Bangladesh Delta Plan 2100: Charting A Course For Sustainable Ocean Governance And Maritime Development

Rear Admiral M Khaled Iqbal[1*] and Captain Wahid Hasan Kutubuddin[2]

Abstract

The Government of Bangladesh (GoB) has approved the Delta Plan 2100 (BDP 2100) which is a holistic plan to integrate the activities of delta-related sectors across the country. BDP 2100 *is a strategic planning document with long term strategies and multi-sectoral coordinated policy for the marine ecosystem and water resources development within the Ganges-Brahmaputra-Meghna (GBM) Delta in the context of climate change and other socio-economic factors. Ocean governance is an indispensable part of the BDP 2100, which can contribute to the overall implementation of various sectors of delta management. This study concentrates on reviewing the BDP 2100 to explore the relevant provisions for sustainable ocean governance and maritime development of Bangladesh. The study explores the challenges for implementing the BDP 2100 and deliberates on the necessary legal, policy and institutional arrangements to reduce different unplanned infrastructure in the coastal area through the formulation of Ocean Policy and Marine Spatial Planning (MSP). The study emphasizes the necessity for a robust budgetary mechanism and governance structure so as to achieve the set targets in time. Moreover, the study reveals that strong regional cooperation and formulation of an Integrated Regional Delta Plan is essential to get the maximum dividends. Finally, emphasizing on higher maritime education and taking a proactive approach to the UNESCO declared 'Decade of Ocean Science 2021-2030" are few inevitable spinoffs of this study in order to implement the BDP 2100 for sustainable maritime development for Bangladesh.*

Key words: Ganges-Brahmaputra-Meghna (GBM) Delta, Bangladesh Delta Plan-2100, Ocean Governance, Delta Management, Ocean Policy, Delta Challenges, Marine Spatial Planning.

[1*] Vice Chancellor, Bangabandhu Sheikh Mujibur Rahman Maritime University, Bangladesh.

[2] Director, Institute of Bay of Bengal and Bangladesh Studies, Bangabandhu Sheikh Mujibur Rahman Maritime University, Bangladesh.

* Corresponding Author: Email: vc@bsmrmu.edu.bd

1. Introduction

The Ganges-Brahmaputra-Meghna (GBM) Delta covers almost entire onshore and offshore Bangladesh located at the confluence and convergence of three major rivers Ganges, Brahmaputra and Meghna. Bangladesh being truly a riverine and maritime nation is confronted by a 710 km long indented coastline at the apex of the Bay of Bengal (BoB). The destiny of this mystic land and its people are often dictated by the whims and nature of the climate and the adjacent ocean system. Being blessed by one of the largest deltas of the world, its innumerable sinuating rivers, waterbodies and floodplains regularly support the lives, livelihoods and economy of Bangladesh. The country is criss-crossed by around seven hundred rivers of which fifty-seven are transboundary with India and Myanmar. The Delta is the unique consequence of the interaction of rivers and tidal processes which results in the vast sedimentary deposits coming down from the Himalayas. This huge waterbody and the Deltaic Plains are primarily a matter of blessings in terms of agriculture, socio-economic condition, transportation and livelihood of the people. But the fruits of the Delta and the river systems don't come automatically, rather it needs to be managed, cared for and harnessed with sound plans and policy. Otherwise, the blessings can easily turn into a curse and misery battered by the impacts of climate change, extreme weather conditions, floods, storm surges, droughts, etc. These natural calamities have become a commonplace in Bangladesh resulting into incalculable human, economic and infrastructural losses.

In spite of its vulnerability to the climate and nature, the people of Bangladesh are resilient and have learnt disaster management, mitigation and coping mechanism with the changing nature and climate. Bangladesh under the leadership of the Hon'ble Prime Minister Sheikh Hasina has articulated Vision 2041 with an aspiration to become an industrial, prosperous and developed country by 2041. The country's efforts to achieve the UN Sustainable Development Goals (SDGs) by 2030 are praiseworthy. Even in the maritime sector, the government took up many Blue Economy Initiatives like building of deep-sea ports, Special Economic Zones (SEZ), offshore energy clusters, multi-modal freight corridors, coastal industrial growth belts and other maritime facilities. From ports & shipping to marine aquaculture, ship-building to ship recycling, offshore hydrocarbon to marine bio-technology, maritime tourism to maritime education, in fact all the potential maritime sectors are being developed, nurtured and rejuvenated in order to ensure proper utilisation of our maritime resources.

However, all these development projects have a direct correlation with the climate change. Because the causes and effects of climate change do not only concern the lives and livelihood of the coastal population but the issues like salinity intrusion, sea level

rise and global warming can have negative impact on the entire range of development agendas. However, in order to reduce the impact of climate change, a number of effective measures have been taken by the Government in the recent years including some commendable efforts with the international community in addressing the climate change issues. Moreover, the formulation of 'Bangladesh Climate Change Strategy and Action Plan, 2009', "National Steering Committee on Climate Change" and 'Bangladesh Climate Change Trust' needs special mention. But most importantly the Government has prepared the 'Bangladesh Delta Plan 2100 (BDP 2100)' with support of the experts from Netherlands so as to make our country more liveable for the future generations. The concept puts focus on the management of GBM Delta impinging on the socio-economic, agricultural, hydrological, oceanographic and other climate related factors. The BDP 2100 is a strategic planning document for next 100 years that identifies and prioritizes actions to reduce climate risk and environmental degradation in the delta region. Few important challenges that may get focus in the Delta Plan may be issues like water management, climate change adaptation, sea level rise, protection against storm surges, more frequent and stronger cyclones, flood prevention, water logging in cities, extreme weather conditions, land reclamation etc.

In fact, BDP 2100 has a strong connection with ocean governance, which is the integrated conduct of the ocean policy and all oceanic affairs to protect ocean environment, ensure sustainable use of coastal and marine resources as well as to preserve the biodiversity. In the overall context of global climate change, it is imperative to continue with our lofty projects of the BDP 2100 in the decades ahead. However, we need to understand the cumulative effect of the increased human activity in the marine environment that leads to competition for overlapping and collocated marine space, increased stress on marine ecosystems and conflicting ocean use. Thus, all government and concerned private sectors should design the ocean governance policies through the Marine Spatial Planning (MSP) process. In fact, MSP as a holistic approach is the process of analyzing and allocating ocean uses over space and time to achieve economic, ecological and social objectives. It will also allow the development of a common vision towards effective utilization of maritime realm and "ocean governance" for sustainable use of coastal and marine resources reducing the risk of irreversible damage to the marine eco-systems. The process of ocean governance should be integrated horizontally so as to allow the participation of governmental institutions, private sectors, NGOs, academicians and scientists as well as vertically across all the levels of governance within an integrated system with reciprocal collaboration. Overall, the maritime governmental issues can be properly addressed if we have a well-crafted Ocean Policy that will care for, understand and use our maritime space wisely.

2. Context of the study

Bangladesh being located at the usual paths of the tropical cyclones, almost one third of the country lying within less than five meters above sea level, it is prone to natural disasters on one hand and vulnerable to the impacts of climate change on the other. Moreover, the shallow water of the Northern BoB and the double concavity of our coastline has deteriorated the situation further. Some scientists have even commented that about 20% of the Bangladesh coastline may be inundated by 2050 due to sea level rise and climate change impacts displacing one in every seven persons on the coastal belt. It is predicted that the climate vulnerability may be worsened in the delta region of Bangladesh due to geographic location, over population and severe poverty. Specially, the central and western part of delta areas are more vulnerable as the western part contains Sundarbans which have more low-lying land areas.

In the last decade before the onset of COVID-19, Bangladesh embarked upon massive infrastructural developments and innumerable mega projects while maintaining steady economic growth, drawing admiration from all around the world. According to the International Monetary Fund (IMF), even the real GDP growth of Bangladesh remained consistent within 7-8% in last 5 years though it is projected to decelerate to 3.8% in 2020 driven by falling readymade garment exports, contraction in foreign remittances and wider economic downturn due to COVID-19. Mentionable that Bangladesh Bureau of Statistics (BBS) has however predicted a rebound of our GDP growth at 8.2% in 2020-21 while the latest IMF report also indicates a rebound close to 8% in next 2-3 years.

The COVID-19 pandemic is a crisis of a fully different magnitude and one that will demand a response of unprecedented scale (World Economic Forum 2020). The report of National Food Security by BRAC shows that during the lockdown in Bangladesh, the farmers face a loss worth of 565.36 billion taka (Welle 2020). During this time, 1150 factories report order cancellation/suspension of USD 3.18 billion which impacts around 2.28 million workers in the industry. The IMF, World Bank and Asian Development Bank report and forecast that GDP will be downward from 7.8-8.2% to a range of 2.0-3.8% and export will be fallen by 15.4%, import will slow down by 11.8% and remittance will be grown at 6.0% in 2020-21 (Asia-Pacific Research Exchange 2020).

However, BDP 2100 aims to deal with the country's long-term development in the context of the opportunities and risks that come out from the interface between water, climate change and human activities (Paul 2017). Zevenbergen described about important features of BDP 2100 which are: involvement of multiple stakeholders; considering a risk-based perspective; taking an approach in possible strategies and

various investment agendas (Zevenbergen, et al. 2018). Besides, they showed the challenges and opportunities for successful formulation and implementation of BDP 2100. However, there is a gap of systematic analysis of the Plan in the context of ocean governance and maritime development. This study is expected to guide us in our systematic approaches for implementing the BDP 2100 with the consideration of sustainable ocean governance and maritime development in this uncertain era of post Covid -19 scenario.

3. KEY CHARACTERISTICS OF BANGLADESH DELTA PLAN-2100

BDP 2100 is considered as a long-term, holistic, techno-economic, water-centric and strategic plan. BDP 2100 has been taken based on the 26 baseline surveys and targeting to achieve the goals that consider different hazards and climate change in the deltas. Bangladesh is most likely to suffer adverse impacts from climate change that brings a significant delta hazard. Unfortunately, about 18% of the total land area may be submerged if the sea level rises by only 1 meter. Having 50% land within 8 meter above sea level, coastal flooding is a common issue in Bangladesh. Moreover, our country has been highly susceptible to tropical cyclones causing innumerable casualties over the years.

The ultimate aim of BDP 2100 is to alleviate extreme poverty gaining upper middle-income status by 2030 and help the country to achieve Vision 2041 for a prosperous and developed Bangladesh. Considering rivers and water resources, BDP 2100 includes some specific goals like confirming safety from floods and climate change related disasters, improving water security and efficiency of water usages, ensuring sustainable and integrated river systems and estuaries management, maintaining and preserving wetlands and ecosystems. The plan has taken the short- term and mid-term delta agenda until 2050 but keeps in consideration its longer-term implications to 2100 (Rahman, et al. 2020). By employing an adaptive, multi-sectoral and comprehensive delta management, Bangladesh has become able to conduct robust planning in the context of a rapidly changing environment (GED,Bangladesh Planning Commission 2020). The relevant issues of ocean governance and maritime development for Bangladesh under the BDP are discussed in succeeding paragraphs.

3.1 Water Resources Management

According to rainfall season, Bangladesh is categorized into two parts where wet season consists of five months (June-October) with 80% of the local rainfall whereas the inflows of 57 trans-boundary rivers are also concentrated in this season. On the other hand, remaining seven months carry only small portion of the annual rainfall (Shahid 2010). These twin problems cannot be regarded in isolation. The biodiversity including

flora and fauna and the livelihood of Bangladeshi people are dependent on these problems being performed jointly in an integrated manner (GED, Bangladesh Planning Commission 2018).

3.2 Water Supply and Sanitation

UN 2030 SDG 6 seeks to ensure availability and sustainable management of water and sanitation for all (WaterAid 2020). In the twenty-first century, the situation in Bangladesh has deteriorated dramatically with large number of people being deprived of minimum facilities for water supply and sanitation. Furthermore, the coastal population is likely to face the cumulative effect of flooding, salinity intrusion, river bank erosion, water-logging and cyclones (M. N. Rahman 2019). Thus, the BDP 2100 has given special priority on the water supply and sanitation, based on the fact that developing a resilient coastal zone is a long- term challenge (GED, Bangladesh Planning Commission 2018).

3.3 Sediment Management

A large quantity of sediments is carried annually by the GBM Delta. But in recent decades, upstream dams restrict the downward flow of the silt that hampers river navigation and leads to flooding. Irregular sedimentation accelerates riverbank erosion and as a result about 100,000 hectares have been lost from 1970s onward, forcing millions of people out of their their homes. However, most of the 1.2 billion tonnes of sediment carried by the GBM river system every year is deposited in the estuary. As sediment is being deposited, it is quite possible to reclaim more land from the coastal area of the country. In contrary, mushrooming growth in illegal sand mining from riverbeds could seriously harm this process. Thus, planned dredging and delegating levy on sand mining is essential for sediment management of Bangladesh (Islam 2019).

3.4 Coast and Polder Issues

Bangladesh coastal area covers approximately 32% (47,201 km^2) of the total area of the country, comprising 19 districts. The huge sediment inflow from the GBM river system is subject to coastal dynamic processes propagated by tides, waves and currents that lead to erosion and land reclamation on a regular basis. Moreover, the living conditions in this region gets laborious due to freshwater limitations, salinity intrusion and frequent cyclonic storms. So far, the Coastal Embankment Project (CEP) in the year of 1960-1970 has been the largest physical intervention in Bangladesh. However the Government has planned to reclaim 1,600 square kilometers of land from the Jamuna and Padma rivers within 25 years (GED, Bangladesh Planning Commission 2018).

3.5 Climate Change

Climate change is one of the most important themes under the BDP 2100 *and it is a serious threat to this deltaic and coastal region due to rising sea levels, resulting in frequent flooding and increasing salinity in the area. Besides, there are major hydrological risks, such as riverbank erosion, land subsidence,* environmental pollution *and siltation. All these risks have long-term impacts on livelihood, migration and economic security* (Climate and Development Knowledge Network 2020). *Generally natural d*isasters are directly related to the climate change. As such, it is important that the data and information on climate change are documented and shared to reduce the climate change vulnerability on the general mass. Both global and local climate change scenarios reveal that the historic trends are likely to continue whereas the temperature and total annual rainfall are likely to increase in the future (GED, Bangladesh Planning Commission 2018).

3.6 Disaster Management

The types and nature of the disasters differ geographically within the country. Now a days the disaster issues generally get priority in any development planning. However, it should be taken into consideration that the disaster management is comprehensive focusing on disaster risk reduction and emergency response (GED, Bangladesh Planning Commission 2018).

3.7 Ecological Setting

The ecological setting plays an important role in the ecosystem, economy and livelihood in Bangladesh. The BDP 2100 baseline survey covers the state of biological environment like ecosystem types with its resources, bio-ecological zones, current situations of ecosystem management, ecosystem services, issues for ecosystem conservation and possible future plan which relates to the GBM Delta (GED, Bangladesh Planning Commission 2018).

3.8 Sustainable Transportation and Infrastructure

For sustainable economic development, an adequate and efficient transportation system is a pre-requisite. The transportation system of Bangladesh is composed of roads, railways, inland waterways, seaports, shipping and civil aviation, catering to both domestic and international traffic. From BDP 2100 point of view, roads and highways as well as railways need to be designed in relation to requirements of the water systems and future risks due to climate change (GED, Bangladesh Planning Commission 2018).

3.9 Fisheries

Marine Fisheries can be an important source of protein for the people of Bangladesh and a main source of livelihood for the coastal communities. BDP 2100 has incorporated plans for ensuring protein-based food security of the rapidly increasing population. Thus, the GoB has aimed to achieve long term food security with safe fish products and equitable resource management with good governance (GED, Bangladesh Planning Commission 2018).

3.10 Forest and Biodiversity

Forest is one of the renewable resources which generates oxygen, reduces the intensity of the cyclone and tidal surge in the coastal areas, sustain water yield in the river systems and influence the rainfall. However, a continuous depletion of forestry has been taking place in recent times. The Plan suggests for the development of renewable energy for the protection of the forest and to maintain ecosystem (GED, Bangladesh Planning Commission 2018).

4. Institutional Arrangements

In order to implement any public policies and programs it requires proper governance mechanism and underlying institutional arrangements. The BDP 2100 provides for involving multiple line ministries, local government institutions, communities and private sector parties to get feedback from the long-term plan. There is scope to gather opinions from relevant sectors at national and sub-national levels, different types of relevant organizations and actors focusing on a holistic and collaborative implementation process.

5. Regional Cooperation

Bangladesh is situated downstream of the mighty GBM basin as a lower riparian country. All the three rivers flow through India and then into Bangladesh falling into the BoB. The entire basins are flood prone and vulnerable to flood consequences. The frequency and intensity of floods are expected to increase due to climate change and natural calamities (GED, Bangladesh Planning Commission 2018). As such, mutual regional cooperation is the key to overcoming the challenges of the climate change.

6. Context of Blue Economy

The BoB has contributed in the economic growths and development in the area for a long time. BDP 2100 supports research and development programs with other government or non-government agencies to measure the resources of BoB. These steps aim to explore the “Blue Economy” which ensures that the maritime resources can contribute to the national economy and livelihood pattern of the people. The Plan has created prospects to establish a center for research for the students, researchers,

faculties of universities and professionals to utilize and manage BoB maritime resources and understand their role in Blue Economy (Ahsan 2019).

7. Sustainable Delta Management

BDP 2100 is a long-term strategic plan and has been prepared through known delta problems, reviewing existing policies and governance challenges in the sector of water resources, land, environment, disaster, agriculture, fisheries, livestock, transportation, finance, governance, knowledge generation, etc. The BDP 2100 would help in sustainable delta management as it has considered delta vision, delta goals and delta framework that would contribute to sustainable delta management for Bangladesh. For effective implementation of BDP 2100, it is necessary to organize national and regional level research and training in order to create skilled manpower as well as awareness buildup among all sectors of population.

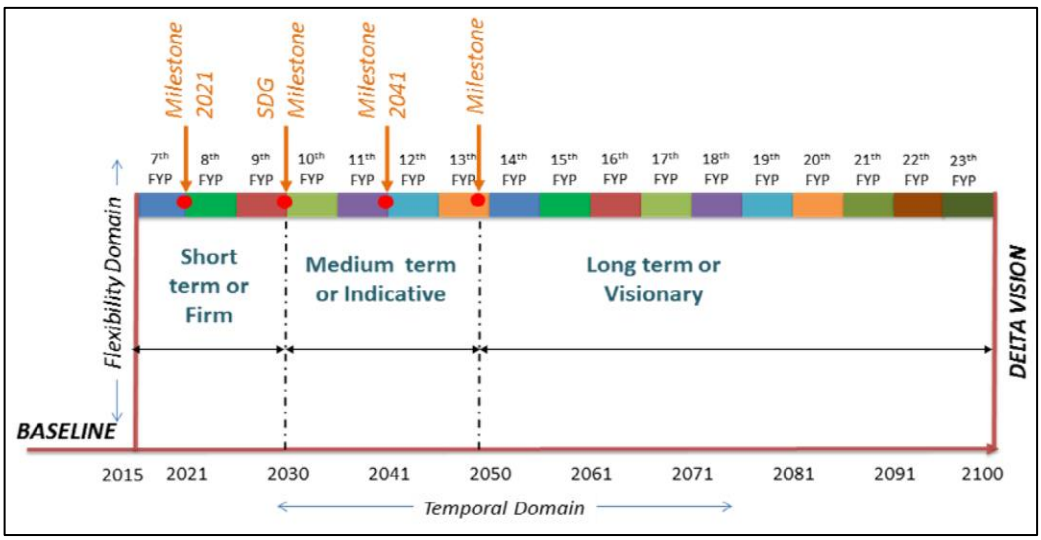
8. Delta Plan-2100 And Ocean Governance In Bangladesh

Analysis of the key characteristics of the BDP 2100 shows that the Delta Plan addresses several major aspects of ocean governance including water Resources management, sediment management, climate Change, disaster management and environmental pollution. Ocean governance is the integrated conduct of the policy, actions and affairs regarding the ocean for sustainable use of coastal and marine resources. The major elements of ocean governance are widely based on safety, environmental and security concerns spanning unlawful criminal acts of violence from terrorism to piracy on the high seas or in coastal zones. It deals with the ocean policy to understand and protect marine biological diversity, ocean environment and its resources. Besides, it conducts the policy to exercise and protect the rights and jurisdiction of the country over offshore areas and resources. Ocean governance focuses on the development in social and economic indicators with substantial investment in regional connectivity, deep seaports, special economic zones, dedicated economic corridors, coastal industries, energy clusters and offshore oil and gas exploration, etc. Due to the lack of any MSPAct and proper guidance of ocean policy, unplanned development in the coastal areas is a commonplace.

On the other hand, BDP 2100 aims to support the country's long-term development in the face of the opportunities and risks that emerge from the interface between water, climate change and human activity. The goals of the BDP 2100 are to alleviate extreme poverty and gain upper middle-income status by 2030 and transform into a prosperous country by 2041. Considering rivers and water resources, BDP 2100 includes some specific goals (Fig-1) like ensuring safety from floods and climate change related disasters, improving water security and efficiency of water usages, ensuring sustainable

and integrated river systems and estuaries management, maintaining and preserving wetlands and ecosystems.

Figure-1: Time Frame of BDP Strategy



(Source: GED, Bangladesh Planning Commission, 21 Jan 2019)

In fact, Ocean policy is a key tool of ocean governance. The ocean policy should provide for a healthy sustainable ocean which contributes for the benefit of present and future generations. The Ocean policy should have the following goals (a) Realize and protect marine biological diversity ensuring that ocean uses are ecologically sustainable, (b) Conserve the rights and jurisdiction over offshore resources, (c) Pay attention to community needs and aspirations (d) Endorse integrated ocean planning and management arrangements (e) Sponsor public awareness and understanding of the importance of the ocean (Iqbal 2019). The governance structure for the ocean policy and delta management is an important issue for the implementation of BDP 2100. As the plan is divided into different timelines like the first stage by 2030, the second stage by 2050 and the final stage by 2100, the governance structure should be improved and different Ministry/ Division related to deltas and BDP 2100 can come in a common structure/platform.

In the overall context of global climate change, it is imperative to continue with our efforts and lofty projects of the BDP 2100 in the decades ahead. However, we need to understand the cumulative effect of the increased human activity in the marine environment that leads to competition for overlapping and collocated marine space,

increased stress on marine ecosystems and conflicting ocean use. Thus, all government and concerned private sectors should design the ocean governance policies through the MSP process. In fact, MSP as a holistic approach is the process of analyzing and allocating ocean uses over space and time to achieve economic, ecological and social objectives. It will also allow the development of a common vision towards effective utilization of maritime realm and "ocean governance" for sustainable use of coastal and marine resources reducing the risk of irreversible damage to the marine eco-systems. The process of ocean governance should be integrated horizontally so as to allow the participation of governmental institutions, private sectors, NGOs, academicians and scientists as well as vertically across all the levels of governance within an integrated system with reciprocal collaboration. Overall, the maritime governmental issues can be properly addressed if we have a well-crafted Ocean Policy that will care for, understand and use our maritime space wisely.

The BDP 2100 provides specific goals to protect coastal area from the devastation of floods and climate change, to ensure water supply and sanitation, to develop integrated and sustainable riverine area, to preserve the wetlands and ecology, to make effective organization and justify good governance. For achieving the goals of BDP 2100, GoB has taken different plans from time to time. Remarkably, these are consistent with the Annual development Plan (ADP), 7th five-year plan, SDGs and vision 2041. The ADP (2019-20) has considered the water resources, agriculture/ irrigation, transport/ shipping, forestry, fisheries, water supply and power etc as the parameters of BDP 2100. Moreover**,** the Delta Plan has been adequately considered in Bangladesh's 7th Five Year Plan (2016-2020). In the plan there were some delta related parameters like ensuring long-term water and food security, human resource development, economic growth and environmental sustainability, climate change, natural disaster and other delta related issues through equitable, adaptive and integrated water governance (GED,Bangladesh Planning Commission 2020).

The Delta Plan is also compatible to the UN Sustainable Development Goals (SDGs). The Goal 14 focuses on the waterbodies related issues like reducing bad impacts on marine and coastal ecosystems, ocean acidification, illegal harvesting and ending overfishing/IUU fishing. This has also introduced technology-based management plans to ensure utmost sustainable growth and economic benefit for sustainable management of fisheries, aquaculture and tourism. Besides, it covers the scope to explore scientific knowledge, evolve research capacity and transfer marine technology in the overall context of Intergovernmental Oceanographic Commission (IOC) Criteria and guidelines on the Transfer of Marine Technology (TMT) (United Nations Department of Economic and Social Affairs 2020).

9. Challenges To Implement Bdp 2100

On analysis of the provisions of the Delta Plan and actual ground realities, this study would highlight on the following challenges to implement BDP 2100:

9.1 Absence of Integrated Legal and Institutional Arrangement

As ocean governance can play an important role for the implementation of BDP 2100, it should focus on the governance structure more closely. Besides, it should have regulatory bodies to implement the BDP 2100 in a systematic way. In Bangladesh there are too many institutions involved in maritime affairs. A Number of Ministries are responsible for various maritime affairs like Ministry of Ports, Shipping & IWT; Ministry of Energy, Petroleum & Mineral Resources; Ministry of Fisheries & Livestock; Ministry of Defense; Ministry of Forest and Environment; Ministry of Home Affairs; Ministry of Foreign Affairs (Maritime Affairs Unit), Ministry of Industries and Ministry of Finance. Besides, the GoB has introduced the "Blue Economy Cell (BEC)" to coordinate the blue economy related activities of different ministries. In fact, all the maritime related institutions should adhere to a common umbrella of plans and policy to implement the objectives**.**

9.2 Lack of Adequate Financing and Budget

Financing the investment to implement the BDP 2100 will pose a critical challenge on the development and implementation of the overall Delta Plan. BDP 2100 should be regularly incorporated in the existing annual budgeting process. But a natural tendency of giving priority on the more obvious development and mega projects may take the Delta Plan away from the frontline agendas unless the concerned Ministries give due attention to the Delta Plan target. Moreover, the impact of Covid-19 causing global economic downturn may result into re-appropriation of budget away from the Delta Plan towards the sectors concerning lives and livelihood. In case the targeted budgeting is not complied, this is likely to push back the Delta Plan timeline automatically. In this context, in the FY 2019-20 the projected budget for the implementation of the BDP 2100 till 2030 was estimated to be BDT 2,978 billion (US$ 37 billion) (Alam 2019), but it now remains to be seen to what extent the COVID-19 pandemic may hamper such budget execution.

9.3 Lack of Integrated Climate Development Action Plan

According to Global Climate Risk Index 2020 Bangladesh has been ranked 7th among the vulnerable countries in the world considering climate change. To address the climate changes, the GoB has formulated some climate change policies like National Adaptation Programme of Action, 2005**;** Climate Change Trust Act, 2010**;** Bangladesh Climate Change Strategy and Action Plan, 2009**;** Intended National Determined

Contribution, 2015**;** Climate Change and Gender Action Plan, 2013**;** National Plan for Disaster Management, 2016-2020**;** National Water Management Pan, 2000 and National Adaptation Plan. All the plans and policies are supported by public and private sectors for climate resilience. However, different divisions/ministries have prepared these plans and policies based on their respective sectors. Thus, GOB have a difficult task of not only balancing resources with immediate needs, but also negotiating between competing interests.

9.4 Lack of Proper Resource Management due to Population Pressure

Bangladesh suffers from high population pressure that makes equitable allocation of land and water resources difficult (Sharif Shahab Uddin 2019). Currently, the population increases by approximately 2 million people per year. The projected population in the year 2025 is about 180 million and about 220 million in the year 2050. The trend of growing population will obviously put increasing pressure on the existing land and water resources (Siddique 2019). It is a big challenge to implement the BDP 2100 considering the rapid population growth as well as lack of proper resource management. Due to covid-19, many people are becoming jobless giving rise to unemployment issues and socio-economic. Thus, economic implications of covid-19 should be taken into account in the future implementation of Delta Plan since the socio-economic factor of the delta region is a major element. Hotspots for population growth identified in the delta plan can be considered for better strategic management.

9.5 Lack of Arrangements for Marine Spatial Planning and Marine Protected Areas:

The Plan does not provide any option for the development of MSP and Marine Protected Areas (MPA), which has become an integral condition for sustainable ocean governance. Regional MSP should be implemented focusing on the ocean resources, economic and related opportunities, industries and economic based development, current and contemporary threats to ocean and coastal area and community-based interest. MPA should be demarcated for the protection and maintenance of the biological diversity, natural and cultural resources. In the coastal area, there exists severe competition for overlapping zones among collocated agencies, coastal communities, fishermen and intricate web of ocean lives.

9.6 Lack of Regional Integration of Delta Plan:

There is not much information about the linking of the respective water management strategies among all the countries of South Asia ie Bangladesh, India, Nepal, Bhutan, Myanmar and Sri Lanka. Since the GBM Delta involves almost all the countries of South Asia, it is pertinent to integrate the Delta Plan 2100 with all these countries'

national strategies for water resources management and climate change. In the absence of regional integration, the real fruits of Delta Plan will be difficult to achieve.

10. Conclusion And Recommendations:

We firmly believe that the human health and quality of living greatly depends on the health of surrounding eco-system. We are also aware that many countries around the world are mapping a path towards a climate –resilient and low greenhouse emissions in future. While we don't want to get entangled with the global climate diplomacy, we expect a positive outcome among the developed and developing nations alike in determining a carbon footprint. However, the recent onslaught of the pandemic Covid-19 has cast a shadow of pale and despair in the progress of global civilization and predicts an uncertain economic gloom and downturn in the global trade and commerce. As such, it is high time we ascertained the challenges for successful implementation of BDP 2100 and chart a course for sustainable ocean governance to achieve the objectives of the plan including maritime development for Bangladesh.

In fact, BDP 2100 sets up a long-term vision for the evolution of the GBM Delta by the end of the 21st century towards achieving a safe, climate resilient and prosperous delta. As steps to reach that vision, it has set short to medium term goals to achieve upper middle-income status eliminating extreme poverty by 2030 and become a prosperous country by 2041 with the longer-term challenges of sustainable management of water, ecology, environment and land resources in the context of climate change. However, BDP 2100 comes with an adaptive, holistic and long-term integrated plan to steer the opportunities and vulnerabilities created by the interface of water, climate change, natural disasters, ecological balance, poverty, environment, agriculture, land use and inland water management for national development. This study provides the following recommendations:

- Implement BDP 2100 with a robust governance structure and integrated budget allocation mechanism as well as an effective and efficient sectoral institutional setting. Efforts may be made to avoid duplication/overlapping tasking by developing a common umbrella of institutional arrangement.
- Efforts may be made to retain priorities on Delta Plan annual projects and allocate adequate budget.
- Initiate bilateral/ multilateral regional arrangements for rapid response in the prevention of marine pollution, ensuring maritime safety and security in the ocean.

- Encourage attendance in the regional programs acquiring knowledge about the dynamic ocean environment, climate and coastal hazards prediction and the establishment of ocean observing system.
- Focus on the development of marine science and technology in order to characterize and improve the understanding of the coastal zones, oceans' interaction with the atmosphere, marine jurisdictions, ecological systems, biological resources and their underlying geological features. Take proactive steps in the implementation of the UNESCO declared 'Decade of Ocean Science (2021-2030)'.
- Adopt a Marine Spatial Planning Zones Act to restrict the misuse and abuse of coastal areas from different unplanned infrastructures and allocate dedicated spaces in case of collocated and overlapping ocean use.
- Focus on regional cooperation for trans-boundary water management with India and Myanmar in the best mutual interest of sharing water resources, transportation and regional connectivity.
- Attach increasing importance on the need for quality maritime education training and research in order to create a new generation of skilled maritime experts. The focus should be on the science and technology-based knowledge, capacity building for understanding the science and research, training for delta management, offshore/coastal and river engineering, etc. Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU) may play an important role in this regard.
- Efforts may be made to restrict population growth in order to avoid overstretching the resource allocation mechanism ensuring an equitable allocation of land and water resources.
- A robust awareness buildup program about the fruits of Delta Plan should be developed among the mass population in Bangladesh across the entire range of students, professionals, industries, policy makers, academicians, scientists and stakeholders.
- The GBM Delta covering almost all the countries in South Asia (Bangladesh, India, Myanmar, Nepal, Bhutan and Sri Lanka), efforts may be made to establish working links with all these countries and create a South Asian Delta Plan mechanism through regional integration.

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