

## Comparison of Gridded Rainfall Estimates with Gauge Rainfall during the South-West Monsoon Period in the Wet-Zone of Sri Lanka

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### Abstract

As a most emerging country of south Asia, Bangladesh has the potentiality to explore, exploit and manage of its living and non-living natural resources which located in the Bay of Bengal. The natural resources that are dubbed as Blue Economy have a great contribution to the economy of Bangladesh. Being located in the armpit of India and right on the Indian Ocean, Bangladesh a small riverine country, plays a significant role in world geo-politics and eventually for its strategic location has drawn attention of the countries like China, India, Japan, USA etc. This article aims to analysis the importance of blue economy of the Bay of Bengal. The study finds that since Bangladesh is rapidly heading towards industrialization; therefore, it requires huge amount of power supply in daily basis. But, depending only on conventional power production systems, it can not be economically prospered. To check balance between power consumption and production and to think for future perspective, Bangladesh needs to finds out alternative renewable energy systems which will be less costly but socio-economic and environment friendly. It is therefore; essential for Bangladesh to look for the South (Bay of Bengal) in protecting the rights and interests of natural resources.

*Keywords: Renewable energy, Food security, Fisheries, Power sector, Blue Economy*

### Introduction

Sri The Bay of Bengal is blessed with rich coastal and marine ecosystems which is a major hotspot center of many living and non-living natural resources. Around 511 marine species, together with shrimps, exist within Bangladeshi waters [1]. A 714 km long coastal area and 166,000 km<sup>2</sup> EEZ of the Bay of Bengal supports a large artisanal and coastal fisheries. Preserving the rights and interests of natural resources amid climate change, economic and financial uncertainty and the growing competition for consuming natural resources is a big challenge for developing country like Bangladesh. To combat these challenges for a sustainable economy, an integrated and inclusive response is required. Protecting the rights and interests of natural resource assets particularly in the oceans, seas and costs; the Blue Economy strategy was formulated in 2012. It is to be noted that oceans provide a substantial portion of the global population with food and livelihoods and are the means of transport for 80% of global trade [2]. So, it is very urgent to ensure healthy oceans for global food security, livelihoods and economic growth. Costal countries like Bangladesh is burdened with high rate of unemployment and resources crunch. With a view to evading such material problems, the coastal and island countries adopted the blue economy strategy and paved the way of promoting smart, sustainable and inclusive economic growth. After the long-awaited decision of the International Tribunal for Law of the Sea (ITLOS) regarding the Bangladesh-Myanmar maritime boundary, 2012 and the decision of the Arbitral Tribunal of the UNCLOS on India-Bangladesh maritime boundary, 2014 established sovereign rights on more than 118,813 km<sup>2</sup> area of territorial sea and 200 nautical miles (NM) of Exclusive Economic Zone (EEZ) and all kinds of living and non-living resources under the continental shelf up to 354 nautical miles from the Chittagong coast [3].

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## **Methodology**

This paper obtained the secondary data from different journal's articles, web pages, and newspapers. The secondary literature and instrument, relevant public records, text books, administrative and public records, magazines and available statistical data, reports of various NGOs, government reports through various ministries were considered to complete the study.

## **Development of Sea Resources for Bangladesh**

The term Blue Economy denotes to oceans and seas as "Development Spaces" where spatial planning integrates conservation, sustainable use of living resources, oil and mineral wealth extraction, bio-prospecting, sustainable energy production and marine transport. The term aims for improvement of human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities. Based on the pillars of ecological, social and economic sustainability, maritime economy which includes seas, coasts and other maritime resources is one of the postulates of economic growth of Bangladesh. Successful integrated approaches need to be taken for fisheries, aquaculture, habitat protection and pollution reduction as a means of secure financing and catalyze good ocean governance. Careful balancing act between conservation and growth is inevitable for a sustainable blue economy. Fish which provides about 3 billion people globally with almost 20 percent of their average per capita intake of animal protein is primarily come from developing countries like Bangladesh. But, there are a number of common issues that have an impact in Exclusive Economic Zones (EEZs) and in the high seas in regard to resource use and conservation. From small-scale artisanal fisheries to large-scale industrial fisheries, and whether in national waters or Areas Beyond National Jurisdiction (ABNJ), the related issues of who has the right to exploit the fishery's and marine genetic resources and the nature of that right are a key part of the sustainable management of the resource. Marine garbage may result from activities on land or at sea and is a complex cultural and multi-sectoral problem that exacts tremendous ecological, economic, and social costs around the globe.

Being a major world largest trade hub, seaports alone annually handle 80% of global trade by volume and on a national basis the percentage is increasing. World seaborne trade grew by 4% in 2011, to 10.7 billion tons by 2017 and container traffic is projected to triple by 2030 [4]. Considering shipping as one of the safest, secure, efficient and most environmental-friendly sound means of bulk transportations; costal countries like Bangladesh have complied with the regulations of International Maritime Organization (IMO) along with industry initiatives and technological developments with a view to catering for growing trade and optimize the benefits. To contribute to global sea transport and sustainable economy, Bangladesh is building its first deep-sea port in Cox's Bazar with the help of its development partners China, India and Japan although at present there are two medium-large sized sea ports and another minor sized port which are respectively situated in Chittagong, Mongla and in Patuakhali of Bangladesh. It is to be noted that after becoming an independent state, Bangladesh has never built a new port, while it uses the existing Chittagong and Mongla sea ports that annually does \$60 billion of trade despite their too shallowness for large container ships in terms of global competitiveness. As a world's fastest growing economies, Bangladesh needs to construct more deep sea ports with adequate maritime infrastructure. To materialize the long-cherished dream of Bangladesh; China, its long-term and all-weather friend has come forward with open heart. Bangladesh has warmly accepted the invitation of the China's the Belt and Road initiative Project considering its future benefits especially for securing and bolstering their commercial trade routes. China's the 21st Century Maritime Silk Road which will extend from its own coastlines through Southeast Asia, the Indian Ocean, the east coast of Africa, and up through the Mediterranean to Greece. Lies in the womb of Indian Ocean, Bangladesh sees multiple opportunities being a major part of this maritime agenda.

## **Fisheries and Aquaculture**

Fish is a popular complement to rice in the national diet, giving rise to the adage a Bengali is made of fish and rice [5]. The coastal and marine environment of Bangladesh is blessed with a warm tropical climate and high rainfall, enriched with nutrients from the land, creating one of the world's richest ecosystems with high productivity [6]. Therefore, the fisheries sector plays a very important role in the national economy, contributing 3.69% to the Gross Domestic Product (GDP) of the country and 22.60% to the agricultural GDP [7]. Alike fisheries, aquaculture is also contributing to the global food sector by providing 47% of the fish for human consumption annually. The total first sale value of fisheries and aquaculture production in 2016 was estimated at USD 362 billion, of which USD 232 billion was from aquaculture production [8]. Aquaculture under the blue economy will incorporate the value of the natural capital in its development, respecting ecological parameters throughout the cycle of production, creating sustainable, decent employment and offering high value commodities for export [9]. Due to stable fisheries production, reduced wastage and continued aquaculture growth; there was a record high 171 million tons total fish production in 2016, which fulfilled the 88 percent of human consumption. With scientific and technological innovations, the aquaculture production has increased from 712,640 and 2,060,408 metric tons from 2000 and 2016. It is very true that fisheries and aquaculture industry are not only providing with food security and nutrition but also creating employment of millions of people who directly depend on this industry. Additionally, the agenda of the United Nations 2030 focuses on Sustainable Development and its 17 Sustainable Development Goals (SDGs) particularly SDG 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) is directly relevant to fisheries and aquaculture. But, increasing number of humans movement and activities has been

responsible for reducing the ocean productivity. Moreover, along with reducing nutrient mixing, ocean stratification has also been increasingly occurred in the open seas due to climate change. Global Ocean Observing System (GOOS) and LME assessments show significant warming trends from which model projections 2040-2060 forecast a steady decline in ocean productivity [10].

### **Marine Tourism**

Being a part of global tourism industry, marine and coastal tourism play a key importance to many developing countries in terms of economic development. As a worldwide export category, tourism ranks third after chemicals and fuels and ahead of automotive products. In many developing countries, tourism is the top export category. The United Nations World Tourism Organization (UNWTO) addressed marine tourism related to SDG-14, which ensures benefits for host countries from tourism activities through sustainable use of marine resources. Marine tourism is one of the key components of the blue economy and is linked to environmental conservation. Many governments have considered this tourism industry as alternative livelihoods of people for economic growth and environmental well-being as it can ensure social, environmental, and economic benefits through sustainable use of marine resources. This tourism segment has great potential in Bangladesh with the existence of the Bay of Bengal in the southern territory of the country. According to a study result marine tourism development can ensure various elements of social well-being, such as improving quality of life, infrastructure development, and enhancing public facilities.

### **Energy Sources in Bangladesh**

In Bangladesh, there are many natural resources such as coal, gas and petroleum. The main source of energy in Bangladesh is natural gas (24%) which is likely to be depleted by the year 2020. The country has about 1.5 billion people who lack electricity access, according to IEA's 2008 estimates, representing almost 20% of the total population. About 52% of Bangladesh's total population are connected to the main grid, while almost 75% of rural population are not connected to it. Since Bangladesh has a 724 km long coastal line; therefore, it is a huge potential of wave energy that may be the vital source of electricity and can contribute to face the energy crisis problem of both in island communities and in mainland of Bangladesh. Ocean wave energy which is generated directly from ocean waves, is another viable type of renewable energy which not only helps to generate power but also to decrease the harmful emissions of greenhouse gases during the power generation process. The primary purpose of ocean wave energy is concerning to generating powers; but, it can also be used in agricultural sectors such as in pumping water, water desalination etc. The oscillating water column method is technically feasible and is becoming economically attractive for this purpose in many countries. So, Bangladesh has the potential for harnessing ocean wave energy from the Bay of Bengal.

In 2018 offshore fields accounted for more than 33% of worldwide crude oil production and this is projected to rise to 34% in 2025 and higher subsequently, as almost half the remaining recoverable conventional oil is estimated to be in offshore fields - a quarter of that in deep water. Fossil fuels include mostly methane, natural gas and oil at the sea area of Bangladesh can be extracted and processed not only for meeting up energy supply but also in various ways.

### **Biotechnology and Marine Genetic Resources**

Countries vested with huge number of population such as Bangladesh, China, India, etc. are at high risk of food scarcity. Thus have resulted in urgent need for high yielding crop varieties through agricultural technologies. Researchers across the globe are developing GM crops and producing high yielding crops to feed the growing population. Marine biotech can meet the global challenges of human health, sustainable food supplies, energy security and environmental remediation. It can also greatly contribute to the pharmaceutical industry since marine genetic resources like bacteria are a rich source of potential drugs and treatment remedy of cancer. One area where marine biotech may make a critical contribution is the development of new antibiotics. The unexplored and understudied nature of much of the underwater world means that the capacity of marine organisms other than fish and shellfish to provide inputs to the blue economy is only just beginning to be appreciated, partly through new gene sequencing technologies for living organisms.

### **Submarine Mining**

Considering the future demands and necessity of natural resources, the world is gearing up for the exploration and exploitation of mineral deposits on and beneath the sea floor and Bangladesh is also an under this project. Industrialist countries are paying more attention to the potential riches of polymetallic nodules, cobalt crusts and massive sulphide deposits which are important for ICT hardware and renewable energy technologies. The International Seabed Authority has developed the Mining Code regulations to meet these changing circumstances and has commenced issuing licenses for the exploration of the international sea floor.

### **Sea Salt Production**

Salt industry of Bangladesh plays a very crucial role in the socio-economic sector by creating a large number of job employment and moving to industrialization. This industry is one of the largest labor oriented industries in Bangladesh after garments. This is the workplace of about 5 million people who are directly or indirectly engaged in this sector.

## Conclusion

Bangladesh has vested with number of natural resources particularly abundant in the Bay of Bengal. But, most of its natural resources are still in unexplored and unused. Comparing to its neighboring countries-India and Myanmar; Bangladesh is going too slowly to excavate its potential natural resources. Being a middle-income country, Bangladesh needs to take urgent measures and adopts well-planned policies to utilize these invaluable resources to move the economic-wheel faster. It's high time to search for new method and adopt scientific technologies to cope with the competitive world to best use of resources. Along with using traditional or manual method and equipment; priority should be given to the modern technologies. To ensure best and proper utilization of blue economy of Bangladesh; we have to work hand in hand. We should just not only look for the economic interest of the natural resources; but, also have to ensure that the ecological balance is not disrupting by any means; and protecting the rights and interests of natural resource assets must be considered first. It is undeniable that Bangladesh is burdened with socio-political, economic and infrastructural problems that create blockage to way of prosperity. However, effective measures can mitigate the such problems and lead the country to a right direction.

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