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# THE FUTURE OF MARINE LIFE IN CHANGING OCEAN: COMPARATIVE ANALYSIS OF INDIA AND CHINA ON GLOBAL WARMING

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## ABSTRACT

“Global Climate change” in broad sense refers to a change in earth system. It is most usually used to describe the diversity of changes that are associated to the rapid growth in human activities that began about the middle of the 20th century; this increase is referred to as the great acceleration. The term "global change" refers to the transformations that take place within the Earth system as a whole, including all of its interacting physicochemical and biological components, as well as the influence that human cultures have on those components and vice versa. Changes in the global environment are what are referred to as global change and these changes might include shifts in climate, land, productivity, seas or other water resources, atmospheric chemistry, and ecological systems. These shifts have the potential to affect the earth's ability to support life. In this research paper I would be addressing the issues, causes, outcomes or impacts that the marine life or the future of our ocean has due to the climatic change caused preponderance by the human activities. Human activities include like ocean dumping, exploiting the sea floor, massive sulphide deposits, plastic pollution, oil spillages, ocean acidification etc. Some of the examples of the global or environmental change are due to burning fossil fuels which emits 8.5 billion tons of carbon into the earth's atmosphere each year, deforestation, ozone depletion, ocean acidification, biodiversity loss, drought, desertification. Changes in hydrological processes and freshwater supplies, as well as degradation of land and limits on feeding systems, are all significant worldwide environmental risks that are hazardous to human health.

**Keywords:** Ocean acidification, Global Warming, Oil spillage, Coral reefs, Marine ecosystem.

## CHAPTER I:

### 1.1 INTRODUCTION:

Marine life also referred to as sea life or ocean life encompasses the diverse array of flora, fauna, and other biological entities that inhabit the saline waters of seas and oceans, as well as the brackish environments found in coastal estuaries. Marine life has a crucial role in shaping the ecological dynamics of the planet. Over 200,000 marine species have been recorded in existing documentation, with an estimated additional two million marine species yet to be documented. The classification of oceanic organisms can be broadly categorised into three primary groups, namely plankton, nekton, and benthos. Plankton exhibit buoyancy and are found suspended in aquatic environments. Nekton organisms exhibit locomotion by swimming through the aquatic medium. Benthic organisms inhabit the benthic zone of the ocean floor. But these marine species as well as the ocean of ours is in a dangerous situation which is due to human activities. In laymen's language, the depletion of marine life is due to a mixture of chemical substances and solid waste, predominantly originating from terrestrial origins, which are subsequently transported into the ocean through processes such as water runoff or wind dispersion. The presence of pollution leads to detrimental effects on the environment, the well-being of many organisms, and global economic systems.

The conservation of marine biodiversity is of utmost importance for the ecological well-being of marine ecosystems and the overall sustainability of the world. Governments have the ability to establish marine protected areas, enforce fishing quotas, and regulate pollution levels in order to conserve and preserve marine ecosystems. But to tackle the global climate change and to preserve the marine life the whole world must work together in a unity and execute all these policies or the schemes to save the future ocean from depletion.

#### 1.1.1 Literature review:

*S.C. Gall, R.C. Thompson, "Impact of debris on marine life" (2015)*, this article discusses Marine debris is recognised as one of the primary perceived risks to biodiversity, and it is of special concern due to its prevalence, long-lasting nature, and ability to survive in the marine ecosystem. He is of the view that a multitude of both direct and indirect outcomes were documented, raising significant uncertainty and concern over the potential sub lethal effects resulting from ingestion. The comparison with the IUCN Red List revealed that a minimum

of 17% of species impacted by entanglement and ingestion were classified as threatened or near threatened. When marine debris interacts with other human-caused or anthropogenic stressors, it has the potential to impact populations, trophic interactions, and assemblages. He is of the opinion that the biodegradability of PBS fishing gear within marine sedimentary ecosystems, a significant contributor to the issue of accidental catches resulting from abandoned fishing gear, sometimes referred to as "ghost fishing". According to the biodegradation analysis conducted in accordance with ISO 19679, it was observed that the PBS fishing gear underwent a conversion process resulting in the production of carbon dioxide, with a rate of 27.3% over a period of 180 days. Following the process of biodegradation, the residual polybutylene succinate (PBS) had a discernible reduction in molecular weight, suggesting a phenomenon of bulk erosion. However, no alterations were seen in terms of crystallinity and thermal characteristics. In the final analysis, the deterioration of the polybutylene succinate (PBS) occurred predominantly via the process of surface abrasion, accompanied by the metabolic consumption of hydrolysis by-products by microbes<sup>1</sup>.

*Rachel Hagen, "Underwater and Underrated: Coral Reefs and Climate Change" (2018)*, his research paper discussed about the underwater coral reefs which are very important in the marine life and proportionately significant to the humans out there. He in his paper has viewed that Coral bleaching stands out as a prominent factor in the destruction of coral reefs. Coral bleaching transpires when coral organisms expel the symbiotic zooxanthellae residing within their tissue. The removal of zooxanthellae results in the exposure of the coral's skeletal structure. The animal remains alive during this period, albeit exhibiting a high vulnerability to disease. Coral organisms predominantly expel their zooxanthellae as a response to thermal stress. Fish populations can decline and reefs can be damaged due to harmful fishing practises such overfishing and indiscriminate fishing. Overfishing of living animals in reef ecosystems can affect their function. This could lead to species loss or overproduction, affecting coral reef ecosystems. He also adds that not only this but the pollution also plays a significant role in harming the marine ecosystems like the micro plastics and the dumping of wastes<sup>2</sup>.

*Stephanie E. Chang, Jeremy Stone, Kyle Demes and Marina Piscitelli, "Consequences of oil spills: a review and framework for informing planning" (2014)*, they have given a summary

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<sup>1</sup> SCIENCE DIRECT, <https://doi.org/10.1016/j.marpolbul.2014.12.041>, (last visited August 23, 2023).

<sup>2</sup> Rachel Hagen, *Underwater and Underrated: Coral Reefs and Climate Change*, Jstor (Dec 2018, No time mentioned), <http://www.jstor.com/stable/resrep19816>.

of the literature review as well as an overview structure in order to assist communities in methodically considering the aspects and linkages that might influence the outcomes of a potential oil spill. The focus is on leaks that were caused by incidents involving oil tankers. He has focused on the impacts of oil spills which have two types of impacts they are ecological and societal impacts. He also opined that when there is an oil leak and the oil floats, the species that are most at risk will be those that live in the intertidal zone. This is because the rising and lowering tides will bring different species into close contact with the majority of the spilled oil. Ingestion of oil, accumulation of pollutants in tissues, DNA damage, effects on immunological functioning, cardiac dysfunction, mass mortality of eggs and larvae, such as in fish, loss of buoyancy and insulation for birds are few instances of the plethora of toxicological pathways that can be found in different species. Broadly speaking, they noted that humans can be affected by oil spills in three major ways: oil can affect ecological processes that cause direct harm, e.g., health impacts from eating seafood with bio accumulated oil toxins; oil spill stressors can change intermediary processes, e.g., economic impacts to fishers from oil spill impacts to fish; and stressors can directly harm humans, e.g., health impacts from breathing oil vapours<sup>3</sup>.

*Magnus Johnson, Fish market prices drive overfishing of the 'big ones' (2014)*, in this he has discussed about the relationship between the overpricing of the fishes due to the excessive fishing by collecting the data and has put them through table forms and graphs and explained it through them like how the prices of fishes hiked which is directly affected by the overfishing which is also called the ghost fishing. He viewed that the prices observed in fish markets play a significant role in influencing the economic decisions made by fishers, specifically in terms of the species they choose to target. Based on economic theory, it may be argued that fishers base their decisions on prospective profitability. Consequently, fluctuations in price can influence the level of attractiveness in fishing a specific species (Holley & Marchal, 2004). According to Sethi, Branch, and Watson (2010), fish species that have the potential for higher profits in the market are prioritized and targeted initially. The influence of market demand on biological populations and human behavior can vary in terms of its direction and quantity, contingent upon biological features and institutional constraints, which makes those types of

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<sup>3</sup> Stephanie E. Chang, Jeremy Stone, Kyle Demes and Marina Piscitelli, Jstor (Jun 2014, No time mentioned), <https://www.jstor.org/stable/26269587>.

fish species extinct<sup>4</sup>.

*Secretariat of the Pacific Regional Environment Programme (SPREP)*, “*Overview of the marine litter issue*”(2022), they have overlooked the problem of marine littering and also discussed about the sources like;

- The disposal of garbage in the environment, whether it is abandoned on the ground or straight into the sea, poses several environmental concerns. These concerns include the leachates that are generated from landfill sites, the sludge that is produced from wastewater treatment systems, and the run-off that occurs as a result of agricultural activities.

- The practise of ship breaking, which involves dismantling ships for recycling purposes, has gained significant attention in recent years due to its environmental and occupational health implications.

- Accidental cargo losses at sea have emerged as a pressing concern within the maritime industry, necessitating a comprehensive understanding of the causes, impacts, and potential mitigation strategies associated with such incidents.

- Micro plastic pellets, also known as nurdles, are small plastic particles that serve as raw materials in the production of plastic products.

He also gave a point of view of the amount of plastic waste stored in the ocean like he has given a round figure of around 75-199 million tons and said that the amount of plastic waste which enters the marine ecosystem is around 9-14 million tons every year and opined that if this situation do not stop and if no proper care is been taken then by the end of 2040 this marine litter will triple with huge surge in plastic waste in oceans without any meaning actions. He also viewed that the lethal has a detrimental impacts on marine organisms, including whales, seals, turtles, birds, fish, and corals<sup>5</sup>.

## 1.2 Research Questions:

1. What are the causes and impacts of the toxic substances on marine ecosystem?

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<sup>4</sup> Peerj, <https://doi.org/10.7717/peerj.638>(last visited August 23, 2023).

<sup>5</sup> Secretariat of the Pacific Regional Environment Programme (SPREP), “*Overview of the marine litter issue*” (2022, No time mentioned), <https://www.jstor.org/stable/resrep46390.10>.

2. How the global warming affects the sea level. Implications on marine species?
3. What is Ocean Acidification? Why pollution is the root cause for this?
4. Discuss the consequences that the apex predators will face due to decline in maintaining the balance of marine food chains?
5. What are the policies that have been implemented to control the ocean dumping? And role of international countries in curbing the pollution that are caused by human activities?
6. Comparative analysis between India & China regarding causes and impacts of Global Warming on Environment?

### **1.3 Statement of Research Problem:**

The oceans of the world are crucial ecosystems that provide essential sustenance for a wide range of marine creatures, encompassing both minuscule microorganisms and big marine mammals. Nevertheless, the escalating anthropogenic activities, encompassing pollution, overfishing, habitat degradation, and climate change, are presenting substantial challenges to the diversity of marine life and the overall health of ecosystems. In spite of extensive endeavours to address these effects, there exists an urgent requirement to get a thorough understanding of the complex interplay between human actions and marine ecosystems, as well as to evaluate the enduring implications on the population size, geographic range, and viability of diverse marine species. The objective of this study is to examine the diverse array of obstacles encountered by marine organisms as a result of anthropogenic causes as a result of human –induced activities and the subsequent impact on marine ecosystems.

The Earth's surface is predominantly covered by oceans, which account for over 70% of its total area. These vast bodies of water serve as habitats for a wide array of species, a significant portion of which remain unidentified and await discovery. The comprehension of marine biodiversity facilitates the identification and preservation of distinct species and habitats, so making a significant contribution to the general conservation of the Earth's biological diversity. As there is lack of proper execution for the protection of the marine life and to curb the pollution which is caused by human activities and how these are affecting marine species

directly or indirectly and what were the aftermath consequences when the ocean is getting polluted by the industrial wastes and dumping plastic and medical wastes. The species which are excess in population are now entering the endangered list just because increase in pollution. This problem if not recognised now then it would be a great loss to our marine ecosystem and ultimately the affect is directly proportionate to the human beings.

#### **1.4 Research Objectives:**

1. To critically analyse how human activities like these oil spillages, plastic wastes, medical or pharmaceutical waste and extensive fishing are impacting the marine life and to investigate the role of the coral reefs as they are the vital marine habitats and the threats, they face due to climate change and propose potential solutions.
2. To collect data on how raising temperatures are affecting the increase in sea levels and the melting glaciers which are in turn are the main cause for the rapid hike in distinctive diseases.
3. To critically evaluate that global warming which means increase in green house gases is one of the causes for ocean acidification. Ocean acidification is a phenomenon characterised by a prolonged decrease in the pH levels of the ocean, mostly attributed to the absorption of carbon dioxide (CO<sub>2</sub>) from the Earth's atmosphere. Due to over polluting the air and the ocean with dumping of industrial wastes and dumping of municipal sludge are destroying the marine life and also to analyse the deep sea volcanoes which are caused by the escalation in rising global warming.
4. In order to create a visual depiction of a marine food web, it is essential to identify and delineate the primary producers, consumers, and decomposers within the ecosystem. Furthermore, it is crucial to elucidate the interdependencies that exist among these organisms.
5. The protection and preservation of marine life are of paramount importance, and all the international countries assume a crucial role in this endeavour through the implementation of laws, regulations, and enforcement measures. Governments in every country have the ability to establish marine protected areas, enforce fishing

quotas, and regulate pollution levels in order to ensure the preservation and protection of marine ecosystems. The countries have also entered and signed agreements and conventions to curb the pollution caused by human activities.

6. To get to know the comparative analysis between India and China regarding the causes and impacts of global warming on environment.

### **1.5 Importance of the study:**

Biodiversity and conservation efforts in marine ecosystems are of paramount importance due to the presence of a diverse range of species, a significant proportion of which remain unidentified. The study of marine life enables the documentation and comprehension of its remarkable biodiversity, hence facilitating enhanced conservation endeavours aimed at safeguarding endangered species and vulnerable marine ecosystems. The health of marine ecosystems is of paramount importance as they are intricately interwoven and serve a vital function in sustaining the overall well-being of the Earth. The study of marine life enables the monitoring of ecosystem health, the detection of changes, and the implementation of interventions when deemed necessary to prevent or alleviate the impacts of pollution, climate change, and habitat loss. The regulation of the Earth's climate is heavily influenced by the oceans. These entities possess the capacity to assimilate and retain substantial quantities of thermal energy and carbon dioxide, so exerting an impact on meteorological phenomena and the overall state of the Earth's climate. Gaining knowledge about marine life enables us to comprehend these processes and their influence on climate change.

In essence, the examination of marine organisms is imperative for the progression of our scientific understanding, preservation of the natural surroundings, establishment of sustainable resource practises, resolution of worldwide predicaments, and enhancement of the welfare of ecosystems and human communities.

### **1.6 Research Methodology:**

The nature of Research would be doctrinal approach. Research methodology will involve exploration of the causes, impacts and implications on ecosystem due to pollution. The sources of data and information, includes like policies, agreements, conventions on climate change, and relevant treaties or schemes that are been implemented by the respective countries. I



would be collecting data from journals, articles, and by reviewing research papers and drawing conclusion from them and also through reading books on marine ecosystem.

## **CHAPTER II:**

### **2.1 Causes and impacts of the toxic substances on marine eco system due to human activities:**

Marine pollution encompasses a mixture of chemical substances and solid waste, predominantly originating from terrestrial origins, which are subsequently transported into the ocean by processes such as runoff or wind dispersion. The pollution in question leads to detrimental effects on the environment, the well-being of all living organisms, and global economic systems.

The issue of marine contamination is more prevalent in contemporary society. The ocean is currently seeing an influx of two primary forms of pollution, namely chemical contaminants, and solid waste materials.

Marine debris comprises a wide range of manufactured objects, predominantly composed of plastic materials, which ultimately find their way into the ocean. The collection of debris is influenced by various factors, including littering, strong storm gusts, and inadequate waste management practises. It is noteworthy that around 80 percent of this material originates from terrestrial sources. The prevailing forms of marine debris encompass a range of plastic articles such as shopping bags and beverage bottles, in addition to cigarette butts, bottle caps, food wrappers, and fishing equipment. The persistence of plastic waste renders it a significant environmental concern due to its extended lifespan. Plastic objects have the potential to undergo decomposition over extended periods of time, often spanning several centuries<sup>6</sup>.

This waste presents hazards to both human beings and animals. Fish become entangled and sustain injuries as a result of the presence of waste in their environment. Additionally, certain animals mistakenly perceive things such as plastic bags as edible and ingest them. Microscopic organisms consume fragmented plastic particles known as microplastics and assimilate the chemical compounds included in the plastic into their biological tissues. Microplastics, which exhibit a diameter of less than five millimetres (equivalent to 0.2 inches),

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<sup>6</sup> National Geography, [ngimagecollection@natgeo.com](mailto:ngimagecollection@natgeo.com)(last visited August 24, 2023).

have been identified in many marine organisms, encompassing planktonic organisms as well as cetaceans such as whales. Upon ingestion of microplastics by larger organisms, the harmful compounds included in these minute particles are assimilated into their bodily tissues. The phenomenon described involves the migration of micro plastic contamination through the food chain, ultimately leading to its incorporation into the human diet<sup>7</sup>.

Besides this the daily activities which takes place in the sea ports or while travelling in sea there are many ship wrecks accidents happening and due to this there is a lot more damage happening to the marine ecosystem and the marine species as there would be a lot of crude oil spillages in the sea which is a very difficult task to get it removed as there is no proper machinery or instrument to get it out of the sea surface and as the oil has the capacity to block the air to enter the water surface when it is poured on water and because of this the species living in the water bodies will have the difficulty to take in oxygen and there will be block of all of the prominent gases or air entering into the water and due to this the marine species are going extinct. Oil spills occurring in rivers, bays, and the ocean predominantly result from inadvertent incidents involving tankers, barges, pipelines, refineries, drilling rigs, and storage facilities. However, it is worth noting that such spills can also arise from recreational boats and within marinas<sup>8</sup>.

Oil spills have the potential to cause significant harm to several marine species, including avian, reptilian, and mammalian organisms. Additionally, fish and shellfish populations may also be adversely affected by these incidents. The extent of the damage inflicted by oil spills is contingent upon the specific circumstances surrounding each event. The presence of oil has detrimental effects on the insulating capacity of fur-bearing animals, such as sea otters, as well as the water-repellent properties of avian feathers, so rendering these organisms vulnerable to adverse environmental conditions. Numerous avian and terrestrial creatures are also subject to oil ingestion, resulting in toxicity either during self grooming or through the consumption of prey contaminated with oil<sup>9</sup>.

Fish and shellfish possess the ability to metabolise oil, perhaps leading to alterations in their reproductive patterns, growth rates, or even mortality. Species of significant commercial

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<sup>7</sup> Ibid.

<sup>8</sup> National Oceanic and atmospheric administration, "*Oil spill; A major marine ecosystem threat*"(last visited August 24, 2023).

<sup>9</sup> Ibid.

value, including oysters, prawns, mahi-mahi, grouper, swordfish, and tuna, may potentially experience reductions in population or become sufficiently contaminated to pose risks to their safety for both capture and consumption<sup>10</sup>.

Furthermore, Coral reefs serve as vital ecosystems that facilitate the proliferation of marine organisms, playing a crucial role in supporting the reproduction and development of many aquatic species such as fish, corals, and numerous other marine organisms. Coral reefs provide the necessary resources for several global populations to attain socioeconomic stability and provide food security. Out of the 100 or more nations that harbour coral reef ecosystems, around 80 are classified as developing countries. The number 14 is being discussed. Among the group of developing nations, a total of 19 countries are classified as Least-Developed Countries (LDCs) due to their low-income levels, restricted availability of resources, and precarious economic conditions. The number 15 is the subject of discussion. The individuals residing in Less Developed Countries (LDCs) who depend on coral reefs for socioeconomic stability and food security are frequently associated with the most economically disadvantaged communities globally. Consequently, their reliance on coral reefs is crucial for their existence. A further noteworthy function of corals is their ability to serve as a natural barrier against waves, so providing protection from flooding<sup>11</sup>.

Regrettably, coral reef ecosystems face additional perils outside the scope of climate change. Harmful fishing practises, such as overfishing and indiscriminate fishing, have the potential to result in the depletion of fish populations and the degradation of reef ecosystems. The depletion of one or more living organisms from a reef environment due to excessive fishing can lead to the disruption of the ecological functions performed by these organisms. The potential consequences of this phenomenon include the potential decline or excessive proliferation of one or more species, which could have implications for the overall health of coral reef ecosystems<sup>12</sup>.

## **2.2 Effects of global warming on raising sea level and implications on marine species:**

The raise in global temperatures are also the major threat to the environment of all over the

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<sup>10</sup> Ibid.

<sup>11</sup> Rachel Hagen, Underwater and Underrated: Coral Reefs and Climate Change, Jstor (Dec 2018, 2:52 PM), <http://www.jstor.com/stable/resrep19816>.

<sup>12</sup> Supra note 2.

world as these are due to excessive release of greenhouse gases into the atmosphere which in turn results in global warming. Raising temperatures not only affects the raise in sea level but also puts the species like land mammals, water mammals and birds which are correlated to the balance in sea level and due to the raise in temperatures these species are going extinct and some are entering the endangered species list which is very saddening to see this because for the sake of human pleasures its costing the lives of the species which cannot even raise their voice to protect themselves.

The increasing sea levels pose a significant threat to biodiversity through various mechanisms. Numerous coastal regions exhibit a progressive topographic profile, rendering them susceptible to the adverse effects of even a little increase in sea levels, resulting in the submergence of extensive land areas. Regions that were previously influenced by the fluctuation of tidal movements will undergo a transformation into exposed bodies of water. Dry sandy shorelines and coastal wetlands will be inundated, while inland freshwater wetlands, forests, or dune habitats will be replaced by more resilient communities adapted to higher salt levels. Additionally, freshwater streams and underground water reservoirs may experience an increase in salinity, resulting in a brackish or saline composition. The displacement of habitats poses a significant source of stress for species, even in places that remain undeveloped. However, in regions where human activities have led to the urbanisation of coastal zones, the migration of habitat zones towards land is impeded as a consequence of rising sea levels. Consequently, certain habitats will be lost<sup>13</sup>.

The impact of climate change on human cultures can be highly destructive, and its adverse consequences on human health are no different. One possible way to rewrite the user's text to be more academic is as follows: The Climatic variations have been found to contribute to the exacerbation of around 58% (218 out of 375) of infectious diseases documented in human history. Empirical evidence demonstrates a multitude of 1006 distinct pathways via which climate change facilitates the emergence and proliferation of a wide range of diseases<sup>14</sup>.

Glacier ice is widely recognised as a highly valuable indicator of climate change due to its rich repository of information. The extensive data contained inside glacier ice, encompassing

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<sup>13</sup> Dave Owen, "Sea-Level Rise and the Endangered Species Act", (2012, No date mentioned), <https://heinonline.org/HOL/License>.

<sup>14</sup> Oxford Academic, <https://doi.org/10.1093/jtm/taad015>, (last visited August 25, 2023).

various aspects such as microbiology, play a crucial role in elucidating paleoclimatic histories and facilitating predictions on the trajectory of climate change.

The Intergovernmental Panel on Climate Change has produced a special report which states that human activities have contributed to a rise in global temperatures of approximately 1 degree Celsius from the pre-industrial period. The existing rate of change is projected to lead to a rise in global temperature by 1.5°C within the time frame of 2030 to 2052, thereby causing the melting of glaciers. The user's text is too short to be rewritten academically. The adverse impacts on health resulting from the 1.5°C rise in temperature and associated dangers have been extensively documented<sup>15</sup>.

Various viral candidates, including influenza 'A' virus, enteroviruses, and caliciviruses, have been observed to have a significant presence within ice glaciers. Subsequently, upon the melting of these glaciers, these viral candidates are discharged into interconnected water bodies, thereby actively contributing to the perpetuation of disease cycles. Climate change poses an unprecedented and formidable challenge to the well-being of humanity, especially in relation to the phenomenon of glacier melting. Furthermore, the failure to effectively reduce the underlying causes will further worsen the impact<sup>16</sup>.

### **2.3 Root causes for Ocean Acidification and its potential effects on marine life:**

Ocean acidification poses a significant global peril to the Earth's seas, estuaries, and water bodies. Referred to as the "malevolent counterpart of climate change," this phenomenon is anticipated to expand in magnitude due to the persistently escalating emission of carbon dioxide into the atmosphere. Similar to a sponge, the Earth's seas are progressively assimilating elevated quantities of carbon dioxide from the surrounding atmosphere. This interaction plays a crucial role in the regulation of atmospheric carbon dioxide levels on Earth. However, it has negative consequences for marine ecosystems and organisms, especially shellfish species like economically significant oysters and clams. Ocean acidification is primarily recognised for its resemblance to osteoporosis in shellfish, resulting in challenges for these organisms in shell construction and maintenance. The process of acidification has a significant impact on various species that play a crucial role in the marine ecosystem, such as

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<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

reef-building corals and pteropods. Pteropods, which are small snails consumed by a wide range of species including fish and whales, are also affected by acidification<sup>17</sup>.

In the span of the last two centuries, the Earth's seas have assimilated an excess of 150 billion metric tonnes of carbon dioxide originating from anthropogenic sources. The global mean quantity of waste generated per individual on a weekly basis is approximately 15 pounds, which is sufficient to fill a train of considerable length that could encircle the Earth's equator 13 times annually. The quantities of carbon dioxide in the ocean presently exceed levels observed over the past 800,000 years, and the rate of growth is believed to be unparalleled.

Ocean acidification is significantly impacting the chemical equilibrium of oceanic and coastal waters worldwide, posing a substantial threat to their fundamental composition and balance across the whole latitudinal range. Ocean acidification is often referred to as the "osteoporosis of the sea" with valid justification. Ocean acidification has the potential to induce adverse effects on several marine organisms, such as oysters, clams, lobsters, prawns, coral reefs, and other species that rely on mineral deposition for the formation of their shells and skeletons<sup>18</sup>.

The phenomenon of ocean acidification is anticipated to exert detrimental impacts on numerous marine organisms in a comprehensive manner. This phenomenon has the potential to disrupt marine food webs and subsequently impact the availability of food resources for human populations. The process of acidification may also result in a reduction of storm protection provided by reefs, potential negative impacts on tourism opportunities, and a diminishment of additional benefits that are challenging to quantify<sup>19</sup>.

#### **2.4 Consequences that the apex predators will face due to decline in maintaining the balance of marine food chains:**

Due to the inherent omnivorous nature, humans possess a natural inclination towards active participation within food webs. Human beings engage in predation activities towards many animal species across different tropic levels. Additionally, they use nearly 50% of the Earth's land surface for the purpose of livestock rearing. Furthermore, humans devour a significant portion of both marine flora and fauna. Moreover, they take over 25% of terrestrial net primary

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<sup>17</sup> National Oceanic and atmospheric administration, <https://oceanacidification.noaa.gov>, (last visited August 25, 2023).

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

productivity to meet their dietary needs. While our focus is mostly on generic food-web theory, our examples tend to prioritise aquatic systems to a certain extent.

This observation mostly aligns with our research focus, which centres on the significant ecological services provided by food webs in vast marine systems, as well as the prevailing trends shown in the existing literature.

In the western Atlantic region, the population of ten large shark species has experienced a significant decline as a result of extensive fishing activities. Significant decreases were seen, with the sandbar shark experiencing an 87% fall, while the bull, dusky, and smooth hammerhead sharks had declines of 99% or more. The act of fishing effectively mitigated the predatory influence exerted on a taxonomically varied assemblage comprising 14 species of rays, skates, and small sharks. The food-web response that stood out the most was observed in the cownose ray, scientifically known as *Rhinoptera bonasus*, as its population experienced a notable increase of over 40 million individuals. Consequently, there was a subsequent increase in predation pressure on bivalve populations, including bay scallops, soft-shell clams, hard clams, and oysters, resulting in a significant decline in their abundance. The bay scallop population experienced significant negative impacts, resulting in the cessation of a fishery that had been in operation for almost a century, primarily due to predation by rays, as of 2004<sup>20</sup>.

As an illustration, subsequent to the decline of planktivorous sardines and anchovies in the northern Benguela food web off Namibia during the 1990s, jellyfish populations experienced a significant increase, reaching exceptionally elevated levels. These heightened levels were detrimental as they led to the entanglement of fishing nets, spoilage of catches, and obstruction of power station coolant intakes<sup>21</sup>.

Predatory species inhabiting upper trophic levels within marine ecosystems, such as marine mammals, giant teleosts, and sharks, have been experiencing a significant global decline in population. According to recent estimates, there has been a significant regional loss of 90% or more in populations of large sharks. The condition of huge tuna, billfish, and ground fish, as well as reef-associated predators in areas affected by human activities, is equally concerning. While there may be some disagreement over the extent of certain declines, the

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<sup>20</sup> Annual reviews, <https://www.annualreviews.org>, (last visited August 25, 2023).

<sup>21</sup> *Ibid.*

consensus among academics is that there have been significant and widespread changes in the abundance of top trophic levels in the oceans. It is evident that the precise anticipation of the ecological ramifications resulting from past decreases, as well as prospective future declines, holds significant importance in the realm of fisheries and ocean ecosystem management. Ecosystem models are presently the predominant approach employed to investigate the broader implications associated with the decline of upper trophic levels<sup>22</sup>.

In the study of marine ecosystems that involve large predators, it is common for researchers to make the assumptions that trophic cascades take place through direct predation, namely the deadly consequences on mesoconsumers. By employing this theoretical framework, it becomes possible to comprehensively measure the impacts of predation by considering factors such as the dietary preferences, metabolic rates, and population sizes of predators, as well as data on the dynamics of prey populations. The decrease in the population of apex predators is expected to result in the liberation of mesoconsumers from predation, thereby leading to an indirect rise in the death rate of the species that serve as resources. This relationship has been supported by previous studies. Therefore, it is anticipated that the absence of apex predators will result in an increase in the population of intermediate consumers and a decrease in the abundance of species that serve as primary resources.<sup>23</sup>

### **2.5 Role of International countries to curb the pollution that are caused by human activities:**

In order to address the far-reaching consequences of pollution on society, the global ministers of environment convened at the United Nations Environment Assembly in 2017 and articulated their political dedication to the pursuit of a planet devoid of pollution. Governments have also implemented Resolutions that specifically address several dimensions of pollution, including air quality, water pollution, soil pollution, marine litter, and microplastics, as well as chemicals and wastes. A comprehensive Implementation Plan was established, encompassing all aforementioned resolutions, with the objective of facilitating expedited action, strengthening capabilities to tackle pollution, and attaining the Sustainable Development Goals. The Plan has been warmly received by the Environment Assembly,

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<sup>22</sup> Lenfest ocean programme, <https://www.lenfestocean.org>, (last visited August 25, 2023).

<sup>23</sup> Ibid.



which acknowledges its significance as the primary mechanism for expeditious execution.

The United Nations has urged all Member States and relevant stakeholders to actively participate in the successful execution of its objectives<sup>24</sup>.

The UNEP/International Resource Panel (IRP) was tasked by the G20 to produce a 'think piece' titled "Policy Options to Eliminate Additional Marine Plastic Litter." This report aims to qualitatively explore potential policy options that can contribute to the realisation of the Osaka Blue Ocean Vision. The vision, voluntarily adopted by G20 countries, sets the goal of achieving a comprehensive life-cycle approach to reduce marine plastic litter to zero by 2050. Consequently, this would ensure that the net volume of plastic entering the ocean is effectively eliminated by the target year. The present analysis examines the marine plastic waste patterns projected for the year 2050, provides a concise overview of the existing plastic policy framework, and investigates both upstream and downstream policy actions aimed at realising the Osaka Blue Ocean Vision. The analysis offered in this study culminates in a series of policy statements aimed at achieving the Vision and facilitating the necessary structural reforms in the plastic economy. The aforementioned items encompass:

- In order to effectuate the requisite modifications to the plastics economy, it is imperative that the G20 expedites its efforts pertaining to marine plastic litter as a matter of utmost importance. Presently is not the opportune moment to divert one's attention. Taking immediate action can effectively mitigate the necessity for future actions.
- There is an urgent need for enhanced coordination of measures aimed at reducing marine plastic litter. In lieu of fragmented measures and prohibitions, there is a pressing need for a cohesive overhaul of regulatory frameworks, business models, and funding methods. This entails the creation of a platform that facilitates the coordination and dissemination of analysis pertaining to proven strategies and approaches.
- To accomplish the Osaka Blue Ocean Vision, it is imperative to implement a significant shift in both international and national policy ambition. The realisation of

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<sup>24</sup> United Nations Environment Programme, <https://www.unep.org/beatpollution/global-response-pollution>, (last visited August 25, 2023).

the Osaka Blue Ocean Vision necessitates the adoption of more progressive policy targets, which should be formulated on a global scale but implemented at the national level.

- Efforts aimed at promoting, disseminating, and expanding actions proven to effectively mitigate marine plastic litter should be promptly endorsed and implemented. These strategies encompass transitioning from a linear to a circular approach in plastic manufacturing and consumption. This involves the elimination of waste through design, promoting the reuse of plastic materials, and utilising marketbased mechanisms as incentives. These strategies will yield immediate positive outcomes, serving as catalysts for additional policy measures and fostering an environment conducive to innovation.
- The implementation of COVID-19 recovery stimulus packages holds the capacity to facilitate the realisation of the Osaka Blue Ocean Vision. The implementation of measures aimed at mitigating marine plastic pollution is expected to yield employment opportunities within the Greentech and Bluetech industries, while also contributing to the realisation of the Osaka Blue Ocean Vision<sup>25</sup>.

The Background Report and report to UNEA3 by UNEP offer a comprehensive overview of pollution on a worldwide scale, encompassing details on the origins, consequences, and potential remedies for pollution. The World Environment Situation Room offers users the opportunity to access a wide range of data and information pertaining to pollution and various other environmental subjects<sup>26</sup>. The preservation of marine life is contingent upon international cooperation, given that the ocean encompasses 70% of the Earth's surface and its ecosystems exhibit interconnectivity. Governments worldwide have acknowledged the significance of safeguarding marine life and have collaborated to form international agreements aimed at fostering cooperation and conservation endeavours<sup>27</sup>.

#### ➤ **Convention on Biological Diversity (CBD):**

An example of such an agreement is the Convention on Biological Diversity (CBD), which

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<sup>25</sup> United Nations Environment Programme, <https://www.unep.org/beatpollution/global-response-pollution>, (last visited August 27,2023).

<sup>26</sup> Supra note at 23.

<sup>27</sup> Supra note at 24.

was ratified in 1992 with the objective of conserving biodiversity, facilitating the sustainable use of its constituents, and guaranteeing the just and equitable distribution of benefits derived from the exploitation of genetic resources. The Convention on Biological Diversity (CBD) has been instrumental in facilitating the advancement of marine conservation initiatives. One of its key programmes, the Marine and Coastal Biodiversity programme, is dedicated to safeguarding marine and coastal ecosystems, fisheries, and other valuable marine resources<sup>28</sup>. The United Nations Convention on Biological Diversity, informally known as the Biodiversity Convention, is a multilateral treaty opened for signature at the Earth Summit in Rio de Janeiro in 1992. It is a key document regarding sustainable development. It comes under the United Nations Environment Programme (UNEP)<sup>29</sup>.

➤ **The Aims of the Convention on Biological Diversity (CBD):**

The aims of the Convention are enumerated as follows:

1. The concept of conserving biological diversity is of utmost importance in the field of environmental science.
2. The sustainable utilisation of the various constituents of biodiversity.
3. The concept of ensuring a just and impartial distribution of advantages derived from genetic resources.

The concept of CBD entails the formulation of comprehensive national strategies aimed at the preservation and responsible utilisation of biological variety. The agreement encompasses a comprehensive range of genetic resources, animals, and ecosystems. The utilisation of biological resources in a sustainable manner is a primary objective associated with conventional conservation initiatives. A set of principles has been established to ensure the equitable and just distribution of advantages derived from the utilisation of genetic resources, particularly those intended for commercial purposes. The Cartagena Protocol on Bio safety encompasses the burgeoning domain of biotechnology, encompassing aspects like as technology advancement and dissemination, equitable distribution of benefits, and concerns

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<sup>28</sup> Gray Group International, <https://www.graygroupintl.com/blog/role-of-governments-in-preserving-marine-life>, (last visited August 27, 2023).

<sup>29</sup> Byju's exam prep, <https://byjus.com/free-ias-prep/uncbd-united-nations-convention-on-biological-diversity>, (last visited August 28, 2023).

related to bio safety<sup>30</sup>.

➤ **Convention on International trade in Endangered Species (CITES):**

The Convention on International trade in Endangered Species (CITES) is a significant international agreement that governs the global trading of endangered flora and fauna species.

The convention serves to safeguard the preservation of wild animals and plants by regulating international trade in their specimens, so mitigating the risk of endangering their existence in their natural habitats. The roster of species afforded protection under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) encompasses a diverse array of marine organisms, including sea turtles, whales, dolphins, and sharks. The classification system employed by CITES categorises plants and animals into three distinct groups, which are determined by the level of harm they face<sup>31</sup>.

Approximately 5,600 animal species and 30,000 plant species are safeguarded by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to mitigate the risks of excessive exploitation in the context of global commerce.

The Convention imposes a shared obligation on both producer and consumer Parties to effectively manage wildlife trade in a sustainable manner and to avoid any instances of unlawful trade. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is responsible for the regulation of global trade involving more than 36,000 species of plants and animals, as well as their products and derivatives. Its primary objective is to safeguard the continued existence of these species in their natural habitats, while also promoting the well-being of local communities and the overall global environment. CITES has assumed a prominent role in increasing awareness regarding the escalation of illicit wildlife trade and adopting a unified strategy to combat this issue. This has been achieved through the establishment of the International Consortium on Combating Wildlife Crime (ICCWC), a collaborative initiative involving five inter-governmental organisations: CITES, INTERPOL, the United Nations Office on Drugs and Crime, the World Bank, and the World Customs Organisation. The primary objective of ICCWC is to provide synchronised

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<sup>30</sup> *Supra* note at 27.

<sup>31</sup> *Supra* note at 28.

assistance to national wildlife law enforcement agencies, as well as sub-regional and regional networks, which actively safeguard natural resources on a daily basis<sup>32</sup>.

➤ **Stockholm Convention:**

The Stockholm Convention is an international treaty that was ratified by the Conference of Plenipotentiaries in 2001 and subsequently enacted on May 17, 2004. The primary objective of its implementation was to safeguard human well-being by mitigating the adverse effects of persistent organic pollutants (POPs) that remain suspended in the atmosphere for extended durations. The primary objective of the treaty is to mitigate or eradicate the use of persistent organic pollutants (POPs) by means of proactive initiatives undertaken by the participating member states.

The Energy and Resources Institute (TERI) published research in January 2018 regarding the presence of Persistent Organic Pollutants (POPs) in the Indian environment. The paper highlights that the levels of POPs in the Indian environment are significantly elevated due to inadequate management practises concerning electronic trash, as well as municipal and industrial waste.

India has been granted an exception from the prohibition of DDT due to its adherence to the Stockholm Convention (SC), thereby permitting the country to engage in the production and utilisation of DDT solely for the purpose of managing vector-borne illnesses.

➤ **Bonn Convention:**

The Bonn Convention refers to an international pact established in 1979 in Bonn, Germany, which focuses on the preservation of migratory species of wild animals. The legislation was enacted in 1983. The convention, commonly referred to as the Bonn Convention or CMS (Convention on Conservation of Migratory Species), holds significant importance within the realm of international environmental treaties and protocols.

The primary objective of the Bonn Convention is to safeguard the habitats and migratory patterns of several species of wild animals. The aforementioned treaty is the only international

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<sup>32</sup> United Nations Sustainable Development Goals, <https://sustainabledevelopment.un.org>, (last visited August 28, 2023).

agreement pertaining to migratory species and operates under the framework of the United Nations Environment Programme. The convention encompasses legally binding agreements as well as non-legally binding Memorandum of Understandings (MoUs) that are specifically suited to address conservation requirements. India has recently initiated the implementation of the National Action Plan aimed at safeguarding migratory species within the Central Asian Flyway.

➤ **Vienna Convention:**

The Vienna Convention was implemented in 1988 and achieved global ratification by 2009. The international agreement is commonly referred to as the Convention for the Protection of the Ozone Layer. The primary objective of the Vienna Convention is to safeguard the ozone layer against depletion. The treaty was initially signed by 28 countries on March 22, 1985. The Vienna Convention and Montreal Protocol were accepted internationally on September 16, 2009, making them the first treaties in the history of the United Nations to gain universal ratification.

The responsibility for the protection and implementation of the Montreal Protocol in India lies with the Ministry of Environment, Forest & Climate Change. The establishment of the Ozone Cell is to ensure the efficient and prompt execution of the Montreal Protocol. India has fully eliminated the use of carbon tetrachloride (CTC) as of January 1, 2010.

➤ **Rio Summit:**

The United Nations Conference on Environment and Development (UNCED), also referred to as the Rio de Janeiro Earth Summit, Rio Summit, Rio Conference, and Earth Summit (Portuguese: ECO92), was a significant international conference organised by the United Nations. It took place in Rio de Janeiro, Brazil, spanning from 3 to 14 June 1992. A total of 172 governments were involved in the event, with 116 of them being represented by their respective heads of state or government.

One noteworthy achievement of the summit was the establishment of a consensus about the Climate Change Convention, subsequently resulting in the formulation of the Kyoto Protocol and the Paris Agreement. And further provision entailed refraining from engaging in any actions on the territories of indigenous communities that could result in environmental

deterioration or cultural inappropriateness.

➤ **Basel Convention:**

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is an all-encompassing convention that was formally adopted in

1989 by the Conference of Plenipotentiaries. The primary objective of this initiative is to safeguard the human environment from the detrimental consequences arising from the generation, management, and disposal of hazardous waste within the global community.

In September 2019, the Ministry of Consumer Affairs Food and Public Distribution in India implemented a comprehensive prohibition on the utilisation of single-use plastic items throughout all of its Public Sector Undertakings (PSUs), including the Food Corporation of India. This convention holds significant importance within the realm of international environmental agreements<sup>33</sup>. Thus, these are some of the very important conventions ratified and adopted by many member countries of United Nations Organisations and most of these regulations mentioned in these conventions are been implemented by the countries in their states<sup>34</sup>.

**2.6Comparative analysis between India & China regarding causes and impacts of Global Warming on Environment:**

The future global environment is expected to be significantly influenced by the developmental trajectories of China and India, which are projected to emerge as two of the world's three largest economies during the next twenty-five years. The issue of global warming will mostly be influenced by the cumulative greenhouse gas emissions originating from these two nations. This article provides a comprehensive overview of the economic growth experienced by both countries, along with the subsequent rise in environmental challenges. It examines the patterns and consequences of heightened energy consumption, as well as the trends and impacts associated with greenhouse gas emissions. Additionally, it explores the potential for

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<sup>33</sup> Supra note at 27.

<sup>34</sup> Supra note at 26.

mitigating these effects, contingent upon the willingness of the two nations to take action<sup>35</sup>.

The significance of India and China is mostly attributed to their substantial population, since the combined total of these two countries currently represents 2.5 billion individuals, accounting for almost 40% of the global population. The economies of China and India, while now distinguished by their respective dominance in worldwide manufacturing and global services, are both seeing rapid growth across all sectors<sup>36</sup>. As China has experienced a significant increase in its economic advancement, transitioning from the fourth position in 1960 to the second position in 2023. The Chinese economy primarily relies on manufacturing, exports, and investment as its key drivers. The entity takes pride in its substantial labour force, strong government support, developments in infrastructure, and rapidly growing consumer market. As of now the current China's GDP, Per Capita and Annual GDP rate are as follows;

- GDP: \$19,374 billion
- GDP By Country Per Capita: \$13,720
- Annual GDP Growth Rate: 5.2%

The Indian economy has a remarkable degree of diversity and rapid expansion, driven by pivotal industries such as information technology, services, agriculture, and manufacturing. The nation leverages its extensive domestic market, a skilled and technologically proficient workforce, and a growing middle class. India has secured fourth place among the world's largest economies. As of now the current India's GDP, Per Capita and Annual GDP rate are as follows:

- GDP: \$3,750 billion
- GDP By Country Per Capita (Nominal): \$2,601
- Annual GDP Growth Rate: 5.9%<sup>37</sup>.

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<sup>35</sup> Betty J. Diener, William P. Frank, "The China-India Challenge: A Comparison of Causes and Effects Of Global Warming" ( March, 2010), International Business & Economics Research Journal.

<sup>36</sup> Ibid.

<sup>37</sup> By Forbes India, <https://www.forbesindia.com/article>, ( last visited August 29, 2023).



Both countries exhibit a multitude of environmental issues that are comparable in nature. A significant proportion, exceeding 75%, of the water found in urban rivers in China is deemed unsuitable for both drinking and fishing purposes. In the context of India, the rivers are commonly characterised as polluted bodies of water, exhibiting high levels of toxicity. This has resulted in a notable decrease in fish populations, particularly in close proximity to major coastal urban centres such as Mumbai and Calcutta. Approximately 25% of the Indian population lacks access to potable water, while a staggering 90% of the country's water resources are contaminated. The groundwater levels in both nations are experiencing a decline, accompanied by significant contamination of the groundwater resources. Approximately 27.46%<sup>38</sup> of China's land is covered by desert, which is accompanied by widespread deforestation and soil degradation. India has similarities in terms of environmental degradation, as evidenced by the loss of almost 90% of wildlife habitats due to agricultural damage and deforestation by the mid-1990s. Additionally, the country had a substantial depletion of 25 billion tonnes of topsoil between 1995 and 2000<sup>39</sup>.

China is presently positioned as the second-largest energy market globally. With aspirations to quadruple its economic output, China foresees a corresponding doubling of its yearly energy consumption. In 2005, China's energy consumption amounted to 1.742 million tonnes of oil equivalent (mtoe), with a projected increase to 3819 mtoe by the year 2025. China anticipates a substantial growth in its electric consumption, projecting a rise of 2600 gigawatts by the year 2050. This expansion is equivalent to the addition of four power plants with a capacity of 300 megawatts each on a weekly basis, spanning a period of 45 years.

The energy demand in India experienced an annual growth rate of 2.3% between 2009 and 2015, resulting in its current level of 537 million tonnes of oil equivalent (mtoe), which is comparable to that of Japan. According to alternative projections, there is a potential for an annual long-term growth rate of 8%. This growth rate would necessitate a significant expansion in power generating capacity, estimated to be six times the current capacity. Consequently, it is anticipated that emissions would also see a four-fold increase. The exponential increase in energy needs exhibited by these two nations is particularly concerning due to the fact that it will necessitate energy supplies that surpass the existing global energy

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<sup>38</sup> United Nations Environment Programme, Convention on Biodiversity, <https://www.cbd.int/countries/profile>, (last visited August 29, 2023).

<sup>39</sup> Supra note at 4.

resources. This scenario can only be mitigated via the implementation of efficient measures to reduce energy intensity. Moreover, it would exceed the Earth's capacity to absorb, resulting in a disastrous impact on climate change. If the per capita oil consumption in China and India were to reach the same levels as the current per capita demand in the United States, the total demand from these two countries would be twice the current global oil demand. This increased demand would result in the depletion of proven oil reserves over a span of only 15 years<sup>40</sup>.

Simultaneously, each entity is endeavouring to diminish its reliance on petroleum due to the volatility of prices. Imported oil constitutes a mere 10% of China's energy supplies, with coal accounting for a dominant share of 70%. However, the importation of oil remains imperative to meet China's transportation requirements. China aimed to enhance the utilisation of renewable energy sources, with the objective of elevating the proportion of renewable energy fuels from 8.5% in 2003 to 10% by the year 2012. The aforementioned level experienced a decline to 7% in the year 2005. This can be attributed to the predominant emphasis on non-renewable energy sources, which witnessed a general upsurge in utilisation during that period. In 2003, India's utilisation of renewable energy sources accounted for 4.3% of its overall energy consumption. Simultaneously, India held the position as the fourth largest global generator of wind power, while Suzion Energy, an Indian company, ranked among the top five makers of wind turbines worldwide<sup>41</sup>.

## **CHAPTER III:**

### **3.1 Suggestions:**

The Earth's oceans include around 71 percent of its surface area and harbour significant species and ecosystems that play crucial roles in providing sustenance, supporting livelihoods, regulating climate, and fulfilling other essential functions. The preservation of marine ecosystems can often appear to be a daunting endeavour; nevertheless, by collectively contributing our efforts, we have the potential to enact substantial positive change.

#### **➤ Alternative to plastic:**

It is imperative to advocate for corporations to offer consumers viable alternatives to plastic

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<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

materials and to reject the utilisation of disposable plastics, including items such as straws, plastic cutlery, coffee cups, water bottles, plastic bags, balloons, plastic-wrapped goods, and take-out food containers.

➤ **Minimise the environmental impact of your carbon emissions:**

The presence of carbon dioxide, a well-established greenhouse gas, is contributing to the acidification of our oceans. The escalating acidity of water is a significant factor in the global decline of coral reefs, as it weakens the calcium skeletons of corals.

One can effectively decrease their carbon footprint by implementing a variety of straightforward strategies,

- It is advisable to opt for other modes of transportation such as cycling, walking, or utilising public transportation as opposed to relying on private automobile usage.
- It is advisable to switch off the lights while exiting a room.
- During the winter season, it is advisable to don a jumper as an alternative to increasing the temperature on your thermostat.
- Engage in an enjoyable dietary experience by opting for sustainably sourced wild seafood. This resource is classified as renewable and necessitates just a limited amount of freshwater for its production, while also exhibiting lower carbon dioxide emissions compared to land-based protein sources like as cattle.

➤ **Avoid products which are made from harming ocean:**

Numerous items have a clear correlation with the detriment of endangered or threatened species, irresponsible fishing practises, and environmental contamination. To illustrate, it is advisable to refrain from utilising cosmetic products that incorporate shark squalling, adorning oneself with jewellery crafted from coral or sea turtle shell, acquiring souvenir shells derived from conchs, nautilus, and other marine creatures, as well as employing single-use plastics such as straws and water bottles, which have the potential to accumulate in our seas. These goods facilitate the practise of unsustainable fishing methods, posing a significant harm to crucial species and ecosystems.

➤ **Consume food that is produced and sourced in a sustainable manner:**

Eating more plants, with the significant surge in worldwide meat consumption by 500% from 1992 to 2016, it becomes evident that there is a pressing need to restore equilibrium in our dietary habits by placing greater emphasis on plant-based foods and adopting a more moderate approach towards the consumption of animal products. Make responsible sea food choices. It is advisable to incorporate a variety of species obtained from effectively regulated sources, consume organisms lower in the food chain, and select seafood options that have reduced carbon emissions.

➤ **Voting on Ocean related issues:**

The election of public officials who advocate for favourable ocean policies has the potential to safeguard marine life and preserve the integrity of our seas. It is imperative to engage in thorough study on candidates, so enabling one to make a well-informed decision. Subsequently, it is incumbent upon individuals to exercise their right to vote, recognising it as both a privilege and a duty. Furthermore, it is imperative to maintain communication with individuals beyond Election Day. It is advisable to maintain regular communication with both candidates and elected officials in order to consistently reinforce your advocacy for certain issues of interest.

### **3.2 Conclusion:**

The dynamic nature of marine life presents a multifaceted and worrisome challenge that necessitates immediate attention and a comprehensive approach. Throughout the course of time, a diverse range of human activities has exerted a substantial influence on marine ecosystems, resulting in a plethora of adverse outcomes. The repercussions of these changes are extensive, affecting both the environment and human societies.

To conclude my study, I got to know that there is loss of biodiversity due to lots of the loss of biodiversity has been seen because of the modification of maritime habitats caused by pollution, overfishing, habitat destruction, and climate change. It will also have economic and social impacts as numerous global communities depend on marine resources as a means of sustenance. The alterations in marine biodiversity have the potential to cause disturbances in several sectors such as fisheries, tourism, and other related industries, thus resulting in

economic instability and presenting societal issues. I feel that there should be more execution and implementation of government policies as it is imperative for governments and international organisations to effectively develop and enforce comprehensive rules and regulations aimed at mitigating detrimental activities that contribute to the deterioration of marine ecosystems. This includes the mitigation of pollution, overfishing, and greenhouse gas emissions. Regarding the comparative analysis the inclusion of China and India in the global solution is crucial for effectively mitigating greenhouse gas emissions on a global scale. In order to attain this objective, it is imperative to identify a viable approach that enables the sustenance of economic expansion while concurrently reducing overall emissions.