offering different potential co-operative benefits with different associated costs. For each international basin, the optimal mode of co-operation will depend on a mix of factors including hydrologic characteristics, the economics of co-operative investments, numbers, the relationships of riparian, and the costs of parties coming together. This project will put forward a basic research to promote co-operation on international waterway transport

Identification of the need and the effect of transportation infrastructure investment are particularly important when development resources are scarce as in the context of a developing country and/or region. From the perspective of the decision makers it involves identification and assessment of the need for infrastructure development, accurate estimation of the need that allows for effective budgeting and financing of the projects, informed decisions while evaluating individual projects, and above all a balanced distribution of resource and efficiency through incentives for competition.

All these aspects have generated considerable research interest in the analysis of investment needs and optimal allocation of resources. At the core of investment decisions is economic performance.

Performance of invested resources is usually measured by an efficiency factor, which is the ratio between output and input factors of production. In the case of investment in infrastructure for development the output factors are usually expressed in different forms of aggregate production and the input factors include natural resources, land area, population and accessibility.

Transportation is considered to be one of the most important infrastructure components influencing production. For this reason there exists considerable pressure for investment in the transportation sector. The statistical analysis of Aschauer (1990) shows that a one percent increase in the nonmilitary public capital stock (16 billion dollars in 1985) is estimated to result in a rise in the corporate profit rate of 10 basis points (1/10 of one percentage point) in the US.

The study incorporated streets and highways, water supply, sewerage and publicly owned electricity and gas facilities, which constitute over half of the total public capital stock in 1990. Streets and highways represent almost 61% of the core infrastructure in 1990. Other studies such as by Aschauer (1989), Biehl (1986) and Blum (1982) suggest that the differences in levels of infrastructure spending might also be capable of partially explaining the cross-country differences in productivity growth.

Aschauer (1990) cited the example of Japan, which has invested 5.1% of output in public facilities and achieved productivity growth of 3.1% per annum, while the US has had a low public investment ratio of 0.3% and inferior productivity growth of 0.6% per annum. Concentrating on only the effect of transportation infrastructure, it is demonstrated that due to increase in paved roads and rural road density aggregate crops output increases by 0.26% and 0.12% in one developing country (Emmanuel, 1995).

Transportation improvements affect both economic development and productivity. "Pure" economic development effects are usually regional in nature and result from improved assess to labor pools or to larger markets (NCHRP, 1998). While considering the economic development of different regions of a country, transportation infrastructure and the overall system may play a significant role in removing regional economic disparities. Within the same country and under the same development policies, significant role for transportation implies that regions with better transportation infrastructure will have better access to the location of input materials and markets and thus will, ceteris paribus, be more productive, competitive and hence more successful than regions with inferior transportation accessibility (Vickerman et al., 1995).

Better accessibility and mobility also plays a significant role in human resource development of a region. There seems to be a clear positive correlation between transportation infrastructure endowment or interregional accessibility and the level of economic indicators, such as, GDP per capital (Beihl, 1986).

But many a times it is observed that investment in transportation far exceeds commensurate investment in other input factors, and hereby resulting in wastage of resources and reducing efficiency. In fact the critical question in connection with resource allocation is to determine the marginal rate of return for the input factors of production. It also leads to the identification and quantification of slack or surplus of the input factors. Existence and magnitude of slackness determines the need for further investment.

This chapter examines the role of accessibility, provided by multimodal transportation facilities, in aggregate efficiency of production of different regions. During the last couple of decades transportation attracted more than twenty percent of national investment, most of which is concentrated in road transportation sector. In addition, it is observed that there exists severe disparity in the spatial distribution of this investment.

Although this investment has increased aggregate production in many areas, its relative effectiveness and marginal rate of return of the input factors requires further investigation. Aschauer (1990, 1993) and Vickerman et al. (1995) discuss the role of transportation on aggregate production; those studies do not explicitly examine issues like relative efficiencies and imbalance in input factors. The spatial variation of input resources and observed distribution of outputs provide a potential context for analyzing economic efficiency through the application of a non-parametric mathematical programming in terms of output productions, input factors and their weights, which are determined endogenously.

The inputs include land area, population density and accessibility, and the outputs include gross domestic production of each of the study areas. The accessibility measure includes travel time and cost of transportation among zones (regions-spatial subdivision in Bangladesh), and considers multimodal facilities.

Bangladesh is one of the least developed countries in the world. GNP and GDP levels of the country are quite low. Present per capita income of the people is about US $ 600. The gross area of the country is approximately 147,570 square km. According to the latest population census, which was conducted in 2001, the population of the country is 123.14 million.

The average population density is about 827 persons per square km. According to 1995-1996 Labor Force Survey, the total Civilian Labor Force of the country was estimated at 56.0 million of which, 34.7 million are males and 21.3 million are females.

8.2 Transportation System of Bangladesh

The transport system of Bangladesh consists of four modes, road, rail inland waterways and airways. At present the total of National Highway, Regional Highway and Feeder Road Type A amounts to 21,174 km in the country. 'National Highways' are the roads connecting the national capital with divisional headquarters, old district headquarters, port cities and international highways. 'Regional Highways' are the roads connecting different regions with each other, which are not connected by national highway system. 'Feeder Road Type A' roads connect Upazila (each district consists of a number of upazilas) Headquarters and important growth centers with the main arterial road networks. 'Feeder Road Type B' roads connect growth centers with other centers and Upazila Headquarters. Table 16 presents the inventory of major road network of the economy, which is considered in this study.

Table 16: Roadway Inventory of Bangladesh (Length in Km)

Survey year	National Highway	Regional Highway	Feeder Road Type A and B	Total
2006	4212	2160	19057	25429

Source: *Economic Review of Bangladesh,2007*

Rail transport is a public sector concern. Bangladesh Railway has a total 2,768 route kilometers and operates through 452 rail stations nationwide. About ninety percent of the country's area is accessible by railway.

The navigable waterways of the country consist of approximately 5.968 km of rivers and channels during monsoon, which reduces to approximately 3,600 km during the dry season. The waterway network facilities natural drainage of the country and serves as one of the major means of transportation for some areas, specifically the southern districts of the country.

Air transportation in Bangladesh is predominantly a public sector concern. Very recently a handful number of private airlines started operating their flights for domestic air transportation only. Biman Bangladesh Airlines is the state owned air transportation service provider. At present, Biman is operating at 3 domestic and 19 international destinations. Compared to other modes, the role of air transportation in passenger and freight movement is negligible.

8.3 Modal Share

Modal share of both passenger and freight transportation in Bangladesh is dominated by roadways. According to the most recent study, roadway carries about 73 percent of passengers and 65 percent of freight as shown in Table 17. Like other countries of the world, reliability on road transportation for passenger transportation has been increasing very rapidly. Inland water transport is the second most widely used mode of transport providing accessibility into the remotest parts of the country at the cheapest fare.

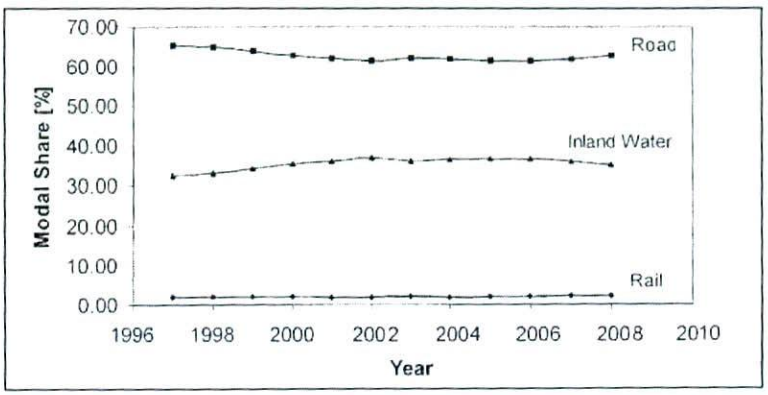
Table 17: Share of different modes of transport

Year	Passenger Transportation (%)			
	Road	Rail	Water	Total
1974-75	54	30	16	100
1984-85	64	20	16	100
1994-95	68	17	15	100
2004-05	75	12	13	100
2010	73	13	14	100

Source: BITSS, 2010

The modal share of railway in both passenger and freight transportation reduced for more than 30 percent in 1974 to about 13 percent in 2009. Although the number of rail passengers has declined over time, recently introduced inter city passenger services have gained popularity because of improved quality of service.

Figure 10 : Freight transportation trend in Bangladesh



Source: BITSS, 2010

Road and land water modes carry the largest share of freight. The dominance of water transportation is due to relatively cheaper fare and higher accessibility particularly in the coastal area. About 50% of the land area and three fourths of the economic activities in the country are located within a distance of 10 km from the nearest navigable waterways.

8.4 Macro-Economic Features of Bangladesh

Bangladesh is an agriculture-based country. Agriculture contributes 22.54 percent to national economy which is followed by industry and trade services. Annual contribution of important sectors to the GDP of the country in recent years at base 1995-96 constant market prices is shown in percent in Table 18. In recent years, there is a trend of decreasing agricultural contribution in the total GDP and increasing contribution of industry and trade services.

Table 18: Sector-Wise Contribution of GDP in Current Market Price
(Figures in %)

Important Sectors	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02
Agriculture	25.28	24.73	25.33	24.64	24.73	24.48	25.25	24.62	23.31	22.54
Mining and Quarrying	1.01	1.01	1.01	1.00	1.00	0.98	0.94	0.97	1.04	1.08
Industry	14.35	14.75	14.33	14.82	14.98	15.62	14.92	14.69	14.98	15.16
Construction	6.01	6.14	6.36	6.62	6.73	6.92	7.11	7.43	7.63	7.75
Transport, Storage and Communication	9.53	9.37	8.87	8.71	8.62	8.36	8.21	8.33	8.74	8.90
Power, Gas, Water and Sanitary Services	1.56	1.56	1.49	1.44	1.41	1.32	1.29	1.30	1.32	1.35
Trade Services	12.54	12.67	12.95	12.98	12.77	12.99	12.99	12.93	13.45	13.68
Housing	8.66	8.86	8.59	9.02	9.02	8.81	8.91	8.92	8.83	8.85
Public Administration and Defense	2.48	2.50	2.42	2.42	2.45	2.48	2.53	2.63	2.65	2.67
Banking and Insurance	1.44	1.48	1.47	1.51	1.53	1.49	1.53	1.54	1.55	1.55
Professional and Miscellaneous	17.14	16.93	17.18	16.82	16.77	16.55	16.32	16.64	16.50	16.47
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: *Economic Review of Bangladesh 2002*

8.5 Region-wide Contribution to GDP

Dhaka, the capital of Bangladesh, contributes about 13 percent of national income, which is followed by Chittagong, the major industrial area of the country. It may be observed that during the last ten-year period the relative contribution of the districts in national GDP has not changed significantly.

Since independence in 1971, many development projects, including infrastructure development activities, have been implemented throughout the country. Infrastructure facilities such as health facilities, educational institutions, electricity transmission lines, and drinking water facilities have been provided more uniformly across districts than transportation

infrastructure. Although, many transportation infrastructure elements such as roads, inland water transportation facilities, rail stations, and new airports have been built in both rural and urban areas of the country, there exist significant regional disparities.

It is frequently observed that investment priorities concentrate more on already developed areas under the pretext of higher rate of return. Consequently such investments are expected to result in imbalance in production factors and inefficiencies in the production process. It is possible that with relatively excellent transportation infrastructure facilities some districts are not producing as efficiency as other districts would with a modest investment.

Table 19: Relative Efficiency and Weights of Input and Output Sector-Wise GDP Model

Districts	Efficiency	Weights					
		Primary	Secondary	Tertiary	Area	Pop. Density	Accessibility
Dhaka	1.00	0.024	0.065	0.917	1.78	0.04	0.022
Mymensingh	1.00	0.899	0.040	0.264	0.23	2.35	0.010
Tangail	0.77	2.044	0.001	0.001	2.83	0.01	1.15
Jamalpur	0.80	1.201	0.001	0.001	3.05	0.01	1.24
Faridpur	0.80	1.218	0.001	0.236	0.80	0.88	1.19
Chittagong	1.00	0.163	0.900	0.097	1.30	0.33	0.87
Ctg. Hill Tracks	1.00	1.264	1.299	0.738	0.37	9.31	8.67
Noakhali	0.91	1.889	0.001	0.001	2.62	0.01	1.06
Comilla	1.00	0.770	0.017	0.682	2.06	0.07	0.24
Sylhet	1.00	0.366	0.098	1.496	0.36	2.35	0.17
Rajshahi	0.83	0.874	0.001	0.484	0.70	1.34	0.16
Dinajpur	0.86	1.397	0.001	0.271	0.92	1.01	1.36
Rangpur	1.00	0.958	0.006	0.106	0.82	1.00	0.17
Bogra	0.99	2.054	0.001	0.001	2.29	0.01	2.11
Pabna	0.69	1.657	0.001	0.001	2.29	0.01	0.93
Khulna	1.00	0.002	0.109	2.752	0.29	3.59	0.09
Barisal	0.95	1.156	0.001	0.641	0.93	1.78	0.22
Patuakhali	1.00	2.581	0.158	0.079	1.54	0.13	6.69
Jessore	1.00	1.302	0.006	0.002	1.51	0.58	0.89
Kustia	0.77	2.148	0.001	0.001	2.97	0.01	1.21

Source: *Author's own calculation*

Again, some districts might have economic potential but poor accessibility and this may act as an inhibitor for efficient economic activities. Patuakhali, the accessibility situation is extremely poor although the districts are performing efficiently with respect to the limitation of resources.

The analyses presented above clearly demonstrate the deficiency of accessibility in a couple of zones of the country, which include Chittagong Hill Tracks and Patuakhali. The other areas where investment in accessibility is deemed necessary include Tangail, Jamalpur, Faridpur, Bogra, Dinajpur. In all these districts accessibility primarily depends on the roadway network.

Lack of facilities for alternative transportation modes and its influence on efficiency is clearly demonstrated in the analysis. In the analysis it is also observed that Chittagong, which is the main port of the country and one of most important industrial cities, suffer from lack of accessibility.

Compared with the investment scenario of transport sector, it is observed that there exists severe disparity in spatial allocation of resources. Most of the investment in transport sector concentrates on improving accessibility of Dhaka. Also, relatively higher priority is provided on road sector. The analysis here suggests that investment in improving the accessibility of peripheral districts is required and it should be increased with more priority in improving multimodal accessibility.

In this chapter, the role of accessibility in regional production has been studied using a relatively new method in investment and decision-making. The chapter presents an elaborate analysis of the significance of accessibility in the efficiency of regional production with respect to Bangladesh. A new approach is developed to identify and assess the need for investment in improving accessibility and its spatial distribution.

The approach is devised on the basis of a Data Envelopment Analysis (DEA) framework. Considering Gross Domestic Product (GDP) in current market price as the output and unable land area, population density and accessibility as input in the production process, efficiency is estimated as the weighted ratio between output and input.

Initial analyses have shown that most of the zones perform inefficiently thereby causing imbalance in input factors of production and waste of resources. It also identified specific regions where production efficiency is severely constrained by lack of accessibility. Such regions include Chittagong Hill Tracks, Patuakhali, Dinajpur, Bogra, Pabna. The analysis also suggests that investment to improve accessibility in Tangail, Jamalpur, Faridpur and Chittagong will be beneficial.

Analysis of efficiency on the basis of sectoral production suggests that the regional economy is still primarily dependent on the agricultural sector. Although the service sector plays a significant role in a few regions, the role of the manufacturing sector is insignificant.

In many zones where agriculture is the driving force in economic activity, there exists scope for investment in transportation sector with relatively higher marginal rate of return.

Further investigation is required to differentiate the impact of natural resources and other investment. This will also provide further insight into the impacts of various input factors on production. Finally, performing similar analysis on time series data will enable validation of the methodology as well as the development of a new planning tool for planners and decision makers.

CHAPTER-NINE

Findings : Opinions of Experts

9.1 Introduction

The literature review identified several conceptual categories that might influence the successful development of a multimodal transport system in Bangladesh. For convenience, these are grouped into the role of the Bangladesh Government, changes in freight transport in Bangladesh, changes in technology and systems, and logistics concepts and practice.

Each survey statement was numbered and relevant statements are shown in parentheses. As an example, (S1. 1) refers to Statement 1.1 in Appendix 2: 'Customs law and formalities are greater barriers to a multimodal transport system than inland transport time'.

9.2 Role of the Bangladesh Government

Infrastructure development including roads, ICDs and inland terminals is essential for origin-to-destination cargo movement in a successful multimodal transport system. It was proposed that government investment in transport infrastructure development has failed to develop adequate feeder roads and inland river terminals with a need for more inland terminals or ICDs (S2. 3). The private sector also needs to invest in such infrastructure to allow origin-to-destination containerized cargo movement (S3. 1).

Government must ensure simple and flexible customs procedures to allow door-to-door movement of containerized cargo. Views were divided on whether customs authorities have yet to develop a system or procedure to facilitate such movement (S5. 2), but there was consensus that procedures such as arranging escorts and the bonded warehouse system have restricted effective door-to-door delivery (S5. 1), as has the outdated attitude of trust-distrust in the customs-client relationship (S5. 4).

The recently introduced Automated System for Customs Data (ASYCUDA) is improving the customs clearance system (S5. 5), but procedures should be simplified to facilitate quicker clearance of consignments (S5. 6).

The structure of government transport ministries, currently based on particular modes of transport, does not favor multimodal transport (S7. 1). With no single organization responsible for a uniform and comprehensive policy, private bodies including the shippers' council and freight forwarders association could perhaps better develop a uniform policy and regulations for developing multimodal transport (S13). Transport ministries should employ people with knowledge and experience in transport and logistics (S7. 2).

9.3 Changes in Freight Transport

Participants in a global economy typically operate within competitive and deregulated freight markets. However, although these conditions characterize road freight operations in Bangladesh, state ownership, operation and control of rail, ports and, to some degree, inland waterways hampers progress towards a multimodal freight transport system.

Currently, companies offering an inland freight transport service are small, and it was agreed that a healthy market needs companies of all sizes to avoid a monopoly (S8. 1), although panelists' views varied.

Although the respondent group was relatively homogeneous, after two Delphi rounds, based on statements generated by the respondents themselves, they displayed least consensus about their own sector, failing to reach consensus after applying the APMO formula on 13 statements, although six achieved 'near consensus' (75%). There was no consensus over the establishment and operation of inland terminals or clearance depots (S3. 2), the extent of trade unionism (S4. 2) and a lack of discipline (S4. 3) in the freight transport sector.

Views differed regarding subsidy and profit for railways in a multimodal development (S9. 1) , whether freight forwarders and other trade bodies has accepted multimodol transport (S6. 2), whether local carriers have the capacity to become owners of international shipping lines (S11.3) or whether shippers are accepting the use of door-to-door services with more modern information technology and reliability (S13.4). These exploratory results imply that Bangladesh companies should have a direct stake in multimodal development, but have mixed views on their own capacity to deliver an adequate service.

Concerning the scope for multimodal transport, consensus was achieved that the Dhaka-Chittagong corridor has sufficient volume of cargo for a multimodal rail transport system operating at a profit (S17). Joint ventures or partnerships of foreign companies with local carriers or freight forwarding companies were perceived as the best local option, as they were considered more able to meet local challenges than an international company (S11. 2) Similarly, effective co-operation between local companies and international shipping lines would be important in providing a quality service (S11.4), and there are enough skills and expertise for this (S11.1).

The panel saw scope for non-asset-based freight forwarders to be MTOs (S22), but there was no consensus on whether local carriers have the capacity to own international shipping lines (S11.3).

Panelists felt that a multimodal service including rail, as well as road, maritime and inland water way, is a better option for international overseas trade (S15). However, current government ownership and operation of the rail freight service is a barrier to developing such a service. A privatized rail freight service is considered better than a state-owned one for multimodal development (S16).

Regarding the role of subsidy for a rail freight operation to encourage multimodal transport development, panelists considered that all transportation in both private and public sectors should run at a reasonable

profit (S9.3), and a rail freight service would not improve or last long without making a profit (S9.2). However, to encourage multimodal transport the rail freight option must be cheaper (S9.4).

To raise the effectiveness of containerization, inland transport infrastructure must be developed to speed up door-to-door movements of containers. However, although road and rail were both considered inadequate in meeting the needs of inland containerized cargo movement (S2.1), and despite inland transport not being considered time-effective, panelists did not consider it a barrier to multimodal transport (S1.2).

Customs law and formalities presented a greater barrier (S1.1). Any requirements for transhipment at border crossings will also hinder the development of a multimodal transport service for trade with neighboring countries (S26). Although inadequate inland transport systems are impeding multimodal transport development, customs procedures may prevent it.

Containerization and multimodal transport systems enable international shipping lines to offer point-to-point transport and logistics services in other countries, but currently, only port-to-port or port-to-point services in Bangladesh.

To develop an effective multimodal system, international shipping lines need to establish joint ventures or partnerships with local carriers (S20). The local carriers in the shape of feeder services have already become part of the international transport haul (S10.1). However, local carriers need to upgrade their skills and knowledge (S10.3). Bookings should be routed through freight forwarders and not directly with shipping lines to enable a competitive door-to-door service (S13.2).

9.4 Technology and Systems Change

Containerization has revolutionized cargo handling and technology in ports and terminals, but in Bangladesh, panelists agreed that the main ports are not sufficiently developed to act as container terminals (S5), and there is insufficient port competition (S7). Average ship turnaround time is too long

(presently averaging 3.76 days; S6), but despite these limitations, port operations were not considered a barrier to a multimodal transport system (S1.3).

A sufficient number of ICDs, including logistics centers and inland river terminals with container-handling equipment and other facilities, are required for door-to-door cargo movement, but an effective and sufficient number of ICDs was not considered to exist in Bangladesh (S3). Bangladesh has long navigable water ways that interconnect all production centers, but river ports are not developed.

Panelists agreed that more terminals and ICDs are required (S2.3) with inland water terminals needing to be developed with such facilities as container-handing equipment and container freight stations (53.3).

Multimodalism requires standardized flows of information, but shippers or consignees are unable to get sufficient information about their consignments because of the incapability of carriers or freight forwarders to offer effective tracking and tracing of shipments (S8). Even recent information suggests that the ports, and customs have not yet establish Electronic Data Interchange (EDI) systems, although efforts are ongoing (Asian Development Bank, 2003a, 2005). News about shipping is rarely published and often dated (S6.3) and shippers do not know where to obtain sufficient information about multimodal freight rates (S6.5).

9.5 Logistics Concepts and Practice

Modern developments in logistics and supply chain management are limited in Bangladesh with many shippers largely unaware of their potential benefits. There is consensus that nobody knows that adoption of a multimodal transport system would improve the international trade and investment environment (S24), the shippers are not aware what benefits multimodal transport can offer (S6.4), nor what a freight forwarder can do and what a shipping line should not to assist door-to-door transport services (S13.1).

Traditional terms of sale or INCOTERMS such as free on board (FOB) or cost, insurance, freight (CIF) tend to split shipment responsibility, usually at ports. Panelists agreed that these traditional INCOTERMS do not affect the use of multimodal transport (S12.1), although they acknowledge that internationally accepted INCOTERMS suitable for multimodal transport systems enhance widespread acceptance of freight forwarders (S12.3).

They agreed that government procedures, dishonesty, lack of awareness and infrastructure limitations are much greater deterrents to a multimodal transport system than INCOTERMS (S12.2).

Having identified key issues affecting multimodal freight transport development in Bangladesh, model is proposed to transform conventional segmented freight services into an integrated multimodal freight transport system (chapter six). Considering first the implications for the role of government regarding infrastructure, panelists exhorted private sector investment to supplement government investment in roads, terminals and ICDs.

Overall, they felt that complex and inflexible customs procedures presented a greater barrier to multimodal freight development than shortcomings in transport infrastructure. Customs authorities have developed a system to facilitate door-to-door cargo movement, but development is hampered because details of current formalities, documents and fees required to trade with Bangladesh are not readily available online. Would-be traders must have a right to such information, which must be transparent and free from corruption.

Finally, panelists perceived that systemic improvements had taken place in government ministries, but further development requires a single co-ordinator to oversee multimodal freight transport initiatives. Despite sustained pressure for restructuring government ministries, respondents identified that requisite skilled and knowledgeable manpower was already employed by the current Department of Shipping within the Ministry of Shipping.

Such a body must initiate, co-ordinate, and implement policies and actions backed by private bodies representing truckers and freight forwarders, the shippers' council and shipping lines, port and terminal operators, and customs authorities. A department or organization dedicated to registering shipping and licensing MTOs will necessarily require that the Ministry monitor its activities and investigate any complaints.

Panelists perceived a need for changes in inland freight transport networks, agreeing that a healthy market must offer more size variation amongst service providers than current domination of road transport by small operators and other modes by state monopolies. Perhaps predictably, public- and private-sector employees exhibited differing perceptions of the degree of state intervention desirable in multimodal service provision.

There was agreement that companies should be involved in multimodal development, but many doubted the extent to which they had embraced modern developments, or were capable of operating internationally. Local carriers currently offered mainly feeder services, lacking the skills and knowledge demanded for competitive international hauls. Limited in their size and capacity, the operators, particularly in road freight and also in rail, lacking equipment, locomotives and skilled manpower, understandably sought further joint ventures and partnerships with internal shipping lines to increase their prospects of trading with powerful multinational companies.

To develop international trade required multimodal options including rail, which would require private finance. Few activities have yet been deregulated or privatized under the Ministry of Shipping, which shares this remit with the approval or consent of other ministries and departments, including the Ministry of Law, the Ministry of Finance and the Privatization Board, which is answerable to the Prime Minister's Office. A policy of transport privatization since 2002 envisaged in the Ministry of Shipping's 'Vision and Private Sector Participation Policy for the Shipping Sector of

Bangladesh' has not yet generated significant competition between ports and terminals, and further privatization of seaports and river terminals is required.

A commercial identify for Bangladesh railways, akin to India Railways, would precede privatization. Privatization of rail freight services has been shown to stimulate interest, commitment, and co-ordination amongst shipping, rail and road operators (Hensher and Brewer, 2001). Door-to-door containerized cargo movement probably requires double-track rail running between the main cargo centers and further road network upgrades, but road and rail should also both compete against and complement each other. A Dhaka-Chittagong railway route, the preferred option for international multimodal services, must be accompanied by commercial services including intramural competition.

Transport technology and systems must change to embrace multimodal developments. Port competition and development were currently considered insufficient to support significant container terminals, but port operations in isolation were not a barrier to multimodal system development. Local entrepreneurs have gained infrastructure investment opportunities for ICDs in Chittagong but not Dhaka, and more are required.

More container-handling equipment is required at inland water terminals. Improvements to information flows urgently require attention with priority for services offering tracking and tracing of shipments, and publication of multimodal freight rates. However, echoing findings that 70% of infrastructure investment in LDCs is state funded (Jacobs and Greaves, 2003) panelists favored continued state investment supported by private investment in developing door-to-door services.

A clear policy is required to delineate the role of private parties, where, for example, entrepreneurs might propose locations for developing depots or terminals, but government remains responsible for ensuring that the location is appropriate to and accessible by all modes (Hensher and Brewer, 2001).

Logistics concepts and practice need updating to replicate findings elsewhere (Tan et al., 1998) that overt conservatism amongst the traders and investors is threatening much needed FDI. Many local shippers are unaware of the potential benefits of multimodal transport, or the services which freight forwarders can offer. Government procedures, dishonesty, a lack of awareness and infrastructure limitations are greater deterrents to multimodal transport systems than INCOTERMS. To achieve an efficient multimodal system demands a concerted and integrated effort by all parties involved (Razzaque, 1997), with ongoing dialogue (Temple, 2001, 2003; The New Nation, 2003) and will require ongoing research to prioritize and monitor the progress of future developments.

Appendix 1: Results of the First Delphi Round

Sl. No.	Original statement	Result
01.	The present transport system is a barrier to multimodal transport as the inland transit time is to high	No consensus
02.	The inland transport infrastructure is suitable for origin-to-destination containerized cargo movement	No consensus
03.	There are sufficient inland clearance terminals for efficient door-to-door cargo movement	Disagree (77%)
04.	The Bangladesh Government should not invest any more in developing inland terminals or inland clearance depots.	No consensus
05.	The main ports are sufficiently developed to act as container terminals	Disagree (77%)
06.	The port system is a barrier to multimodal transport as the average ship turnaround time at port is too long	Agree (85%)
07.	There is insufficient port competition to make port services efficient	Agree (92%)
08	Shippers or consignees are unable to get sufficient information about their consignments because of inadequate modern communication technology, e.g. Electronic Data Interchange (EDI)	Agree (92%)
09.	Inland transport operators are too restricted by government regulation and this prevents effective competition	No consensus
10.	Customs procedures do not restrict the operation of door-to-door transport of containerized cargo	No consensus
11.	There is sufficient information about multimodal freight rates or transit time is generally available to shippers	No consensus
12.	The structure of government transport ministries (or departments) is already suitable for multimodal transport development	No consensus
13.	A uniform policy and regulation for the development of multimodal transport is better when developed by private parties (e.g. shippers association, freight forwarders association) rather than by a government	Agree (85%)

Appendix 1 description in the next page

Sl. No.	Original statement	Result
14.	A smaller number of trucking companies with high-capacity carriers (i.e. tractor-trailer) could create a healthy competitive market in Bangladesh suitable for origin-to-destination international transport hauls	No consensus
15.	The road-rail-maritime multimodal service is better than road-maritime or road-inland water-maritime multimodal options for international overseas trade	Agree (75%)
16.	A privatized rail freight service is better than a state-owned one for multimodal development	Agree (92%)
17.	There is sufficient volume of cargo on the Dhaka-Chittagong route for running a commercial multimodal rail freight service at a profit	Agree (100%)
18.	To encourage multimodal transport it is not necessary for a rail freight service to operate at a profit	No consensus
19.	The sea shipping lines calling at Bangladesh ports do not encourage local carriers to be the part of international origin-to-destination transport hauls	No consensus
20.	An effective multimodal system requires that international sea shipping lines have joint ventures or partnerships with local carriers or freight forwarders	Agree (85%)
21.	An effective multimodal system requires that international sea shipping lines take ownership of local carriers or freight forwarders	No consensus
22.	Freight forwarders should not be multimodal transport operators if they do not own vehicles or vessels	Disagree (77%)
23.	Most letters of credit use INCOTERMS free on board (f.o.b) or cost, insurance and freight (c.i.f) for international shipments and this prevents the development of multimodal transport	No consensus
24.	The problem with developing multimodal freight transport is that nobody knows it can improve the international trade and investment environment	Agree (85%)
25.	Shippers are reluctant to call for door-to-door (origin-to-destination) transport as they see no advantage in it	No consensus
26.	Cross-border trade with neighboring countries will increase if there is a multimodal transport service without transhipment at the border	Agree (83%)

Appendix 2: Results of the Second Delphi Round

Sl. No.	Original statement	Result
1.1	Customs law and formalities are greater barriers to a multimodal transport system than inland transport time	Agree (83%)
1.2	The inland transport system is not a barrier to multimodal transport even though it is not time-effective	Agree (83%)
1.3	Port operations are not a barrier to multimodal transport even though they are not time-effective	Agree (83%)
2.1	Road transport is not adequate and railways are not capable of meeting the needs of inland-containerized cargo movements	Agree (83%)
2.2	Inland transportation of containerized cargo is possible only by road and railway, not by inland waterway	No consensus
2.3	More inland terminals / inland clearance depots / container freight stations should be established	Agree (92%)
3.1	Government and the private sector should invest side by side to establish more inland terminals / inland clearance depots.	Agree (100%)
3.2	Government should establish more inland terminals / inland clearance depots but private management operators should operate them	No consensus
3.3	Important inland water terminals must be developed with such facilities ads container-handling equipment and container freight stations	Agree (100%)
4.1	The inland transport market is enjoying an effective competitive regime free from government restrictive regulation.	No consensus
4.2	There is overriding trade unionism in the freight transport market	No consensus
4.3	Competition is hampered by a lack of discipline in the freight transport sector	No consensus
5.1	Customs procedures such as arrangement of escorts, bonded warehouse systems, etc. have restricted effective door-to-door delivery	Agree (92%)
5.2	Customs have not developed a system or procedure for door-to-door transportation of containers	No consensus

Appendix 2 description in the next page

Sl. No.	Original statement	Result
5.3	The final price of products is high because of 'under-the-counter' payments to ensure customs and port clearance	No consensus
5.4	The outdated attitude of trust-distrust in the customs-client relationship prevents effective door-to-door service	Agree (92%)
5.5	The recently introduced ASYCUDA is improving the customs clearance system	Agree (83%)
5.6	Customs procedures should be more simplified to facilitate faster clearance of consignments	Agree (83%)
6.1	Transport and logistics service providers are unable to publish multimodal freight rates or transit times as there is uncertainty of cost and time	No consensus
6.2	Unlike in North America and Europe, freight forwarders and other trade bodies have not yet accepted multimodal transport systems	No consensus
6.3	Unlike in developed countries, news about shipping is not published sufficiently and is not up-to-date in Bangladesh	Agree (100%)
6.4	Shippers are not aware what benefits multimodal freight transport can offer	Agree (92%)
6.5	Shippers do not know where to get sufficient information about multimodal freight rates.	Agree (92%)
7.1	The structure of government transport ministries or departments needs to be changed to enable a more aggressive approach to multimodal transport development by government	Agree (100%)
7.2	People with knowledge and experience in transport and logistics should be employed by transport ministries and departments	Agree (92%)
7.3	To avoid spurious operators, multimodal transport operators should be registered or licensed	Agree (100%)
8.1	A healthy and competitive transport market needs big, medium and small companies to avoid a monopoly	Agree (100%)
8.2	There is nothing wrong with the existing structure of the trucking industry	No consensus
9.1	To encourage multimodal transport government can subsidize rail but must be run on a breakeven (i.e. no profit or loss) basis	No consensus

Appendix 2 description in the next page

Sl. No.	Original statement	Result
9.2	Without profit the rail freight service will not improve or last long	Agree (100%)
9.3	All transportation either in the private or public sector should run at a reasonable profit	Agree (100%)
9.4	The rail freight service should be cheaper but reasonably profitable	Agree (100%)
10.1	Local carriers in the shape or feeder services have already become part of the international transport haul	Agree (100%)
10.2	Although sea shipping lines encourage local carriers to be part of the international transport haul, it is not possible for sea shipping lines to enter every segment of the business	No consensus
10.3	The local carriers need to upgrade their skills and knowledge	Agree (92%)
11.1	There is enough skill and expertise in Bangladesh to operate multimodal transport system in joint venture or as agents of international shipping lines	Agree (92%)
11.2	A local company can meet local challenges better than an international company. So, joint venture or partnership is the best option for effective multimodal services	Agree (92%)
11.3	Local carriers have no capacity to become owners of international shipping lines	No consensus
11.4	Effective co-operation between local and international shipping lines is more important than taking over a local carrier or forwarding company	Agree (92%)
12.1	Current usage of INCOTERMS does not affect the use of multimodal transport	Agree (92%)
12.2	Government procedures, dishonesty, a lack of awareness and infrastructure limitations are much greater deterrents to multimodal transport systems than INCOTERMS.	Agree (92%)
12.3	Internationally accepted INCOTERMS suitable for multimodal transport systems enhance widespread acceptance of freight forwarders	Agree (100%)
13.1	Shippers are not aware what a freight forwarder can do and what a shipping line should do to assist door-to-door transport services.	Agree (92%)

Appendix 2 description in the next page

Sl. No.	Original statement	Result
13.2	Like airlines, bookings must route through freight forwarders with no direct bookings to shipping lines to enable a competitive door - to - door service	Agree (83%)
13.3	Shippers are interested in efficient multimodal freight but such services have not yet developed here	No consensus
13.4	With the development of modern information technology and reliability of services, shippers now-a-days feel more relaxed about using door-to-door services.	No consensus

CHAPTER- TEN

SUMMARY AND CONCLUSION

10.1 Summary

Intermodal/Multimodal transport is a type of service where a multimodal transport operator (MTO) assumes a contractual responsibility to move goods from a point of origin in one country to a destination in another under a transport contract, for an agreed price with possibly a time limit for the delivery. Multimodal transport is often used loosely and interchangeably with the term intermodal transport from origin to destination.

The concept of intermodality is at the heart of modern transportation systems. In addition, there are many concepts used to cover the same (or similar) issues, such as combined transport and multimodal transport. Intermodal transport refers to the characteristic of a transport system that allows at least two different modes to be used in an integrated manner in a door-to-door transport chain. The intermodal transport system consists of the physical subsystem (infrastructure and transport equipment) and the intermodal service subsystem. The focus is on freight transport. Interconnectivity and interoperability are important issues determining the quality of intermodal transport.

With the chronic financial problems of Bangladesh like many other developing countries, adoption of intermodal requirements along the entire transport chain is in its infancy. The country is lagging behind considerably in its adoption of the earlier phase of development containerization.

The line of unemployed people in the country is very long. The segregated transport industry and unimodal transport services are still the dominant organizational structure in Bangladesh. Road transport continues to the most dynamic mode of transport development in Bangladesh. With the shrinking of navigable waterways due to siltation and the Bangladesh Railway's inertia

of the monopolistic era and in consequence its inability to gear itself and function in the changed real-world transport market environment, the share of road transport has increased sharply.

There are two sea ports-Chittagong and Mongla, 22 inland river ports, and about 827 way-side launch landing stations in Bangladesh. About 40% of the sea ports' cargo traffic moves by inland waterways. To serve around 160 million people in Bangladesh, a substantial amount of cargo movement is essential. As the cheapest possible mode of transport, water-borne transport is a possible solution for Bangladesh to transport cargoes.

The development of Inland Clearance Depots (ICD), an integral part of intermodal transport services, has taken place world-wide throughout all areas where containers are traded in large volumes and seaports are at some distance from inland receiving areas and/or there is some impediment to transfer between ports and their hinterland.

A number of studies conducted by Japan International Co-operation Agency (JICA) and Bangladesh Inland Water Transport Authority (BIWTA) recommended that by using natural waterways, establishing a riverside container terminal at the river port of Dhaka, an attractive container transport system by waterway-economical, simple and environment-friendly-could be created.

Development emanating from international trade and investment in many developing countries is impeded by the inland freight systems that restrict multimodal transport. Increasing international trade may raise gross domestic product, generating increased demand for internal containerized cargo movements, but the requisite transport infrastructure is lacking in Bangladesh. The volume of international trade of Bangladesh trebled between 1971 and 2010 as did the number of vessels calling at the port of Chittagong, but port capacity increased much less quickly due to inadequate and inefficient containerized transport operations.

From the discussions with experts in intermodality, it is understood that the issue is very much ambiguous to many, which requires a detail assessment of the multimodal transport system in Bangladesh.

In many developed economies, containerization revolutionized transport technology and cargo-handling systems and in newly industrialized areas including, ASEAN members have begun to develop such systems. Multimodal transport, which facilitates the origin-to-destination freight transport service under a single operator's responsibility using more than one mode of transport, is a natural extension of containerization.

Road infrastructure often suffers from low maintenance and limited funds. The transformation from a traditional fragmented freight transport system to a multimodal system requires appropriate technology, government support and an application of conformity theory. As multimodal freight terminal developments in developed countries are becoming increasingly interwoven with complex marketing channels and telecommunications, the local economic effects or any barriers to development are likely to be amplified.

The value of Bangladeshi internationally traded goods more than trebled in between 1971 and 2010, with rapid growth in tonnages exported, and it has been forecast to continue to grow rapidly. Containerized cargo handling in Chittagong Port, which handles 83% of Bangladesh's international trade, averaged 15% annual growth between 1995 and 2008. Although still at modest levels by international standards, these could treble in a decade

In 1987, the government established a rail-dedicated inland clearance depot (ICD), later upgraded, situated in a congested area of Dhaka with restricted accessibility. It is owned by Bangladesh Railway and is operated by Chittagong Port Authority, both state-owned organizations. A private company undertakes container-handling operations and equipment maintenance, but the depot is insufficient to meet the commercial needs of international trade, being capable of handling about 10% of container movements to and from Dhaka.

Restrictions imposed by customs authorities may impede trade, where door-to-door movement operations are sometimes restricted by customs clearance procedures and requirements for customs-authorized escorts for inland movements.

In terms of conventional cargo handling, the Port of Chittagong has direct inland accessibility to its hinterland by all three surface transport modes, but containerized cargo is only accessible by rail and to a very limited extent by road close to the port, mainly to and from the Chittagong Export Processing Zone (EPZ). Recently, road infrastructure from Dhaka-Chittagong has been upgraded to enable containerized cargo movement, but feeder or connecting roads have not.

Many Asian entrepreneurs are known to be reluctant to commit to major risks, perhaps fearing unforgiving investors and because of a few of failure, favoring business strategies that reduce their exposure to risk. Supporting the view that the Bangladeshi trading community has yet fully to acquire the culture and practices of international business found little infusion of new ideas among executives in Bangladesh.

Logistics concepts such as just-in-time or 'total quality management' (TQM) were reported as holding little practical value for them. Manufacturing, exporting and importing firms, including foreign firms, encounter logistics-related problems such as a lack of cargo-tracing services, local carriers' lack of delivery dependability, excessive loading and unloading time at terminals, inadequate transport infrastructure, and the unavailability of transport services.

IWT and road transport networks in Bangladesh are interdependent and complementary. IWT routes are generally oriented in a north-south direction, while the road network has a more varied pattern. The railway network became isolated after 1947, and the orientation then shifted toward the sea ports-Chittagong and Mongla.

The Master Plan of BIWTA has observed that the navigability of Bangladesh's waterways has deteriorated considerably over the past decades, resulting in severe development constraints. The identified causes of deterioration include progressive siltation of river channels; decrease in the volume of water of the south-western rivers due to reduction of trans-boundary flow; and an increasing abstraction of surface and ground waters in the dry season for irrigation.

Although water transport is slow, the physical environment of Bangladesh provides ample opportunities to utilize the numerous distributary channels of the major rivers for the transport of bulky commodities. However, since 1971, public sector allocation in the different Five-Year Plan (FYP) periods for water transport had been significantly lower than other modes, namely, road and rail.

The funds allocated to the IWT sector were clearly not commensurable with its role and importance, and this trend continued through the eighties and nineties. Consequently, IWT in Bangladesh did not develop at an optimal rate despite the favorable physical framework.

Rivers and waterways are natural assets, while anthropogenic forces are effecting changes in them which might diminish, and have in fact diminished, the intrinsic value of some of them. Hence, it is imperative that the factors contributing to adverse impacts on the waterways potential are identified and halted, and corrective measures are implemented. Human efforts are now essential to salvage and maintain this environmental resource.

Port marketing and promotion in its real sense does not exist particularly in the surface transport sector in Bangladesh. There exists no co-ordination between the government authorities and the users of the ports. It is important to understand "what is marketing" with particular reference to port activities. Marketing can be defined as, 'Marketing is a specific process whereby an

organization seeks to identify, quantify and anticipate the needs of its customers, both present and future, and develop the services to satisfy them' (ADB, 1995, p33).

Port marketing plays an important role in port development. Marketing in ports is composed of activities related to market research and marketing implementation. The market research enables the port to identify, quantify and anticipate the present and future needs of the clients, and thereby the port is able to adopt a marketing strategy to fulfil the customers need. In this way, there is a mutual understanding between the port and port user community, which leads to attract more traffic to the port. Then the port can earn a substantial amount of revenues from the additional traffic which is only possible due to the port's marketing strategy. Therefore, a marketing strategy is needed at the port in a competitive environment in order to provide services and facilities to the customers in accordance with their needs.

10.2 Conclusions

Containers transported on rivers are a rare view in Asia. Particularly, no South-Asian country has developed intermodality for transport of containers to inland destinations using the waterway. Nowadays the trend of world business is drastically changing. In the last six decades, international trade has grown enormously. Port activities are closely related to the sea-borne trade and the performance of multimodal transport. The conclusions from the analysis of this research could potentially provide significant direct and apparent economic benefits. The following recommendations are made on the basis of this study to improve intermodality and create an aggressive marketing scope/opportunity for Bangladesh. The recommendations the author would like to emphasize are given as below:

10.2.1 Infrasructure development including roads, ICDs, logistics centers and inland river terminals with container-handling equipment and other facilities, are required for door-to-door cargo movement. It was proposed that government investment in transport infrastructure development has failed to develop adequate feeder roads and inland river terminals with a need for more inland terminals or ICDs. The private sector also needs to invest in such infrastructure to allow origin-to-destination containerized cargo movement.

10.2.2 To raise the effectiveness of containerization, inland transport infrastructure must be developed to speed up door-to-door movements of containers. However, although road and rail were both considered inadequate in meeting the needs of inland containerized cargo movement, and despite inland transport not being considered time-effective, considering it is a barrier to multimodal transport.

10.2.3 To develop an effective multimodal system, international shipping lines need to establish joint ventures or partnerships with local carriers. However, local carriers need to upgrade their skills and knowledge.

Bookings should be routed through freight forwarders and not directly with shipping lines to enable a competitive door-to-door service.

10.2.4 Containerization has revolutionized cargo handling and technology in ports and terminals all over the world. But in Bangladesh, the main ports are not sufficiently developed to act as container terminals, and there is insufficient port competition. Average ship turnaround time is too long but despite these limitations, port operations were not considered a barrier to a multimodal transport system.

10.2.5 Shippers or consignees are unable to get sufficient information about their consignments because of the incapability of carriers or freight forwarders to offer effective tracking and tracing of shipments. The ports, and customs have not yet establish Electronic Data Interchange (EDI) systems, although efforts are ongoing. News about shipping is rarely published and often dated and shippers do not know where to obtain sufficient information about multimodal freight rates. Therefore multimodalism requires an effective and standardized flows of information. Improvements to information flows urgently require attention with priority for services offering tracking and tracing of shipments, and publication of multimodal freight rates. EDI approaches more and more to the objectives of computerisation and automation which are the zero defect, zero delay, zero paper.

10.2.6 Having identified key issues affecting multimodal freight transport development in Bangladesh, model is proposed to transform conventional segmented freight services into an integrated multimodal freight transport system. Considering first the implications for the role of government regarding infrastructure, private sector investment to supplement government investment in roads, terminals and ICDs.

10.2.7 Government must ensure simple and flexible customs procedures to allow door-to-door movement of containerized cargo. Customs authorities have yet to develop a system or procedure to facilitate such movement but there was consensus that procedures such as arranging escorts and the bonded warehouse system have restricted effective door-to-door delivery. The recently introduced Automated System for Customs Data (ASYCUDA) is improving the customs clearance system but procedures should be simplified to facilitate quicker clearance of consignments.

10.2.8 The structure of government transport sector currently based on particular modes of transport, does not favor multimodal transport. With no single organization responsible for a uniform and comprehensive policy, private bodies including the shippers' council and freight forwarders association could perhaps better develop a uniform policy and regulations for developing multimodal transport. Respective government ministries/ departments should employ people with knowledge and experience in transport and logistics.

10.2.9 It is felt that a multimodal service including rail, as well as road, maritime and inland waterway, is a better option for international overseas trade. However, government ownership and operation of the rail freight service is a barrier to developing such a service. A privatized rail freight service is considered better than a state-owned one for multimodal development.

10.2.10 Regarding the role of subsidy for a rail freight operation to encourage multimodal transport development, it is considered that all transportation in both private and public sectors should run at a reasonable profit, and a rail freight service would not improve or last long without making a profit. However, to encourage multimodal transport the rail freight option must be cheaper.

10.2.11 Complex and inflexible customs procedures presented a greater barrier to multimodal freight development than shortcomings in transport infrastructure. Development is hampered because details of current formalities, documents and fees required to trade with Bangladesh are not readily available online. Would-be traders must have a right to such information, which must be transparent and free from corruption.

10.2.12 To develop international trade, it requires multimodal options including rail, which would require private finance. Few activities have yet been deregulated or privatized under the Ministry of Shipping, which shares this remit with the approval or consent of other ministries and departments, including the Ministry of Law, the Ministry of Finance and the Privatization Board, which is answerable to the Prime Minister's Office. A policy of transport privatization since 2002 envisaged in the Ministry of Shipping's 'Vision and Private Sector Participation Policy for the Shipping Sector of Bangladesh-has not yet generated significant competition between ports and terminals, and further privatization of seaports and river terminals is required.

10.2.13 Door-to-door containerized cargo movement probably requires double-track rail running between the main cargo centers. But road and rail should also both compete against and complement each other. A Dhaka-Chittagong railway route, the preferred option for international multimodal services, must be accompanied by commercial services including intermodal competition.

10.2.14 Transport technology and systems must change to embrace multimodal developments. Port competition and development were currently considered insufficient to support significant container terminals, but port operations in isolation were not a barrier to multimodal system development. Local entrepreneurs have gained infrastructure investment opportunities for ICDs in Chittagong but not Dhaka, and more are required.

10.2.15 For the smooth and safe navigation of inland container vessels betwwen Dhaka and Chittagong and between Dhaka and Mongla, an appropriate maintenance and conservancy works should be carried out regularly. The need for pilotage services should be reduced to a minimum by optimising;

- ❖ Inland navigability information services and
- ❖ Navigation aids

10.2.16 Further development requires a single coordinator to oversee multimodal freight transport initiatives. Despite sustained pressure for restructuring government ministries, it is identified that requisite skilled and knowledgeable manpower should be deployed in the shipping and transportation sector. Such a body must initiate, coordinate, and implement policies and actions backed by private bodies representing truckers and freight forwarders, the shippers' council and shipping lines, port and terminal operators, and customs authorities. A department or organization dedicated to registering shipping and licensing MTOs will necessarily require that the Ministry monitors its activities and investigates any complaints.

10.2.17 Modern developments in logistics and supply chain management are limited in Bangladesh with many shippers largely unaware of their potential benefits. Logistics concepts and practice need updating to replicate findings elsewhere that overt conservatism amongst the traders and investors is threatening much needed FDI. Government procedures, dishonesty, a lack of awareness and infrastructure limitations are greater deterrents to multimodal transport systems than INCOTERMS. To achieve an efficient multimodal system demands a concerted and integrated effort by all parties involved, and will require ongoing research to prioritize and monitor the progress of future developments.

10.2.18 An appropriate and aggressive market promotion policy and research scheme should be implemented. In this policy, disseminating information about the progress of the port activities to the potential users, government agencies, financial institutions, labour unions, political parties, foreign missions in Bangladesh, and the people as a whole is needed. Besides printed materials such as reports, circular letters, magazines, advertisements, arranging conferences, symposiums, visits and talks could be a direct method. Also efforts should be taken to attract cargoes from and to Assam, Tripura, Nepal and Bhutan.

10.2.19 A consolidated port promotion policy is necessary to be adopted. Finally, a clear policy is required to delineate the role of private parties, where, for example, entrepreneurs might propose locations for developing depots or terminals, but government remains responsible for ensuring that the location is appropriate to and accessible by all modes.

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