

# **SUSTAINABLE APPROACH TO LIFE IN WATER: Science and Ethics of the Oceans**

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**Abstract:** Oceans have always remained a mystery to humankind. We owe the oceans the very air we breathe. Oceans are storehouses of nutrient rich food that can alleviate the hunger of many generations to come, offer rich minerals and medicines to cure many diseases, regulate the temperature of our planet, stabilize weather patterns, and provide livelihood for many in the fishing and tourism industry. But sadly they are overexploited and polluted to the core. The very fact that these mighty oceans have started showing the ill effects of anthropogenic activities itself is testimony to the tremendous greed of humanity. Among all the mighty oceans, the Arctic ocean is the most sensitive and vulnerable to these changes as it holds a pivotal position in maintaining life on Earth by different mechanisms. The Sustainable Development Goal (SDG) 14 of the United Nations underlines the urgent need to conserve marine resources and give equal rights to people in all countries to enjoy these resources. The current review is an attempt to highlight the enormous number of ways in which oceans have helped humankind, the serious threats the oceans are facing now, and how best we can have a sustainable approach to halt the total crashing of our great ocean systems.

**Keywords:** Arctic Ecosystem, Biodiversity, Oceans, Overfishing, Sustainability, Weather Patterns.

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## 1. Introduction

Currently, we are in the twenty-first year of the present century. Though the technological advancements made by humankind would have never even been in the wildest of dreams of the early humans, it is high time we give serious thoughts on the pertinent question of sustainability after all these achievements and conquests. It has been known that millions of years ago, life originated in the oceans. God has given us a bountiful planet – both our landmasses and oceans are teeming with diverse flora and fauna. Every year, lots of newer marine species, novel uses to existing species, and innovative methods to further exploit the oceans are being unravelled. The demands of an exploding human population, however, is creating a huge pressure on oceans in the world. Melting icebergs, overfishing, ocean acidification, ocean deoxygenation, habitat loss of many species, pollution with microplastics, all pose significant threats to our oceans. Already the damage done to the oceans is humungous, but mostly it escapes plain sight as these happen under water and hence not as obvious as the destructive activities happening in the land. The United Nations has called for an action to protect our planet, end poverty and make sure that our planet prospers in a sustainable way by 2030. The aim of Sustainable Development Goal (SDG) 14 is to conserve and sustainably use oceans and its resources for sustainable development. This is of utmost importance as people world over rely on oceans for food and livelihood. Among the different oceans in the world, the Arctic ocean is the most susceptible to fluctuations from the normal – be it natural or by human agency.

Of all the dangers oceans face, the gravest is the enormous rates of totally unscientific industrial fishing, which has already led to the crash of more than 90% marine species. Another serious threat is the exploitation of the polar regions, especially the North Pole. The entire Arctic belt is undergoing rapid commercialization, thanks to the vested interest of neighbouring countries especially for tapping oil rich seabeds. This very event is destroying the entire physical, chemical, and biological ecosystems of the Arctic Pole, the ramifications of which are being felt all over the globe. There are many initiatives like Marine Arctic Peace Sanctuary (MAPS) to stop commercialization in the Arctic and make it a protected territory,

but these have to definitely gain momentum to produce tangible results (parvati.org 1). Another practical difficulty is that unlike making perfect borders for the landmass of different countries, it is extremely daunting to have perfect borders of oceans. This can often lead to arguments between countries which finally ends up in countries over exploiting the resources with no legal binding and no one to question their deeds. Added to this, will be the threats posed by illegal activities happening in different countries that go undocumented many a times. All countries should consider themselves as major stakeholders in the ocean protection venture and contribute to prevention of further damage by adapting practices for the sustainability of oceans.

Conservation biologists may be at the forefront to voice their opinion to protect oceans from further damages, but all those who benefit from oceans, should be motivated by self-interest to protect the oceans (Auster et al. 235). Healthy oceans are very much needed for the very existence and livelihood of millions of people depending on fisheries, tourism, and allied activities. Active ocean scientists would be the best authorities who can give convincing facts about the threats that oceans face these days. Attempts should also be made to connect to the people on the issue of ocean sustainability via local measures through influential leaders. School children are to be taught at a very early age, the significance of oceans, and the roles they play directly or indirectly. The support and orientation extended by the government and the NGOs also matters a lot in making such events successful. The current review is an attempt to have a broader view of the innumerable benefits we derive from oceans, how extremely threatened they are and how significant it is to prevent it from breaching the tipping points with special reference to the Arctic ecosystem. Unless one realises these facts about the oceans, it would be difficult to contribute to any local or global efforts to make our oceans sustainable.

## **2. Role of Oceans in Stabilizing Earth's Temperature**

Like how a room is kept cool by air conditioners, the snowcaps in the poles stabilize Earth's temperature. These giant air conditioners on the two corners of Earth indeed used to make our planet livable as the pristine white gigantic icebergs reflect almost 50% of the sunlight. But due to the extensive rates of global warming, the

icebergs are drastically melting leading to the formation of more and more darker waters. These will reflect only about 10% of the sun's radiation, trapping most of it in the Earth. This again leads to more rise in Earth's temperature and more melting of icebergs. This is what the geologists call the "death spiral". As technology advances, we are tapping and exploiting these resources without a thought on sustainability.

Covering about 70% of the global surface, oceans hold significant influence on the planet's climatic conditions by helping in heat exchange and transfer of moisture and gases with the atmosphere. They absorb most of the heat from solar energy owing to their high heat absorbance and release it gradually over time thereby affecting the climate pattern. Additionally, the heat released in turn regulates atmospheric circulation through aerosols, cloud covers, and rains. Ocean currents help in transporting cold water from the poles to the tropics and the warm water from the equator toward the poles. If not for the ocean currents, our planet would have witnessed superhot temperatures in the equator and supercool temperatures in the poles, limiting habitable places on Earth. Since oceans have more heat storage capacity than land or atmosphere, they tend to warm up slowly thus helping keep the air cool in summers. Conversely, they tend to cool slowly thereby keeping the air warm in winters. Oceans are the source as well as the sink of CO<sub>2</sub>, one of the major greenhouse gases. The steep increase of atmospheric CO<sub>2</sub> in the past few years to levels more than 400 ppm has made the oceans acidic by absorbing it and forming Carbonic acid, which has its effect on marine forms like coral reefs, shellfish, etc. Studies show that almost half of the corals in the Great Barrier Reef in Australia have been lost since 1995. The UN predicts that a rise in temperature by 1.5°C will kill 90% of all corals and other coral associated species (Dietzel et al. 1).

There is evidence supporting a decline in ocean salinity upto about double of the initial levels since the Archean period (Knauth 554). Contributing to planetary climate, variations in ocean salinity have been shown to affect water density, evaporation and precipitation patterns, heat circulation patterns and warming of polar regions (Cullum et al. 4278). Warming of ocean water also is increasing sea levels because when water absorbs heat, it expands. Along with melting glaciers these contribute to rising sea levels

threatening the natural ecosystem. Altogether, these interlinked weather fluctuations affect ocean-atmosphere biogeochemical cycles, heat transfers, wind patterns, planetary climatic conditions and habitability of oceans and the planet. A study by Daniel J. A. Johansson probed into the role of effective heat diffusivity in oceans on global temperature change and concluded that the ocean's heat absorption capacity has an important role in regulating weather conditions (Johansson 108).

The ice caps in the Arctic are melting at tremendous rates. Recent data has revealed that the previous estimates of sea ice thickness using radars have not taken into account the presence of brine near the snow-ice interface (Nandan et al. 1092). If this also is taken into account, the Arctic ice cover would be much lesser than previous estimates. One of the ways of maintaining the temperature of oceans all over the planet is to protect the Arctic region from the so-called developmental activities including seismic testing, oil drilling, etc. When compared to the Antarctic region, the Arctic regions bear the brunt of increased number of developmental activities. One of the reasons behind this extremely rigorous commercialization is the proximity of many countries like the USA, Canada, Russia, Norway, Sweden, Finland, etc. to the Arctic circle. This helps more exploitation at less cost when compared to tapping the resources in Antarctica which is far off and has extremely harsh weather and hostile climatic conditions. All the events happening in the poles cannot be thought of as threats to the polar ecosystem alone. Like the tentacles of the octopus they have their ramifications all over the globe.

### **3. Role of Oceans in Regulating Currents**

The Arctic ocean has been playing a huge role in stabilizing weather patterns long before human beings started walking on this planet. Even minor temperature fluctuations of the Arctic waters will create changes in ocean currents which in turn will have effects on the patterns of wind and rain, including the monsoons. While oceans are central to stabilizing climatic conditions, the ocean currents help counteract non-uniform distribution of solar radiation reaching the planet's surface. Being typically driven by wind, surface ocean currents occur on local and global scales while being confined to the top 400 meters of the oceans (Constantin 1).

These ocean current flows are dynamic and interlinked with the remaining breadth and depth of the oceanic heat transfer. These horizontal and vertical heat transfers are aided by ocean currents and are crucial in regulating the transfer of energy across and within ocean surfaces.

Research has shown that oceans have absorbed more than 80% of the earth's thermal imbalance due to anthropogenic causes (Levitus et al. 4) and about 93% of the energy from enhanced emissions of greenhouse gases as reported by the International Panel on Climate Change (IPCC) 5<sup>th</sup> Assessment Report (Constantin 1). Though oceans give off the heat absorbed by them, it is at much lower rates than those of heat absorption.

It had taken millions of years to stabilize the ocean current patterns and the various wind and rainfall patterns across the world. In general, low temperature and high salinity of ocean water are the driving forces of convection. Convection happens primarily in the polar regions, but is involved in thermohaline circulation, which spans the entire oceans like a gigantic conveyor belt. These biogeochemical events used to have a lot of predictable seasonality till recently – for example, the monsoons arriving at the Indian subcontinent were notoriously punctual. One can compare this to the current state of affairs where there are extremes of climate and that too in unexpected seasons - the recent wildfires engulfing millions of hectares in Australia, California and Amazon rainforests, the increasing number and severity of cyclones in the Indian ocean, etc. All these stand testimonies to the extreme fluctuations in the weather patterns of the world. Recently one of the coldest places on Earth, a Russian town of Verkhoyansk recorded an all-time high temperature of 100°F which is unimaginable for a cold Siberian town (Gramling 1). Rising global temperatures can have indirect effects too as in the case of the emergence of the huge locust swarms recently in Kenya, which has devastated thousands of hectares of crops even in the Asian subcontinent. The reason for this unexpected calamity can be attributed to the untimely rains which in turn led to simultaneous hatching of locust eggs in the African deserts. We primarily owe all these direct and indirect calamities to the fluctuations in the water cycle in our mighty oceans.

#### **4. Oceans as Treasures of Biodiversity**

Millions of years ago, our planet had a very hostile environment, where survival of life forms was unthinkable. Slowly and steadily through numerous evolutionary and corrective measures, there formed astonishing biodiversity on this planet. There was a rhythm, recycling of materials, and balance in nature. Periodically there were also calamities which have played a role in restoring the balance of nature whenever there were disruptions in normality. The so-called masters of the Earth, the human beings, disrupted this delicate balance of Mother Nature, the ramifications of which were felt in the oceans too. Ranging from the tiniest microbes to the largest species like the whale, oceans inhabit a diverse range of organisms. This contributes to species and genetic diversities, while also forming several integral levels at the global food web. These attributes have dual utilities - the intrinsic value and the economic value. While the latter arises through food markets derived from marine organisms, animal feed, fertilisers, tourism, and so on, intrinsic value is immense in terms of the heritage and natural value that oceans possess *in lieu* of their rich biodiversity. Each and every species, be it small or big, definitely contributes to maintaining the ecological balance. The entire biome on this planet is like a carefully woven sweater – by pulling a single thread out of it, the entire sweater has the possibility to come loose and get disintegrated.

Despite there being more than 90% of the oceans still unexplored, scientists believe that oceans offer abundant information on origin and evolution of life. Fossil records indicate the presence of bacterial life in the oceans about 3.7 billion years ago (Dodd et al. 60) and that marine diversity exceeded land diversity for about 3.6 billion years (Benton e2000724). The biogeographic theory postulates that species richness increases with habitat area and oceans cover about 71% of the planet's surface (Costello et al., *Surface*, 8821). World Register of Marine Species (WoRMS) is the first comprehensive online database of marine species identified and named, and has about 2,43,000 accepted species as of 2017 (Costello et al., *Global*, e51629). This database is dynamic and always in flux, *i.e.* species get added, removed, or modified constantly. For example, 'cryptic diversity' is always a challenge since it refers to those species living hidden in crevices among rocks like holdfasts, mussel beds and corals. Marine

biodiversity is also influenced by abiotic factors in the marine environment like water salinity, temperature, and availability of light.

Unfortunately, these habitats are not immune to anthropogenic threats that are damaging the marine species and their habitats. Destructive activities like overfishing, waste disposal, pollution, and so on are damaging oceanic habitats and their inhabitants. Studies report that human fishing has removed about 90% of fish population worldwide (Myers and Worm 13) and over two-thirds of fish abundance from reefs worldwide (Edgar et al. 216), thus causing a global decline in fisheries. Seabed trawling and dredging have contributed to destruction and fragmentation of benthic habitats leading to tremendous loss of biodiversity (Pusceddu et al. 8866). Yet another serious problem is the unimaginable amount of plastics floating in oceans and also the grave danger of microplastics present in most of the animals in the food chain.

Precautionary and remedial practices as prescribed by Convention on Biological Diversity advocate practices to ensure protection of ecologically or biologically significant areas through integrated management of marine environment thus ensuring protection of marine ecosystems. Large marine reserves that are permanent and fully protected are another such refuge for the remaining marine species and those yet to be endangered or extinct (Edgar et al. 218). Policy measures like having unfinished 'control' areas will be helpful in establishing a baseline for assessment of sustainability of fisheries (Costello, *Sustainable*, 341). Ethical and educational modes of sensitising people about the inherent, economic, biological, and social values of oceans need to be advocated. Empirical analyses of species richness and distribution need to be upscaled to identify regions of marine species, endemism and richness and form local and global scales so as to prioritise regions for conservation (Selig et al. e82898).

Even after so much technological advancements there are many areas of oceans still untapped or unrecognized for their potential. If one looks close at nature, one will find answers to most of the problems we have – be it the medicinal plants in which the secret formula to treat many diseases lie or the nutrient rich animals and plants which can be used to satisfy the nutritional requirement of the humans or the inspiration from bird's beak to create the

aerodynamic models of high speed bullet trains or the hooks of plants, for seed propagation *via* animal fur, being conceptualized in the creation of Velcro. When we disrupt the ocean ecosystem, we might close doors to the discovery of more and more options of biomimicry too.

## **5. Oceans as Source of Nutrient Rich Food**

Food and nutrition are vital to all life forms. Food chains and food webs ensure a constant transfer of energy across and between species thus aiding in continuity of life. The enormous number of marine plants and animals form a crucial aspect of the global food chain. Rapid changes in human population, lifestyles, cultural preferences and incomes have caused global increase in demands for nutritious food. Population analyses and income trend projections (by 2050) along with rates of malnutrition and hunger advocate for a future that will be in need of more than 500 megatonnes of meat annually for human consumption (Costello, *The Future*, 98). Marine food is famous for its nutritional composition, with protein content being a major value. Among other such beneficial values are availability of macronutrients and essential fatty acids that are otherwise hard to be obtained from terrestrial foods. This enables mariculture to have a unique contribution towards global food and nutritional security (Hicks et al. 95).

Fishing has been expanding and intensifying exponentially over the years with advancements in technology and more access to previously untapped areas of oceans. However, recent years have witnessed a plateau in this growth, due to exhaustion of some stocks up to their limits (Worm et al. 578). Small pelagic fishes constitute the largest biomass that is removed by current industrial fishing, despite there being only about two-thirds of this being used for human consumption. The rest of it is directed towards use as fodder fish for mariculture production of carnivorous aquatic species that are popular and valuable in seafood. Unscientific bottom trawling methods literally scrape off the ocean floor stripping it off the biodiverse flora and fauna. These may end up just being thrown back to the ocean without being used for sales. Each trawl net would be the size of a football field and hence one can imagine the area of ocean floor getting permanently damaged

each time the trawl gates drag through the seabed. Whales, seabirds, etc. are considered to be the main “sentinels” of ocean health. The first signs of a suffering ocean and coastal ecosystem will be shown by these creatures. For instance, nutrients like Phosphorus and Nitrogen from seabird excreta have been shown to increase the growth and functioning of coral reefs (Dias et al. 326). Seabirds are very sensitive to noise, light, invasive species, etc. and high levels of all these factors would greatly disturb their breeding behaviour resulting in low fecundity (Lorrain et al. 3721). Trawling activities have also caused a lot of seabird deaths by way of the birds getting entangled in trawl nets while hauling, collision with the warp cables etc. This indeed should be taken seriously as the seabird population reflects a healthy marine and coastal ecosystem and decline in the same will significantly reduce the monitoring opportunities these sentinel species offer.

Oceans being extensively large in terms of both volume and surface area are considered as practical sources of nutrition and seafood for countries with growing human footprints. These human demands are only going to increase in future accompanied by incremental population explosion and global trades of marine food. Though the problems faced by mariculture due to overfishing, global warming, pollution, and other exploited anthropogenic practices project a challenge impossible to be overcome, research shows that ecological, economic, policy, and technological factors will be crucial in mitigating these concerns in order to ensure a safe future for global marine food supply (Costello et al., *The Future*, 95). In fact, it is the sheer greed of humankind which has resulted in disruptions in sustainability. For example, most of the traditional fishermen used to know the pulse of their local seas and their ecosystems well, and respected those. Hence they used to indulge only in sustainable fishing. This is in stark contrast to the humongous overexploitation of the seas by the present day fishing lobby; some of these unsustainable practices include bottom trawling, cyanide fishing, dynamite fishing, ghost fishing, bycatching, etc. Sustainable fishing translates to retaining enough fish in the ocean so that they can breed and make more of their lot and also maintain a stable ecosystem. It gives thrust on respecting habitats and ensuring that people who depend on fishing can maintain their livelihoods.

Any attempt of sustainable fishing should take into consideration two main aspects – well-being of humans and ecosystems. Thanks to the emergence of a lot of improved fishing technologies and rising demand, fishing intensity in a given area has grown by leaps and bounds. This has resulted in the depletion of stocks of large-bodied fish, resulting in targeting new species (Hughes et al. 363). Indigenous North Pacific people, for example, have depended on salmon for subsistence and livelihoods for more than 10,000 years. It is regarded as a keystone species. Apart from its extensive culinary uses as an excellent nutrient rich food, it has a multitude of other benefits. It serves as feed for countless other species like the bears, wolves, eagles, and whales. Salmons are anadromous species as they divide their lives between freshwater and the ocean. They are born in freshwater, travel to oceans and mature and go back to their native streams to spawn traversing thousands of miles. These journeys are not without significant ecological impacts. These salmon runs play a role in the transport of energy and nutrients between the oceans, and rivers. Apart from supplying nutrients to animal species, this process also helps great forest trees derive nutritional benefits from the animal and bird droppings of salmon along the forest floors. A large-scale study conducted using data from the past four decades has revealed that there has been widespread decline in body sizes of four salmon species (Oke et al. 7). Despite salmon being a highly resilient fish species, many wild salmon species populations are dwindling in numbers and also reducing in body sizes. One way of rescuing the salmon population from overfishing and pollution hazards is by revitalizing indigenous fishing practices and learning from indigenous systems of salmon management. This is exemplified by the indigenous North Pacific communities, maintaining sustainable salmon harvests using in-river and specific fishing tools like traps, weirs, dip nets, and reef nets (Atlas et al. 198). Only coordinated and perseverant efforts from different countries and ethnic groups can bring solutions to such grave problems as the geographic boundaries being affected encompasses different countries and even different continents. Briefly, these pathways include improvement of the management of wild fisheries, implementation of policy reforms of mariculture, advancement of feed technologies for mariculture. The key message to be delivered to all stakeholders

is that if they don't act now, some losses would be permanent and irreversible.

## **6. Oceans as Sources of Medicines**

Drug discovery has always been one of the most innovative fields in medicine, especially with countries focusing more on indigenous sources for drug production. Marine environment is an extensive source of pharmaceutical compounds. Marine organisms have a greater scale of evolution than other organisms along with a wider range of adaptability. Their ability to thrive in difficult and extreme habitats have made them very sturdy and hence can be potential sources of proteins and enzymes that possess antibacterial, anticancer, and immune-protective properties. Research from 1981 to 2008 denotes that about 68% of drugs (and 63% of anti-cancer drugs) were derived from natural sources (Cragg et al. 3012). India has also devoted significant resources to aid in ocean research *in lieu* of its abundant biodiversity and potential for pharmaceutical compounds. Marine derived drugs include treatments for cancer, bacterial diseases, HIV, Alzheimer's disease, etc. Nutritional supplements, bio-active peptides, etc. also add to this list.

The exploitation of the oceanic resources for a never-ending search for novel pharmaceutical compounds, however, leads to destruction of marine biodiversity posing a threat of extinction to aquatic species. These can be monitored at national and international levels through patents, policies, and laws enforced to protect, preserve, and replenish marine biodiversity. Another problem is the release of sewage and effluent discharges from industrial and other places in regions with close proximity to marine environments. These human-dwelling regions have a high probability of discharge of waste into oceans, ponds, lakes, and other marine environments, hindering the survival of aquatic organisms. These challenges along with other problems of global warming, eutrophication, and climate change in turn compound the pressure on marine species.

## **7. Oceans as Source of Energy and Minerals**

Marine environment has been used as a reservoir for minerals since ancient times. The classic example includes that of table salt. Commercial mineral recovery includes additional salts like sodium,

magnesium, calcium, and potassium. An important portion of the infinite reserve of ions and minerals present in oceans comes as a result of effluent discharge from land and returns to the marine ecosystem. Moreover, extraction of marine ions and minerals is done using simpler extraction and beneficiation techniques as compared to those performed for terrestrial ions and minerals (Bardi 1980). Seafloor Massive Sulphides (SMS) are associated with active and inactive hydrothermal vents along oceanic ridges and constitute high sulphide content along components like copper, gold, zinc, lead, barium and silver (Hein 1).

Apart from minerals, the marine ecosystem is also a rich source of renewable energy. Tidal energy was first used as tide mills on the seashores of Spain, France, and Britain. Interestingly, the waves, and tidal devices have been shown to be beneficial to the conservation of marine biodiversity. Installation of these devices have proven to be natural hindrances to fishing boats thereby offering refuge to birds, fishes, and their surrounding regions. The disadvantage of these devices is that tidal enclosures and barrages prevent relocation of marine life. This problem can be mitigated by installation of these devices in regions that have minimal impact on species migration and the environment.

A significant problem of marine energy is that it is a niche in itself. Since it is highly dependent on the energy from oceans and high economic investments, this form of energy is preferentially advantageous for developed countries and regions that have significant power of wave and tidal energy. Despite there being numerous forms of marine energy, feasibility of their extraction and utilization is still a major concern. One of the major challenges includes the high economic costs needed to sequester such marine energy resources through advanced technological tools. Another threat is the naturally harsh and unpredictable nature of these marine ecosystems that have sometimes led to the damage of the installed energy turbines in oceans. Hence, the location of installation of these technologies and their endurance to extreme oceanic environments is of utmost necessity. Such assessments need to be performed so as to limit any problems, destruction of technology and adverse economic effects.

One of the biggest threats to the Arctic ocean is the abundance of oil on its seabed, which is attracting the petroleum lobby from

nearby countries to commercialize the region. Sadly, this is shattering the entire Arctic ecosystem – whales becoming deaf due to the sound of airguns shot into ocean floors as part of seismic testing, disruptions in the mating behaviour of many species due to sound and water pollution, etc. The ramifications of a crumbling Arctic ecosystem are being felt world over in the form of extremes of weather as exemplified by the wildfires, floods, cyclones, and droughts. All these will badly affect crop productivity and in turn food security of nations.

### **8. Economic, Ecological, and Ethical Nexus**

Generally, a value proposition is attributed to a certain commodity when there is a tangible quantity of 'discernible benefits or losses' associated with it. In this regard, there are limitations to those services whose values cannot be quantified using fixed thresholds or parameters (e.g., biodiversity, aesthetic value, and the cultural heritage associated with oceans). In conservation biology, this is explained through the concepts of 'intrinsic value' and 'instrumental value'. Though oceans provide instrumental value through their services like food, recreation, medicines, and tourism, the aspect of their inherent value has always been an interesting point of contention among researchers and philosophers. The 'intrinsic value' is attributed to something for its virtue of being valued, independent of people's views or opinions about it as in the case of oceans' role in weather patterns, biodiversity, etc.

The social importance of oceans can be explained through the fact that they act as unifying agents bringing together global cultures of coastal countries. They have played a very significant role during the course of evolution and continue to be vast resources of species biodiversity. In terms of being a commodity, humans obtain numerous benefits from oceans through services like fishing, pharmaceuticals, tourism, nutraceuticals, and aquaculture. However, over-utilization and exploitation of oceans and their biodiversity is a major threat to humanity and habitability on this planet. Oceans are vast, and marine biological diversity cannot be limited by physical boundaries, thus making it difficult and expensive to impose geographical or jurisdictional restrictions. Their global interconnectedness additionally makes it an open-access service that cannot be easily governed by property rights.

Policing of utilization of natural resources is generally executed through laws placed for their security, safety and sustainability. Hence, measures to circumvent these natural problems of oceans as well as those created by humans would be through sustainable governance regimes. Few of the objectives of these global policies could be: a) regulation of access to oceans, b) ensuring conservation of oceans and their biodiversity, c) regulation of intergenerational and interspatial effects of ocean resources, d) robust and pragmatic management and policy systems to manage the complexities of oceanic ecosystems, e) regular assessment, evaluation and revision of market value of ocean services, and f) concurrence of these laws/policies with the protection and safety of the environment (Costanza 199).

In the earlier centuries, freedom-of-the-seas doctrine was in existence; limiting rights over the oceans to a narrow belt of sea surrounding a particular nation's coastline. Post World War II, many nations started claiming more and more rights over larger stretches of seas around their countries. With advancements in science and technology, bigger and more mechanised fishing fleets traversed the seas blindly exploiting marine life in their paths without much thought on sustainability issues. Pollution from vessels carrying cargo and extensive oil drilling projects started impacting marine life negatively. Nations started fighting for ocean resources. Illegal activities occurring in oceans affect resource sustainability and damage its ecosystems, thus delaying us from achieving SDG 14. Controlling such activities could also be possible through global agencies like the United Nations. Currently the Division for Ocean Affairs and the Law of the Sea (DOALOS) of the UN is engaged in advising countries on the legal, political, and economic aspects of tapping marine resources. Still we periodically come across countries violating these UN laws and claiming rights over parts of the seas.

At this juncture one should also think about the plight of subsistence level fisher-folk in many countries. With the increase in the number of huge fishing fleets, these poor people have become poorer. They may resort to some minor illegal activities just to feed themselves. When countries try to impose rules, most often these poor people fall prey and the big shots escape paying bribes to the authorities. One example of such breaking of laws of the sea is the

practice of Saiko prevalent in Ghana – trade of by-catch fish that takes place across the decks of big fishing fleets. Though it is illegal, many practice it openly as any stoppage of that trade will result in the disruption of livelihood of thousands of poor families. In the long run this cannot be considered as good for sustenance of these poor people, as the very trawling activity which gives them this job is highly unsustainable and has the potential to crash marine fish population. This is now an industry worth more than 50 million US dollars annually. The downside is that, if the current practices prevail uninterrupted, the marine fishery of Ghana will collapse in about five years (Young 1). This is just one of the hundreds of such practices going on in different parts of the world. In most cases, the nexus between the parties involved is too complicated to unravel.

Oceans are to be valued for its aesthetic, recreational, evolutionary and historic importance, apart from its nutritional and economic benefits. Of paramount importance is the understanding in people that all these concerns are global, interconnected and integrated. Educating the general public, especially the school children could indeed act as a positive driving force in helping implement the policies for sustainability. If we are able to drive home the point in them that their lives would be at stake, if we don't act now, then we can be considered partially successful. They are the ones who will be facing the brunt of all these calamities if there is no action from all of us. Inherent awareness about the importance of oceans, their services to humanity and ill effects of over-utilization of its resources is very crucial in bringing about a paradigm shift among people in terms of their approach towards utilizing these natural resources.

## **9. Conclusion**

We have indeed come a long way from our stone age counterparts. Humans have been blessed with the most complex nervous system for any animal on Earth. With this, combined with the zest for achieving more, we have tapped and exploited each and every fellow being on this planet. The very duty of each and every one of us is to preserve the biodiversity that Nature has provided us and give the benefits of it to the coming generations. This was the main aim of the United Nations while formulating the 17 Sustainable Development Goals (SDGs). Development must balance social,

economic and environmental sustainability. SDGs are 'global goals' and a 'universal call' to foster peace and inclusive societies. The main mandates of SDG 14 are to reduce marine pollution, protect marine and coastal ecosystems, end overfishing, increase economic benefits of sustainable use of marine resources to small island states and least developed countries and implementation of international law as proposed by the 1982 United Nations Convention on the Law of the Sea (UNCLOS); referred to as the 'constitution for the oceans'. This kind of international commitment is urgently required because these issues affect all of us equally, one way or the other, sooner or later.

Sustainable living needs to become a virtue and not just a trend. Each and every deed by a sustainability conscious person must be built on the three pillars of sustainability – economic viability, environmental protection, and social equity. A simple act like carrying your own cup to the canteen rather than opting for a plastic cup can make a huge difference as our oceans are being dumped with these recalcitrant plastics. Similarly, avoiding the use of products like cosmetics with microbeads, can also help sustain marine life. Apart from physically damaging the organs of marine organisms they also adsorb a lot of pollutants which traverse upwards in the food chain affecting all the species in that food web. We all know that oceans were the primary place where organic life mysteriously took birth. Scientists have been trying for ages to mimic this, but not with much success. It is with this awe, that one should gauge these mighty oceans worldwide. It has a history which none of us can ever fully understand. Oceans have withstood the vagaries of nature for a very long time in the history of this planet and would continue to be resilient unless we pollute and torture them in herculean scales. Even without sacrificing too much we all can be a part of this noble cause of saving our oceans. What matters most is the awareness, and genuine and persevering efforts in executing these practices in our day to day life. Only the conscious and concerted efforts to protect and preserve our bountiful oceans by the people and governments will help build a sustainable, safer, and more prosperous planet for all.

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