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Release of Marine Debris-An Overview

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Abstract

The National Oceanic and Atmospheric Administration (NOAA) delineates marine debris as any of the persistent solid material that is mainly manufactured or processed and directly or indirectly, intentionally or unintentionally disposed of or are abandoned into the marine terrain. This paper provides information regarding the strategies and laws enforced to get rid of dumping of marine debris.

Keywords: *Marine debris, Solid material, Laws, Strategies*

INTRODUCTION

While this definition mainly encompasses a very wide range of materials, most items fall into a relatively very small number of material types such as plastic/polystyrene pieces, rope/cord/nets, cotton swabs, and light weight food packaging. Marine debris is a crucial problem; it is a problem like e-waste, where large amount of attention has to be paid off, along shorelines, and in coastal waters, estuaries, and oceans throughout the world. It is any man-made, solid material that specifically gains entrance into waterways either directly or indirectly. In India, it gained entrance into the oceans and coasts through a number of land- and ocean-based sources. Yearly, more people move near the coastal area of the country, and the generation of trash and the potential for marine debris continues to increase. It is necessary to better control the disposal of trash and other wastes, or else continue to find marine debris in our rivers, streams, and Oceans and other smaller water bodies too. The geographies of countries play an important part in their contribution to marine debris. Among the top 20 ocean polluters are Sri Lanka, Philippines, Indonesia and countries with the long

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coastlines, such as China and Vietnam. Marine litter is found in all oceans of the world, from the poles to the equator, and mainly from continental coastlines to small remote islands. It occurs not only close to densely populated coasts, but also in remote places far away from any obvious sources. It consists of the slow degrading materials and however, the continuous input of the large quantities of such items from many land- and sea-based sources results in a gradual build-up in the marine and the coastal environment, which spoils beaches, floats on the surface, drifts in the water column, and is even found on the deep seabed (Bhattacharya et al., 2010). Over the past four to six decades, contamination and pollution of the world's enclosed seas, coastal waters and the wider open oceans by the plastics and other synthetic, non-biodegradable materials has been an ever-increasing phenomenon (Bjorndal et al., 1994). The environmental and other problems that may arise from the indiscriminate disposal of the marine debris into global oceans and seas are chronic in nature rather than moderate, and are long-recognized international problems .Plastic and synthetic materials are the very common types of marine debris and are the major cause of the problems for marine animals and birds. At least 268different species are known to have suffered from the entanglement or ingestion of marine debris, including seabirds, turtles, seals, sea lions, whales and fish. Debris sizes can broadly be divided into the following generally accepted categories: macro-debris (>21 mm diameter), meso-debris (6–20 mm) and micro-debris (<5 mm) (Boerger et al. , 2010). The term mega-debris (>100 mm) is also availed and can be applied to large debris items such as derelict fishing nets.

TYPES OF MARINE DEBRIS

Marine debris may comprise of plastic, glass, metals, styro foam, rubber, derelict fishing gear and derelict vessels. Plastics are the predominant type of marine debris in the Pacific Gyre; it represents between 62 and 80% of the total marine debris in the world's oceans. It also comprises of rope and netting, fragments, packaging, other fishing debris, micro plastics, paper, glass and metal (Fig: 1). High quantities of marine debris may be seen on the shoreline close to urban areas. UNEP/IOC has included the following items in the list of marine debris: -Plastic (moulded, soft, foam, nets, ropes, buoys, monofilament line)(Boland et al.,2010).

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Fig: 1 Marine debris

- Fisheries related equipment,
- Smoking rakished items such as cigarette butts or lighters,
- Metal (drink cans, bottle caps, pull tabs),
- Glass (buoys, light globes, fluorescent globes, bottles)
- Processed timber (including particle board),
- Paper rubber and cloth.

The highest percentage of item of marine debris consists Pawar et al. (2016) of cap, spoon, small sachets, syringe, paste tube, straw, pen assorted, plastic bits, bead, hair clips and the plastic and nylon ropes specifically followed by thermocol and sponge (Borgå et al.,2004) .

SOURCES OF MARINE DEBRIS

The United Nations Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) estimated that the land-based sources are responsible for up to 80% of marine debris and the remainder was due to sea-based activities. The main land and sea-based sources of the marine

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debris are thus listed and explained (Borgå et al., 1995).

LAND-BASED SOURCES

Marine debris from the land-based sources is blown into the sea, washes into the sea or is discharged into the sea. Land-based sources encompass the following (Browne et al., 2011):

-Storm water discharges: Storm drains collects the runoffwater generated during heavy rain events. The drains directly discharge this wastewater into the nearby streams, rivers or the ocean. Rubbish from streets can be washed into the storm drains and is then discharged straight into the ocean or to streams/rivers which, in turn, may carry the rubbish to the ocean.

-Combined sewer overflows: Combined sewers carry much sewage, as well as storm water. During heavy rains, the handling capacity of the wastewater treatment system may be exceeded prolifically and the sewage plus storm water is directly discharged into nearby rivers or oceans. This waste can encompass rubbish such as condoms, tampon applicators, syringes and street litter (Browne et al., 2011).

-Littering: Beachgoers may carelessly leave litter at the coast and this will become the marine debris, thus the debris encompasses food packaging and beverage containers, cigarette butts and plastic beach toys. Fishermen may leave behind the fishing gear. Litter from inland areas can become the marine debris if it gets into streams or rivers. In this way marine debris may result from the rubbish left by workers in forestry, agriculture, construction and mining operations (Browne et al., 2009). .

-Solid waste disposal and landfills: Run-off from landfills located in the coastal areas or near to rivers may find its way into the marine environment (Browne et al., 2013).

DEFINING MARINE DEBRIS

Marine debris is any persistent, manufactured or processed solid materials mainly discarded, disposed of, or abandoned in the marine and coastal environment (Bugoni et al., 2001). While this definition encompasses a broad range of materials, most items fall into a relatively very small number of material types such as glass, metal, paper and plastic. Plastic items are the most abundant type of the marine debris on a global scale and plastic is also the most frequently

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reported material in encounters between the debris and marine organisms. Marine debris commonly stems from the shoreline and recreational activities, ocean/waterway activities, smoking related activities, and dumping at sea .Man-made items of the debris are now found in marine habitats throughout the world, from the poles to the equator, from shorelines and estuaries to the remote areas of the high seas, and from the sea surface to the ocean floor (Camedda et al., 2013).

THIS ISSUE IMPORTANT

The incidence of debris in the marine environment is cause for the main concern. It is known to be harmful to the organisms and to human health, it presents a hazard to shipping, it is aesthetically detrimental, and it may also have the potential to transport contaminants over long distances. Marine debris, and in particular the accumulation of the plastic debris, has been identified as a global problem alongside other key issues of our time encompassing climate change, ocean acidification and loss of biodiversity(Claessens et al.,2011).At present, the main perceived threats to marine biodiversity encompass the effects of climate change, ocean acidification, invasive species, overfishing and the other extractive activities, pollution and marine debris, habitat degradation, fragmentation and loss, particularly human population expansion, tourism, and the impact of a vast range of human activities in the coastal zone(Clark,1997). The presence of the marine debris in this list highlights its key significances a factor considered to contribute toward biodiversity loss, underscoring the need for the greater understanding of the impacts of such debris and the potential measures to facilitate mitigation and management (Cole et al., 2013).

METHODOLOGY

Section 1 of this report reviews the current phase of knowledge about the effect of marine debris on ecosystems and biodiversity (Collignon et al., 2012). Evidence of the effects of marine debris on the species is examined and assessed, the number of reported encounters between the individuals and debris and their effects considered and compared with the species' conservation status as defined by the IUCN, and effects on ecosystems were assessed. Indirect effects such as the facilitation of transport of invasive species and the potential provision of novel habitats garnered by marine debris are also considered (Collignon et al., 2014).

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Impacts are considered fewer than four broad headings:

1) Ingestion and entanglement
2) Provision of new habitat—potential for the debris to provide new habitats
3) Dispersal via rafting, including transport of invasive species
4) Ecosystem level effects

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Each report and publication was examined, assessed and information extracted in relation to documented encounters between marine debris and an organism. This information is outlined in the Annex 1. Data on the species affected by marine debris was then cross referenced with the IUCN Red List in order to establish the extent to which the endangered or vulnerable species were implicated. For reports of the species rafting on marine debris, and the use of marine debris as habitat, data were extracted. Numbers of the individuals, however, was not commonly reported, and consequently was not included in the assessment. Type of harm was also not relevant in these data (Corcoran et al., 2010).

The chemical ingredients of 56 per cent of plastic Polymers are hazardous, according to the hazard ranking model based on the United Nations Globally Harmonized System of the Classification and Labelling of Chemicals (Cózar et al., 2014). There is evidence that the high concentrations of some additive chemicals used in plastics, such as polyvinylchloride (PVC), can leach out of the plastics and into aquatic habitats from the landfill sites, especially if there is no insufficient treatment and retention of leachate to prevent the groundwater contamination. Plastic debris also much readily accumulates harmful persistent, bio accumulative and toxic (PBT) chemicals from the seawater, increasing their concentration by orders of magnitude35. This process is reversible, with plastics releasing contaminants upon ingestion (Dekiff et al., 2014). Clean plastics may also remove PBTs from contaminated animals and act as a net sink for PBTs, potentially reducing exposure. However, the high uptake of contaminants onto plastics and the longevity of plastics in the environment suggest that plastic debris will not remain “clean” for any extended period of time. Modelling analysis has suggested that the bioaccumulation pathway is unlikely to significantly aggrandize risk at current micro plastic concentrations found in marine sediments. Uptake of the micro plastics has recently been reported in commercially reared bivalve mollusks grown in the open systems, indicating that

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micro plastics are being ingested by the humans via seafood (Debier et al., 2006). The potential health risks to humans of ingesting micro plastics from the marine environment are not fully understood. Although plastics originating from the land-based sources make up most of the marine debris in the oceans, there are some sea-based types of plastic debris that can have quiet significant impacts on marine biota and habitats. There are both direct and indirect damaging impacts of the abandoned, lost or discarded fishing gear (ALDFG) on marine ecosystems, mainly through "ghost fishing", the trapping of the marine biota in derelict fishing gear, and habitat degradation. Derelict gear is a key concern and threat to endangered species, such as the Hawaiian monk seal, and causes significant mortality for the other marine mammals, seabirds and invertebrate. Ghost fishing is a chronic stressor for the fisheries, with direct economic losses through target and non-target species mortality. Derelict gear also incurs other socioeconomic costs through the gear replacement; vessel damage and reduced fishing time (Derraik, 2002).There are many well-known solutions to address plastic marine debris, especially for land-based sources.

SOCIAL-ECONOMIC IMPACTS OF MARINE DEBRIS

Fishing, transportation and tourism sectors, as well as the governments and local communities, suffer from the negative economic and financial impacts of the marine debris and the costs allied with plastic and other marine debris are often borne by those affected by, rather than those causing, the problem(Desforges et al.,2014). It is important to specifically note that the true costs from marine debris are likely to be greater than those quantified so far because of the distinct paucity of available data (Epa, 2011).The most obvious economic impacts are the loss of fishing opportunities due to time spent cleaning debris from nets, propellers and blocked water intakes and myriad impacts on subsistence livelihoods. For instance, fouling of the nets of the subsistence fishermen in Indonesia, with plastic bags reduced catch rates and resulted in lost revenues. It has been estimated that the damage from the marine debris on fishing, shipping, and tourism industries in the APEC region is US$1.266 million annually and a recent report has also shown that marine debris costs the Scottish fishing industry around US$17 million per year, the equivalent of 5.2% of the total revenue of the affected fisheries (Eriksen et al., 2013). There are the

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additional negative consequences for aquaculture .Marine debris is also the significant ongoing navigational hazard for shipping, as reflected in the aggrandizing number of coast guard rescues to vessels with fouled propellers. In the United Kingdom, for example, there were 287 such rescues in 2008, at a cost of up to US$2.8 million (Eriksson et al., 2003). Cleanups of beaches and waterways can be expensive. In the Netherlands and Belgium, approximately US$13.66million per year is spent on removing beach litter. Cleanup costs for municipalities in the United Kingdom have increased by 39% over the last ten years, to approximately US$23.61 million annually and it is estimated that removing litter from South Africa's waste water streams would cost about US$278 million per year (Sigler, 2014). A further consideration is aesthetic damage caused by marine debris. Litter affects the public's perception of the quality of the environment and in turn, can lead to loss of income to the tourism, and in some cases by national economies dependent on tourism. A model of the value of beach quality in Dalian, China, for example, gives an estimation of coastal beach quality improvement of about US$27 per person .Major companies that make and use packaging have recognized that while modern packaging can have significant benefits to communities, "its detrimental impacts exist because: 1) packaging production is resource intensive; 2) toxicants and other environmentally relevant chemicals used during the growth, harvest or the extraction and processing of raw materials, processing of the recycled materials and the production of packaging materials, packaging components and units of packaging can mainly release harmful emissions into natural eco-systems and have direct or indirect effects on human health; and 3) packaging has end-of-life implications that add stress to both for the human and natural systems" . These companies recognize that the design, production, and use of their products can also have social as well as economic effects on local communities, and have committed to taking this into account in their business sustainability practices. There are environmental and economic benefit sallied with waste minimization achieved through material reduction, re-use and recycling (Spear et al., 1995). For example, where the plastics are recycled to generate goods that would otherwise have been made from new (virgin) polymers, this will directly reduce the oil usage and can also reduce emissions of greenhouse gases associated with plastics production.

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CONCLUSION

Marine debris is any persistent material especially solid which is difficult to degrade. Which cause deleterious effect to marine ecosystem. The issue was raised by ecologist of developed and developing countries. There are certain researches carried out to understand and remediate the problems.

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