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MANAGING MARINE POLLUTION IN THE INDIAN OCEAN: A REVIEW OF COOPERATIVE LEGAL MECHANISMS

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ABSTRACT

It has been discovered in recent times that marine pollution is a widespread problem worldwide. As a result, many nations that border the sea are worried about the best way to manage pollution in the seas and establish effective regulatory frameworks to not only control existing pollution, but also stop it from happening again and protect the marine ecology for everyone's benefit. This essay will concentrate on the importance of the marine ecosystem and how pollution from it puts both the environment and the human race in jeopardy if it is not stopped at its source.

Keywords: Coastal State Jurisdiction, State Responsibility, High Seas Convention, Pollution, Jeopardy

INTRODUCTION

Sea water, which makes up 70% of the earth's surface, is essential to maintaining the right ecological balance because it safeguards both the terrestrial and marine ecosystems. "Persistent organic pollutants (POPs), acidification, radioactive substances, marine litter, overfishing, destruction of coastal and marine habitats, oil spills, untreated sewage, heavy siltation, eutrophication (nutrient enrichment), invasive species, and heavy metals from mine tailings and other sources are among the threats that are included in the category of marine pollution." The removal and management of marine pollution has found a good home in the current law of the sea, notwithstanding the belief of many jurists that this will require complicated effort and independent action from all bodies administering international law. The Convention on the Law of the Sea, 1982 contains the procedures for resolving disputes pertaining to marine pollution; yet, few jurists still believe that these procedures are not particularly thorough. There was only sluggish development in between the conclusion of the Second World War and 1970. A few conventions were adopted during this time, but the majority focused on marine oil pollution caused by ships.

The Indian Ocean is third in size in the globe with a water surface area of 20%. In the west, it stretches to Africa and Arabia; in the east, it reaches Australia and South East Asia; and in the south, it reaches Antarctica. There is a wide variety of flora and wildlife in the Indian Ocean, which is home to nine of the thirty-six biodiversity hotspots, including Madagascar. It is also asserted that the Indian Ocean has half of the world's mangrove ecosystem, the bulk of which is situated in Indonesia. The western Indian Ocean is home to some of the largest densities of phytoplankton blooms, and the region is home to a wide variety of marine species. It is essential to the economies, militaries, and commerce of nearly forty nations.

Some of the most populous countries in the world, with India having the biggest population at 1.3 billion, encircle the Indian Ocean. Geographically and culturally, the area surrounding this ocean is incredibly diverse. The Indian Ocean is not subject to the dangerously high levels of marine pollution that affect nearly every other body of water on the planet. The term "marine pollution" refers to the contaminating effects of human waste on bodies of water. It seriously endangers aquatic life, which is a vital link in the food chain. The primary sources of marine pollution in the Indian Ocean include plastic, chemicals, and oil spills.

INDIAN OCEAN - DEFINITION & PHYSIOGRAPHY

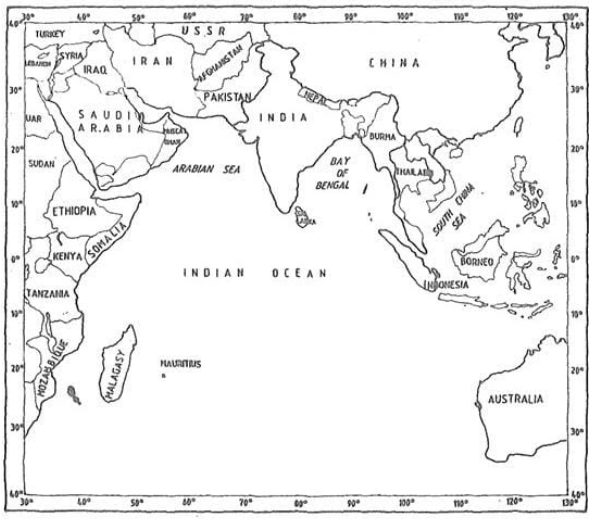

Fig. 1 Geographic layout of the Indian Ocean

The Asian continent is mostly to blame for the Indian Ocean's asymmetrical shape with respect to the equator. As a result, this ocean becomes isolated from the northern hemisphere's deep-seated vertical convection zones. In the depths of the Northern Indian Ocean, such an unbalanced arrangement results in poor renewal and feeble circulation (Dietrich 1973). With the peripheral waters included, the Indian Ocean covers 74.92 x 106 km2. It is 3873 metres deep on average. This vast region of sea spans From the Asian subcontinent, across Western

Australia to Eastern Africa forming its northern boundary. For this review, the range of latitudes 25° N–30° S and the range of longitudes 40° E–98° E have been taken into consideration. Data accessibility has been the basis for this consideration.

Geographically speaking, it includes the area north of 30°5 latitude that stretches to the Gulf of Oman and the head of the Bay of Bengal, as well as the east coasts of Burma, Thailand, and Malaysia (excluding the Strait of Malacca) and the East African coast on the west. There are nineteen countries in this area of the Indian Ocean. As of 1982, these nations span about 9.6 x 106 km^3., and their population is approximately 1221 million. The population density is 127 km^2 on average. Therefore, 18.6% of the world's land area is home to 22.5% of the world's people on average.

The Indian Ocean is an area with negative water balance, according to Budyko (1972). It receives 88,000 km^3 of precipitation and 6000 kilometres of river runoff., and 103000 km^3 of evaporation annually. Situated in the northeastern region of the Indian Ocean, the Bay of Bengal has a positive water balance even though the Indian Ocean as a whole has a negative water balance. The Bay is located between 80° and 100° E longitudes and latitudes 0° to 22°N, covering an area of 4.087 x 106 km^2. It receives roughly 2000 km^3 of runoff and 11,000 km^3 of precipitation yearly. This results in an approximate yearly 5% dilution for the upper 25 m, which is believed to be the greatest depth at which the riverine effect can occur. The Arabian Sea, which forms the northwest portion of the Indian Ocean, is a region with a negative water balance when runoff ranges from 7 to 10 km3 and evaporation exceeds precipitation on a yearly basis. It spans 6.255 x 10 km between latitudes 0° and 25°N and longitude 50° and 80° E (Venkateshwaran, 1956). Together, The Bay of Bengal and the Arabian Sea together account for 9% of global river runoff although making up only 3% of the ocean's total area. This indicates that, in comparison to the rest of the world, this region receives three times more river runoff per unit area. The surface circulation in the northern part of the Indian Ocean reverses annually, during the winter monsoon, from the northeast to the southwest, which is one of the ocean's unique aspects. Because of this occurrence, studying the ocean-atmosphere interaction is best done in the Indian Ocean. The Indian Ocean is home to three different large-scale circulation systems, according to Wyrtki (1973). These are the Antarctic waters with the circumpolar current, the subtropical anticyclonic gyre in the southern hemisphere, and the seasonally fluctuating monsoon gyre north of 10°S. In the Bengal Bay, the northeast monsoon is very powerful.

During the southwest monsoon, favorable winds and currents cause moderate upwelling along the Indian coast, despite the fact that surface water movement offshore may be somewhat offset by river runoff. The south equatorial current and the Somali current combine to create a powerful wind-driven gyre in the equatorial Indian Ocean during the southwest monsoon (Wyrtki, 1973).

In the Northern Indian Ocean, the water mass between 100 and 1200 metres has extremely little dissolved oxygen. As a result of denitrification, nitrate-nitrogen is decreased. The oxygen-poor layer's turn-over period was found to be 4 years when precisely, these were measured and the known values of the advection and diffusion constants were combined.

The severity of denitrification's short-term fluctuations and the short-term regeneration time of intermediate waters imply that the oxygen-deficient layer is a temporally unstable phenomenon. characteristic that might respond swiftly to any future changes in the climate or environment.

Therefore, there is a concerning chance that the layer might become totally anoxic if there is even a little increase in the flux of organic carbon brought on by pollution or a rise in atmospheric carbon dioxide. Nearly every nation that borders the Indian Ocean is a developing nation. Agriculture, manufacturing, and in certain nations mining are their main sources of income. Despite the fact that these activities have been going on for a while, the impacts of pollution on the marine ecosystem have only just been apparent. The circulation of water due to the topography of the bottom and the continuous discharge of industrial and residential trash resulting from the region's growing Industrialization and urbanisation are the main causes of the pollution issues that are felt closest to the coastal seas. Numerous rivers that cut through the landmass pick up residential and industrial pollutants, which significantly worsen the condition of the nearby waters.

NATURE OF ENVIRONMENTAL PROBLEMS

Marine pollution is defined as "Introduction by man directly or indirectly of substances or energy into the marine environment (including estuaries) resulting in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities including fishing, impairment of quality for use of sea water and reduction of amenities." This definition is provided by the United Nations Panel of Experts on the Science of Marine Pollution. In a strict sense, any deviation from purity would be considered pollution. When the phrase "pure" is used in relation to water pollution, it should refer to water that is in a perfect state and suitable

for human consumption. A material must be classified as a pollution if it renders the water unsafe for human consumption.

Instead, then being an immoral occurrence, environmental contamination is an inevitable byproduct of progress. Pollutants can be classified as natural or native, meaning they are not caused by humans, as manufactured by humans but not created by them, or as synthetic, meaning they are entirely made by humans (Johnston, 1976). Broadly speaking, the first group includes hydrocarbons and soluble inorganic and organic compounds; the second includes the man's redistribution and exploitation of these substances; the third includes plastics, radioactive tides, and pesticides. The oceans are neither immune to the effects of pollution, nor are they devoid of contamination. It will be extremely impossible to completely eliminate pollution as long as we continue to exploit the ocean as a common sink.

1. Pollution from oil

When used in reference to environmental issues, "oil pollution" refers to contamination caused by petroleum products, either refined or crude. An unavoidable result of a fast-expanding population's reliance on oil-based technologies is oil pollution. Thankfully, there have only been three blowouts and fifteen tanker tragedies in the Indian Ocean (north of the equator) between 1970 and 1982 (Couper 1983). As a result, The Indian Ocean's oil contamination is mostly caused by oil from tanker ballast, bilge, and cooling water. However, it is impossible to overlook other sources, such as home and industrial releases.

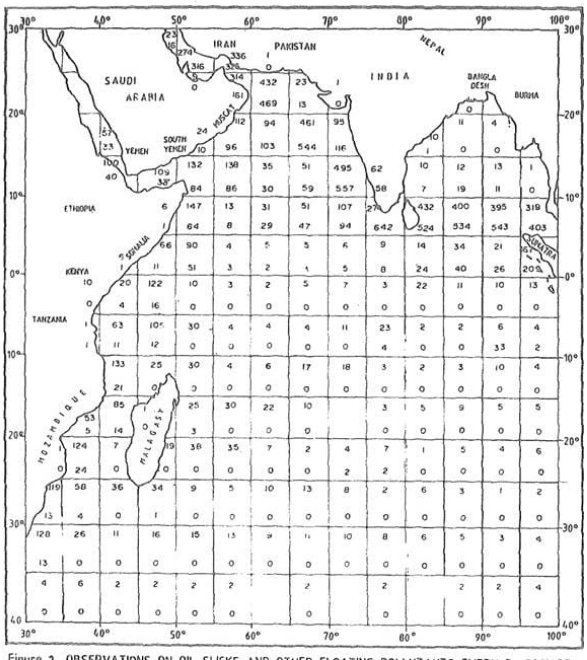

Figure 2. OBSERVATIONS ON OIL SLICKS AND OTHER FLOATING POLLUTANTS EVERY 5° SQUARE IN THE INDIAN OCEAN. THE UPPER VALUES INDICATE THE OCCASIONS OF THE ABSENCE OF OIL SLICKS WHILE LOWER VALUES INDICATE THE OCCASIONS WHEN OIL SLICKS WERE SIGHTED (Courtesy : Japan Oceanographic Data Centre)

2. Toxic Metal Contamination

Sea pollution caused by oil is obvious, drawing attention to it right away. However, the majority of other contaminants are invisible and only their harmful effects may be understood. Toxic heavy metals are one of the most important of these sources. In general, human activity and natural processes can both result in heavy metal contamination.

Metals	1978	1979	1980	1981	1982
Mercury	0.16	0.03 - 0.22	0.04	0.03	0.01
Cadmium		ND - 0.34	2.0	ND-0.93	0.90
Lead		1 - 1.19	ND	ND-2.63	0.62

Table 1: Mercury, Cadmium, And Lead Concentrations (In Ppm Wet Weight) In the Skipjack Tune Muscles Caught from The India Coastal Region From 1978 To 1982

Metals may be added to the marine environment in significant amounts via weathering, underwater volcanic activity, and other natural processes. Ores of various metals from submerged deposits are taken out, purified, and smelted to use in various industries, since, they are the most usable material known. Significant amounts of metals are released into the marine environment by each of the aforementioned processes as rejects or tailings, where their lengthy stability extends the bioavailability period. River runoff, residential and industrial discharges, and atmospheric transport might also be their points of entrance. For biological functions, these metals can be separated into components that are necessary and those that are not. While the majority of metals are considered essential, some, like Lead (Pb), cadmium (Cd), and mercury (Hg) are regarded as non-essential. Each of these metals has a catastrophic event associated with it, such as the Minamata and Itai-Itai diseases that were brought on by eating Fish from Japan tainted with mercury (Hg) and copper (Cd).

3. Agricultural Wastes

Fighting off natural pests like weeds, moulds, and insects is essential to human survival. For this reason, tonnes of pesticides and fertilisers are used annually in agriculture to reduce disease vectors and pests. Pesticides are often categorised either on the type of pest they target or on the structure and composition of their chemical makeup. Approximately 25% of the pesticides used are anticipated to find their way into the aquatic ecosystem via means of direct discharges, runoff from rivers, and the atmosphere. A many of these insecticides are dispersed over different areas of the marine environment and have a "half-life" of almost ten years.

4. Domestic wastes

Large levels of organic matter, such as N and P, found in sewage and household wastes can occasionally improve the coastal environment but can frequently cause imbalances. Additionally, they aid in the growth of unwanted species, particularly pathogenic bacteria. In addition to the aforementioned kinds of pollutants, domestic wastes also contain a number of additional inorganic elements that, while necessary in lower quantities for animal growth and marine fertility, can have a detrimental effect on the ecosystem when introduced out of control.

5. Sensitive/Fragile Environments

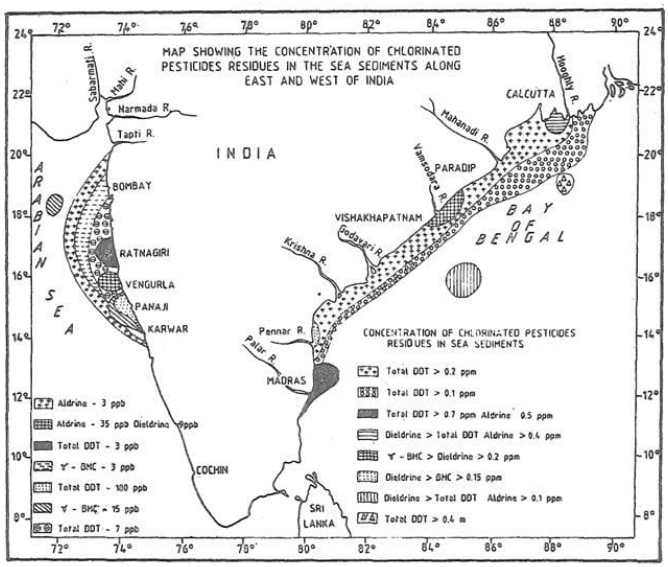

Figure 3 : (Modified from : Qasim & Sen Gupta 1988, Sarkar & Sen Gupta 1987)

Certain delicate and delicate habitats, such seagrass beds, mangroves, and coral reefs, merit particular attention since they serve as nursery and breeding places for a variety of fish, gastropods, and crustaceans that are significant to the global economy. They are home to a diverse range of plants and animals. They may provide raw materials for manufacturing and home use as well as novel pharmaceuticals. They are under a lot of pressure since they are closer to human habitation, which is causing a lot of environmental stress.

WHAT CAN BE DONE?

Enforcing the numerous international rules and legislation that forbid the disposal of hazardous materials in oceans is a significant task. The task of addressing the massive amount of contaminants that have already been accumulated is a significant concern in addition to limiting the sources of pollution that are present and future. Since chemical contaminants disrupt the food chain and accumulate in ocean bodies, they are particularly challenging to completely eradicate. The decomposition of polymers takes hundreds of years. The governments of the area should make investments in the construction of better waste disposal facilities in order to

mitigate the Indian Ocean's growing pollution. Industries should carry out regular examination efforts, and those who disobey the rules ought to face harsh consequences. Along the Indian Ocean's coasts, where ecotourism, renewable energy, sustainable economic growth, and ethical maritime transportation are all practiced, there should be an effort to establish a "Blue Economy." Finally, the area has to encourage sustainable shopping, encourage minimising, recycling, and reusing harmful items while doing all within its power to protect the environment.

MARINE DEBRIS LAW AND POLICY IN INDIA

In India, politics and economics have not addressed marine pollution as a separate topic. The United Nations Environment Programme's 2016 report on marine litter legislation provides evidence that India's policy to combat marine litter has been limited to outlawing single-use plastic. The study solely highlights India's actions in relation to a plastic bag ban. Only specific kinds of plastic—most notably, plastic bags with a particular thickness—are prohibited in India. Although this step has been welcomed, if polypropylene is not segregated and eventually burned, it is by no means the solution.

As an illustration:

The UN report is divided into multiple sections that address policy development for marine trash. Limiting and Disincentivizing the Retail Use of Land-Based materials that cause marine litter is the subheading under which banning any single-use plastic falls.

There are further sections on controlling and limiting the transfer of garbage (from landfills) into the maritime environment, but Indian policy is not articulated in any of these areas. This includes research initiatives, university involvement, and policies governing public and corporate sector participation in combating marine pollution. Our oceans will continue to be threatened by plastic until all federal, state, and local processes collaborate with one another.

Furthermore, delving into the topic of ocean governance in India is a challenging task in and of itself. One of the causes is the absence of a cohesive institutional framework at the national level that addresses oceans holistically. Among the ministries involved in ocean governance are the Department of Agriculture (Department of Fisheries), the Ministry of Earth Sciences, the Ministry of Environment, Forests, and Climate Change, the Ministry of External Affairs, the Ministry of New and Renewable Energy, and the Ministry of Defence (Indian Coast Guard and Indian Navy).

There is a great deal of dissonance since these ministries and departments don't always work well together. Numerous 'Blue Economy' initiatives have been implemented in an effort to address some of this. However, the term "Blue Economy" refers to a broad concept, and marine trash is only a small element, and it's not the one receiving the greatest attention either. The necessity to support the maritime industries of offshore oil, gas, and wind, deep-sea mining, and fisheries means that certain concerns that are necessary to address marine debris in a targeted way are either completely disregarded or given little more than lip service.

India has a National Marine Litter Policy that was being discussed last year, with funding from Norway is a participant in yet another Blue Economy project. Whether and how such policy was established are currently unknown to the general public.

The way Indian environmental policy operates—or rather, fails to operate—has another distinct aspect. For an issue like the Blue Economy and, consequently, marine pollution, numerous stakeholders frequently wind up shaping the basic policy. A programme needs to consist of four key components in order to make a significant difference: defining the issue, providing targeted answers, testing the concepts using a test project, and evaluating the results to allow for the expansion of successful pilot projects and the revision of unsuccessful ones.

However, we are still only at the problem identification stage when it comes to creating a viable plan to combat marine litter/pollution in India. Many 'Blue Economy' reports point out the problems and suggest solutions, but none go beyond that.

Nothing more has to be said to emphasise how important it is to protect our oceans and their resources, no more "statements of noble intent." An end-to-end strategy that integrates the crucial elements of tech-finance, policy and regulation, taxation, revenue-positive economic models, and other areas is what is required in order to create a long-term, sustainable solution that will maintain the health of our oceans. India's political and social objectives should, at the very least, place a high priority on tackling marine pollution and ending practices that contribute to it.

JUDICIARY DECLARATIONS

- **Union of India & Ors v. S. Jagannath on December 11, 1996**

The discernible rise in marine pollution and the consequent depletion of marine resources sparked grave concerns at the United Nations Conference on Human Environments in

Stockholm (1972). This made it clear that quick corrective effort must be taken in order to identify the marine habitats' severely polluted areas, especially in coastal seas.

The Conference came to a unanimous decision that the littoral states should assess and manage marine pollution from all sources as soon as possible at the national level and conduct systematic monitoring to determine the effectiveness of the pollution regulating actions they have implemented.

With the backdrop of the Stockholm Conference and the 1982 Convention on the "Law of the Sea," which established the territorial seas' authority, the United Nations Environment Programme (UNEP) has developed a complete model action plan. In compliance with international agreements and for the greater good of the country, the governments of India and the coastal states are legally obligated to avoid marine pollution and maintain the coastal habitats..

- **M.C. Mehta v Union of India AIR 1988 SCR 538**

M.C. Mehta, an activist counsel, brought attention to the Ganga river's pollution through a writ suit to the Supreme Court. In this ruling, it was noted that a tannery that cannot establish a basic treatment plant will not be allowed to remain in operation, just as a business It is not acceptable for it to pay its employees less than the minimum wage existing the presence of dangerous companies along its banks.

CONCLUSION

Lastly, it should be noted that marine pollution is a major problem that has damaged a variety of species. Since the sea is a vital habitat for marine life and one of the main sources of energy for civilization, it is imperative that we give significant consideration to finding solutions to all forms of pollution in it. The direct effects of marine pollution and contamination on human health, marine life, and habitat destruction for marine organisms are well known. The liability side of global environmental awareness must be met by environmental protection organizations and international legislation. The ultimate aim is to see human life in a more secure and stable environment. People now need to think about the significance of marine life to the earth and start to feel that maintaining the ocean's survival is essential. In order to preserve the ocean's tremendous variety, hopefully, there will be a growing variety of marine organisms in the future. It ought to come first for us.

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