An Overview to the Inclusiveness of Science in Diplomacy within the Indian Ocean Economy

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Introduction

"Diplomacy is more than saying or doing the right thing at the right time; it is avoiding saying or doing the wrong things at any time" – Bo Bennett

On the diplomatic level, the 21st century provides nations a critical arena characterized by economic and regional challenges which force traditional diplomatic practices to new spheres, which are more flexible and effective in the ever -growing international environment. These new spheres are notably affected by internal legislation, internationalization, and the transfer of technology and innovation. New instruments, such as corporate and business diplomacy, which are a common use on land, have moved to a new dimension known as the *'Blue Economy' (BE)* or as '*Blue Diplomacy' (BD)*.

Over the past decade, the BE gained a lot of attention in terms of increasing strategy to global, regional and national negotiations. This developing sector has led to the basis of effective and efficient policies and treaties harnessing potential of government and private sector entities. The wide range of opportunities, that BE offers can contribute in boosting economic development and growth within various sectors. Ocean resources are not infinite being exploited at a significantly higher rate, would impact island nation states, the marine environment and coastal areas. Overexploitation of ocean resources is not the only cause of diplomatic intolerance, but impacts of climate change are also

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putting tremendous pressure on both marine and terrestrial environments through extreme weather, which would in all likelihood increase natural disasters. Governments are constantly developing policy measures, having negotiations with regional groupings and global entities to address these challenges to ensure sustainable approach for the future generations.

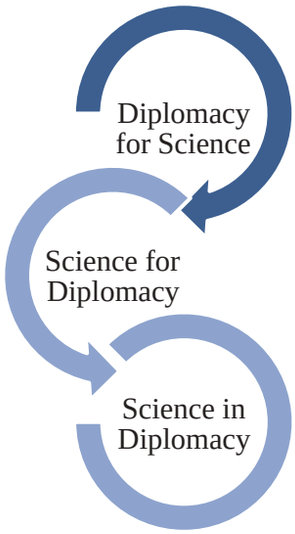
Small Island Developing States (SIDS) are most vulnerable to climate change-driven disturbances; with millions of people threatened by natural disasters such as flooding, storm surges, erosionand other coastal hazards. Therefore, there is a need for Science Diplomacy and international collaboration to address these challenges. In addition, the need for improved disaster risk reduction measures and actions are also highlighted, which are essential for the management, prevention and improvement of land environment management.

The use and integration of science to policy developments have become an essential focus and key for diplomats in effective decision- making and negotiations. Taking into consideration the current economic crisis and evolving political, social and environmental conditions within the IOR, there is a need to put together multidisciplinary actors from different countries and entities to ensure an ideal environment for the SD. Not only would this act as a 'global diplomatic bridge' but would also enable creation of an inclusive approach for societies, economic developments and sound policies for environmental conservation and cooperation among nations.

Science Diplomacy

It is vital to understand conceptual framework of the SD as a global trend to international collaboration in research and development among many industries. Countries are facing many challenges in terms of economic, environmental and social developments, which are considered to be the key aspects to attain sustainable development policies and practises.The SD could, therefore, be described as the *gateway* to sustainable development goals through the use of scientific collaborations among nations to address common problems and to build constructive and international partnerships. The implementation and recognition of this new term by diplomats would provide guidance to foreign policy objectives.

Figure 1: Types of Science Diplomacy



The above figure represents three different concepts of SD, based on the goals of the relationship of *'science'* and *'diplomacy' issues*. The SD is considered to guide and harness international scientific cooperation, including education, knowledge transfer, capacity- building and advanced technological developments through innovations. Therefore, diplomacy does not include only informal and formal relationships among countries, but it can also be used as an effective tool to harness developments and negotiations achieving Sustainable Development Goals (SDGs) by 2030.

SD for scientific collaborations among nations to address common problems and to build constructive international partnerships

In January 2010, the Royal Society noted that "science diplomacy" refers to following three main types of activities[1]:

- Informing foreign policy objectives with scientific advice (science in diplomacy)
- Facilitating international science cooperation (diplomacy for science); and

- Using science cooperation to improve international relations between countries (science for diplomacy).

As an umbrella term covering a wide range of partners within different sectors, SD plays an essential role in the process by which states represent themselves and their interests in the international arena when it comes to areas of knowledge, its acquisition, utilisation and communication. This would lead to a developmental shift within diplomatic practises including three main entities for effective cooperation ; scientists, policy-makers and business community.Incorporating this approach to diplomatic decisions would reduce overall imbalances and act as a stepping stone to escalate sustainability for humanity and economic developments.

The Need for Science Diplomacy

As mentioned, SD forms a holistic pattern and roadmap to achieve different goals and objectives. The need for cooperation between diplomats and scientists on a larger multilateral programme is acknowledged as a key driver to global cooperation with science- based facts. According to the Food and Agriculture Organization, overexploitation of marine -based industries such as fisheries already face various challenges, especially extinction of some fish species. This is exactly where the impact and guidance to control illegal, unreported and unregulated (IUU) policies fall into place. Hence, diplomacy is a key facilitator to science, technology, research and development, and would act as an enabler to establish a full-fledged communication channel for negotiations which stretches beyond boarders. The implementation of SD assists various nations to increase global and regional collaboration based on mutual areas of interest. This allows multiple actors and diplomats to build stronger inter-agency collaborations based on various facts and figures for foreign policy-makers.

Focusing on marine-based industries and the emergence of the BE paradigm, it becomes urgent to promote a '*Blue Diplomacy*' approach focusing on the service of sustainability for future generations. The need for SD to promote reasonable, sustainable exploration and advanced technological developments for oceans is critical in the world we live in today.

The future requires intensified science, research and technological developments to foster a stronger civil society which would equip leaders with required information for effective foreign policy decisions based on a wide range of issues. Worldwide challenges such as climate change, use of atomic energy, decolonization, cybersecurity, ecological footprints and the human impact on the environment among others creates not only a need for SD, but indicates an urgency.

Blue Economy Architecture

Oceans are a major source of economic activity, and contribute to approximately 5 percent of the world's GDP. It is important to note that more than 70 percent of the earth is covered by water. Water is known for many centuries as the starting point for all life, including humanity. Not only is water a requirement for existence of life but it provides food security, energy resources, transport routes and employment opportunities.

The ocean and its resources are increasingly recognised as being indispensable for addressing multiple challenges that the planet would face in the decades to come. As mentioned by the Ocean Economy in 2030,[2] by the mid-century, enough food, jobs, energy, raw materials and economic growth would be required to sustain a predicted population between 9 and 10 billion people. Ocean has the potential to assist these requirements, and thus requirement is for a wide and substantial expansion of ocean- related economic activities. The questions arise — how would governments control development of sustainable economic related activities? How can the threats and the challenges be prevented related to climate change or over- exploitation of fisheries management and marine pollution? The questions are prominent and the answer is simple.

One Apparition – Science Diplomacy

As a relatively new term, the BE is a marine-based economic development that leads to improved human well-being and social equity

while significantly reducing environmental risks and ecological scarcities.[3] This developmental paradigm contributes to 'developmental spaces between ocean borders' for the sustainable use of ocean resources, which are integrated into economic and foreign policy developments. As such, the BE concept is also a developing world initiative pioneered by the Small Island Developing States (SIDS), but is relevant to all coastal states and countries with an interest in waters beyond national jurisdiction. The SIDS have, therefore, remained at the forefront of BE advocacy, recognising that oceans have a major role to play in humanity's future, and that the BE offers an approach to sustainable development better suited to their circumstances, constraints and challenges. As a developing industry, the BE plays a critical role within the IOR, since countries within this have vast maritime zones under their jurisdiction.

SIDS and the Blue Economy

The importance of marine and coastal resources to the SIDS is evident, and has been elaborated in numerous international fora. The BE, however, offers potential for SIDS to alleviate one of their defining obstacles to sustainable development, namely that of a narrow resource base. The remarkable per capita marine resource area, enjoyed by the SIDS, especially the BE approach offers vast prospect to sustained, environmentally-sound and socially inclusive economic growth. The current global challenges and opportunities through Science and Technology (S&T) provide SIDS the opportunity to prepare and position themselves to realise optimal benefits for their sustainable development to the development of the '*blue revolution*'.

The benefits of the BE, however, are not exclusively tailored for the SIDS, they are equally applicable to coastal countries, and ultimately the BE approach offers means for sound utilization of resources beyond national jurisdiction. This allows countries to enhance sustainable development of the common heritage of humanity with a main focus on the *'blue resources'* that oceans provide.

Blue Economy Components

The BE is considered to be the essential key for long-term sustainability of freshwater and

Figure 2: Components of the Blue Economy

Type of activity	Blue Economy Sectors
Harvesting of living aquatic resources (marine bio-technology, seafood, plant and marine organisms)	Fishing (inland, coastal and deep seas) Aquaculture Mari-Culture Pharmaceuticals, chemicals, cosmetics and genetic research
Extraction of non-living resources and generation of new energy resources	Deep-sea and seabed mining Offshore oil and gas exploration Renewable energy
Commerce and trade in and around the ocean and rivers	Maritime transport and port infrastructure and services River transport Tourism and recreation
Protection	Coastal protection Sustainable use of ocean resources (effective fisheries management strategies)
Knowledge and information sharing	Scientific, socio-economic and political research Marine Biotechnology
Cultural and religious views	Cultural and religious practises

Source: Author's compilation.

coastal ocean spaces assisting health of oceans and freshwater resources, which are inextricably linked to long-term management, development and well-being. The importance of the BE needs to be highlighted in the IOR. The vast opportunity of the ocean acts as an important factor contributing to future 'employment creation platform' for public and private sectors. The ocean covers 72 percent of world's surface, and constitutes more than 95 percent of the biosphere, which is vital for the overall existence of mankind. With this important resource in mind, the BE approach is based on a vision of "*improved wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities*" (UNEP 2013).[4]

The overall aim of the development within the BE is to adopt strategies and policies which would promote decent livelihood and food security for communities. With a focus on the IOR, countries within the rim have the opportunity to tap on this source for economic growth, ensuring prosperity within the region. Economic sectors such as fisheries, marine aquaculture, seabed mining, coastal tourism, shipping, renewable energy, maritime safety and security, biotechnologies and port infrastructure developments, all fall under the critical developmental paradigm of the BE (Figure 2).

Oceans and inland water resources provide enormous investment opportunities and benefit humanity as a whole and create *'blue spaces'* to ensure that these opportunities are utilized. Water resources include: fisheries, food and nutrition, economic and social well-being, marine and coastal tourism, mining opportunities; and are open for innovative approaches to renewable energy developments for a safer environmental approach. More than 40 percent of the global population lives within 100 km of coastal regions. Thirteen of the world's biggest business hub cities are located alongside the coastal regions. Overall, nearly 700 million people live in low-lying coastal areas, which are less than 10m above sea level, and are highly dependable on aquaculture and fisheries to sustain development of the region. The demand for ocean resources, jobs, renewable energy and economic growth would be required in the future to upgrade well-being of the people in the IOR. This is a main focus area which needs to be addressed with appropriate policies and strategies to harness benefits of the Blue Economy concept[5].

The investments and developments to enhance BE paradigm in terms of science and technology have transformed entire dimension and approach by diplomats formulating foreign policies. With reference to employment policies and incentives, around 58 million people are employed within fisheries and aquaculture industries alone and around 200 million people are harvesting benefit from direct and indirectly from employment opportunities, which are created by the developments in the value- chain of the industry. The importance of the fisheries and aquaculture industry is one of the most important sectors which are growing faster than traditional agricultural methods and have drawn attention from various countries within the region.

It is to be noted that technological developments have enabled undersea exploration. The growing demand of natural resources has put the fragile marine environment under tremendous stress. As a common global interest, SD plays a significant role in the development of the BE with nations through scientific data, assisting foreign policy decisions and government entities connecting society for the better while striving to achieve the SDGs.

The Indian Ocean serves major trade routes from Australia, much of Asia, the Middle East, the Atlantic and the Mozambique Channel, connecting to European markets. It is also a major oil shipment sea highway, which the US Energy Information Administration identifies as one of the global strategic chokepoints. Thus, the BE is not merely a dynamic business model of an ocean economy. The model is also dedicated to address the issue of scarcity of resources and waste issues while ensuring long-term economic prosperity. The BE hence embodied the key value of sustainable development goals, especially the goal number 14, 'Life below Water'. The Indian Ocean is blessed with vast and untapped natural resources but it also faces great threats and

What makes the BE different from a land-based economy industries?

Difference #1: The Ocean is much larger than land Implications: Natural marine processes, ecosystems and species are not confined to maritime legal boundaries. Different legal regimes apply to a single activity depending on where it takes place, even within the jurisdiction of a single coastal country (territorial waters, contiguous zone, economic exclusion zone), and is further compounded by the interests of other countries in areas beyond national jurisdiction (international waters).

Difference #2: Water is less transparent than air Implication: Remote sensing technology is not able to penetrate deep below the sea's surface. This makes it much harder and much more expensive to know what's going on in the water column and the seabed. Marine research and monitoring costs are extremely high, which helps explain why we know much less about what goes on in the ocean than about what happens on land.

Difference #3: The Ocean is more three-dimensional than land Implication: Marine life occurs from the sea surface down to the deepest ocean trench, while on land only comparatively few species (i.e. those with the ability to fly) can sustain themselves above the land surface. The same also applies, to a certain extent, to human activities. This renders two-dimensional maps less useful, and increases the complexity of marine spatial planning and management. It also makes it more difficult to study the marine environment, how it works, how it is affected by human activities (see difference #2), and how the ocean benefits the economy and human well-being.

Difference #4: The Ocean is fluid and interconnected. Implication: What happens in one place may affect what happens elsewhere, as pollutants and alien species are carried by ocean currents and/or vessels to much greater distances than on land.

Difference #5: Marine species can potentially travel much longer distances than terrestrial ones Implication: This makes the management of human activities that use marine resources particularly difficult, as they are accessible to almost anyone.

Difference #6: Aggregations or clusters of animals in the water column can shift rapidly from one location to another Implication: The mapping of these species and their movements is more difficult, and measures to protect or manage them need also to shift in time and space accordingly.

Difference #7: Nutrients and pollutants can be retained for several decades until they are returned by ocean circulation Implication: There can be significant time lags between the periods when certain human activities take place and the time when their impacts occur, potentially placing significant burdens on future generations.

Difference #8: Lack of ownership and responsibility in the ocean are even less favourable to sustainable development than on land Implication: Private utilisation of the ocean and its resources is usually dependent on licenses or concessions from public authorities. National authorities have the power to allow private activities in areas under the jurisdiction of the coastal state; the International Seabed Authority can license activities in the area, but in international waters, private activities have much fewer controls. Common property regimes are even scarcer than on land given the mobile nature of many marine resources, which makes the exclusion of non-authorised users extremely difficult.

Difference #9: Humans do not live in the ocean because the sea is not our natural environment; our presence is dependent on the use and development of technology. Our sparse presence in the sea also makes it much more difficult, and costly, to exercise adequate law enforcement.

Sources: Crowder and Norse (2008); Douvere et al. (2007); Douvere (2008); Ehler and Douvere (2007); Norse and Crowder (2005).

challenges from unsustainable practice of utilizing ocean and competition over resources, control of international trade and military activities in its international waters. The implementation of BE to catalyse ocean-driven economic growth is directly linked to threats and challenges confronted by the Indian Ocean, especially to human well-being, food security and maritime safety and security for coastal communities.

The concept of BE thus establishes a mutual platform for governments, private and public partnerships and scientists, establishing a paradigm shift to the methods of utilising ocean-based resources and interactions among various entities.

Challenges before the Blue Economy

Healthy oceans are essential for livelihoods of millions of people, and critical aspects of balanced growth. The sustainable use and development of BE industries is required to be designed and implemented to benefit local communities directly, leading to inclusive growth.

Yet, challenges are faced due to the inability to incorporate innovative methods, resistance to change and economic growth, which is the primary focus of majority of activities.

The challenges within the BE are as follows:

- The coordination and implementing process of projects among different agencies tends to be time- consuming;
- Financial activities under SDG 14- Life below Water – and providing trained human resources to support these activities;
- Lack of understanding based on the importance of BE paradigm and emerging industries;
- Risk of neglecting SDG 14 due to higher priorities depending on the country's interest;
- Balancing trade-off between competing end-uses of ocean spaces; and
- Defining specific criteria for ocean activities, which are currently listed as emerging industries within the BE.
- The establishment and formulation of national ocean policies.

Blue Economy Diplomacy

As mentioned above, the BE contributes highly to improved well-being and social equity, while reducing significantly environmental risks and ecological scarcities. It is important to note that according to the UN Water estimations (2016),[6] by 2050 it is predicted that the global water withdrawals would increase by 55 percent due to higher demand for production, domestic use and for agricultural supply of emerging economies. The globalization process contributes significantly to SD and to a new term related to the BE as 'hydro-diplomacy', as mentioned by Islam and Repella (2015)[7]. This framework includes three basic assumptions—water is a flexible resource: science, policy and politics combined to create water networks, which are of an increasing complexity. The role and importance of SD, acting as a communication facilitator among interested policy-makers, business entities and scientists within the ocean administration, starts with developments and collaboration on national and sub-national levels dealing with various issues emerging within basin or global scale marine issues/resources; foreign policy decisions - even if they have similar economics and sustainable goals -, and if they are fragmented and lack political power international (Pohl, 2014).[8] As such, international organisations and governments, whose intentions for the BE are similar, are recommended to establish negotiating processes for institutional and legal conditions along with capacity-building, financial and political coordination on all the four levels.

The BE diplomacy merely focuses on the diplomatic actions behind emerging BE industries, strengthening the role of diplomats in promoting sustainable development. This concept is derived from the green economy concept, reducing environmental risks and ecological scarcities; but the BE is slightly different in terms of the *ocean space* and *blue sectors* (UNEP, 2016).[9]

Representing national interests, diplomats are instruments of promoting politics in developing areas of common interests among different countries. Since trade and investment is a key factor, knowledge on the ways and means

towards nations vision in achieving sustainability are of utmost importance. Many new diplomatic dimensions are developing; the *'blue diplomacy'* provides a broad spectrum in the promotion of conservation and sustainable use of ocean resources. The specialisation of diplomats to implement effective and efficient concepts entails cooperation of scientists and CEOs of large corporations. Diplomacy and science is considered to be a holistic approach and essential in the formulation of strategic negotiations, implementation of international treaties or the development of national or international institutions aiming to share knowledge and creating a solid foundation for research and developmental data.

The role of diplomats represents a key aspect to the future success for the implantation of the BE paradigm. Therefore, through the assistance and collaboration between science- and research-based industries, innovative technologies and business community, diplomatic decisions are bound to tackle global challenges with collaboration of nations. Not only does the BE build a bridge between nations and various entities, but it builds a holistic platform to address multiple factors.

Plea for Governance of the Indian Ocean Region and Marine Spatial Planning

It is important to also include and highlight the importance of Ocean Governance within the region. There is a significant high rate and need to preserve marine resources and ecological environment. Maritime shipping lanes and trade flows, fisheries management, science and technological developments, aquaculture and the acidification of the ocean need to be monitored and researched.

This is yet an important aspect to SD, requiring regional governance of ocean states, especially within the IOR. Marine Spatial Planning (MSP) is a strategic tool to plan and manage conflicting ocean uses and their interactions with marine ecosystems. The MSP thus allows and allocates space for marine-based industries and activities to fulfil demand for marine-based industries and activities, fulfilling demand for marine-based goods and services while facilitating environmental conservation through regulatory and management measures. This concept integrated within the BE is an ideal example for the need of science in diplomacy. The MSP indicates and assists diplomats in making proactive decisions, reducing cross-sector conflicts and safeguarding valuable ecosystem resources. As a continuous long-term aspect within the BE paradigm, there is indeed a shift in diplomatic assessments, negotiations and foreign policies with regards to the use of science, technology and innovation.

Regional Organisations and Missions Towards Science Diplomacy Within the Blue Economy

As BE is a vast subject, covering a wide range of policies and areas of interest, the following case studies highlight the fact that SD is a reality within the IOR and the BE paradigm. Whether it be Science for Diplomacy; Science in Diplomacy or Diplomacy for Science, the reality of pure learning and transfer of innovation, technologies and science cooperation is a necessity and much is integrated across the globe.

Science for the Blue Economy and Africa's potential - (Science for Diplomacy)

The BE buzzword has brought a newly developed, a new paradigm to diplomatic corps. Being a holistic approach to different sectors, the BE is receiving increasing attention as a key to development of the African region. At the 19th Session of the Intergovernmental Committee of Experts (ICE), held from the 2 to 5 of March 2015 in Madagascar, delegates recognised that the BE in Eastern Africa has an important role to play in contributing to structural transformation, sustainable economic growth and enduring social development.

The BE is an ever-growing economic opportunity for governments and private sectors which act as the main initiator to economic

development. The sustainable use of aquatic ecosystems, inclusiveness, conservation on the principles of the Sustainable Development Goals 6 and 14 on "Ensure availability and sustainable management of water and sanitation for all" and "Conserve and sustainably use the oceans, seas and marine resources for sustainable development",respectively, are main areas influencing the use of SD.

African Case Overview

The International Seabed Authority (ISA), whose main function is "to regulate deep seabed mining and to give special emphasis ensuring that the marine environment is protected from any harmful effects which may arise from mining activities including exploration and exploitation", has issued exclusive exploration permits to the China Ocean Mineral Resources Research and Development Association (COMRA) and the Republic of Korea, to undertake polymetallic sulphides' exploration in the Indian Ocean. The Authority has also given a permit to the Government of India to undertake polymetallic nodules exploration in the Indian Ocean. This is an opportunity that Eastern African countries should also exploit. The resources of the high seas are international public goods to which all nations have a legitimate right. Thus, as discussed in Madagascar, Eastern African Member-States should approach ISA either together or individually to assert their rights and establish their claims to deep-ocean resources.

The findings of the report demonstrate that despite significant endowments in BE resources, Eastern Africa has failed to achieve growth with sustainable and inclusive development, and poverty still is prevalent in the region. Traditional and non-traditional BE sectors face challenges that believe their potential contributes to inclusive growth. This can only be achieved if there is a better alignment between different BE sectors and greater coherence between schemes and initiatives. This requires significant investment of time and energy on the part of decision-makers, who need to build stakeholder consensus and promote corporate social responsibility by engaging private-sector associations. The BE development can only take place with the participation of stakeholders at all levels and at all stages. Social inclusion in the distribution of benefits is essential as is the focus on small- and medium sized producers and the use of cutting-edge technology, while promoting food security in the region.[10]

India's approach to Science Diplomacy – Case Study – Science for Diplomacy

India's effort to harness Blue Economy received boost with the establishment of the International Training Centre for Operational Oceanography (ITCOocean). This Centre operates under the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad, known for its expertise in ocean sciences and services, including advisory to society, industry, government agencies and the scientific community through sustained ocean observations.

The ITCOocean serves as a specialist institution for Operational Oceanography and a field of study relating to systematic and long-term measurements of various changes in the oceans and atmosphere, and undertakes interpretation and dissemination of data in the form of 'now-casts', 'forecasts' and 'hind-casts' to a number of stakeholders. This centre is also expected to commence work in June 2018, and will train technical and management personnel engaged in varied sectors of the Blue Economy such as fisheries, seabed and marine resource development, shipping and ports, coastal tourism, marine environment, coastal management, etc.

The ITCOocean potentially can support development of Blue Economy in the Bay of Bengal through capacity-building in at least five ways. First, it can serve as a regional hub for collation and dissemination of scientific data among regional science centres and communities. For instance, in Bangladesh, the National Oceanographic and Maritime Institute (NOAMI), Bangladesh Oceanographic Research Institute (BORI) and National Oceanographic Research Institute (NORI) can be part of the ITCOocean network for Bay of Bengal Blue Economy initiatives.

Second, Blue Economy is data-intensive, which is a function of the collection of observations generated through satellites, research vessels, sea-based sensors, including those embedded in the ocean floor, and weather modelling. These systems, devices and processes generate tens of terabytes of data and require technology and expertise to interpret it for the operational use. Further, oceanographers and scientists operate with diverse data types obtained through a variety of national technical means and methodologies. At the ITCOocean, an oceanographic data- bank for use by the regional scientific community can support regional initiatives to study and harness the oceans in a sustainable manner.

Third is human resources training in oceanography and creating a gene pool of professions to support national Blue Economy programmes in the regional countries. India has an excellent track record of training scientists, and in the last few years, besides training scientists for their own needs, the INCOIS faculty has trained 105 scientists from 34 other countries in different aspects of operational oceanography.

Fourth is supporting innovation for ocean-related disruptive technologies, which are transforming modern day operational oceanography. Big data, artificial intelligence, augmented reality/ virtual reality, block-chain technology and additive manufacturing commonly known as '3D printing' are mushrooming and driving innovation to augment operational oceanography. For instance, 3D printing technologies support real-life applications in oceanography through hydrodynamics, biomechanics, locomotion and tracking and surface studies. Another significant use of 3D printing is in the preparation of coral reef replicas, and thereafter seeding corals to restore damaged reefs.

Fifth, ITCOocean is also an important diplomatic tool for science diplomacy. The Indian government has promoted Blue Economy in multilateral fora at regional and sub-regional levels, such as the Indian Ocean Rim Association (IORA) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC). As far as the latter is concerned, the 15th BIMSTEC Ministerial Meeting's joint statement notes that member countries agreed to constitute a Working Group to develop Blue Economy. In that spirit, Bangladesh hosted an international conference in October 2017, where it was noted that the lack of scientific marine knowledge and technology could be the Achilles Heel of Blue Economy development in the Bay of Bengal.

Although ITCOocean is well-positioned to support high-end Operational Oceanography, there would also be a critical need to establish vocational institutions to promote and train and skill workers adept at understanding the oceans and working in industries that support Blue Economy.

Indian Ocean Rim Association Leaders' Summit in March 2017 in commemoration of the 20th Anniversary – Jakarta Declaration on Blue Economy – Science for Diplomacy

Declaration

Declaration of the Indian Ocean Rim Association on the Blue Economy in the Indian Ocean Region

Jakarta, Indonesia - 8 – 10 May 2017

We, the Ministers and representatives of the Member States of the Indian Ocean Rim Association (hereinafter referred to as "IORA"), the Commonwealth of Australia, the People's Republic of Bangladesh, the Union of Comoros, the Republic of India, the Republic of Indonesia, the Islamic Republic of Iran, the Republic of Kenya, the Republic of Madagascar, Malaysia, the Republic of Mauritius, the Republic of Mozambique, the Sultanate of Oman, the Republic of Seychelles, the Republic of Singapore, the Federal Republic of Somalia, the Republic of South Africa, the Democratic Socialist Republic of Sri Lanka, the United Republic of Tanzania, the Kingdom of Thailand, the United Arab Emirates and the Republic of Yemen attended the Second IORA Ministerial Blue Economy Conference (BEC-II) in Jakarta, Indonesia, on 8 – 10 May 2017;

Recalling

- the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and other international conventions and instruments related to the activities in the oceans and seas;
- Goal 14 of the Sustainable Development Goals (SDGs), to conserve and sustainably use the oceans, seas and marine resources;
- the Recommendations and the Declaration of the First Ministerial Blue Economy Conference in Mauritius on 2-3 September 2015;
- the Jakarta Concord on Promoting Regional Cooperation for A Peaceful, Stable and Prosperous Indian Ocean, signed in Jakarta, Indonesia, on 7 March 2017;
- Relevant UNGA Resolutions, including 61/105, 64/72, 66/68, 69/292;

RECALLING ALSO the intention to implement the IORA Action Plan of 2017-2021, as adopted by the Council of Ministers' (COM) Meeting in Jakarta, Indonesia, on 6 March 2017;

RECOGNISING that oceans, along with coastal and marine resources, play an essential role in human well-being and social and economic development;

STRESSING the need for the IORA Member-States to harness the potential of the Blue Economy to promote economic growth, job creation, trade and investment, and contribute to food security and poverty alleviation, whilst safeguarding ocean's health through sustainable development of its resources;

CONCERNED about the disparities in economic development of the IORA Member -States, including in skills and human resource development, research and development, business opportunities, resource allocation; technology and innovation and its impact on the public and private sector, including the Small and Medium Enterprises (SMEs);

AWARE OF the need to promote communication and maritime connectivity in the Indian Ocean region;

STRESSING the need to promote observation, protection, conservation and sustainable use of ocean resources so as to continue to meet the needs of the present without comprising opportunities of future generations;

REAFFIRMING that research and investment are required to address key challenges of the IORA and to provide solutions and create a friendly business environment to attract investors in the Blue Economy in the Indian Ocean region;

RECOGNISING the importance of promoting entrepreneurship, innovation and SMEs, with a special focus on promoting youth and women's engagement in the sustainable development of the Blue Economy;

MINDFUL OF increasing challenges, both natural and human factors, such as overexploitation of resources, increasing marine plastics debris and nutrient pollution, illegal, unreported and unregulated (IUU) fishing, over fishing, destructive fishing, crimes in the fisheries sector, biodiversity loss and its impacts on blue carbon stocks, illegal mining and the impacts of global climate change and natural disasters;

ENCOURAGING the IORA Member- States to move towards integrated and ecosystem-based approaches in the management of marine resources to maximise sustainable economic yield from the ocean, including through utilising appropriate management tools such as marine spatial planning, marine protected areas, etc.;

RECOGNISING the importance of public-private partnerships in the development of and cooperation in the Blue Economy;

ENCOURAGING sharing of information, experiences, expertise, best practices and technology in Blue Economy related cooperation among IORA Member- States and Dialogue Partners;

ACKNOWLEDGING the outcomes of IORA Blue Economy events on related topics, including marine aquaculture, marine tourism, postharvest processing, seafood safety and quality, maritime connectivity, port management and operation, ocean observation monitoring, forecasting and seabed minerals and hydrocarbons;

HIGHLIGHTING importance of collaborating

and cooperating with relevant stakeholders, including regional and international organisations for the advancement of the Blue Economy in the Indian Ocean region;

ENCOURAGING IORA Member -States to mainstream ocean-related issues in their national planning and policy-making process, based on their priorities;

EMPHASISING the need to foster support and financing opportunities, as well as promote transfer of technology, capacity -building and skills development for local fishery entrepreneurs and coastal communities directly dependent on the sea, including through triangular cooperation;

REAFFIRMING IORA's role and commitment in the development of the Blue Economy through the sustainable use, management, observation, protection and conservation of marine resources in the Indian Ocean region;

REITERATING on the commitment to establish an IORA Working Group on the Blue Economy, which would enhance cooperation to promote Blue Economy.

We, the Blue Economy Ministers/Head of Delegations of the Member -States of the Indian Ocean Rim Association;

Hereby Declare as follows:

That the Member-States of the IORA will be guided by the following principles when developing and applying blue economy approaches to sustainable development and enhancement of socio-economic benefits, particularly of the coastal communities, in the Indian Ocean Region.

- The Blue Economy should ensure sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts, by including strengthening their resilience and taking action for their restoration in order to maintain healthy and productive oceans, and achieve inclusive economic growth in the Indian Ocean region;
- The development of IORA's Blue Economy priority sectors, namely: Fisheries and Aquaculture; Renewable Ocean Energy; Seaports and Shipping; Offshore Hydrocarbons and Seabed Minerals; Deep Sea Mining, Marine Tourism; and Marine Biotechnology, Ocean Observation, Research and Development, should be carried out in an environmentally sustainable manner;
- IORA Member- States are encouraged to pledge their voluntary commitments, including implementation of capacity-building programmes, in the concerted effort to strengthen cooperation in the blue economy;
- IORA Member- States are encouraged to develop their Blue Economy sectors based on their priorities,which could contribute to boosting their economic growth and contribute to job- creation and poverty alleviation;
- IORA Member -States, in collaboration with Dialogue Partners, should encourage the financing of ocean economy infrastructure and development projects, including development and investment inthe Economic Development Zones as well as investment and exploration of new technologies for Blue Economy Development;
- IORA Member- States and Dialogue Partners should enhance cooperation and collaboration to promote: research and development; networking; technology transfer; sharing of information, data and best practices; exchange programmes and expertise; and networking across the Indian Ocean region for sustainable development of the Blue Economy;
- IORA Member -States should adopt ecosystem-based approaches to sustainably manage and use their marine resources, while protecting and conserving marine environment;
- IORA Member- States are encouraged to consider full range of technologically advanced solutions as well as local wisdom and traditional knowledge, as appropriate in the context of adaptation and mitigation strategy to confront climate- change effects on societies;
- IORA Member -States, in collaboration with Dialogue Partners, should promote capacity-building, including collaboration of ocean observation training and scientific capacities, and skills development in the Blue Economy sector through collaboration reinforcing

and networking with relevant regional/ international organisations and institutions in the Indian Ocean region;

- IORA Member- States, in collaboration with Dialogue Partners, need to address challenges and key issues related to the Blue Economy, including overexploitation of resources, marine plastics debris pollution and nutrient pollution, biodiversity loss, IUU fishing, illegal mining, and climate changeand its impact on marine resources, and ecosystems;
- Collaboration between IORA Member- States and Dialogue Partners in various aspects, including financing and development of Blue Economy activities and projects; technology transfer should be strengthened to ensure balanced economic development in the Indian Ocean region;
- Cooperation among IORA Member -States, Dialogue Partners and relevant stakeholders in: carrying out marine scientific research; sharing, collecting, and managing data and information; and implementation of concrete projects on emerging ocean science and blue economy issues;
- The development of effective legal, regulatory and institutional frameworks and ocean management policies should be enhanced as appropriate, for informed decision and policy-making, which are crucial steps toward structuring and guiding its growth;
- Sustainable development of the Blue Economy should be in accordance with the 1982 United Nations Convention on the Law of the Sea (UNCLOS);
- IORA Member- States are encouraged to promote public-private partnerships and involvement of business communities in developing Blue Economy, including infrastructure development and transfer of technology in varied blue economy sectors such as: fisheries and aquaculture; ocean observation; renewable ocean energy; seaport and shipping; deep sea mining and marine tourism, including cruise tourism;
- IORA Member -States should cooperate to promote efficient monitoring and inspection programme to prevent maritime trade of uncertified/unauthorized chemicals and pesticides;
- IORA Member -States consider, if deemed necessary, supporting the establishment of an IORA business travel card to ease business travel on blue economy businesses and collaborate with member -countries ready to do so;
- IORA Member-States, in accordance with international laws and consistent with existing obligations, should perform environmental impact assessments before engaging in relevant deep- sea mining activities and fulfil relevant obligations to ensure effective protection of marine environment from any harmful effects of deep- sea mining;
- IORA Member -States are encouraged to adopt and implement transparency and traceability measures to strengthen application of sustainable fishing practices by regulating harvesting and ending poverty, fight against IUU Fishing destructive fishing and crimes in fisheries sector; providing access to small -scale artisanal fisheries to marine resources and markets and protect food security;
- The empowerment of women and youth to participate in the development of the blue economy is essential through better access to education, training, technology and finance. Women and youth should be encouraged especially by supporting MSMEs and small-scale fisheries, to be equitably included in the sustainable economic growth;
- The proposed Working Group on the Blue Economy would consider programmes, activities, pilot projects and studies for regional cooperation in the Blue Economy;
- IORA Member -States consider developing a Master Plan on the Blue Economy to identify and prioritize concrete projects and tangible areas of cooperation, to promote blue economy as a driver for socio-economic development;
- The sustainable development of the IORA priority sectors of the Blue Economy in the Indian Ocean Region would contribute to: food security; poverty alleviation; the mitigation of and resilience to the impacts of climate change; enhanced trade and investment;

enhanced maritime connectivity; economic diversification; job -creation and socio-economic growth;

- IORA Member -States and Dialogue Partners should increase economic benefits derived from the Blue Economy to Small Island Developing States (SIDS) and least developed countries (LDCs) from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism;
- Collaboration among IORA Member -States, Dialogue Partners, research institutions, industries and public-private partnerships should be enhanced to create an environmentally sound business environment and attract foreign investment, which would accelerate commercialization of ongoing research in exploring data and in creating new products derived from marine and maritime data resources;
- IORA Member- States, in collaboration with Dialogue Partners, are encouraged to carry out pilot projects and set-up modern and accessible technologies to effectively develop Blue Economy in a sustainable manner.

ADOPTED by the Blue Economy Ministers/ Head of Delegations of the Member- States of the Indian Ocean Rim Association on 10 May 2017 at Jakarta, Indonesia.

The above Declaration between the 21 Member-States of IORA, is a pure case of SD within the IOR for prosperity, peace and perseverance of not only marine resources, but a relationship among IORA countries.

The Indian Ocean Rim Association Blue Economy Core Group

Case Study – The Blue Economy Core Group (BECG) – Science in Diplomacy

BECG was established with the IORA Secretariat funding in 2014. The first workshop was held in Durban, South Africa from 4 - 5 May 2015, focusing on the Promotion of Fisheries & Aquaculture and Maritime Safety & Security Cooperation in the Indian Ocean region. The second workshop on Maritime Connectivity and Financing for Development in the Indian Ocean Rim, took place at Qingdao, China from July 13-14, 2016. Both of these workshops were well attended and have assisting in bringing to the fore important regional issues and initiatives related to these aspects of the Blue Economy in the Indian Ocean region.

The Third workshop of the BECG held on 10–11 April 2017, focussed on measures and actions which are to be taken in order to deal with issues of environmental sustainability, climate change adaption and disaster risk reduction. Several topics were addressed, including *inter alia*: impacts of climate change on coastal environment and marine resources; approaches toward disaster risk prevention, reduction and management; collaboration to strengthen early warning systems and search and rescue through holistic approach by mainstreaming disaster risk management in educational programmes; community resilience and integration for disaster risk reduction, preparedness and response; post-disaster management, construction and rehabilitation; and public-private partnership for sustainable post-disaster construction.

Objectives

To enhance coordination and sharing of knowledge, information and best practices on Blue Economy, including disaster risk prevention, reduction and management, as well as Risk Transfer Mechanisms and community resilience in the IOR region;

- To enhance resilience of the communities to climate change-driven disasters and hazards;
- To increase public awareness on environmental sustainability and blue economy in the IOR region;
- To strengthen networking among institutions, experts and regional organisations in IOR region;
- To promote public-private partnership for the sustainable development of the Blue Economy;
- To identify potential projects of collaboration in developing the Blue Economy in the IOR..

The Second Indian Ocean Expedition – Science in Diplomacy

The Second International Indian Ocean Expedition (IIOE-2) is a major global scientific programme which will engage international scientific community in collaborative oceanographic and atmospheric research from coastal environments to deep -sea over the period 2015-2020, revealing new information on the Indian Ocean (i.e. its currents, its influence upon the climate, its marine ecosystems), which is fundamental for future sustainable development and expansion of the Indian Ocean's blue economy. A large number of scientists from research institutions from around the Indian Ocean and beyond are planning their involvement in IIOE-2 in accordance with the overarching six scientific themes of the programme. Already some large collaborative research projects are under development, and it is anticipated that by the time these projects are underway, many more would be in planning or about to commence as the scope and global engagement in IIOE-2 grows.

Focused research on the Indian Ocean has a number of benefits for all nations. The Indian Ocean is complex and drives the region's climate including extreme events (e.g. cyclones, droughts, severe rains, waves and storm surges). It is the source of important socio-economic resources (e.g. fisheries, oil and gas exploration/extraction, eco-tourism, and food and energy security) and is the background and focus of many of the region's human populations around its margins. Research and observations supported through IIOE-2 would result in an improved understanding of the ocean's physical and biological oceanography, and related air-ocean climate interactions (both in the short-term and long-term). The IIOE-2 programme will complement and harmonize with other regional programmes underway and collectively outcomes of IIOE-2 would be of huge benefit to individual development and regional sustainable development as the information is a critical component of improved decision-making in areas such as maritime services and safety, environmental management, climate monitoring and prediction, food and energy security.

IIOE-2 activities would also have a significant focus on building the capacity of all nations around the Indian Ocean to understand and apply observational data or research outputs for their own socio-economic requirements and decisions. IIOE-2 capacity- building programmes will, therefore, be focused on the translation of the science and information outputs for societal benefit and training of relevant individuals from surrounding nations in these areas.[11]

MH370 Clear Case of SD – Science finding answers to Diplomatic and Nations Questions - Diplomacy for Science Case

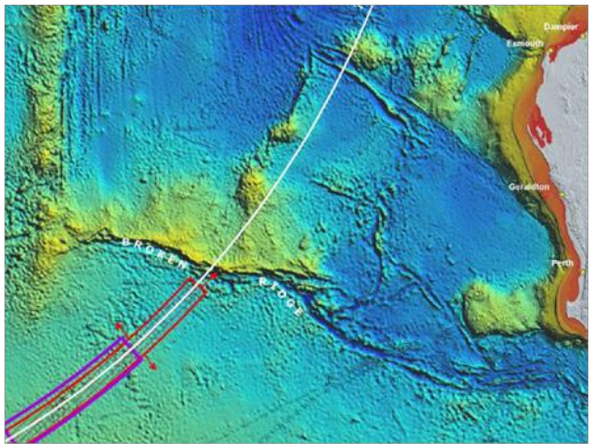
The flight that disappeared on 8 March 2014 while flying from Kuala Lumpur International Airport, Malaysia, to its destination, Beijing Capital International Airport in China. The aircraft, a Boeing 777-200ER operated by Malaysia Airlines, last made voice contact with air traffic control at 01:19 MYT, 8 March (17:19 UTC, 7 March) when it was over the South China Sea, less than an hour after take-off. The aircraft disappeared from air traffic controllers' radar screens at 01:22 MYT, but was still tracked on military radar as it deviated westwards from its planned flight path and crossed the Malay Peninsula.

The search continues and the question remains unanswered. Where does the diplomacy for science in this case appear? There is an extensive and expensive research programme still underway which needs to be leveraged by different countries within the Indian Ocean Region. Find answers to nations' questions, providing answers based on scientific research programmes to governments.

Dr David Griffin, an Australian oceanographer at the CSIRO, has discovered that the missing plane could only be 35 degrees south in the southern Indian Ocean. "The oceanographic reason for why 35 [degrees south] is more likely than say 34, or 33, or 32, is that at all those latitudes the current goes to the east," he said.

"So if the crash had been in any of those latitudes then there would be a high chance of at least one or two things turning up in Australia, whereas there have been 20 or 30 or so items turned up in Africa, and not a single one to Australia. "Once you start looking in the vicinity of 36 to 32, then 35 is the only option." His claims

Figure 3: The MH370 search area has been assessed and reassessed



that the plane could be near to this location as Australian investigators believe there were five different autopilot control modes MH370 could have been on when it plunged into the ocean.

Calculations from four of those settings led to a location 36-39 degrees south or further north at 33-34 degrees south. But according to the ABC, a source close to the investigation, said only one of the five autopilot settings — constant magnetic heading (CMH) — would lead to a crash site at 35 degrees south, where the ocean current was moving towards Africa. This would explain why most of the debris believed to be from the MH370 flight recovered off the African coast in places like Mauritius, Reunion Island, Tanzania and Mozambique.

The claim comes after the Australian Transport Safety Bureau released a report that narrowed the search zone for the missing plane down to an area half the size of Melbourne in August 2017. The report placed the most likely location of the aircraft "with unprecedented precision and certainty" at 35.6°S, 92.8°E — in between Western Australia and Madagascar.

Malaysia's government has vowed to pay a US company 'Ocean Infinity' up to $70 million if it can find the wreckage or black boxes of Malaysia Airlines Flight 370 within three months in a renewed bid to solve plane's disappearance nearly four years ago. Transport Minister Liow Tiong Lai said there was an 85 per cent chance of finding the debris in a new 25,000 square km area — roughly the size of Vermont — identified by experts.

The government signed a "no cure, no fee" deal with the Houston, Texas-based company to resume the hunt for the plane, a year after the official search by Malaysia, Australia and China in the southern Indian Ocean was called off.

"The primary mission by Ocean Infinity is to identify the location of the wreckage and/or both of the flight recorders ... and present a considerable and credible evidence to confirm the exact location of the two main items."

If the mission is successful within three months, payment would be made based on the size of the area searched.

Liow said the government pay Ocean Infinity $20 million for 5,000 square km of a successful search, $30 million for 15,000 square km, $50 million for 25,000 square km and $70 million if the plane or recorders are found beyond the identified area.

Ocean Infinity Chief Executive Oliver Plunkett said the search vessel Seabed Constuctor, which left the South African port of Durban, is expected to reach the southern Indian Ocean by Jan. 17 to begin the hunt. He said eight autonomous

Figure 4: Autonomous Underwater Vehicles (AUVs) which will be put in the ocean to search for the wreckage of the missing plane, MH370.

Figure 5: A large piece of debris found in Tanzania recently which has been confirmed as a part of a wing flap from missing Malaysia Airlines passenger jet MH370.

Figure 6: The 'Seabed Constructor' which has been dispatched to the southern Indian Ocean to search for the wreckage of the missing plane, MH370.

underwater vehicles, which are drones fitted with hi-tech cameras, sonars and sensors, would be dispatched to map seabed at a faster pace. Plunkett said the underwater drones can cover 1,200 square km a day and complete the 25,000 square km within a month.

"We have a realistic prospect of finding it," he said. "While there can be no guarantee of locating the aircraft, we believe our system of multiple autonomous vehicles working simultaneously is well suited to the task at hand."

The official search was extremely difficult because no transmissions were received from the aircraft after its first 38 minutes of flight. Systems designed to automatically transmit the flight's position failed to work after this point, said a final report from Australian Transport Safety Board last January.

"I feel very happy but at the same time very panicky whether it can be found or not. Now it's back to four years ago where we have to wait everyday (to find out) whether debris can be found," said Shin Kok Chau, whose wife Tan Ser Kuin was a flight attendant on MH370.

Underwater wreck hunter David Mearns said the new search takes into account oceanographic models used to drastically narrow the possible locations of the crash and deploys state-of-the art underwater vehicles that will allow the company to cover far more seabed at a faster pace.

"There are no guarantees in a search of this type. However, notwithstanding that uncertainty, this upcoming search is the best chance yet that the aircraft wreckage will be found," he said.[12]

Recommendations

The following recommendations are proposed to enhance Science Diplomacy:

- **Ocean Governance**: well defined legal regimes for ocean exploration and marine spatial planning; enforcement of regulations and maritime safety and security are prerequisites for harnessing the BE;
- **Innovators:** financing the BE, supporting the development of ocean -related technologies to further regional research, capacity- building and job- creation;
- **Technology**: encouragement by governments on the aspect of continued research and development from ocean observations, use of innovative technologies, integration of data, collecting environmental and underwater data transcribed into accessible platforms for policy-makers to use as the key to effective

decisions and harnessing full potential of the BE paradigm;

- **Integrated Management Techniques**: efficient resource management is the key to the BE. Furthering and promoting MSP and Integrated Coastal Zone Management (ICZM) and efficient marine administration;
- **Use of soft powers to Science and Technology** as a tool for building long-term relationship based on human resource development and capacity- building;
- **Mitigating science and technological gaps**;
- **Enabling people-to-people contact** as a tool for public diplomacy through Science and Technology engagements;
- The **visibility** of the importance of the overall contribution towards the economic development within the Indian Ocean region. Creating a common platform to increase the visibility of the industry, able to attract required workforce, ensuring sustainability and effective developments within the BE development paradigm;
- Member States are encouraged to develop ***'Blue Educational'*** technical and vocational education and training **(TVET)** institutions/ programmes. These Technical and Vocational colleges and manual labour should be made compulsory in the Indian Ocean region;
- The preparation and implementation of an '*integrated blue skills development strategy*' is essential if workers are to acquire job-specific skills and knowledge;
- Member States are encouraged to promote and provide entrepreneurship programmes to citizens in coastal regions. This would contribute to sustainable coastal management techniques and contribute to Sustainable Development Goals.
- **Increase funding for knowledge-creating** basic science and provide increased financial support to S&T-related activities in universities, research institutes and think-tanks;
- **Re-establish a Ministry of State for Science and Technology** as an interface with other levels of government and to coordinate and integrate S&T programmes and activities across federal governments and among civil society actors;
- **Offer courses in science diplomacy/ international S&T** on a regional basis within the Indian Ocean Region and encourage practice of public and science diplomacy;
- **Through recruitment, secondments, exchanges, promotions and incentives**, encourage Foreign Service Officers to skill-up and specialize in international S&T issues management.

Conclusion

Blue Diplomacy as a global concept is mainly a subject of interest among many Indian Ocean states which have opening shores to the water. Since this is a new developing concept regarding the sustainable use of ocean resources, diplomatic tactics and negotiations among countries include a wide range of scientific facts and figures. Trade agreements and establishment of international legislations regarding private sector developments are clear evidence that the Member States within the IOR are investing and developing national policies to enhance regional cooperation with regards to the BE.

It is impossible to carry out and achieve all the SDGs set by 2030. Countries follow different pathways with reference to SDGs, and, therefore, SD plays a critical role to assist Developed and Least Developed Countries (LDCs) which are unable to attain certain SDG Goals. The establishment of the bridge between diplomats and scientists allows countries to promote effective bi-lateral collaborations and to transfer technologies. Instead of being disconnected in terms of different SDG Goals, SD provides an ideal platform as highlighted in the case studies above to find mutual interests, develop R&D, sharing of technologies and finding mutual agreements to achieve sustainability.

The BE as a holistic approach to the management of ocean resource and connecting nations has a great overall impact on diplomacy tactics and policy developments. Diplomacy has become something very much more than the diplomacy of states and governance; it has evolved into a science-based arena, equipping

diplomats with enhanced skills and abilities to draw up accurate and competent foreign policies. Not only does the role of diplomats represent the future, success of implementing the concepts discussed throughout the paper, it acts as an initiator to research and developmental innovations towards a better future. Diplomatic background now requires academic and science on various subjects related to innovation, sustainable developments and technology. This determines economic evolvement and assists the framework to respond to basic needs for effective foreign policy measures. Innovation and technological developments are crucial in SD, and for a sustainable development measures. The enhanced quality of life in terms of 'health- care', regional cooperation on areas of mutual interest, job creation and social capital development, especially within the BE paradigm are critical.

Above all, SD and the BE go beyond the traditional thinking, where oceans are looked upon only as a resource providing and promoting oceans as life -support system. SD and the BE coincides in preserving oceans health, recognising the approach to achieve SDGs set by the United Nations. This paradigm shift provides SD as an ideal arena for collaborative research, innovations and technological developments, establishing a wide range of available data for effective and efficient policy developments.

The '*Blue Revolution*' binds nations and SD for the betterment of the globe as a whole, yet the questions seem simple in SD, but the answers are explosive. Global concerns have provided 17 SDGs, providing the common global language for science, political influences, innovations, R&D and capacity -building.

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