

Blue economy: A way to sustainable economic development in India

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Abstract

This research paper strives to present the status of the blue economy in India. The study shows that there is a contrary relationship between the coastal area and unemployment percentage. The total coastal shipping has increased by 60%. Moreover, the results show that average fish production in India was 11.7158 MMT between the period of 2014-15 to 2018-19 but India's marine fish production lessened by 8.1% in 2018 as compared to the previous year. The total amount of Rs 71.81 Crore was issued under the Swadesh Darshan Scheme of the Ministry of Tourism for coastal circuit development. Overall status of the Indian blue economy is developing.

Keywords: *Blue economy, Sustainable economic development, India*

JEL Classification: *F63, Q01*

Introduction

Three types of capital hand out the welfare of humans by holding up the production of goods and services in economic operations. These three capitals are KP (physical capital), KN (natural capital), KH (human capital). Where KP comprises machinery, factory, and equipment, etc, which are used in manufacturing; KN is employed to generate materials as well as energy for sustained production; and for the proper use of the above two capitals, human dexterities are needed, which is included in the KH capital (**Barbier, 2020**). Without the benefaction of natural capital like energy and other materials required for the production of services and goods and the growth of the economy will not be possible. At the time of the emergence of modern Economic growth theories during the 1950s and 1960s significance to natural resources and the environment were not there (**Toman, 2003**). Economists are now considering the environmental factors in their concepts of economic development. They have recognized natural or environmental factors as one of the substances of growth of a country's economy. Development of a country without the recognition of the significance of environment and due care to protect the natural resources is not praised in international levels and which is not even development in true sense. Environmental economics contemplate sustainability and also economists are in general more agreeable with the wide interpretation of sustainability, as it can be effortlessly expressed in economic terms, for example, benefits and economic opportunities received today should not be in the price of reduced or no benefits and opportunities in the future (**Barbier, 2020**). Human capital, which is used to have an access to the use of natural resources for economic development, mostly relies on technological

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developments. In this age of technology, oceans are attracting more recognition as a new epicenter of economic operations like trade and commerce in different fields like shipping, fisheries, etc. Further emerging activities linking to the ocean like aquaculture, marine biotechnology, ocean energy, and sea-based mining also hold huge prospects to generate jobs and bring wider economic growth **(Ninawe, 2019)**. There are no odds that improvement in technological capabilities and urgency to sustainability or welfare will be repugnant **(Fagerberg & Srholec, 2017)**. The ocean is also another inevitable component of natural capital. Three-quarters of the surface of the earth is occupied by oceans, which also includes 97 % of the earth's water and the living area of 99%. Oceans are avowed as the 'last frontiers' of prosperity in the form of growths and developments but the true potential of oceans is still not availed fully **(Maini & Budhraj, n.d.)**. Oceans provide a weighty portion of the world's population in terms of livelihood and food and also transportation of 80% of global trade is also taking place through oceans **(Bari, 2017)**. The ocean is not boundless and the correlation between humanity and the ocean, and the use and exploitation of marine resources is an evolving and dynamic topic. Notwithstanding various resources are provided by the ocean for the good of human beings (such as food, energy, products including medicines), non-market goods and services are also acknowledged as indispensable for life on earth **(World Bank Group, 2017)**. Since time is out of mind, the ocean is being used as a fount of meeting needs, bracketing the economics around the world. The development of numerous big cities and dominant places of commerce transpired due to the ingress to use the ocean. The conceptual framework of Blue economy mentioned in the World Bank report named 'towards a blue economy: a promise for sustainable growth in the Caribbean' tries to illustrate the linkage between the inputs that are being utilized for different economic purposes from the underlying natural capital and the outputs from the economy affecting the natural resources. In other words, this framework makes an effort to find out the net benefits society getting from the blue economy through collating value changes in natural capital with changes in economic activities **(Patil et al., 2016)**. Blue economy contemplates oceans as 'Development Spaces' and with appropriate planning blue economy blends conservation, sustainable use, extraction of oil and minerals, bio-prospecting, production of energy in a sustainable way, and also marine transportation. Blue Economy shatters the glass ceiling created by usual ways of doing business under the brown economy **(Bari, 2017)**. The main motive of the concept is to discrete socio-economic development from the depletion of the environment. The concept of the blue economy can be lined up with economic and trade activities and the need for conservation and sustainability in managing the maritime sector **(Smith, 2016)**. All over the world, interest in the act of economizing the revenues generated from the ocean is climbing. The role played by the Indian Ocean in creating livelihood and contributing to the fields like fisheries, offshore extraction of oil and gas, tourism, and maritime industries are very significant **(Ninawe, 2019)**. It was gauged that 1 to 1.4 million distinct species living in the oceans prop up the growing commercial attention in marine genetic resources that can be utilized for the commercial development of pharmaceuticals, enzymes, and cosmetic products. Since the discussion made at the UN conference on sustainable development (Rio+20,2012). The concept of the blue economy influenced Indian Ocean Rim Association (IORA) and became a topic of powerful dialogue among the member state of the leading regional governance organization, IORA **(Roy, 2019)**. With the enormous maritime activities carried out by inland seaboard over centuries, India is necessarily

a maritime county. In Indian history, it is seen that the Indus valley civilization in the western parts was involved in activities related to the port. Dry dock at Lothal, Gujarat dates back to 3300 BC. These small ports were used by sailors to sail to different places like Mesopotamia and Egypt etc. On the other hand, different kingdoms like Kalinga, Cholas, and the Pandyas, who were used to sail to various countries back then to create trade (**Dhowan, 2021**). Blue economy furnishes immense opportunities for growth of the country by job creation, increasing food production, increasing power, and energy generation, and acting as a source of raw materials to different industries. Figure 1 shows the different sectors and related industries under the blue economy and each sector includes different possibilities and advantages.

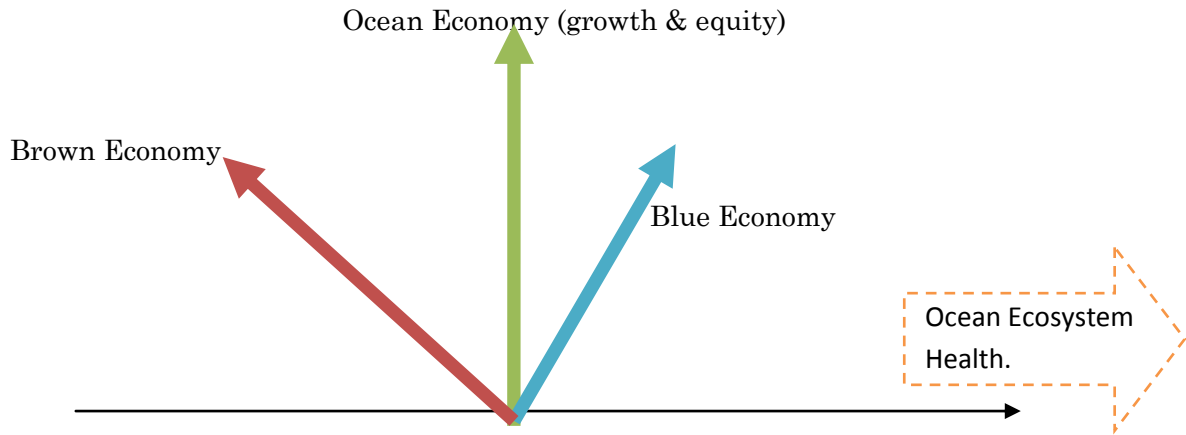
Table 1: Different sectors in Blue Economy

Sector	Industries
1. Harvesting and living resources	a. Fisheries(primary fish production) b. Secondary fisheries and related activities e.g., processing, net and gear making, ice production and boat construction, etc. c. Trade of seafood. d. Trade of non-edible seafood products e. Aquaculture f. Marine biotechnology and bioprospecting
2.Extraction and use of marine nonliving resources(non-renewable)	a. Mining b. Oil and gas c. Desalination
3.Use of renewable natural forces	a. Generation of (offshore) electricity b. Power plants based on renewable energy like solar, wind, tidal, and ocean thermal energy gradient, etc
4. Commerce and trade	a. Shipping and shipbuilding b. Marine transport c. Tourism and recreation
5. Indirect contribution to economic activities and the environment	a. Carbon sequestration with the help of blue carbon b. Waste disposal c. Habitat protection and restoration d. Protection of species and habitants

Source: World Bank Group, (2017) and Mitra *et al.*, (2021)

Some similar-looking concepts are based on ocean-dependent economic growth. However, deep insight will proclaim the true concepts and differences among them. The difference among the similar-looking concepts with the Blue economy is presented in Figure 1.

Figure 1: Brown Economy, Ocean Economy and Blue economy



Source: Patil *et al.*, (2018)

Review of literature

All over the world, it is very easily evident that we try to exploit nature to meet the recent urgencies without considering the future and the needs of the future generation. Due to the blue economy, the importance of the oceans is being recognized for the role they have towards the future of humankind. Cox's Bazar in Bangladesh is a fishing port as well as a tourist destination. This is one of the most visited tourist destinations of Bangladesh. Due to blue tourism, the numbers of tourists are climbing up by and by. Productive sectors of the blue economy aim to achieve total use of ocean resources under the judicial maritime area of Bangladesh (**Islam *et al.*, 2018**). Blue economy considers the oceans as Development Spaces and proper planning bundles up conservation and sustainable development together. A large number of people depend upon the ocean as a source of food and livelihood because the oceans are like treasures from the shore to the bottom of it. The potentials are limitless and it has been observed by South Asia but political initiation, researches, and awareness are the factors that also should be considered alongside (**Bari, 2017**). The geography of the world, history, interaction globally, and developments are confidentially associated with the oceans. Oceans are abundant in oil, minerals, and biodiversity; they became a road to global trade (**Dhowan, 2021**). The definition of the blue economy is easy to recall, manage and assess. In the working definition of blue economy, the blue economy is defined as 'when economic activities are balanced with the long term capacity of ocean ecosystems to provide for such activities and oceans are kept strong and healthy; A sustainable economy based on ocean appears'(**Smith, 2016**). The possibilities of the blue economy are very sanguine in Southeast Asia despite some difficulties in collective action. There are security-related disputes in the region but through cooperation, such disputes can be prevented from being an obstruction against a successful realization of the initiative of the blue ocean economy (**Gamage, 2016**). The tremendous possibilities provided by the blue economy should be cultivated in a balanced way so that the health of the oceans is kept in good condition and the UN's sustainable goals can be attained(**Maini and Budhraj, n.d.**).

Need of the study

Blue Economy is a growing field, which has a colossal amount of potential but its benefits are not being used completely, especially in India. The productive Economic sectors

under the blue economy are focused on harnessing the full utilization of ocean-based resources. But there is a lack of knowledge to avail the maximum benefits from the blue economy (**Islam et al., 2018**). More research on this topic will fill the gap of knowledge regarding the blue economy and its benefits, which will encourage more industries to enter this field. The blue economy includes different sectors with distinct opportunities and benefits and also considers the impact of economic activities on the environment. With the increasing global environmental issues, the blue economy is receiving more importance. India has a large population that demands more jobs, power, and food. In such a scenario blue economy can be acknowledged as a substitution to the brown economy.

Objective of the study

The objective of the study is to study the scenario of the blue economy in India by analyzing data relating to different elements associated with blue economy and their contribution towards Indian economy.

Research Design and Methodology

As descriptive research is suitable in the case of studying a situation, it focuses to describe a situation accurately. To meet the objective of this research paper, a descriptive research design is tailor-made. The data collection method is secondary and for creating a valid pool of data from which unbiased interpretations can be made, all the secondary data were collected from reliable databases of journals, books, working papers, etc and on the other hand, various reports, declarations, conference proceedings of different ministry and bodies of the government of India and international organizations were considered. Some newspaper articles were also considered to present updated data concerning the objective of the study. Collected data were presented with the help of descriptive statistics and also inferential statistics have been applied to interpret in a certain area. Data were also compiled to bring meanings out of them and compare. Spearman's correlation is used to observe whether one variable increases or decreases with another variable.

Results and Discussion

India's coastline

It is expected that the ocean industry value-added is to be doubled from USD 1.5 to 3 trillion by 2030 (**OECD, 2016**). Above 7500km coastline, nine maritime states, two UTs in mainland and two islands, 12 major ports, and 187 non-major ports in India play a vital role in maintaining growth for trade and commerce. With the extended Exclusive Economic Zone to 2.02 million sq km and continental shelf area 0.18 million sq km. India supports 30% of the 1.25 billion population of the country by its coastal area. Indian Ocean region is rich in resources especially in fisheries, aquaculture, and ocean energy and sea-based mining and minerals, etc. Among the coastline in India Andaman and Nicobar islands have the highest coastline with 1912 kilometers followed by Gujarat, which has a coastline of 1600 kilometers (**Statista Research Department, 2019**).

Figure 2: Coastline of India



Source: Centre for Coastal Zone Management and Coastal Shelter Belt, (2017)

Table 2: Coastal States and their unemployment and Coastline area:

Base States ↓	Unemployment Rate (%)	Coastal area
Gujarat	1.8	1600
Tamil Nadu	8.3	980
Andhra Pradesh	7.5	960
Karnataka	5.6	280
Kerala	15.8	560
Maharashtra	4.4	512
Goa	17.7	84
Odisha	3.5	432
West Bengal	22.1	280

Source: CIME,(2021) and Central Water Commission,(2016)

In the above table, data relating to the nine coastal states of India are presented concerning their coastal area and unemployment rate. Spearman's correlation has been used to see whether the coastal area has any association with the unemployment of the respective state. The result of Spearman's correlation is found strongly negative i.e. negative 0.41666667. here it can be concluded that if the coastal area is large there will be a low rate of unemployment.

Blue Economy in India

The development of the blue economy can act as a stimulus for achieving the aim to be a \$10 trillion economy by 2032. Indian Ocean Region has significance to the economic growth as India's oil and gas are imported largely through the sea, which is expected to rise by 2025.

Table 3: Gross Value Added (GVA) in blue economy of India*(in INR Lakh crore)*

Year	Total GVA	Blue Economy GVA	Share in Total Economy (%)
2011-12	81.1	3.3	4.1
2012-13	92	3.7	4
2013-14	103.6	4.2	4
2014-15	115	4.7	4.1
2015-16	125.7	5	4
2016-17	138.4	5.5	4

Source: Economic Advisory Council to the Prime Minister,(2020)

There is a steady growth in GVA in current prices from 2011-12 to 2016-17. But the share in the total economy is approximately the same over the years (Table 3). The Blue Economy in India is coming out as one of the most spirited fields of economy and the blue economy is growing more increasingly than the total economy of India (**Economic Advisory Council to the Prime Minister, 2020**).

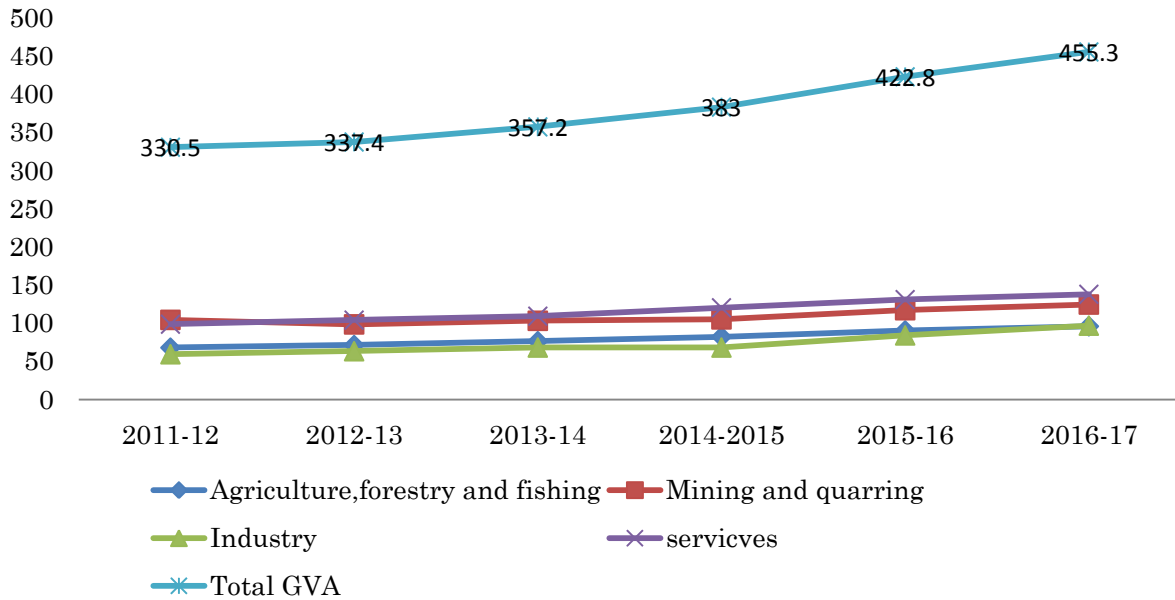
Figure 3: Contribution of the blue economy to different broad fields over the period 2011-12 to 2016-17*(In INR Thousand crore)***Source:** Economic Advisory Council to the Prime Minister,(2020)

Figure 3 shows that the total GVA (Gross value added) of the blue economy in these board sectors is increasing at a great difference from the previous year. Considering individual sectors, it is noticeable that there is a slow but continuous growth is prevailing over the years.

Blue economy's contribution is more in case of service sector over the years followed by mining and quarrying.

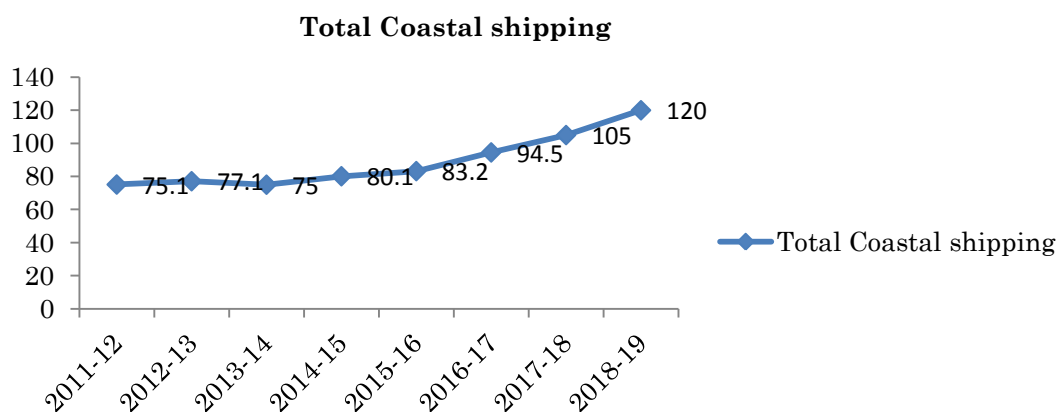
Table 4 : Percentage variation from the previous year (April to June 2021 Vs April to June 2020) of the traffic of different items in Major Ports of India

P.O.L.	P.O.L.	Other	Iron Ore	Fertilizers		Coal		Containers		Other	Total
(Crude, Prod., LPG/LNG)	(Crude, Prod., LPG/LNG)	Liquids	Incl. Pellets	FIN.	Raw	Thermal & Steam	Coking & Others	Tonnage	TEUs	Misc. Cargo	
% Variation from the previous year	8.67	36.89	14.26	-9.03	27.83	52.36	15.55	56.87	57.86	27.16	27.16

Source: Indian Ports Association,(2021)

According to the above figure, there is a positive percentage variation in the case of the traffic of different items in major ports of India between April to June 2021 and April to June 2020 periods except FIN under the category of Fertilizers i.e. -9.03%.

Figure 4: Total coastal shipping volume (Million Metric Tonnes P.A):



Source: Government of India Ministry of Shipping New Delhi,(2020)

Total coastal shipping has increased by 60 % in 2018-19 as compared to 2011-12. Total coastal shipping has increased greatly between 2017-18 and 2018-19 i.e. 14 % (Figure 4). Cochin Shipyard Limited gained a net profit of Rs.481.18 Crore in the year 2018-19 and Rs.396.75 Crore in 2017-18. Another Indian Company associated with shipping is Dredging Corporation of India attained a profit after tax of Rs.4458.98 lakh in 2018-19, which is 168%(approx) more than the previous year (**Government of India Ministry of Shipping New Delhi, 2020**).

Table 5: Descriptive statistics of fish production in India throughout 2014-15 to 2018-19

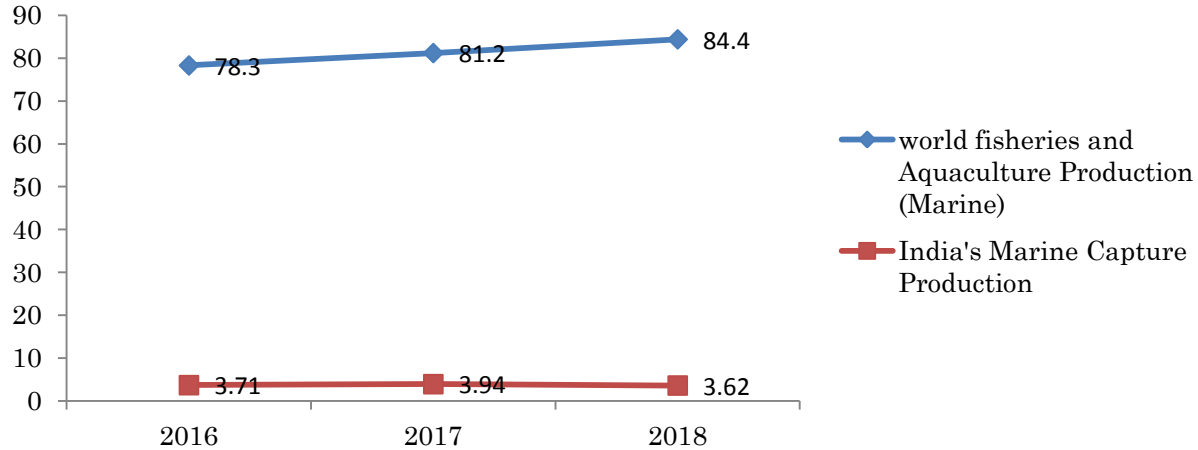
(in Million metric tonnes)

Mean	11.7158
Standard Error	0.6466
Median	11.41
Standard Deviation	1.4459
Sample Variance	2.0907
Kurtosis	-1.0859
Skewness	0.4466
Range	3.631
Minimum	10.069
Maximum	13.7
Sum	58.579
Count	5

Source: FICCI, (2019)

Table 5 discusses that the mean production of fish In India is 11.7158MMT with Maximum 13.7 MMT fish production. Standard Deviation is 1.446(approx).

Figure 5: World fisheries and Aquaculture Production and India's marine capture Production

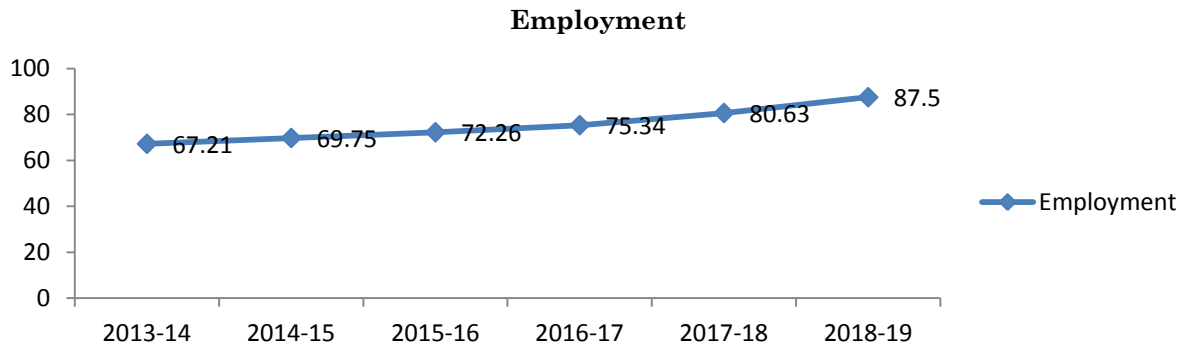


Source: FAO, (2020)

According to Figure 5 world fisheries and aquaculture production is increasing continuously over the three years from 2016 to 2018 at an average rate of 3.8% (approx). Irrespective of increasing million metric tonnes of fish production in India, India's marine Capture production dropped by 8.1% (approx) in 2018 as compared to the previous year. It is projected by FAO that in India fish export for human consumption will decrease from 1398 thousand tonnes in 2018 to 1351 thousand tonnes in 2030 and on the other hand, the import of fish for human Consumption will increase in India from 56 thousand tonnes in 2018 to 109 thousand tonnes by 2030 (FAO, 2020).

The total contribution of the travel and tourism sector of India towards GDP was 234.0 USD billion in 2017, which is expected to be 49.2 USD billion by 2028.

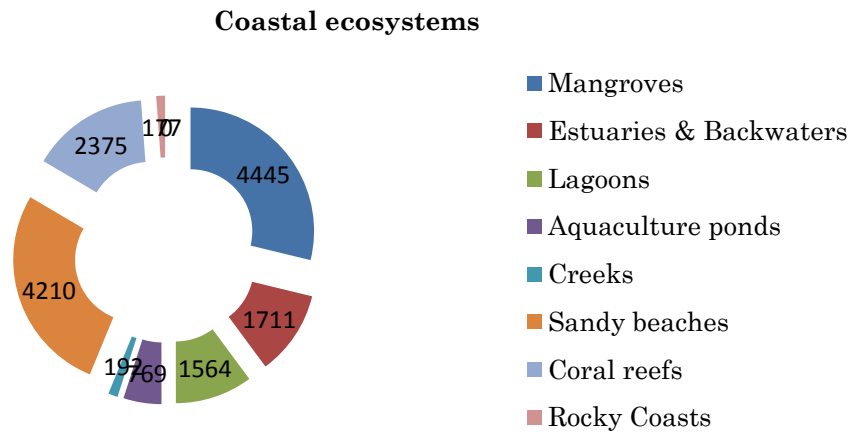
Figure 6: Total (Direct and indirect) contribution of tourism of India towards Employment (In millions):



Source: Ministry of Tourism, (2019)

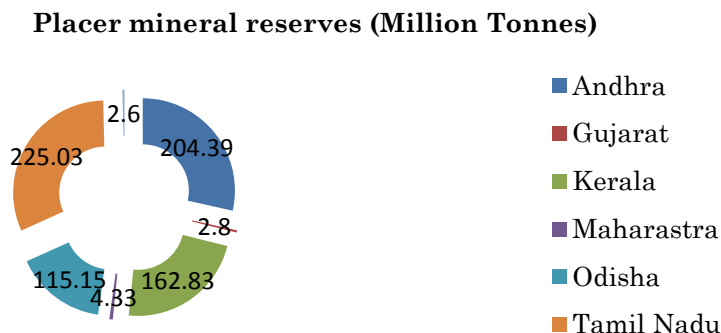
Coastal and marine tourism are some of the rapidly growing products of contemporary tourism. 128 cruise vessel arrivals with 1.2 lakh tourists in 2016-17 increased to 178 cruise vessels with 1.63 lakh tourists in 2017-18 in major ports in India. Directorate General of Lighthouses & Lightships (DGLL) found 13 lighthouse sites for promotion tourist sites in India. 78 more lighthouses around India have been found as destinations of tourism (**Economic Advisory Council to the Prime Minister, 2020**).

Figure 7: Different coastal ecosystems and their respective areas (in Sq.Km)



Source: Economic Advisory Council to The Prime Minister, (2020)

There are abundant coastal ecosystems that are poles apart in terms of their characteristics. Mangroves are found to be the ones holding the highest sq. km i.e. 4445 sq. km followed by sandy beaches (Figure 7).

Figure 8: Placer mineral reserves in the coastal states (excluding Karnataka and Goa)

Source: Blue Economy Working Group 6, (2020)

In terms of reserve of placer mineral reserves, Tamil Nadu is on the top with 225.03 million tonnes followed by Andhra Pradesh with 204.39 million tonnes. Reserves of placer minerals in these 7 coastal states have a mean of 102.45 MT and a range of 222.43 MT (Figure 8).

Table 6: Indian renewable electricity capacity and generation remap 2030 (renewable Energy road map) (Excluding Hydropower)

Renewable electricity Capacity			Renewable electricity generation		
Onshore	2011-12	2030	Onshore	2011-12	2030
	14GW	185GW		21 TWh	463TWh
Offshore	0	3GW	Offshore	0	8TWh

Source: International Renewable Energy Agency, (2017)

The difference between onshore and offshore regarding both Renewable electricity capacity and generation is remarkably high (Table 6). Estimates suggest that India's renewable gas resources stand at around 8 tcm and the most of which are located in India's eastern offshore block. Indian Government is taking steps for establishing technically challenging gas fields and deepwater resources by reforming licensing needs and providing sovereignty to the companies to market their products at High prices (**International Energy Agency, 2021**).

Table 7: Status of PPP and Captive projects under Implementation and operation for the development of ports as of 31-5-2020

PPP and Captive Projects	Total number	Cost (Rs in crore)	Capacity (MMTPA)
Under implementation	23	22270.02	239.15(approx)
Under Operation	55	23093.43	447.41

Source: Indian Ports Association, (2020)

The biggest PPP and captive project under implementation is the Development of container terminals of 2000 MTrs length at Jawaharlal Nehru Port located at Navi Mumbai which will cost 7915 and will have a capacity of 60 MMTPA (**Indian Ports Association, 2020**).

Table 8: Amount allocated under Swadesh Darshan Scheme of Ministry of Tourism during 2019 for development of coastal circuit

States	Amount Released (Rs crore)
Goa	29.81
Maharashtra	3.64
Odisha	22.31
Tamil Nadu	9.70
West Bengal	6.35

Source: Ministry of Tourism, (2019)

Goa has received the highest amount for coastal circuit development under the Swadesh Darshan Scheme i.e Rs 29.81 crore and the total amount of Rs 71.81 Crore (Table 8). In the course of Union Budget 2021-22 Union Finance Minister Nirmala Sitharaman mentioned the preservation of marine biodiversity and a Deep Ocean Mission is going to be implemented. Under Deep Ocean Mission an amount of 4000 crores will be released and will be used over five years. Under this scheme, deep ocean survey exploration and projects to conserve biodiversity will be executed. Dhawan, (2021) Deep Ocean Mission received approval from the Central Government of India on 16 June 2021 (**Tripathi, 2021**).

Summary of Findings and Conclusion

This research paper shows that there is an inverse relationship between the coastal area included in the states and their unemployment percentage rate as suggested by Spearman's correlation i.e. negative 0.41666667 and this result goes with the conclusion of Bari, (2017) the opportunities given by blue economy is limitless and water assists live to grow and helps in sustainable living. Mitra *et al.*, (2021) stated in the conclusion that a blue economy can heighten the GDP of a country by introducing new parts of the sectors like marine biodiversity, fishery and aquaculture, mineral industries and coastal tourism, etc; this study shows that various coastal ecosystems can be promoted well for tourism and also there is also a good number of placer mineral reserves in the coastal states; Tamil Nadu has the most amount of placer mineral reserves among 7 coastal states with 225.03 million tonnes. The total fish production of India shows a range of 3.631 million metric tonnes between 2014-15 to 2018-19 which is a great success in the field of the fishery. Despite increasing fish production in India; marine Capture production dropped by 8.1% in 2018 as compared to the previous year and in India fish export for human consumption will drop from 1398 thousand tonnes to 1351 thousand tonnes in 2030 which is complementary with, Singh, (2020) i.e., in spite of the overall growth in fish production (5.3 million tonnes in 2000-01 to 12.3 MT in 2017- 18), ocean fish production out of the total fish production has declined, due to various reasons like increasing over-capitalization, marine pollution, and the different impacts of climate change. The offshore renewable electricity generation in India is very poor but it is expected to grow to 8TWh by 2030.

The blue economy of India is in the developing stage. Different industries under the blue economy are performing differently, especially tourism, and shipping which are doing well but at the same time marine capture and offshore renewable electricity generation is not doing good but possibilities are there for improvements. Numbers of investment projects are being operated for the development of ports. The total share of the Blue Economy in the total economy of India is in a steady stage.

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