

AN ANALYSIS OF INLAND WATER TRANSPORTATION IN BANGLADESH: CONNECTIVITY AND INTEGRATION

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ABSTRACT

Historically the development and economy of Bangladesh are highly dependent on the water transportation system. Data collected from Bangladesh Inland Water Transport Authority shows that Bangladesh has 24000km of waterway around the country. But only 5968km of this waterway is navigable in the monsoon and 3865km in the dry season. This paper analyzes two important factors of inland water transportation system in Bangladesh. This paper firstly analyzes the current connectivity scenario of inland water transportation system in Bangladesh by reviewing data from Bangladesh Inland Water Transportation Authority and Bangladesh Inland Water Transportation Corporation and Bangladesh Statistical Year Book-2020. In this paper integration is defined as a factor that identifies the intermodal connection of transport modes. Integration facilities of inland water transportation system is evaluated with respect to data collected from internet, local transport authorities. Integration of freight transportation via inland water transportation is evaluated with respect to EU countries as those countries now adopted intra modal freight transportation. Connectivity via inland transportation system is decreasing day by day as little improvement options are adopted throughout the years. Another main factor which is identified by the paper there is no proper integration between water transportation modes and other modes. Finally, this paper will suggest some probable improvement options for sustainable development.

Keywords: *Inland Water Transportations, connectivity, integration, intermodal transportation, sustainable development.*

1. INTRODUCTION

1.1. Background of the study

Bangladesh is a delta which is formed by the deposition of river sediments. Due to this unique land form process the country is surrounded by many large and small rivers associated with many haors, beels and canals. This opens a doorway to the transportation system of Bangladesh. According to BIWTA Bangladesh has 24000km of waterway around the country. But only 5968km of this waterway is navigable in monsoon and 3865km in dry season (Hossain, Awal and Das, 2014). Bangladesh is a densely populated country. Current population of Bangladesh is 163 million (World Bank,2019). Most this population depends largely on road networks for travelling. This huge pressure on road network creates heavy traffic jam and and causing the loss of almost 300 billion BDT every year (The Financial Express). This heavy amount of traffic causing emission of high amount of CO₂ and the amount is 70% (Alam and Rabbani,2007). As a riverine country there is a huge opportunity to shift a large percent of passenger to inland waterways if the new opportunities are explored. Among all the modes of transportations system waterways are the cheapest mode. It is also traditional in the context of Bangladesh as the Bengali civilization is a river based civilization. Any development in the country is related to it's complicated river system. If the major of the country's transport sector shift towards the inland waterways it will be helpful towards the climate. But there is a problem regarding this mode of transportation system. That is inland water transportation system to operate at full capacity it's needed to be integrated with other modes of transport. In Bangladesh intra modal transport system has not been introduced yet. This study will look for the integration opportunities of inland water transportation system with other modes. Integration is necessary for implementing a sustainable inland water transport system. This study will look into these sectors.

1.2. Objectives of the study

This research study will mainly focus on the present condition of inland water transportation system of Bangladesh. This study will review and evaluate the existing system.

Specifically the main objectives will be:

1. To assess the current condition of inland water transportation network in relation to connectivity.
2. To assess the integration of inland water transportation with other modes.
3. To compare the current situation with some selected countries.
4. To recommend probable improvement options.

1.3. Implication of the study

1. This study will help government authorities to analyze the current condition on connectivity and integration of inland water transport system.
2. This study will pave the way on future research on inland water transportation system.
3. This study will help to implement an integrated and sustainable water transport system in Bangladesh.

2. METHODOLOGY

This study is a review study and based on previous studies, research works, data from government authorities and internet. The main procedure of this study is to review, evaluate and interpret those data from the sources mentioned previously and also to answer the following relevant questions:

1. What is inland water transportation connectivity and how is the current condition of inland water transportation connectivity in Bangladesh?
2. What is integration of transportation modes?
3. What is the current condition of integration of inland water transportation mode with other modes in Bangladesh?
4. How the conditions can be improved?

2.1 Data Collection Procedure

This study is review study so data is collected and evaluated mainly from “previous studies”, “Statistical Yearbook of Bangladesh-2020”, “google maps”, “Bangladesh Inland Water Transport Authority”, “Bangladesh Inland Water Transport Corporation”.

3. RESULTS AND DISCUSSION

3.1 Characteristics of Inland Water Transportation System

Inland water transportation system is different from any other modes of transportation. This is completely natural human just have to utilize natural system. According to (Rosso et-al.,2020) inland water transportation system is defined as freights that is moved on inland waterways such as, canals, rivers and lakes during the whole transportation process of an order or during part of this transportation process. According to (Wiegman et-al.,2015), the transport infrastructures along with waterways facilities, equipment for loading and unloading ships.

There is a unique characteristics of inland water transportation system is it dose not face congestion like railways or roadways (Mircetic et-al., 2017). This inherent characteristics bring reliability to the transportation system whereas in case of roads and railways there are poor very poor reliability in some areas. (Achmadi et-al.,2018) showed that inland water transportation system can also reduce congestion. According to Caris(2014) inland water transportation system is safe and secure, using barges for hazardous cargo is suggested to enhance transport safety both society and cargo owner. Maritime transportation is also labelled as one safest mode of transportation (BVB, 2017). (Mircetic et-al.,2017) also asserts that inland water transportation system is very energy efficient than high volume roadway traffic.

(Medda et-al., 2010) argues that ports are an obstacle to the inland water transportation system. They also raised the question about where a certain port can be set up. A study by Chacko et-al., (2018) asserts that ports suffer from poor hinterland connectivity.

(Wiegman et-al.,2017) points out some important factors regarding inland water transportation system. Such as, inland port and terminal operators, shippers, vessel operators, skippers, truck operators for pre- and end-haulage and logistics service providers.

(Teribar et-al.,2018) discusses about the cos effectiveness of inland water transportation system. Their study concludes that inland water transportation system must be equally cost competitive as roads and railways to become a valid alternative.

Many options should be considered for implementing an inland water transportation system. Apart from the three options discussed above the other most important factors are hinterland connectivity, handling capacity of ports etc. According to BVB inland transport structure is a complex structure.

3.2 Inland Water Transportation System in Bangladesh

Bangladesh is a delta. That is why the country is transit of many large and small rivers to their way to Bay-of-Bengal. The use of inland water transportation system in Bangladesh date backs to the ancient times when trader used the naval routes to reach the main cities of the country. Even after the independence in 1971 the small traders always used inland water transport system for it's cost effectiveness. Flooding threatens almost two-thirds of Bangladesh's land. The majority of the year, most places are submerged for two to five months. As a consequence, road and railway construction and maintenance expenses are considerable. Inland water transport, on the other hand, has always been a natural and generally inexpensive mode of transportation. It is the sole form of transportation in certain places. The overall length of the country's waterways (700 rivers) is roughly 13,000 km, including unclassified channels. In the wet season, 8,433 km are navigable by bigger boats (5,968 km

are designated for navigation), whereas around 4,800 km are accessible in the dry season (classified 3,865 km). The Bangladesh inland water transport authority (BIWTA) divides inland navigable waterway routes into four categories: ' Class-I: There are four trunk routes in this category (depth 3.66 m - 3.96m, length about 683 km) - Dhaka-Chowkighata-Chandpur-Shambhupura-Narayanganj; Shambhupura-Demra; Shambhupura-Bhairab Bazar/Ashuganj; and Chowkighata-Barisal-Mongla-Khulna-Maheswarpasha; Class-II: Eight connection routes (depth 1.83m - 3.65m, length about 1,000 km) - Mohanpur-Daikhawa, Bhairab Bazar-Chhatak, Chalna-Raimongal, Hijla-Saistabad, Satnal-Daudkandi, Chittagong-Bazar, Cox's Diara-Barisal via Nandir Bazar, and Chandpur-Ichuli; Class III: Twelve subsidiary routes (depth 0.91m-1.82m, length about 1,905 km) -Dilalpur-Fenchuganj-Zakiganj; Chittagong-Kaptai; Rangamati-Kaptai; Kaptai-Belaichari; Rangamati-Chotohorina; Rangamati-Mahalchari; Rangamati-Marisha; Sripur (Bhola)-Nazirpur-Char Montaz; Jhalakati-Barguna-Patharghata; (depth less than 0.91m, length about 2,380 km). Aside from the aforementioned, there are other unclassified routes. The country-boat industry uses the majority of these routes.

3.3 Operational Inland Water Routes in Bangladesh

From the earlier discussion of this study, Bangladesh has 5968km of navigable waterway available during the monsoon season (Awal et-al.,2013). The whole route is connected by some large and small river ports with the main sea-ports. From the collected the naval connectivity of Bangladesh is 25% to 16% of total waterways available (BIWTA). This finding is an indicator that waterways in Bangladesh are not properly utilized. Bangladesh is mainly centered to the country's capital city of Dhaka. Major portion of passenger transport through inland waterways mainly originate from Dhaka and destined to the southern, south-eastern and south-western part of the country. Sadarghat is the busiest river port in Bangladesh. From Sadarghat a passenger can travel to 45 destination by using inland transportation system (Wikipidea).

Apart from Sadarghat Dhaka there are some major origins for inland water transportation routes in Bangladesh. Such as, Narayanganj, Barishal in the southern part of the country and Chandpur in the south-eastern part of the country. These routes share the major portion of passenger transportation through inland water routes. There are some routes that are mainly used for freight transportation. Such as Mirkadim, Baghabari, Bhairab. A huge portion freight is carried by Sadarghat, Dhaka also.

Looking into the hinterland connectivity, no formal active route has been found. As stated earlier, most of the village in Bangladesh is situated beside a river, lake, haor, beel etc. Historically village people use those inland waterways for shorter distance. But, these areas are not connected with major ports.

In conclusion, existing water route connectivity can only carry small amount of passengers and freights, which is not sustainable.

3.4 Analysis of Existing Water Routes Connectivity in Bangladesh

Connectivity is analyzed with respect to some parameters. These parameters are described below:

3.4.1 Analysis of Passenger Transportation

Data collected from BIWTA (2010-2016) shows a downward trend of passenger movement through inland water transportation system. In 2012, ten major river ports carried 9.76% passenger whereas the percentage falls to 4.17% in 2016. The reason for this downward trend can not be categorized into one single factor. Hossain, Awal, Zubair (2014) showed that accident in waterways is increasing day by day. Poor quality of vehicles, poor service, mismanagement overall no proper planning on connecting possible water routes and utilizing these system leads to the downward trend. It is evident that at present, inland water transportation system need immediate attention to increase connectivity and passenger service.

3.4.2 Analysis of Freight Transportation

Similar to the passenger transportation through inland water transportation system freight transport has also experienced a downward trend. Freight transportation need exact connectivity and proper integration with other modes of transportation also.

3.4.3 Vehicle condition and Passenger Service

As there is very little infrastructure development regarding inland water transport service, vehicle quality is falling day by day. The quality of vehicles also affects connectivity as comfort is one of the requirements for the users. Passengers want comfort and security. A well maintained vehicle can ensure both whereas poor, low quality vehicles are very prone to accident. In case of freight carriers, conditions are almost same. Owners have to frequently incur losses due to accident.

3.4.4 Absence of Proper Integration:

This parameter will be discussed in next chapter of this study.

3.5 Analysis of Integration of Inland Water Transport With Other Modes

3.5.1 Introduction to Integration

Integrated transport system is a modern day need for sustainable development. Inland water transportation system is not sustainable to the users without proper integration with other modes of transportation. In Bangladesh, proper integration of transport modes is necessary. Modern world is now trying to adopt fully integrated transport system. Integrated transport system will allow the users to make the choice of mode more efficiently. It will be also very much cost effective.

Isolated transportation system is also difficult for authorities to monitor. In isolated transportation system there will be a need for independent authority for each mode. Whereas in an integrated system it will be very easy for the authority inspect the whole system as one. Modal choice for the consumers depends on various factors. Such as: time, cost, comfort, accessibility, mobility, safety etc. For ensuring better mobility and accessibility, integration is required among the modes of transportation. Lack of integration is a major complaint of the users since the dawn of modern transportation system. If we look the situation of Bangladesh a person from Barishal has to use at least two modes of transportation if the person want to reach Gazipur, Mymensingh. But lack of integration among modes increase the haphazard for the passenger.

According to world-bank, integration means modifying the various parts to minimize route duplication and transfer requirements. It also states that all routes should be operational during the same hours. Network integration is the process of changing the parts of the network so that there aren't as many routes and transfer needs. An integration of schedules means that all routes that go to the same stop or terminal are running at the same time. This way, no one is left "stranded." Coordination is especially important for routes that connect at the same transfer station but aren't used very often.

3.5.2 Integration: Bangladesh Scenario

Bangladesh is spending huge on public transport. But, all this expenditure are in a single mode at a time. In Bangladesh, there is more than one independent authorities for every possible modes of transportation. For example, inland waterways are controlled by "Bangladesh Inland Water Transport Authority" and "Bangladesh Inland Water Transport Corporation". An authority is not a simple structure. An authority is controlled by bureaucratic structure. So, it is very difficult to integrate two authorities easily. In case of Bangladesh, integration among the transport authorities is necessary before integrating the modes. This paper will evaluate the integration among modes.

3.5.3 Evaluation of Intergation with Respect to EU countries

European policy makers addresses the need to integrate waterway transport with other modes to build up an inter-modal supply chain.(European Commission, 2011). Hesse et-al, 2004 points out the idea of integrated demand for freight transportation. European countries are now considering inland water transportation system as a whole part of integrated transport system. Data collected from <https://www.rome2rio.com/s/Germany/Calais-Ferry-Port> shows that railways, roadways and airways are integrated to Calais Ferry Terminal Port, France. This shows the sign of integration in European countries. In Bangladesh this type of integration is absent. As all the modes are operated by different authorities they are not operating the system with any co-ordination.

3.6 Integration between road network and inland waterways

In Bangladesh road transportation is controlled by Bangladesh Road Transport Authority (BRTA) and Bangladesh Road Transport Corporation. But there is a fact that public transport service is controlled by private bus owners and local syndicates. This mismatch in authorization resulted in discord. As the local syndicates and owners operate the bus service at their will it is very difficult to authorize them properly. Even the road transport authority is unable to control the whole bus traffic system.

In case of inland water transportation the scenario is pretty much similar to the to the bus network. Though, BIWTA is the authority but most of the vehicles are operated by private owners and syndicates. The result is similar like the bus service. No proper timing, unavailability of vehicles, poor service etc. The system in Bangladesh is not suitable for integration between these two modes of transportation. Most of the river ports in Bangladesh are not associated with any dedicated bus terminal so that passenger can get on a bus after getting down from the launch or ferry.

Table 4.1 show the distance of dedicated bus stop from Sadarghat Dhaka.

Dedicated Bus Stop	Distance from Sadarghat Dhaka(in km)
Sutrapur	2.7
Katherpul Mor	1.9
Murgitola	1.2
Doyaganj Mor	2.4
Babu Bazar	4.0
Gulistan	2.2

From the table it is shown that ports and bus stops are not very far from each other but the timings of bus and launch, ferries are not aligned. This situation is same for the whole country.

3.7 Integration between railways and waterways

Bangladesh has total 3600 kilometers of railway network operated by Bangladesh Railway.(Wikipedia, Bangladesh Railway. Situation is same in case of integration as the roadways. The operating system of Bangladesh Railway and Bangladesh Inland Water Transport Authorities are completely different. Trains in bd are completely run under government control whereas launches, ferries and other public water vehicles runs of private ownership. So, proper integration opportunity is also absent here,

3.8 Probable improvement options

For sustainable development Bangladesh must step up fast to build up a sustainable transport network. Waterway transportation is very much cost effective and environment friendly.(Inland Waterways:Positive Impact on Economy, Debashis Mullick). Developing the connectivity by inland waterways can also build a well developed regional business network in South Asia.(Inland Waterways:Positive Impact on Economy, Debashis Mullick). The government of India now trying to build inland waterway network for developing cost effective transportation system.(Economic times, Indiatimes). Bangladesh can revive the canals, dead rivers to build up more inland waterway networks. Specially the vast river network from Kurigram to Teknaf can be used to build up a network which can also be used for tourism. There are many ports in Bangladesh are not operational

right now such as: Chilmari Port. Making these ports operational again can add significant milestone for developing inland waterway transport connectivity.

For developing integration between modes many research challenges are necessary. An Caris et al.,(2014) suggests that analyzing transport geography, productivity, relationship between stakeholders are necessary for developing integrated inland waterway transport system. In case of Bangladesh integration between bus service and waterway transport can be easily done as their system operation is same. Both of the transport modes are regulated by government authorities but operated under public ownership.

Xiangru Meng (2018) suggests that joint supervision of multiple departments, establishment of policy system management mechanism is important for integrating railways and waterways. Common information sharing platform between railways and waterways, common customer service platform, development of freight invoice information is necessary for integrating railways and waterways.(Xiangru Meng, 2018)

Bangladesh should look forward fast to develop an integrated inland water way transport system.

4. CONCLUSION

In this study, present condition of inland water transportation system in Bangladesh is briefly analysed in terms of connectivity and integration with other modes. Bangladesh has a huge river network which can be efficiently use to develop more connectivity. In this study present scenario of inland water transport connectivity in Bangladesh is described and assessed. This evaluation also show the need for developing inland water transport connectivity in Bangladesh. The study also show the overall characteristics of inland water transport connectivity and evaluation of these characteristics with respect to Bangladesh scenario. This evaluation concludes that condition of inland waterway connectivity in Bangladesh is very poor and need more development. In the next part of this study integration of inland waterways with other modes of transport is also analysed and evaluated with respect to European countries. This study showed the lack of coordination among transport authorities of Bangladesh. This study also pointed out some reasons for absence of proper integration. Finally, this study suggested some probable improvement options. This study also pointed out some improvement options which were taken by other countries. In conclusion inland water way connectivity and integration with other modes should more analysed for future development.

REFERENCES

- Awal, Hossain and Das (2014). A Study on the Accidents of Inland Water Transport in Bangladesh: The Transportation System and Contact Type Accident. (1-2). www.researchgate.com
- Alam, M., and M. G. Rabbani. 2007. "Vulnerabilities and responses to climate change for Dhaka." *Environment and Urbanization* 19: 81–97.
- An Caris, Sabine Limbourg, Cathy Macharis, Tom Van Lier, Mario Cools(2014), Integration of inland waterway transport in the intermodal supply chain: a taxonomy of research challenges, www.researchgate.com
- Ahasan, R., & Kabir, A. (2021). Performance Evaluation of Public Transportation System: Analyzing the Case of Dhaka, Bangladesh. *Planning Forum*, 18. Retrieved from: <https://sites.utexas.edu/planningforum/article-3-performance-evaluation-of-public-transportation-system-analyzing-the-case-of-dhaka-ban>
- Achmadi, T., Nur, H.I. and Rahmadhon, L.R. (2018) Analysis of Inland Waterways Transport for Container Shipping: Cikarang to Port of Tanjung Priok. www.researchgate.com
- Baroud, H., Barker, K., Ramirez-Marquez, J. E., and Rocco S., C. M. (2014) Importance Measures for Inland Waterway Network Resilience. www.researchgate.com
- Banglapedia, Article on Water Transport, Website: https://en.banglapedia.org/index.php/Water_Transport

- Bureau Voorlichting Binnenvaart, BVB (2017) The power of inland navigation: The future of freight transport and inland navigation in Europe. Rotterdam: Veenman.
- Bangladesh Regional Waterway Transport Project 1, Environmental and Social Impact Assessment, BIWTA.
- Bangladesh Inland Water Transport Authority, Bangladesh Regional Waterway Project 1.
- Chacko, S., Dinwoodie, J. and Pandian, S. (2018) Promoting waterborne transportation for better sustainable freight movements in the south west UK
- Hesse, M., Rodrigue, J.P., 2004, The Transport Geography of Logistic and Freight Distribution. J. Transp. Geography, 12,171-184
- Inland Waterways: Positive Impact on Economy, Debashis Mullick,
<https://www.sasec.asia/index.php?page=news&nid=1118&url=inland-waterways-positive-impact&enews=74>
- Medda, F. and Trujillo, L. (2010) Short-sea shipping: an analysis of its determinants. Maritime Policy & Management, 37 (3), pp. 285-303.
- Mircetic, D., Nikolicic, S., Bojic, S. and Maslaric, M. (2017) Identifying the barriers for development of inland waterways transport: a case study. MATEC Web Of Conferences, 134, pp. 1-6.
- Rosso, Vural, Abrahamson, Engstrom, Rgerson, Santen(2020), Drivers and Barriers of Inland Waterway Transport, https://journal.oscm-forum.org/journal/journal/download/20200715173532_Paper_8_Vol._13_No._4,_2020_.pdf
- Tap potential of inland waterway transport to achieve a cost effective mode of transport, The Economic Times, Editorials, July 2, 2015.
- Treiber, A. and Bark, P. (2018) Förutsättningar för ökad inlandsvattnensjöfart i sjöar, skärgårdar och kustområden. TFK.
- Wiegmans, B. and Konings, R. (2015) Intermodal Inland Waterway Transport: Modelling Conditions Influencing Its Cost Competitiveness. Asian Journal of Shipping and Logistics, 31(2), pp. 293-294
- Xiangru Meng 2018 IOP Conf. Ser.: Earth Environ. Sci. 189 062074