



The Blue Economy: India and COG

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Abstract

We have always lived in a VUCA world. That is to say that our world is characterised by vulnerability, uncertainty, complexity and ambiguity. Our planet manifests this all too often in myriad ways, nowhere better exemplified than in the ocean and environmental system. The on-going global episode of Covid 19 is but a small facet of how our world can be adversely affected by the tipping of some of these systems. More recently, even a relatively minor incident, in the minute part of the ocean, as exemplified by the Ever Given getting stuck in the Suez, can be seen as a case in point as to how easily the world economy can be affected and how VUCA the ocean is.

Keywords: Economics; Subsidiary; Benefits; Ocean; Sustainability; Antarctic and Arctic

Introduction

The nine planetary boundaries, viz, stratospheric ozone layer depletion, loss of biosphere integrity (biodiversity loss and extinctions), chemical pollution and release of novel entities, climate change, ocean acidification, freshwater consumption and global hydrological cycle, land system change, nitrogen and phosphorous flows to the biosphere and the ocean, atmospheric aerosol loading, all have a tremendous impact on the ocean and equally the ocean impacts them. These are existential threats, for sure. They are not my problems or your problems, or of this country or that. They spell everyone's doom.

Just thinking of three of these, viz, climate change, disruption of nitrogen cycle and loss of biological diversity pose an existential threat, each bigger than the previous one, to all humanity even looking purely from an anthropocentric perspective [1]. The ocean has also been our saviour, for times immemorable, and it continues to be our best hope for the future and it is imperative on all our parts to take care of it in order to continue to derive the benefits it offers to us and those that we have hitherto taken for granted.

A complementary theme is explored by Kate Raworth in her 2017 book Doughnut Economics.

Literature Review

The Blue Economy

The development imperative has historically driven us to a point where nothing is of economic benefit for us until we can cut, dig or kill it, which does not distinguish us much from the animal kingdom, so we added 'burn' to it and the entire construct of natural resource economics is based on our continuing expertise in doing those four things with increasing efficiency [2]. It took us well into the second half of the Twentieth Century to start thinking about the environment and really not until the UN Conference on Human Environment in Stockholm, Sweden in 1972 when environment and development began to be talked about in the same breath, alas with a continued focus on development.

Ocean economy or Blue Economy is really nothing but an extension of natural resource economy, in that; natural capital depletion continues to be ignored. On a positive note, there is an increasing recognition that the environment needs to be valued for its own sake, a theme explored in depth in the 2021 Dasgupta Review. Recognition, in the words of Herman Daly (1938), that the Economy is a 'wholly owned subsidiary' of the environment, not the reverse.

Uses and resources of the marine environment have been dominated historically by fishing and shipping (which came first?) on the one hand and exploration and control (leading to colonisation) on the other. More recently, tourism, non-living resources including energy, laying of submarine cables and pipelines, among others, are increasingly common [3]. Recognition has also dawned as to the ecosystem services that we derive from the marine environment which on the one hand is the global air-conditioner and equally the global dustbin. Deep seabed mining and marine genetic resources are among the potential uses and resources. The predominance of strategic as well as illegal uses continues unabated.

Only about 5% the Ocean has been explored and mapped and it, inter alia, absorbs 25% of Carbon Dioxide, generates 50-80% of Oxygen, is 70% of earth's surface, receives over 80% of land-based pollution, absorbs 90% of excess heat from emissions, carries 95% of world trade, contains 97% of earth's water and offers 99% of the biosphere (living space). Also, the so-called 'cloud' actually is in the ocean given almost 99% of communication cables are laid under the ocean.

Others rarely get a thought: that a mix of inputs (biogeochemical fluxes) that generates this life sustaining output on Earth will not occur on Venus or Mars, for example. The breathable air, drinkable water, tolerable temperatures and fertile lands that allow humans to do everything they do, and the complex ecosystems that maintain them, tend to be taken for granted. Sadly, the world is tending to become LAW less: Landless, Airless and Waterless, in the sense that the lands are getting less fertile due to loss of nitrogen cycle, the air unbreathable because of pollutants and the water undrinkable due to contaminants [4].

Furthermore, our greed means that we are at this strange situation in the history that we know what the problems are and we know what the solutions are but we don't have the political or the economic will to tackle them. We are the first generation to feel the impact of Climate

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Change and the last to do anything about. All of which point to a better way in which to govern the ocean in order to derive the best economic benefits from this, the last frontier and our best hope.

Ocean is our past, our present and our best hope for the future and we must look after it. Sadly, as Roger Revelle famously said 'We know less about the ocean's bottom than about the moon's back side'. Hence the renewed efforts to improve our understanding of the Ocean and complete the knowledge gaps through the United Nations International Decade of Ocean Science 2021-30. We also know too well that the conflicting demands of people, planet and profit must be balanced to achieve equity, justice and peace – *Pacem in Maribus* leading to *Pacem in Terra*.

This is depicted in the six circles underneath the logo of the consultancy service operated by the authors.

Some Definitions

The World Bank defines the Blue Economy as sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem. One that simultaneously promotes economic growth, environmental sustainability (including preservation and protection of the ocean ecosystems) and social inclusion. One that operates within the regulatory framework provided by the UNCLOS and other national, regional and multilateral as well as sectoral governance regimes [5]. One that can contribute to addressing issues of vulnerability, including those associated with remoteness and natural disasters, by fostering international and regional cooperation.

The European Commission defines Blue Economy as all economic activities related to oceans, seas and coasts. It covers a wide range of interlinked established and emerging sectors. The EU approaches Blue Economy primarily from an economic perspective with specific regard to jobs and skills creation, investments and economic growth. While the EU still talks of environmental protection and sustainability, their primary focus takes us back to the age-old profit motive which would be deterrent to the environment.

According to the Commonwealth, the 'Blue Economy' is an emerging concept which encourages better stewardship of our ocean or 'blue' resources. It underpins the thinking behind the Commonwealth Blue Charter, highlighting in particular the close linkages among the ocean, climate change, and the wellbeing of the people of the Commonwealth [6]. At its heart, it reaffirms the values of the Commonwealth, including equity and public participation in marine and coastal decision-making. It supports all of the United Nations' Sustainable Development Goals (SDGs), especially SDG14 'Life Below Water', and recognises that this will require ambitious, co-ordinated actions to sustainably manage, protect and preserve our ocean now, for the sake of present and future generations. Given the Commonwealth and UN OHRLS have significant overlap of membership, there seems to be an appropriate focus on issues of people and sustainability.

Discussion

Ocean Governance

Ocean Governance is the conduct of the policy, actions and affairs regarding the world's ocean. Much has been written on this topic but this section talks about the perspective of one author developed in 2002 as a tribute to Elisabeth Mann Borgese, and subsequently expanded into an education, training and consultancy outfit and a Master Class through what he calls the Seven Pillars of Ocean and Environmental Governance. The pillars themselves, are, Science and technology,

Geopolitical economy, Institutions and organisations, Legislation and implementation, Role of civil society, financial initiatives and Education and awareness [7]. Although only one of these directly refers to the economy, all the pillars form the foundation of the Blue Economy. It is also important to remember that better ocean science (both natural and social sciences are equally important in our context) will lead to better ocean governance and that, in turn, will lead to a well-managed ocean economy.

It is a unique approach to the problematic, in that, all of us belongs to at least one, if not more than one, of these seven pillars and could 'adopt' these as our own and contribute to the nurturing and strengthening them in a collaborative manner while thinking of one main pillar as the centre and the others as the supports of a hexagonal structure, as it were. Financial initiatives are very crucial especially if you want to 'do the right thing because it is the right thing to do' [8]. There are some novel solutions on that front too. For one of the authors, Education and Awareness is clearly the central pillar.

The other approach is to look at Positions, Issues and needs as a PIN diagram. If one thinks of volcanic atolls, the tips that you see above water are the Positions that we take which are often intransigent and arising from our self-importance. What you don't see a little bit below the surface are the Issues which are much closer and interlinked [9]. And at the base of there are the Needs which are really quite basic and common to all of us, as articulated by Indira Gandhi in her famous slogan – 'Roti, Kapda, Makan' – meaning food, clothing, shelter in Hindi.

EU 'Green Shoots' into the Blue Economy

A sustainable 'blue economy' will have to play a central role in alleviating the multiple demands on the EU's land resources and tackling climate change. The role of oceans in mitigating and adapting to climate change is increasingly recognised. The sector can contribute by improving the use of aquatic and marine resources and, for example, by promoting the production and use of new sources of protein that can relieve pressure on agricultural land [10]. More generally, lasting solutions to climate change require greater attention to nature-based solutions including healthy and resilient seas and oceans.

The Commission will analyse the findings of the Intergovernmental Panel on Climate Change (IPCC) special report on oceans and propose measures in the maritime area. This will include ways to manage maritime space more sustainably, notably to help tap into the growing potential of offshore renewable energy. The Commission will also take a zero-tolerance approach to illegal, unreported and unregulated fishing. The 2020 United Nations Ocean Conference in Portugal, postponed to 2022, will be an opportunity for the EU to highlight the importance of action on ocean issues.

India

By way of a general introduction, India is the second most populous (~1.4 billion) and the seventh largest country (~3.3 m sq km) by land area in the world. It is the most populous democracy in the world and is a federation with a bicameral parliamentary system of government. The President of India is the ceremonial Head of State and the Prime Minister is the Head of Government. It is a federation of 28 states and 8 union territories. India's economy is the fifth largest in the world with a GDP of ~\$2.9 trillion (nominal). Roughly 4% of this, or ~\$120 billion, is contributed through Blue Economy [11]. India with its young demography is seen to have tremendous potential to become a

fast growing and successful large economy in the years to come.

'Unity in Diversity' has always been a motto of India alongside 'The World is One Family' from the Sanskrit – Vasudhaiva Kutumbakam, reinforcing the concept of One Planet, One Ocean. Jawaharlal Nehru the first Prime Minister of India and the leader of the Indian National Congress, vigorously promoted unity and diversity as an idea and ideal essential to national consolidation and progress. Nehru wrote extensively on this topic exploring it and exhorting it in detail in his work the Discovery of India. A similar idea is later emulated in the European motto and ideal of In Varietate Concordia – meaning United in Diversity – adopted in 2000 from the Latin phrase coined by the Italian Nobel literature laureate Ernesto Teodoro Moneta. Likewise, Mahatma Gandhi had always talked of Sarvodaya meaning development of all through Antyodaya, the uplifting of the weakest in society, borrowing from John Ruskin's 1860 book 'Unto This Last'.

More recently, Prime Minister Narendra Modi has broadened these concepts by the coining the word SAGAR – an acronym for Security and Growth for the entire Region – which also is the Sanskrit word for the Ocean. India has been trying to consolidate its strengths through geopolitical, economic and strategic alliances in the region and beyond by being associated with many regional and international alliances right since their inception or soon thereafter—South Asian Association for Regional Cooperation (SAARC), Indian Ocean Rim Association (IORA), Antarctica Treaty System (ATS), The Arctic Council, The Commonwealth, United Nations Convention on the Law of the Sea (UNCLOS), International Maritime Organisation (IMO), just to name a few.

In addition, India is a member of the G20, an observer at the Organisation for Economic Cooperation and Development (OECD) and a strategic partner of the European Union, apart from being a member of almost all the UN agencies and organisations, most since their inception and a plethora of other regional and sub-regional bodies. India is also party to a vast range of multilateral environmental agreements (MEAs) most of which have a tremendous influence on the Ocean system.

Within the federation, 9 states and 4 union territories are coastal and the others are landlocked. Two of those 4 union territories are archipelagos in the form of Lakshadweep in the Arabian Sea and Andaman and Nicobar in the Bay of Bengal. Two of the large global marine ecosystems (LMEs) namely the Arabian Sea and the Bay of Bengal flank India. As Admiral Robin Dhowan says, in one of his recent talks, one can get a true perspective of how the sea surrounds India is by looking at the map upside down. One can then get an idea of how India needs to be open to the ocean to give and receive goods and services and to benefit from the riches that the maritime domain has to offer and at the same time realise our obligation to protect and preserve the marine environment.

Peninsular India (2nd largest peninsula in the world) is also strategically surrounded by the Bay of Bengal (biggest bay in the world) to the East, the Indian Ocean to the South and the Arabian Sea to the West and is endowed with a coastline of 7517 km (18th longest in the world) as against a land frontier of 15,200 km. The provisions of the UNCLOS mean that India has a claim to 2,305,143 sq km of Exclusive Economic Zone (also 18th largest in the world) and the Commission of the Limits of Continental Shelf has granted 700,000 sq km continental shelves in the Arabian Sea and the Bay of Bengal put together. This compares with India's land area of 3,287,263 sq km. India also has 14,500 km of navigable inland waterways.

India shares its maritime boundaries with Bangladesh, Indonesia, Myanmar, Maldives, Pakistan, Sri Lanka and Thailand and its relationship with the maritime neighbours, as can be said about its land neighbours, Afghanistan, Bangladesh, Bhutan, China, Myanmar, Pakistan, Nepal and Sri Lanka, can best be described as fair to middling or worse. An interesting observation by Aaron David Miller comes to mind, in this context [12]. The US, the only superpower, has friendly or at the very least non-predatory neighbours to the north and the south that won't, in their wildest imagination try to attack the US and it has fish to the east and west. This means that the latitude for the US to make serious errors is almost infinite, a luxury hardly any other country has, certainly not India.

Shipping and Ports

India has 13 designated major ports : Kandla (Gujarat), Jawaharlal Nehru/Nhava Sheva (Maharashtra), Mumbai (Maharashtra), Vishakhapatnam (Andhra Pradesh), Chennai (Tamilnadu), Mormugaon (Goa), Port Blair (Andaman and Nicobar Islands), Kolkata (West Bengal), Paradip (Orissa), Tuticorin (Tamilnadu), Kochi (Kerala), Ennore (Tamilnadu) and Panambur (Karnataka). Kandla is the busiest port while Mumbai is the largest port. All except Ennore, which is under a private corporation, are operated by the Government of India through the Ministry of Ports, Shipping and Waterways with the Directorate General of shipping having all executive powers [13]. The total tonnage handled by all major Indian ports is about 700 Mt which compares with the total tonnage handled by Shanghai or Singapore alone. Hitherto dominated by public sector ports, the private sector is making strong inroads in the recent past.

The beginnings of India's indigenous maritime industry can be seen in the maiden voyage of SS Loyalty of Scindia Steamship Navigation Company Limited from Bombay to London on 5 April 1919, a day now commemorated as the National Maritime Day since 1964 [14]. India has 43 shipping companies sailing 1400 ships with a gross registered tonnage of 12.69 million tonnes. This compares with some 53,000 ships worldwide with a gross registered tonnage of over 2 billion tonnes. So, on almost all fronts, namely, ports and shipyards, shipbuilding, shipping companies, ship numbers and tonnage, the challenges for India are enormous. India has 21 shipyards, large and small, that engage in shipbuilding and ship repair.

Shipbreaking is an area where India has the distinction, albeit somewhat dubious, of being in the top position globally. Dubious because this activity is known for its notorious health and safety shortcomings. However, India is fast improving the work and safety conditions in these hitherto unsafe shipbreaking yards and has committed in 2020 to the Hong Kong Convention to be compliant in all its shipbreaking activities in the next couple of years. India is a signatory this convention, which has not yet entered into force, and is one of 12 nations that have ratified it (15 are needed). This industry is expected to be growing rather rapidly in this decade given the demand for decommissioning of vessels is on the rise [15].

Fishing and Biological Diversity

India is the 3rd largest producer of fish, both by way of capture fishery and aquaculture, adding to an annual production of almost 11Mt with the state of Andhra Pradesh being the largest producer, contributing almost 25% of the total with a growing share of inland waters (rivers and lakes) fisheries and aquaculture. Mangrove forests are the breeding and nursing grounds for birds, fish and invertebrates and are the veritable super power of the cradle of life, quite apart from acting as biogeochemical buffers or barriers between the land the sea in

the coastal zones and being great carbon sinks.

Unfortunately, India has fallen prey to fail to recognize the effective value of the unique mangrove system. The mangroves are the beginning and the end of the oceans. A healthy ocean starts in the tropics with healthy mangrove forests, moves to healthy seagrass beds, and ends with healthy coral reefs [16]. All three of these ecosystems belong together and must not be destroyed by human greed. Also, our future medicines will come from these three areas and will surpass all known artificial medicines by far.

Framework for Ocean Activity

The Council for Scientific and Industrial Research (CSIR) is an apex body that conducts research activities under the Ministry/Department of Science of Technology (DST/MST) of the Government of India and has pre-independence origins dating back to 1942. Since then, prominent research institutes and laboratories were created under the aegis of the CSIR. The National Institute of Oceanography (NIO) Goa, established in 1966, is one of the 37 constituent laboratories and the premier ocean research institute under the CSIR which itself is under DST/MST. The Central Marine Fisheries Research Institute (CMFRI) Kerala, established just before independence in 1947, is one of 101 institutes under the Indian Council for Agricultural Research (ICAR) since 1967, which comes under the purview of the Ministry of Agriculture and Farmers Welfare (MoAFW) [17]. This is just to give an example of fragmented governance of the ocean relate activities in India.

The Department of Ocean Development (DoD) was created in July 1981 as a part of the Cabinet Secretariat directly under the charge of the Prime Minister and came into existence as a separate Department in March 1982. This was an attempt to unify all ocean related activities under one umbrella organisation. The DoD functioned as a nodal Ministry for organizing, coordinating and promoting ocean development activities in the country. In 1982 the DoD prepared the Ocean Policy Statement which was debated and approved in both Houses of the Indian Parliament.

Department of Ocean Development

In 1981, when the idea of launching to Antarctica was being considered, there was a lot of scepticism and uncertainty about the venture. However, the indomitable spirit of Indian scientists prevailed upon the policy makers and the possibility of sending the first scientific expedition to Antarctica, which combined science with adventure, became a reality. The expedition successfully landed on 12 January, 1982 in Antarctica, Syed Zahoor Qasim as leader of the expedition.

To date, 17 scientific expeditions to Antarctica have been launched, one every year. The first Indian permanent station was established in the year 1983 on the Antarctic ice shelf, and was named Dakshin Gangotri. As is true of any material left on the ice, the station slowly sank down. By the time its warranty period for safe living was over, a new station in the rocky hill ranges, known as Schirmacher Ranges about, 100 km further south, was established and named Maitri.

Maitri is an international, round the year station. It is capable of accommodating about 25 persons comfortably, and is well furnished with living space, laboratories and modern amenities, which offer excellent infrastructure for carrying out front-ranking research in several areas of science. Communication between India and Maitri is well established through satellite and Internet communication. In 1983, India was selected a Consultative Member of the Antarctic Treaty followed by its election as a Member of the Scientific Committee on

Antarctic Research (SCAR) in 1984.

Scientific work in the areas of atmospheric sciences and meteorology, geology and geophysics, biology and oceanography, and environmental physiology and medicines are some of the interesting subjects in which India is conducting its various programmes. Polar research which was not known in the country until the first expedition landed, has gained considerable interest and today there are nearly 25 institutions working on the data, material and samples collected from Antarctica.

A new institute for Antarctic research was established in 1998 and is now renamed National Centre for Polar and Ocean Research (NCPOR)

Tripolar World

India, with its interests in the Arctic and the Antarctica, as discussed above, is increasingly preoccupied with the third largest body of ice to its north in the form of the Himalayas and wants to develop an idea of a tripolar world. India is quite a distance away from the Earth's poles, but its Polar programme is over 30 years old and has resulted in the establishment of three research stations in Antarctica (Bharati, Maitri and Dakshin Gangotri), and one in the Arctic (Himadri) [18]. The Hindu Kush-Himalayan region is the storehouse of the third largest body of snow and ice on our planet after the Antarctic and the Arctic. In 2016, the Indian Government built a high-altitude research base Himansh in the Himalayas. Because of similarities between the Antarctic, Arctic and Himalaya, scientists are now describing these three regions as the 'Three Poles' with the Himalayan system as the Third Pole.

Manganese Nodules Programme

The first successful cruises for polymetallic nodules were undertaken from December 1980 to January 1981 in the Indian Ocean on board the Indian built Research Vessel Gaveshani of the National Institute of Oceanography (NIO). The first nodule sample was lifted from a depth of about 5 km. This was followed by numerous samples of nodules from the Indian Ocean. The success of these cruises, and the others which soon followed generated a great deal of interest within the scientific community of India. The Government of India directed the newly established Department of Ocean Development to act as a nodal agency in the country for policy, co-ordination, promotion of research and to give a new thrust to the overall development in the ocean sector.

The Department identified the programme of the exploration of polymetallic nodules as one of the major thrust areas. India was the first among the developing countries to launch a massive effort to the oceanographic programme dedicated to manganese nodule exploration. Based on the result of the exploration carried out by the NIO, India became a "Pioneer Investor" in the field of deep-sea mining in 1987. A prime area of 4 million sq km was initially demarcated in the Central Indian Ocean Basin (CIOB) in which extensive work had to be conducted to identify the most promising mine site.

These efforts led to the demarcation of a total application area of 300,000sq km. which was divided into two regions of 150,000 sq km of each of equal estimated commercial values. The Indian claim for a mine site in the Central Indian Ocean was thus filed with the Preparatory Commission of the International Seabed Authority (PREPCOM) in January 1984. After prolonged negotiations among the first group of pioneer investors (India, France, Japan and the then FSU) and with the PREPCOM, the Indian application was registered by the PREPCOM and an area of 150,000 sq. km was allotted to India. Thus, India became

the first country in the world to have the registration of a mine site. This event was regarded as an important landmark in the history of Indian Oceanography.

In March 1983, the Department of Ocean Development acquired a most sophisticated and highly advanced oceanographic research vessel "Sagar Kanya". Designed and built in the then Federal Republic of Germany, it has full capabilities to work in the field of physical and chemical oceanography, meteorology, marine biology, marine geophysics and marine geology. The ship has been fitted with a Multi-Sea Beam System, along with underwater TV camera, to study the sea bottom and obtain photographs [19]. The ship has so far completed several hundred cruises in the Indian Ocean to study different aspects of meteorology, geology, geophysics, poly-metallic nodules survey etc.

Fisheries Oceanographic Research

Another multipurpose fisheries and oceanographic research vessel, Sagar Sampada was constructed at the Dannebrog Shipyard Limited Denmark. It was delivered to the Department of Ocean Development on 6 November 1984. Marine Fisheries Resources Research is the principal function of this vessel. It is well equipped for locating fish resources, assessing their extent of distribution and quantifying fish stocks in the water column and on the sea bottom through an effective use of multiplicity of fishing gears as bottom trawl, pelagic and mid-water trawls and long-line. These are aided by modern underwater acoustics and electronic data processing systems.

Oceanographic research which forms an integral part of marine fisheries research is the second area of operation on this vessel. Sagar Sampada has so far completed more than 150 cruises in the EEZ of India and outside on the studies of phytoplankton and zooplankton productivity in relation to fisheries production. It has recently sailed for the Southern Ocean for krill fishing and estimation of economic prospects of krill resources, among other studies in that area.

Human Resource Development

Since the days of the International Indian Ocean Expedition, the primary concern has been to build properly trained personnel in all the disciplines of oceanography. With this objective in view, highly qualified staff was recruited from the Universities, IITs and Fishery Institutions to shoulder the responsibilities of the various projects in the ocean sector. Thus, the programme of manpower development has been a continuous process of the Department of Ocean Development and, since its inception, 73 projects have been funded by the Department. Of these, 48 have been completed. There are 25 projects in operation including the one on the development of potential drugs from the ocean.

The national project on the development of drugs from the ocean was initiated in November 1990 with the participation of 10 laboratories, and the Central Drug Research Institute (CDRI), Lucknow as the apex institution. About 140 marine organisms of potential value were identified from various places along the east and west coasts. Their specimens are preserved in the herbarium at the CDRI and NIO. Of these, 50 marine organisms have shown promising results with anti-viral, anti-inflammatory, anti-fungal, hypotensive, diuretic and toxic activities. This project is multi-disciplinary in nature and provided a lot of scope for developing skills.

Ministry of Earth Sciences

In February, 2006, the Government designated the Department as the Ministry of Ocean Development. The Government of India further reorganised the Ministry of Ocean Development and the new Ministry

of Earth Sciences (MoES) came into being as per the Presidential Notification in July 2006 bringing under its administrative control India Meteorological Department (IMD), Indian Institute of Tropical Meteorology (IITM) and National Centre for Medium Range Weather Forecasting (NCMRWF). The Government also approved the setting up of Earth Commission on the lines of existing Space Commission and Atomic Energy Commission.

The Earth System Science Organization (ESSO) New-Delhi operates as an executive arm of the Ministry of Earth Sciences (MoES) for its policies and programmes. The ESSO provides overall direction for the centres/units and review the implementation of the programs. The ESSO was established in October 2007 as a virtual organization, bringing all meteorological and ocean development activities under one umbrella, recognizing the importance of strong coupling among various components of the earth viz. atmosphere, oceans, cryosphere and geo-sphere. It has four major branches of earth sciences, viz, (i) Ocean Science and Technology (ii) Atmospheric and Climate Science and (iii) Geoscience and Technology and (iv) Polar Science and Cryosphere. The sole purpose of the endeavour was to address holistically various aspects relating to earth processes for understanding the variability of earth systems.

The ESSO is primarily aimed to develop and improve capability to forecast, weather, climate and hazard related phenomena for social, economic and environmental benefits including addressing aspects relating to climate change science, and climate services [20]. ESSO is also responsible for development of technology towards the exploration and exploitation of marine resources in a sustainable way for the socio-economic benefit of the society by taking into account the global developments in the field of marine environment. One of the mandates of ESSO is also to promote research in polar science of both Antarctic and Arctic Regions to understand the various phenomenon and processes of these regions on global climate and weather, in particularly on the Indian Ocean.

The overall vision of the ESSO is to excel in knowledge and technology enterprise for the earth system science realm towards socio-economic benefit of the Indian sub-continent and in the Indian Ocean region. It has three major components:

1. Provide scientific and technical support for both academic and applied research in Earth System sciences as a whole comprising the atmosphere, hydrosphere, cryosphere and the geosphere, with particular reference to the Indian sub-continent and the surrounding oceans as well as the Polar Regions.
2. Provide the Nation with the best possible services in forecasting the Monsoons and other weather/climate parameters, ocean state including early warnings to natural disasters like storm surge, earthquakes, tsunamis and other phenomena through well integrated programs.
3. Support science and technology development for exploration and exploitation of ocean resources (living and non-living), ensuring their sustainable utilization.

These policies/programmes are being pursued through its following institutions that include Centre for Marine Living Resources and Ecology (CMLRE) Kochi, National Centre for Coastal Research (NCCR) Chennai, National Centre for Seismology (NCS) New Delhi, National Centre for Medium Range Weather Forecasting (NCMRWF) Noida, India Meteorological Department (IMD) New Delhi, National Institute of Ocean Technology (NIOT) Chennai, Indian National Centre for Ocean Information Services (INCOIS) Hyderabad,

National Centre for Polar and Ocean Research (NCPOR) Goa , Indian Institute of Tropical Meteorology (IITM) Pune , National Centre for Earth Science Studies (NCESS) Thiruvananthapuram .

Under the framework of ESSO, a well-established mechanism has been put in place to review and monitor the various programs on half-yearly basis, which are generally held in the month of April and October [21]. The primary objective of the review mechanism is to formulate proposals for Annual Plan and apply mid-course corrections, as required.

Fragmented Framework

As we can readily see from the foregoing discussion, the framework for marine activities in India is rather fragmented, to say the least. A cursory glance at the governance structure would indicate that there are at least 15 government departments of ministries that have direct stake with what happens in the marine and maritime realm. These are: Ministry of Agriculture and Farmers Welfare; Ministry of Commerce and Industry; Ministry of Defence; Ministry of Earth Sciences; Ministry of Education; Ministry of Environment, Forest and Climate Change; Ministry of External Affairs; Ministry of Fisheries Animal Husbandry and Dairying; Ministry of Home Affairs; Ministry of New and Renewable Energy; Ministry of Petroleum and Natural Gas; Ministry of Ports, Shipping and Waterways; Ministry of Power; Ministry of Science and Technology; Ministry of Tourism; Ministry of Water Resources.

As we have also discussed before, the Department/Ministry of Ocean Development was an entity created in 1981 precisely with the idea of unifying the efforts of all stakeholders and give it one direction, as it were. While that purpose was not served for reasons of respective 'positions' taken by the stakeholders leading to the weakening of the very idea and it eventually getting subsumed under the Ministry of Earth Sciences in 2006. Most recently, a report by a major trade association, the Federation of Indian Chamber of Commerce and Industries (FICCI) has suggested that the government should create a new Ministry of Blue Economy. While, prima facie, it would seem to be a good idea worthy of serious consideration and even implementation, it might run into the same difficulties of dilution and eventual dissolution, as the erstwhile Ministry of Ocean Development, because no existing government department wants to lose their clout.

Challenges

Some of the challenges India faces can be encapsulated by the following thoughts, all related, some conflicting, others complementary. Our warming world is inevitably changing the Ocean and it is critical that adaptation and mitigation measures are adopted to achieve resilient marine systems. This will involve safeguarding of marine life through conservation of the marine ecosystem, both the habitat and biodiversity. This will help to consolidate the foundation for sustainable and secure future seafood system with a view to achieving food for all. These goals can only be achieved if we are able to reduce marine pollution, especially land-based sources of marine pollution, which contributes to 80% of all pollution ending up in the ocean. This may well be somewhat debatable and new studies are being conducted by GESAMP, among others, to ascertain this.

Urgent attention needs to be paid to linkages between human health and ocean health, particularly in view of the ongoing Covid crisis. Climate-driven species redistribution is one of the inevitabilities due to their poleward movement. Some of the foundations that these can be built on are through a sustainable coastal and offshore blue economy, better ocean governance of sovereign and common pool resources, supporting ocean literacy/education (something we will discuss more

later in this paper as part of the COG proposal) and public engagement, and improving international relations around ocean issues through better compliance with multilateral environmental agreements. At the heart of all this also must be a focus on the coastal communities of local and indigenous peoples.

ABCD of Opportunities

Some of the opportunities for India derive from creating a combination of healthy competition alongside strong cooperation among its IORA neighbours. Also being the biggest in the region, India can play the equivalent of corporate social responsibility in an international sense by being altruistic without being Big Brother. What India needs is to Achieve the threefold goal of Equity, a feeling of environmental and social Justice among its people and create Peace, with the famous motto – Concordia Domi Foris Pax – Harmony Within, Peace Without. Equity can be achieved to create a much-needed Balance among the conflicting needs of People (society), Planet (environment) and Profit (economy). India, as indeed the rest of the world has much to do to Combat Death, Disease and Destruction and this alludes to the existential threats associated with not just the flora and the fauna but also the humans but hope is on hand with Dividend in the form of the vibrant Democracy that India is with the added advantage of Demography with 65% of the population under the age of 35 alongside the fact that a large population creates demand for a product whether it is seafood, marine transportation or coastal tourism.

Opportunities for India abound through the pursuit of the ideal of Collective Self-Reliance, an idea originally proposed as part of South-South cooperation in the context of SAARC region by the former Prime Minister Rajiv Gandhi. India could take the lead in the IORA region taking into account the expectations (aspirations) of the people of the region and use the regional expertise, experience and eloquence to achieve better Ocean Governance.

Looking Back to Look Forward

After WWI, the League of the Nations in 1925 was the first stab, as it were, at creating global governance but the US did not quite follow through and Peace did not result leading to the inevitable WWII. It was recognised also through the words of Baruch Spinoza (1632-1677) that peace is not mere absence of war which led to the design of the world in 1945 with the formation of the UN and related systems. Again, the drawback was that the UN only focused on people and profits (and hence the Economic and Social Commission as one of the six main organs) and completely ignored the third leg of the stool, the planet. Whether it was complete ignorance at that point or sheer hubris on our parts is debatable.

Ocean and Environmental Issues

It was really not until 1972 that environmental issues truly came to the fore after the United Nations Conference on the Human Environment (UNCHE) which led to the formation of the first UN body dedicated to the Environment. We had assumed that the life support system was based on photosynthesis and did not even know that another life support system in the form of chemosynthesis was thriving until 1975. And while global governance of sorts began with the United Nations in 1945, the Revolution in the Ocean did not start until 1967 and only resulted in the form of global ocean governance did not come to us until 1982 as the United Nations Convention on the Law of the Sea (UNCLOS).

When Arvid Pardo, who is recognised most especially for his contribution to the development of the Law of the Sea, started this

'Revolution in the Ocean', his vision was based on two fundamental principles: first that all aspects of ocean space are interrelated and should be treated as an integral whole; and second, that the seabed beyond national jurisdiction and its resources are the common heritage of mankind – a striking departure from earlier thinking on ocean space. Was he perhaps naïve to think the ocean regime would perhaps be mostly Freedom of the High Seas in the waters and the Common Heritage of Mankind in the Seabed with a rather narrow part of the sea in the form of Territorial Sea under national jurisdiction? This question arises given the carving up of the Ocean with over 40% of the Ocean under national jurisdiction (Territorial Sea, Contiguous Zee, Exclusive Economic Zone, Continental Shelf, Extended Continental Shelf, Archipelagic Waters) with little concern hitherto for the other 60% which is beyond national jurisdiction (High Seas and International Seabed Area or, simply, the Area).

Both the Areas beyond National Jurisdiction (ABNJ) and the regime for International Seabed Area are currently under intense scrutiny by the world community, and quite rightly so. The former through the Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction and the latter through the range of studies being conducted under the aegis of the International Seabed Authority through a range of rigorous environmental impact assessments and development of code of conduct for any future ocean mining.

The other area that is receiving a lot more attention is our efforts to learn more about the Ocean. The recently launched United Nations International Decade of Ocean Science for Sustainable Development, with the logo the science we need for the Ocean we want will give us many clues as to how ocean functions and how we can allow it to function better. As we say, our whole thinking must change and the change must come from within. It is also important that each one of us must be that agent of change for better and further that we must all do the right thing because it is the right thing to do.

Conclusion

One of the possible solutions could be to create an Indian National Centre for Ocean Governance (COG) for education, training, consultancy and knowledge creation and dissemination in this area. Complementary to COG and, possibly, even integral to it is another proposal for a Suite of Maritime Masters (SMM).

This approach should generate value capitals in the following ways: Human Capital (inducting talent, nurturing it and then deploying it within and outside), Intellectual Capital (through debates and discussions and by contributing to them), Networking Capital (making professional connections and linkages and expanding the network), Brand Capital (unmatched power to convene through recognition), Globalisation Capital (overarching the four value capitals above).

Everything we do must be with a proviso that it is not the end of the problem but the solutions must begin somewhere

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None

Conflict of Interest

None

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