

Rabnabad Channel Dredging project: Challenges and Prospects

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Abstract:

The Port Payra is the third seaport of the maritime nation Bangladesh and Rabnabad Channel is the main entrance to it. The 4Km long navigational channel which is connected to the Bay of Bengal will contribute to the immense progress and economic development of this maritime country by building up a strong network, connectivity, and in many other ways. The boom in the economy of Bangladesh largely depends on the development of this river channel, and it is essential to maintain the river channel depth through dredging for the smooth movement of the vessels to the port. Dredging in Bangladesh has been a continuous process as Bangladeshi rivers carry a considerable amount of sediments all year-round. The dredging process involves carrying out excavation, removing naturally deposited sediments or debris such as rocks, bottom sediments, construction debris, refuse, etc., to create adequate space for the transportation of vessels. The PPA (Payra Port Authority), and Belgian company Jan de Nul have agreed to dredge a 75km stretch of the channel, assuring a draft of 10.5 meters that would allow entry and anchoring of ships having a carrying capacity of up to 55,000 tons and also to maintain a certain depth that is safe for navigation. This study seeks to figure out the impact of the Rabnabad Channel Dredging Project on the economy, explore its prospects and identify the challenges faced by the project. It also seeks to find out the economic, social, and environmental sustainability of the project. This study has a qualitative approach that depended on data collected from secondary sources. Moreover, the study also gives an overview of the Rabnabad Channel dredging project and makes a recommendation for dealing with the challenges.

Keywords: Rabnabad Channel, Dredging, Payra Port

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1. Introduction

Bangladesh is a riverine country having about 700 rivers flowing through the whole country (B Laxamiah et al.; 2021). Rivers are the wealth of our country. They function as the essential supply of water for irrigation, cultivation, producing electricity, and the principal arteries of economic transportation (Sandra Postel et al.; 2003). Bangladesh has a great potential to boom its economy by facilitating international trade and commerce (Redwan Ahmed, 2012), which largely depends on the location advantage and operational capabilities of its rivers and seaports (Anis Mohammad Tareq, et al.; 2020). Rivers and ports are connected interdependently (Justin Berli, 2018). Ports play a vital role in the economic development and GDP growth of a country (G.S. Dwarakish et al.; 2015). Every 10% development of a port throughput may generate a 6–20% increase in the GDP of that region (Samsul Mannan et al.; 2021).

Being a riverine country, the ports of Bangladesh are dependent on the rivers. The Payra Port, the third seaport of Bangladesh, is located on the Rabnabad river channel bank (Samsul Mannan; 2020). The Rabnabad river channel is the only main channel through which the vessels enter the Payra port (The Financial Express; 2021). This river channel plays a significant role in maintaining the smooth movement of the small and medium-sized vessels. The Payra port can play an essential role in achieving Bangladesh's SDGs (Sustainable Development Goals) by 2030 (Tuhin Ahmed et al.; 2017). So, the boom in the economy of Bangladesh largely depends on the development of this river channel (Razon Chandra Saha; 2015), and it is essential to maintain the river channel depth through dredging for movement of the vessels to the port.

Dredging in Bangladesh is a continuous process as Bangladeshi rivers carry a considerable amount of sediments all year-round (The Business Report; 2021). The dredging process involves carrying out excavation, removing naturally deposited sediments or debris such as rocks, bottom sediments, construction debris, refuse, etc., to create adequate space for the transportation of vessels (S.K Jain, et al.; .2003). Dredging implies digging up and removing sediments from the seabed and maintaining the appropriate width and depth for enabling the safe, unobstructed passage of cargo vessels containing coal, oil, raw materials, and other essential commodities. The dredging process mainly includes widening and deepening the waterway, waterway maintenance for ships, excavation, reconfiguration of larger ships, shore replenishment (Anish; 2020). Sedimentation reduces water depth in the river and navigation channels, thus obstructing the movement of the vessels. To maintain the proper movement of the vessels through the channel removing sedimentation through dredging is necessary (Moien Mojabi et al.; 2010). The Rabnabad river channel is near the Bay of Bengal,

which has high sedimentation, so continuous dredging is necessary for removing the sediments from the surface and maintaining the draft of the channel (Newagebd; 2019).

So, to handle this problem, the PPA (Payra Port Authority), and Belgian company Jan de Nul have made an agreement to dredge a 75km stretch of the channel, assuring a draft of 10.5 meters that would allow entry and anchoring of ships having a carrying capacity up to 55,000 tonnes and also to maintain a certain depth that is safe for navigation (The Business Standard; 2021). The dredging of this long channel is set to be completed in three phases (The Business Standard; 2021).

This study aims to discover the Rabnabad Channel Dredging Project's challenges, impacts & prospects through secondary data analysis. It also seeks to find out the economic impact and the sustainability of the project.

2. Background

The Payra seaport is the 3rd seaport of Bangladesh located approximately between latitude 21°15'-22°00' north and longitude 90°00'-90°39' east of the bank of Rabnabad Channel within Kalapara, a sub-district of Patuakhali (PPPA; 2020). The Rabnabad river channel is located within the Meghna body of water at Tetulia stream in Patuakhali near the Bay of Bengal. (Fig:1) The location is around 270km from the Chattogram Port and 90km from the Mongla Port (The Business Standard; 2021). To increase the commercial operations in the center zone and fulfill the future demand, Payra Port Authority Act 2013 was passed in the National Parliament on 10 November 2013 (The Daily Star; 2015). The geographical position of the Rabnabad river channel falls between 21°52'37" North latitude and 90°16'55" East longitude (approx.) (Md. Bokthier Rahman, et al;2015). The Rabnabad river channel is the only main channel through which the vessels enter the Payra port (The Daily Star; 2021). The site was chosen on the consideration that it offers suitable land along the channel with an average height of two meters above sea level. The land does not get flooded during the monsoon as it is well-connected by road and river networks (The Business Report; 2021).

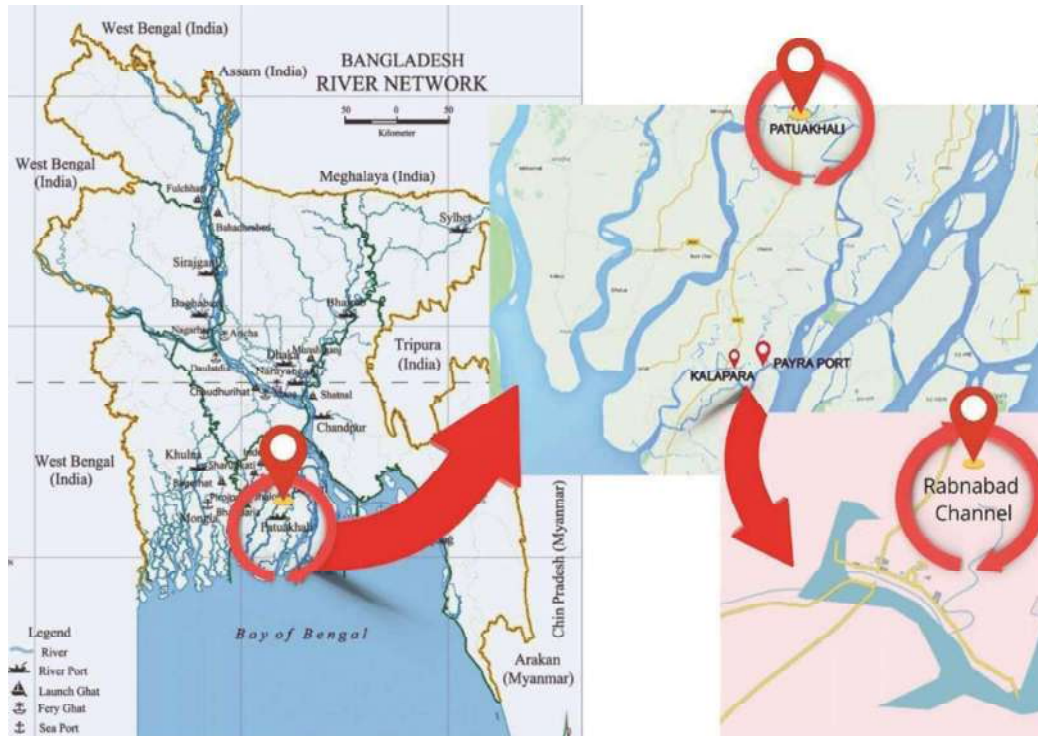


Figure 1: Geographical location of Rabnabad channel

The Payra Sea Port has an almost 75 Km long inner channel which has enough water depth for berthing the deep draught vessels but the lengthy outside channel is too shallow for port operation and a designed canal needs to be dredged and maintained to a particular level that is safe for passage. As such, capital and maintenance dredging of the Rabnabad Channel are key components for extending the Payra Sea Port (PPA; 2020). So, to handle this, the PPA (Payra Port Authority) and Belgian company Jan de Nul have agreed to dredge a 75km stretch of the channel, assuring a draft of 10.5 meters.

Jan De Nul Group, a Belgian company, headquartered in Luxembourg, is engaged largely in the infrastructure industry. The firm has operations in Belgium, which include Canal, Waterways, Construction Contractor Company, Dredging, and Industrial Services (The Financial Express; 2020). For many years, Jan De Nul has been implementing big PPP contracts in Europe and South America, remarked by David Jonckheere, Area Manager of Jan De Nul Group. The firm delivers these sorts of projects and aid public authorities in improving local infrastructure which is frequently important for the country's economic growth (Chronicle. lu ; 2019). The Cabinet Committee on Economic Affairs, Finance Minister AHM Mustafa Kamal approved

dredging of Rabnabad channel of Payra seaport by Belgium-based company Jan De Nul on 28 October 2019 (The Business Standard; 2020, The Financial Express; 2020).

The Belgian Company Jan De Nul holds two dredging contracts with the government. The firm concluded its first contract for capital dredging in the canal to make a draft of 6.3 meters to facilitate the transit of coal-carrying boats for the 1,320MW Payra Coal Thermal Power Project. The second contract is for the preservation of that 10.5m drafts by capital dredging (The Business Standard; 2020). They will dredge both the inner and outer bar of the port to make it navigable for large ships, (The Financial Express; 2019). After dredging, the depth and width of this channel will be increased. The channel's width will be 100-125m and the depth will be 10.5m that will allow entry and anchor vessels having a cargo-carrying capacity of 40,000 tons (during low tide) to 55,000 tonnes (during high tide) (The Business Standard; 2021).

The project involves a cost of Tk 4,950 crore. The government has earlier negotiated a Public-Private Partnership (PPP) contract worth Tk11,000 crore with Jan de Nul. But the corporation was having issues in securing cash on its own. Meanwhile, the government amended its plan and decided to downgrade the deep-sea port project to a standard seaport project and fund the capital dredging work by the newly founded Bangladesh Infrastructure Development Fund (BIDF). This decision has lowered the project cost by 53 percent. Accordingly, the port side has been relocated from its original offshore location by 65 kilometers to an onshore location at the mouth of the Rabnabad channel (The Financial Express;2021).

There are 3 specific objectives of this dredging project declared by the PPPA authority (PPPA website):

1. To develop (design and dredge) and for a specific time maintain nautical access to Payra Port.
2. To evaluate the rate of siltation for all dredged regions using field measurements and state of- the art models.
3. To develop a maintenance plan for all dredged areas including disposal and must implement that strategic plan in accordance.

For the capital dredging operations, Jan De Nul will deploy up to nine dredgers from its fleet, among which some are the most powerful Cutter Suction Dredgers in the world. The firm has already dispatched three of its Trailing Suction Hopper Dredgers — the Bougainville, Diogo Cao and Tristao da Cunha – to carry out the operation (The Business Standard; 2021). Two of the three Trailing Suction Hopper Dredgers are so-called ultra-low emission hopper dredgers. These containers are fitted with an innovative method of filtering that filters or eliminates harmful elements from exhaust fumes. (Ibid) Wim Van Dyck, project Manager of its Bangladesh branch, reported, "In a world of climate change, and overall environmental consciousness, Jan De Nul Group

has chosen to equip its latest generation of dredging vessels with an ingenious system of filtering to remove or eliminate the toxic substance from exhaust gases” (Ibid).

Under this arrangement, Jan De Nul Group pledges itself to train the personnel of Payra Port Authority. Local personnel will get experience in managing and conducting offshore dredging activities. They will be able to go on-site and gain practical experience which will make this training highly effective. This will also create jobs (JanDeNul News;2019).

3. Literature Review

Tuhin Ahmed, Md. Akramuzzaman Shaikh and Shahedul Islam (2017) in their paper titled "Development of a new seaport and its strategic factor analysis: A case study", highlighted the strategic and operational factors of the Payra Sea Port, and its political influences and internal competitive environment,” (Tuhin Ahmed, et al; 2017). In the study, the researcher has also made some statements about SWOT Analysis and PEST Analysis of Payra Sea Port and focused on the economic development through the port.

Md. Bokthier Rahman, Md. Sazedul Hoque and Md. Mahmudul Hasan (2015), discussed the fishing gears and their effects on fisheries diversity of Rabnabad Channel of Patuakhali District of Bangladesh, (Md. Bokthier Rahman, et al; 2015). The researcher also remarked on the fishing diversity and conservation of aquatic resources as well as the aquatic life of the Rabnabad channel. But the study did not focus on the Rabnabad Channel Dredging Project.

A study was also conducted on the nearby site of Rabnabad Channel by Wang Lixue, Shaikh Abdullah Al Mamun Hossain, A. K. M. Adham et al., (2017) in the article titled, "Utility of River Training Structures and Present Status in Patuakhali District Bangladesh." The authors explained the utility of river training structures, coastal environment, and current condition of the Patuakhali district. This research aimed to know the effectiveness of river training structures, regulating hydro-morphological features, socio-economic advantages of people, and present status of the area based on utility of structures, environmental and social benefits by spot visit, face to face interview, and focus group discussion methods. (Wang Lixue, et al; 2017)

M. R. Hasan, S M Rahmatullah, Atiqur Rahman, et al. (2014), in their paper titled, “A Study on the Catch Composition of Set Bag Net Used in the Rabnabad River, Patuakhali District (in Bangladesh)” focused on the set bag net (Behundi Jal) fishery and species composition of set bag net in the Rabnabad River close to the Galachipa Upazila of Patuakhali district. The importance of the Rabnabad river for the fishing diversity is also discussed in the study (M. R. Hasan, et al; 2014). This study was conducted before the dredging project.

DLCA (Digital Logistics Capacity Assessments) researched the Payra Port of Bangladesh (DLCA Report No 2.1.3). The report has notable information about Payra

Port and it also highlights port facilities and infrastructure. But the report did not contain much information about the Rabnabad channel dredging project. The report's data is based on the PPA annual report (DLCA Report No 2.1.3).

There is an EIA (Environmental Impact Assessment) report on Payra 1320 MW Thermal Power Plant Project that was prepared for Bangladesh-China Power Company (Pvt.) Limited (A Joint Venture company of CMC AND NWPGL). The report highlighted the "Payra 1320 MW Coal Thermal Power Plant Project" and also the environmental issues related to the power plant. The purpose of the plant was to obtain an Environmental Clearance Certificate from the DoE (EIA Report-EQMS; 2015). The report didn't highlight the Rabnabad Channel Dredging Project, rather focused mostly on the environment, fishing, and farming.

Another study, titled, "Environmental Impact Assessment of Payra Port.", was conducted by Capt. Samsul Mannan (2020) on the environmental impact assessment of Payra Port. The study focused on the environmental factors, fisheries, and farming near Payra Port (Capt. Samsul Mannan; 2020).

German Scientist Hermann Kudras gave his opinion about Payra Port and mentioned the challenges and sedimentation problems related to the Payra seaport. He also pointed out that the port has no natural access from the deep sea, therefore, it is a challenge of its nature to make Payra a deep seaport. According to him, the channel will need continuous dredging every year and it will be costly (Hermann Kudras; 2017).

Bangladesh has unique geography concerning rivers and their sediments, proper caution is essential before jumping into big scale dredging of rivers Moinuddin Kadir (2018), conducted a study on dredging in rivers of Bangladesh, the scientific and legal elements of both positive and negative impacts of dredging of rivers in Bangladesh. He talked about the necessity of dredging to make the rivers navigable and keep the production of sands adequate, proper use of the rivers in navigation, to produce enough sand to its potential and to prevent the devastation of flood and also recommended some regarding legislative steps for environmentalist activism, scientific exploration and popular attention on the dredging operations. The analysis of this article indicates that Bangladesh is not yet ready for such big-scale dredging without having an impact on the rivers' internal environment (Mohiuddin Kadir; 2018). His article did not mention the Rabnabad channel or its dredging project.

The Rabnabad Channel Dredging Project will have a huge impact on the development of Payra Sea Port as well as meeting the economic advancement of Bangladesh (The Daily Star; 2020). But no specific research study has been conducted on the Rabnabad Channel Dredging Project till now. And here lies the importance of this study. Most of the information of this study is collected based on the government data, trusted and renowned newspapers, reports, articles of a home and abroad. Hence, this study has significant importance especially to the PPA authority, researchers, and policymakers.

4. Methodology

The study applied secondary data analysis to discover the Rabnabad Channel Dredging Project's challenges, impacts & prospects. It also investigates the trends in some variables through descriptive statistics and graphical examination.

This study is a qualitative research based on the syntheses of secondary data. Qualitative research explores phenomena to discover meaning through descriptive and interpretive approaches. (Leah East & Kath Peters; 2019) It is a process of naturalistic inquiry that seeks an in-depth understanding of social phenomena within their natural setting and seeks to justify underlying reasons, opinions, and motivations (Rebecca Drury, K. Homewood, Sara Randall;2011). To collect secondary data, different policy documents, scholarly articles, books related to Payara port, Payra port development projects, Rabnabad Channel Dredging project, channel dredging, etc., and various government websites were reviewed. Besides, data from various web and news portals were also consulted. Google Scholar, ScienceDirect, ProQuest, and some other websites were utilized to search for papers. Around 246 scholarly articles and book chapters, 53 websites, and news articles, were consulted to collect and analyze data. The search was performed on 1 June 2021.

For secondary data analysis, the content analysis method was used. It is a research tool for interpreting and understanding the inner meaning of the textual material, articles, and graphics (Md. Mostafa Shamsuzzaman & M. Mahmudul Islam; 2018). Which helped to understand the inner meaning and the gist of various documents, and reports.

Statistical data were analyzed and graphs were made using Microsoft Excel.

This study was conducted during the pandemic, therefore, there are some limitations of this study as reaching out to the people was tough to get the current data and pieces of information. Figure 2 indicates the procedure of this study.

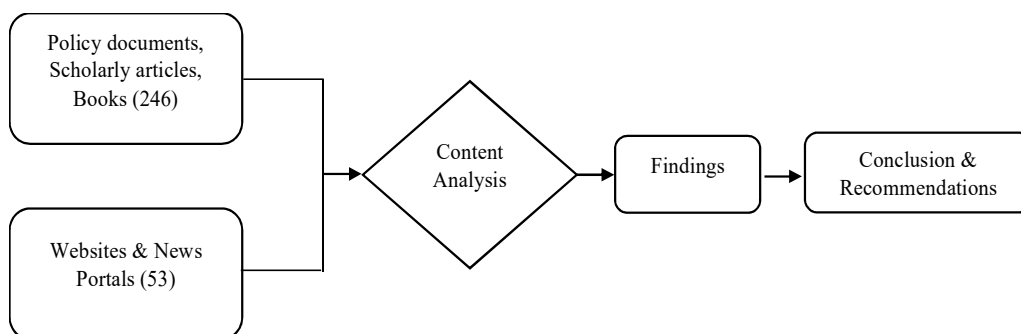


Figure 2: Research Method

5. Challenges of Militating Against Rabnabad Channel Dredging project

5.1 Huge amounts of sediment have to be continuously removed

Almost 100 million cubic meters of sediment are transported from the Meghna estuary. (Hermann Kudras; 2017). The Swatch of No Ground funnels the vast majority of current sediments. (James M. Coleman;1969). Overall sediment flows throughout the Meghna estuary to the Swatch of No Ground (Steven A. Kuehl, et al; 1989). In Patuakhali, the Rabnabad channel is located in the Meghna estuary of the River Tentulia (The Business Standard; 2021). A massive amount of sediment of more than 100 million cubic meters of sediment has to be removed from the Rabnabad channel (Herman Kudras; 2017) and to keep the payra port usable, continuous removal of sediments would be required (Newagebd; 2019). At the same time, a considerable percentage of this sediment load will be retained in the deeper areas of the navigational channel and tidal currents will continually transport material from both sides into the artificial channel restoring the equilibrium surface (Hermann Kudras; 2017).

5.2 Increasing dredging cost

Sedimentation is the process of soil particles being eroded and carried by running water or other carrying media, then deposited as layers of solid particles in water bodies like reservoirs and rivers (Colleta Tundu, et al; 2019). Dredging is the removal of sediments from rivers or reservoirs. Dredging is often used to maintain or increase the depth of navigation channels, anchorages, or berthing places so that boats and ships may pass safely (BIWTA report, 2016). The dredging expenses are tremendous (Mintnews; 2008). And in Rabnabad channel 100 million cubic meters of sediment has to be removed which would increase the cost of dredging (Hermann Kudras; 2017) because to keep Payra port usable, continuous removal of sediments will be required (EIA report; 2015). As a result, continuous dredging will increase the cost.

5.3 Impact on Aquatic biodiversity

The dredging procedure destroys the aquatic life in the riverbed and a consequence of such procedure in the long-term, rivers might start generating species considerably more distinct than current time (Moinuddin Kadir; 2018). During dredging projects, noise, suspended sediment, hydraulic entrainment, and pollutant discharge have distinct influences on fish (Amelia S. Wenger, et al; 2017). The disruption caused by underwater dredging mixes freshwater with silted materials, and the mixed water travels downstream for a considerable distance from the place of dredging which makes it more difficult to gather fresh water from rivers (Moinuddin Kadir; 2018). Rabnabad marine channel is full of plentiful aquatic resources where are 54 species of fish (Md. Bokthier Rahman, et al; 2015). Many fish species rely on constructed habitats and the

loss of natural habitat made by dredging projects will be unsuitable for fishes (The Daily Star; 2016). Moreover, dredging also causes some more short-term effects on aquatic species (Moinuddin Kadir; 2018).

5.4 Currently mother vessels cannot enter the channel

Based on the Range of Services there are two types of ships which are mother vessels and feeder vessels (Marine Insight; 2021). Mother vessels are significantly bigger ships which are often above 10000 TEU capacity and these ships cannot gain entry in smaller ports due to their huge draft and overall size, on the other hand, feeder's vessels are LILo (Liner In / Liner Out) type which operates between the major and minor container terminals, transporting containers to and from the mother ships (Marine Insight; 2021). The size of container ships has been expanding at a quicker pace than all other ship categories and the average container ship size increase (in deadweight tons) between 1996-2015 was 90 percent, this was 55 percent for bulk carriers and 21 percent for tankers (The Impact of Mega-Ships OECD; 2015). Nowadays, the highly competitive markets are seeking ocean carriers and container carriers, because they reduce cost and provide greater quality of service which larger ships can meet (Capt. Sherif Helmy, et al; 2016). Larger ships have advantages in terms of investment, fuel consumption, crews, operating costs, etc than smaller ships (Ibid). For Larger ship capacities, deeper drafts are required (Jean-Paul Rodrigue,2020). The average draft is 8.3 meters for 1,000 TEU containerships and ships above 14,000 TEU require 16 meters draft (Jean-Paul Rodrigue; 2020).

From 2013 to 2018, about 27 ships arrived at Payra port (Dhaka Tribune; 2019). The Payra port project was downgraded for less draft and other geographical conditions, which means Payra port can't handle any mother vessels, currently (The Business Standard; 2021). They will only handle small and medium-sized vessels like the ones handled by the Chattogram and Mongla ports (The Business Standard; 2021).

However, such projects of this nature always have some element of risk and our financial situation allows that very well. Under Mid Term Plan, by 2024 Govt is planning to operate payra port with at least one multipurpose and one bulk terminal where deep draught vessel with up to 12 m can berth safely. Under the Long-Term Plan, by 2030 the port would be fully operational with a 16 m channel. (PPA Website) This will reduce the challenge to a large extent.

5.5 Natural disasters (Cyclone)

Natural hazards produced by geological or meteorological disturbances are mostly coastal areas (Irin Hossain, et al; 2020). Bangladesh suffers a lot from catastrophic tropical cyclones often, due to its unusual geographic location, (Irin Hossain, et al; 2020). Out of 508 cyclones that formed in the Bay of Bengal, 17% of them made their

landfall in Bangladesh over the last 100 years (Manik Kumar Saha, et al; 2014). As the Rabnabad channel is connected to the Bay of Bengal, cyclones would cause the largest damage to the port as they mobilize silt and move it seaward, (Newagebd; 2019). Which may cause huge problems for dredging and other activities.

5.6 Risk of damaging Hilsa production

Hilsa is one of the most economically valuable fish species in South Asian countries (Amiya Kumar Sahoo, et al; 2016). Bangladesh has achieved a Geographical Indication (GI) Registration Certificate for fish hilsa. More than 1.15 percent of Bangladesh's GDP relies from hilsa production (Shafiqul Islam; 2018). In 2018-2019 production of Ilish was 3 lakh 41 thousand 119 tons (The Daily Star; 2020). Hilsa breeds mostly in rivers and, the major breeding season being during the southwest monsoon, and also during a shorter season, from January through February or March (BOBLME; 2015). Dredging activities in the Lower Meghna may particularly damage the hilsa if they are conducted out during its spawning season of March -April, and October-November (BIWTA; 2016). Dredging has huge effects on fish especially during reproduction (Moinuddin Kadir; 2018). Among 54 species of fishes (in the Rabnabad channel) Hilsa is one of them (Md. Bokthier Rahman, et al; 2015) and as they breed in rivers dredging can massively harm the production of Hilsa.

5.7 Chance of river erosion and excessive sedimentation

Dredging rivers is highly popular and frequently done in Bangladesh to gather filling and building materials, however sometimes it has negative effects on riverbed, bank, and nearby regions (Md Kabirul Islam, et al; 2018). In Bangladesh, there is a lack of proper hydrographic survey before dredging and this is why many high-budget projects cannot meet their effectiveness. In this way, dredging becomes a pointless activity and as a result, it needs to be repeated frequently (The Business Standard; 2020). German Scientist Hermann Kudras has been conducting a study on sedimentation process silt and water flows in the Bay of Bengal for over 20 years. He determined that roughly 1.1 billion cubic meters of silt per year flow via the Meghna Basin. Of this, 400 million cubic meters are deposited on the banks of the Payra River alone and around Tk8,000 to 10,000 crores would be necessary to clear this silt every year. In the research, Kudras further indicated that owing to a mild storm, the port may become entirely unusable after the siltation of the sediments (The Business Standard; 2021).

6. Impacts of Rabnabad Channel Dredging project

6.1 Increased depth and width of the channel

The depth of the channel will be 10-12m after the ongoing capital dredging project and this depth will allow ships with a 10.5m draft (The Financial Express; 2021). Moreover, a maximum of up to 12-meter draft vessels will be able to come alongside the port jetty with the help of the tide. The navigation channel of Rabnabad is 4km wide in the payra port area (Tuhin Ahmed, et al;2017). For good navigation and navigational safety, the width of the channel is very important (Vytautas Paulauskas, et al;2012). As per the agreement, 65km of the inner and outer bar of the channel will be dredged and 9.75 million cubics of silt will be removed, the width will increase to 100-125m (The daily star; 2021). The wide channel can allow more ships to the port and will also increase navigability (Vytautas Paulauskas, et al;2012)

6.2 Increased port capability

Container ships of 3000 TEUs and bulk cargo of 40,000 tonnes during (low tide) and 55,000 tons (during high tide) will be able to anchor directly in the port jetty after the capital dredging is complete (The Business Standard, 2021). When the dredging is completed, this channel can allow ships with 10.5m draft (The Financial Express; 2021). The port of Chittagong now operates ships with the draft of 8.6m-9.1m (CPA instructions; 2016). So, the Payra port is likely to be productive after dredging.

6.3 More effective coal transportation

The Department of Power and Energy of Bangladesh has long-term goals to achieve a sustainable power supply. To achieve the target of 27,400 MW (in 2030), and 51,000 MW (in 2041) (Dr. Khondaker Golam Moazzem, et al; 2019), the government has established coal-based power plants like Payra, Rampal, etc. For this increasing demand for coal, it will be more effective to have a dedicated port for handling coal. After the dredging, the Rabnabad Channel will enable the port to handle 20 million tons of coal a year, fulfilling the coal supply requirement for power generation in the western part of the country at a much lower transportation cost. (The Daily Star; 2019) Figure 3 shows the coal forecast for Payra Port.

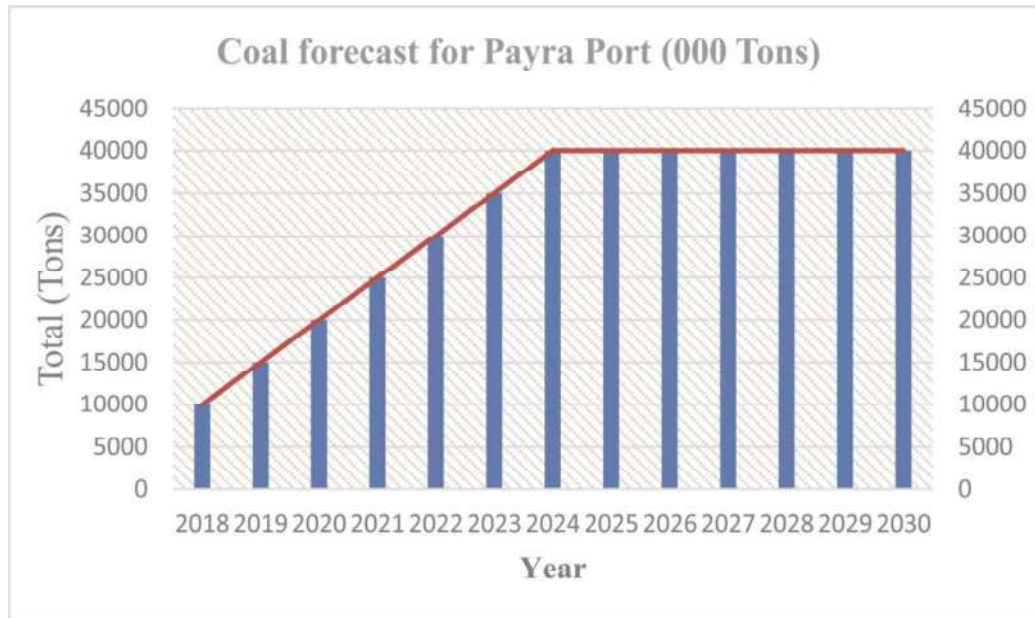


Figure 3: Coal forecast for Payra Port (000 Tons) Source: PPA Website

6.4 Reduced the project cost

Bangladesh is currently working on 13 megaprojects (DATABD.CO; 2020). These big projects are projected to play a critical part in the entire national development process (Saudi Gazette; 2019). This project's total cost is 41.74 billion USD (DATABD.CO; 2020). Among these projects, payra port development is one of them. The government has earlier negotiated a Public-Private Partnership (PPP) contract worth Tk11,000 crore with Jan de Nul. But the corporation was having issues in securing cash on its own. Meanwhile, the government amended its plan and decided to downgrade the deep-sea port project to a standard seaport project and fund the capital dredging work by the newly founded Bangladesh Infrastructure Development Fund (BIDF). This decision has lowered the project cost by 53 percent. Accordingly, the port side has been relocated from its original offshore location by 65 kilometers to an onshore location at the mouth of the Rabnabad channel. To complete the dredging work, the port authority has been given 524.56 million euros at a rate of 2% interest rate from the reserve. So, the Bangladesh government can save a huge amount of money on this project (The financial express; 2021).

6.5 Payra port will be a regular port

Port is an important part of attempts to enhance the exploitation of marine resources while the port also plays a role as a site for collection, production, activity centers, and distribution of these resources (Thomasonan Lutfie, et al; 2018). Payra port is Bangladesh’s 3rd port and this port is located in the East on the side of Rabnabad River under Kalapara union Patuakhali (PPA Website). Payra Sea Port is not in full functioning (Tuhin Ahmed, et al; 2017). Jan de Nul will dredge the Rabnabad channel and it will help to build the Payra Sea Port as a regular port (The Business Standard, 2021). Every 10% growth of a port throughput can produce a 6–20% increase in the GDP of that region (Md. Mostafa Aziz Shaheen, et al;2021). The Bangladesh government has an aim to achieve sustainable development goals (SDGs) by 2030 (UNDP Report; 2020). Payra port can play an important role in achieving Bangladesh's SDGs (Sustainable Development Goals) by fulfilling the demand for a new seaport (Tuhin Ahmed, et. al; 2017). So Rabnabad channel dredging project can play a very significant role here. Figure 4 shows the container trade forecast of 3 major ports of Bangladesh.

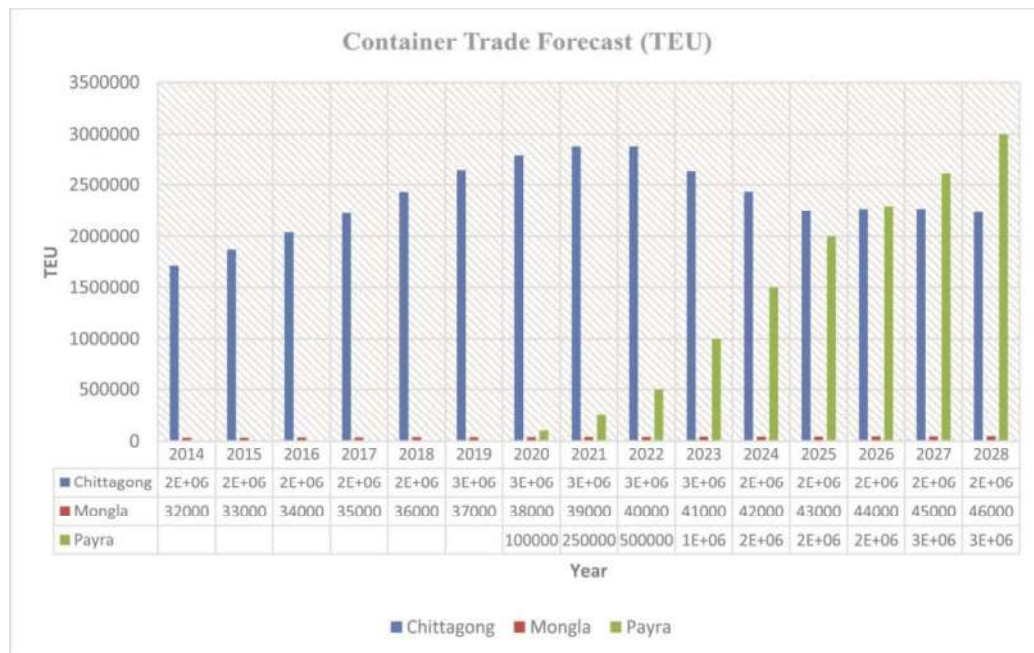


Figure 4: Container Trade Forecast (TEU); Source: PPA Website

6.6 Training locals

Under this arrangement, Jan De Nul Group pledges itself to train personnel of Payra Port Authority. Local personnel will get experience in managing and conducting offshore dredging activities. They will be able to go on-site and gain practical experience which will make this training highly effective. This will also create jobs (Jandenul news; 2019).

7. Prospects of Rabnabad Channel Dredging project

7.1 Improvement in the southern part

Ports perform an essential economic activity in coastal regions and are also vital for the support of economic activities in the inland as they function as a critical connector between sea and land transport (G.S. Dwarakish, et al; 2015) A port improves the local area. After the dredging operation, the Payra Sea Port will bring about a dramatic shift in the southern part of the country by speeding up industrial, commercial, and tourism infrastructure (The business standard; 2021). Moreover, it will be an assisting power for our economic growth in 2035, and the south's economy will accelerate centering the Payra Port and the dredging project will highly contribute to that (United News of Bangladesh; 2021).

7.2 Improvement of national economy

Port has also an economic impact on the national economy (Halima Begum; 2013). Every 10% growth of a port throughput can produce a 6–20% increase in the GDP of that region (Md. Mostafa Aziz Shaheen et al; 2021). Dredging projects have a positive impact on port activity and income (Atef Salem Souf-Aljena, et al; 2016). Port has huge impacts on Sustainable Development Goals (SDGs) and Payra port will play a crucial link role in the Bangladesh-China-India-Myanmar Economic Corridor which will put up a positive impact on the economic growth of Bangladesh (ESCAP; 2020). After the dredging project, Payra Port may function as a cornerstone to the country's economy by 2035 (The Daily Star; 2020).

7.3 Attracting new investors

Nowadays, the port activity is no longer limited to its local operations, rather it has become a vital aspect of the business in an international arena (Teng-Fei Wang, et al; 2006). In this modern era ports play an important role in capturing new markets (APEC Event; 2020). So, ports with good facilities can attract new markets. There is a 1,320MW coal-fired thermal power plant (TPP) at Payra which requires almost 4.12 million tonnes per year (NS Energy; 2020). Rabnabad channel is the main supply route

for the Coal power plant (The Daily Star; 2020). Like the Payra power plant after the dredging project, investors will be interested in establishing industrial estates in the southwest of the country (The Business Standard; 2020).

7.4 Creation of new employment

Nowadays, port activity plays a vital role not only in international business (Teng-Fei Wang, et al; 2006) but also in coastal regions (G.S. Dwarakish, et al; 2015). Industries need a secure and cost-effective way to export completed goods and import raw material and for this, a large number of industries in the globe are concentrated along coastlines and near large ports. These industries, in turn, have an impact on the lives of employees as well as indirect beneficiaries (G.S. Dwarakish, et al; 2015). In this modern era ports play an important role in capturing new markets and creating employment. (APEC Event; 2020).

Unemployment is a great problem in Bangladesh (Sarder Syed Ahmed, BEA). The unemployment rate in Bangladesh is 5.30% in 2020 (World Bank Open Data; 2020) and according to Trading Economics global macro models and analysts' expectations Unemployment Rate in Bangladesh is expected to reach 6.00 percent by the end of 2021 (Trading Economics; 2021). Planning Minister MA Mannan said that the dredging project will help to build the Payra Sea Port as a regular port, which will help to create employment for many people in the region by accelerating industrial, commercial, and tourism infrastructure (The Business Standard; 2021).

7.5 May create new habitat

If there are any poisonous compounds, dredging will remove them from the harbor area (K. Rasheed, et al; 2001). Dredging improves ecosystems by removing trash, silt, dead vegetation, and other debris, it maintains the river clean and protects the native fauna habitats (Mark K. Briggs, et al; 1998). Dredging can promote a healthier aquatic ecosystem that can lead to a more favorable habitat for fish and other creatures. It can also be utilized for garbage and debris clearance to assist eco-friendly rivers (Geoform international, 2021). In the Rabnabad channel this dredging may create a new habitat for fish and creatures.

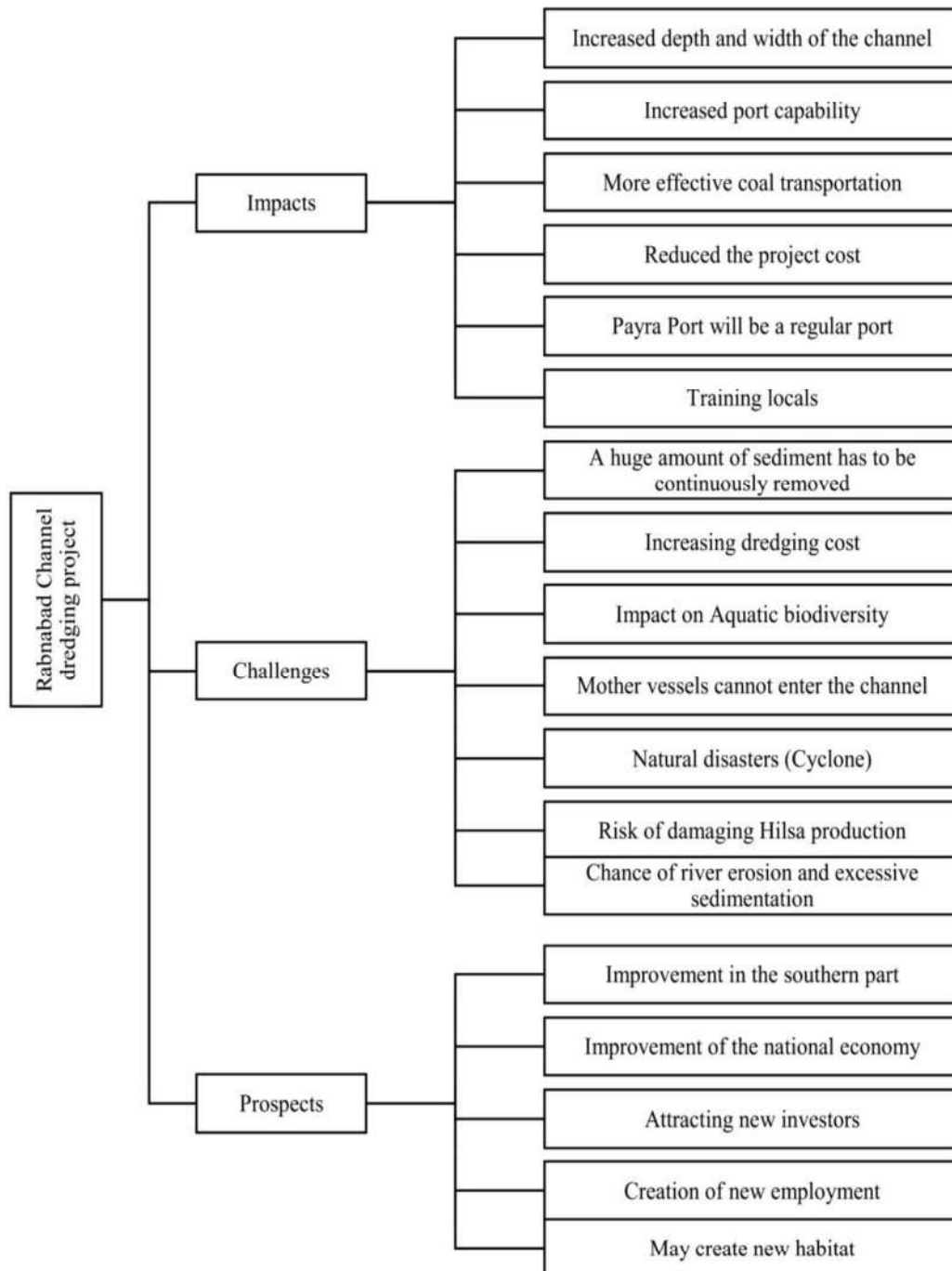


Figure 5: An overall view of the Impacts, Challenges & Prospects

Findings:

Based on this study, some findings can be summarized as follows:

- I. The Rabnabad channel dredging project will help improve the operational activities of Payra Port and make a profound impact on the economy of Bangladesh in the maritime sector.
- II. If the challenges are met properly the project will have immense prospects.
- III. Though Payra Port can't operate equally with the Chittagong Port at this moment in time, it can be hoped that, after the successful completion of the project, the Payra Port will be able to share and relieve the burdens of Chittagong Port using its own performance and dynamic continuity.
- IV. While discussing the environmental impact of dredging in this study, it has been found that though it is harmful to the environment to some extent, it is more beneficial for the overall development of our country.

Conclusion and Recommendation:

As a maritime country, Bangladesh has the potential to use its maritime resources in various ways. Now, the Port of Chittagong is the biggest seaport of the country and works as the main economical gateway of Bangladesh. Around 90% of the country's imports and export are happening through this port. To keep pace with the modern world, to reduce the extra pressure from Chittagong Port, and to improve efficiency, we have to think of an alternative way. After the completion of the ongoing dredging project of Rabnabad Channel, the economic impact of this channel will be huge. Hence, the 3rd seaport of Bangladesh, the Payra Port is situated by the side of this channel. It will become a regular port then and will effectively increase international trade. As the Bangladesh minister for planning MA Mannan puts it, "once complete, the Payra Sea Port will bring about a radical change in the southern region of the country." The study presents a clear picture of these impacts of the dredging project which also includes an increase in the capability of the port and ineffective coal transportation, etc. The study also includes the prospects of the project like improvement in the southern part, improvement of the national economy, attracting new investors, creation of new employment, etc. However, some challenges are militating against the Rabnabad Channel Dredging project. Like, sedimentation issues, increasing costs, impact on aquatic biodiversity, risk of damaging Hilsa production, environmental issues, natural disasters, etc. This study also points out and discusses these challenges.

Sustainability and environmental issues are a growing concern to the world. While discussing the environmental impact of dredging in this study, it has been found that, though it is harmful to the environment to some extent, it is more beneficial for the overall development of our country. However, it is time to work with both economy and

environment, knitted in a harmonious relation by designing the equipment, not from an economic perspective alone. So, this study recommends that an evaluation of the development of a sustainable dredging design with ecological requirements and without compromising the economic aspects is needed.

Finally, the study concludes with a call for further research on facing and handling the challenges of dredging and finding a sustainable solution from a Bangladeshi perspective.

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Appendix:

Year	Power Stations on stream								Total
	1	2	3	4	5	6	7	8	
	NWP	Malay	Rampal	Sena Kalyan Sangstha				RPCL	
2018	5000		5000						10000
2019	5000	5000	5000						15000
2020	5000	5000	5000	5000					20000
2021	5000	5000	5000	5000	5000				25000
2022	5000	5000	5000	5000	5000	5000			30000
2023	5000	5000	5000	5000	5000	5000	5000		35000
2024	5000	5000	5000	5000	5000	5000	5000	5000	40000
2025	5000	5000	5000	5000	5000	5000	5000	5000	40000
2026	5000	5000	5000	5000	5000	5000	5000	5000	40000
2027	5000	5000	5000	5000	5000	5000	5000	5000	40000
2028	5000	5000	5000	5000	5000	5000	5000	5000	40000
2029	5000	5000	5000	5000	5000	5000	5000	5000	40000
2030	5000	5000	5000	5000	5000	5000	5000	5000	40000

Coal Forecast for Payra Port (000 Tones) Source: PPA Website

Year	Mongla	Chittagong	Payra	Total	Payra	Ctg	Mongla
	TEU	TEU	TEU	TEU	%	%	%
2014	32,000	1711084		1743084		98%	2%
2015	33,000	18s67648		1900648		98%	2%
2016	34,000	2038538		2072538		98%	2%
2017	35,000	2225064		2260064		98%	2%
2018	36,000	2428567		2564657		99%	1%
2019	37,000	2650884		2687880		99%	1%
2020	38,000	2790435	100000	2931435	3%	95%	1%
2021	39,000	2874186	250000	3163186	8%	91%	1%
2022	40,000	2873340	500000	3413340	15%	84%	1%
2023	41,000	2642364	1000000	3683364	27%	72%	1%
2024	42,000	2432843	1500000	3974843	38%	61%	1%
2025	43,000	2246487	2000000	4289487	47%	53%	1%
2026	44,000	2264357	2290000	4598357	50%	49%	1%
2027	45,000	2262498	2622050	4929548	53%	46%	1%
2028	46,000	2236431	3002247	5284678	57%	42%	1%

Container Trade Forecast (TEU) Source: PPA website