

IMPACT OF PLASTIC POLLUTION ON MARINE ECOSYSTEM

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Abstract

The accumulation of waste plastic in marine environments is causing severe effects on marine biodiversity with each passing day. As a result, the purpose of this review article is to provide a concise summary of the different types of marine debris, the origins of marine debris, the implications of marine plastics, and the global activities that are being taken to reduce the amount of plastic pollution in the marine ecosystem. Both large and small pieces of plastic come from two different places: the land (for example, homes and factories) and the ocean (for example, fishing). At this time, there is a worldwide concern regarding marine plastic since it is having an effect on important bodies of water, which are marine. As a result, this debris can have a severe influence not only on humans (particularly coastal populations), but also on wildlife, habitats, and other related factors. Both large and little pieces of plastic have a detrimental effect on the marine ecosystem. A questionnaire served as the primary research tool for the purpose of collecting responses for this study. In order to have an idea of how people living along the coast feel about the problem of marine plastic pollution, primary data were gathered by having questionnaires filled out by those living in coastal towns. Characteristics of Those Who Have Responded A total of 96 people participated in the questionnaire process, and their answers came from eight different coastal regions.

Keywords- Marine Ecosystem, Plastic Pollution

INTRODUCTION

There are two different kinds of plastic trash that can be discovered in natural ecosystems: micro, which is the smallest, and macro, which is the largest. About fifty percent of plastic products, such as cutlery and bags made of plastic, are designed for disposal. Because of this, the marine ecosystem is continually being degraded by plastic trash that originates from a variety of sources, such as houses, companies, and so on. Plastics that have been dumped, disposed of, and abandoned by humans have made their way into all of the world's seas, where they have a negative impact on marine animals and the food webs that support them. Additionally, marine trash has a negative impact not only on the economic well-being of humans but also on their way of life. As a result, the pollution caused by plastic has developed into a global concern. Plastics are produced using synthetic or semi-synthetic organic polymers, both of which are exceedingly difficult to biodegrade. As a result, plastics can remain in the ecosystem for up to one hundred years. To begin, plastics have a propensity to deteriorate and fragment into smaller parts when they are subjected to UV radiation in the form of either direct sunshine or water that is salty. There has been a general tendency towards an increase in the manufacturing of plastic all over the world. As an illustration of this, the yearly production of plastic in the 1950s was approximately 1.5 million tonnes, but the annual production of plastic in 2013 was over 299 million tonnes. Microplastics

have only lately garnered attention despite the fact that macroplastics have been found in marine ecosystems from the early days of production of plastics. This is due to the fact that marine species are able to easily consume microplastics. As a result, macro polymers serve as vectors for the chemical transmission of contaminants throughout the food chain. Due to the fact that marine creatures have the potential to swallow plastic litter or become entangled in it, plastic debris poses a significant threat to the health of the entire marine ecosystem. This page discusses the different types of marine debris, the sources of both macro and micro plastic waste, the implications of marine plastics, and global attempts towards reducing the amount of plastic pollution in the marine ecosystem as well. This study will be valuable for those who are responsible for policy making as well as ecologists. Plastic pollution has become a worldwide ecological issue due to the spread of plastic debris and its effects on aquatic biota, biodiversity, and human health in all aquatic ecosystems around the world (Lares et al., 2018; Li et al., 2018; Beaumont et al., 2019; Blettler and Wantzen, 2019; Du et al., 2020; Haram et al., 2020; Li et al., 2020; Mataji et al. Plastic products have seen a surge in popularity around the world as a direct result of its advantageous properties, which include their low manufacturing costs, their light weight, their versatility, and their durability (GESAMP, 2015; Ballent et al., 2016; Ivleva et al., 2017; Hahladakis et al., 2018; Shafiq et al., 2019; Capolupo et al., 2020; Parata et al. According to PlasticEurope (2008), the global production of plastics was estimated to be somewhere about 1.5 million tonnes per year in the 1950s, but by 2007 that number had increased to nearly 250 million tonnes per year. It was estimated that the annual global production of plastics was over 322 million tonnes in 2016, and that number is continuing growing by 10% per year (PlasticEurope, 2016; Crew et al., 2020). This is despite the fact that yearly global production of plastics has been increasing. As a result, these materials make a substantial contribution to the formation of waste (Stoiev and Turra, 2016; Saeed et al., 2020), and it is predicted that between 5 and 13 million tonnes of waste end up in the oceans every year. There is still very little information on their presence, sources, and destination (Thompson et al., 2009; Eerkes-Medrano et al., 2015), along with the social campaign for proper plastic management in freshwater and marine water is very rare. As a result, the knowledge about the plastic waste in river water and sediment in the world is limited, and there is a scarcity of information on their presence. This review chapter aims to expose the available information of plastic pollution in the aquatic ecosystem so that the reader can gain a better understanding of both the plastic pollution problem and its potential consequences. (Peng et al., 2017; Wang et al., 2017; Martins et al., 2019; Masia et al., 2020) Target-oriented plastics particle management solutions, abundance, distribution, and rarity learning are far from satisfactory, and additional quality study is required. In conclusion, various important difficulties and suggestions are explored for further research on plastic, and it is highly recommended that a campaign to limit the amount of pollution caused by plastic be implemented throughout society. The oceans and seas cover more than 70 percent of the surface of the Earth, making it a truly blue globe in which we live. Marine ecosystems all around the world support a substantial number of marine animals as well as human beings, and they are responsible for a diverse range of ecological functions. This includes the provision of food for billions of people, the storage of carbon, the purification of trash, and the cultural advantages, such as possibilities for enjoyment and enhancement of spirituality [1]. They also serve as the basis for a significant portion of the global economy, providing support for a variety of industries like international shipping, tourism, and fisheries. Any threat to the uninterrupted delivery of these ecosystem services has the potential to damage the wellbeing of the wildlife, flora, and human beings living around the planet, opening the way for the loss of biodiversity, food security, livelihoods, income, and health.

Distribution of Plastic Waste in the Marine Ecosystem

In the marine ecosystem, there is an abundance of plastic waste, which is followed by food wrappers, cigarette filters, fishing line, rope and gear, baby diapers and nappies, six-pack rings, beverage bottles, disposal syringes and resin pellets. In the waters of the continental shelf between Virginia and Rhode Island, there was a concentration of plastics that reached up to 14 m³ and took the shape of sheets and pellets. On the other hand, spanning a lateral distance of 1300 km, researchers discovered an average concentration of microplastics in the surface of the Sargasso Sea that was around 3500 pieces' km⁻¹. In Europe, cosmetic products are responsible for between 0.1 and 4.1% of the marine microplastics, which equates to between 2461 and 8627 tonnes of plastic waste annually. On the other hand, microplastics resulting from tyre abrasion contribute between 5 and 10 percent of all marine plastics worldwide.

Types of Plastic Debris Found in the Marine Ecosystem

The marine ecosystem is home to both microplastics and macroplastics, both of which are considered to be different sizes of plastic trash.

Micro debris

There are fluctuations in the concentrations of micro plastics depending on the water depth, which means that the concentrations of micro plastics are larger at the high level water than they are at the low level water (very dynamic zone). According to the findings of recent studies, the threat posed by microplastics to the marine ecosystem is significantly higher than that posed by macroplastics. Microplastics are used in the formulation of cosmetic items such as makeup, sunscreen, nail polish, hair colouring, eye shadow, and shower gels. They are also used in the formulation of personal care products such as toothpastes, facial cleansers, and air blasters. These microplastics are so small that they are almost invisible to the naked eye, and they are likely to enter drainage systems through drains in public restrooms.

Macro debris

The dumping of rubbish causes large debris (greater than 5 millimetres in size) to infiltrate the marine ecosystem. There are variations in the concentrations of macro debris depending on your location. The United States, the Falkland Islands, and Oman all have lower quantities of macro debris than Oman, at almost 29.7 kg km⁻¹, compared to the United Kingdom's approximately 45 kg km⁻¹. On the other hand, substantially higher quantities of macro debris are observed on the beaches of Indonesia and Belgium, such as approximately 1000 kg km⁻¹ and approximately 64290 kg km⁻¹, respectively. Because plastics remain in the environment for such a long time, they have a significant impact on marine ecosystems.

Source of Plastic Debris Found in the Marine Ecosystem

The discharge of waste water and runoff water by the river systems is the primary source of plastic debris in the marine ecosystem. This is followed by the proximity of outfalls from waste water treatment plants and the fragmentation of rejected plastic products from home and industrial wastes. However, due of the fragmentation and deterioration of the trash in small and varied assemblages, it is difficult to determine the exact sources of marine plastics. This makes the task of tracing their origins challenging. In addition, research on the microplastics that float just below the surface of the water in the ocean, which cannot be seen by satellites due to their depth. As a direct result of this, there is no actual information regarding the global entry of plastic into the ocean.

Land based debris sources

Land-based sources are the most significant contributors to the amount of plastic particles found in marine ecosystems, accounting for eighty percent of the total. Land-based plastics can be found in a variety of places, including roadways, parks, parking lots, and other areas. After that, the rain, snowmelt, and wind all contribute to the discharge of the material into the local waterways. In addition, the sources include illegal dumping of residential and industrial rubbish by the public, public littering, dumpsters and dump trucks with inadequate covers, manufacturing sites, processors and transporters, overflowing sewage systems, beachgoers, fishermen, beach-based solid waste disposal, landfills, and water transports. All of these waste management practises contribute to the reckless release of debris, which results in marine debris. In addition, the packing and wrapping of various products, including food items, beverage containers, and other materials, contributed significantly to the contamination of maritime environments.

Ocean based debris sources

Ocean-based sources, which generate 20% of the plastic particle and are located in regions where commercial fishing is the predominant activity carried out by people, are the only other source of plastic debris in the marine ecosystem. Garbage that is discovered in the ocean also comes from human activity, namely from people who are at sea. The majority of the garbage that can be discovered in maritime ecosystems is a direct result of human activities and aspirations. These waste products are being thrown overboard from commercial fishing vessels, military vessels, merchant vessels, and research vessels, in addition to recreational boats and cruise ships, offshore oil rigs, and supply vessels that are linked with those platforms. Even more significantly, the unintended loss of vessels or the malfunctioning of their systems can also result in the production of some debris. Again, some of the principal causes of the debris can be traced back to inefficient practises for waste management and inappropriate discharge of debris from the vessels.

Impact of Marine Plastic Waste

At this time, there is a worldwide concern regarding marine plastic since it is having an effect on important bodies of water, which are marine. As a result, this debris can have a severe influence not only on humans (particularly coastal populations), but also on wildlife, habitats, and other related factors. Both large and little pieces of plastic have a detrimental effect on the marine ecosystem. Entanglement of animals, including birds, mammals, invertebrates, and turtles, can be caused by macroplastics, such as fishing rope and nets. Again, microplastic has a detrimental impact on fish because it is white or opaque in colour, and as a result, surface-feeding fish frequently confuse it for plankton. As a result, microplastic has a negative influence on fish. Therefore, aquatic species that ingest plastics are putting themselves in danger. In addition to that, these microplastics have the potential to infiltrate the human food chain through the consumption of fish and shellfish, which is harmful to human health. The availability of refugia can be altered when macroplastics are present, which can have an effect on the biodiversity of the ocean. In addition, big plastics provide a hard surface for taxa, and as a consequence, the surface is unable to support the settling down of taxa. In a similar vein, the deep water is not an environment that the marine life would typically call home.

Marine sediments

The contamination of marine sediment by plastic trash is a problem. In Hong Kong's fan Lau Tung Wan, an amount of nearly 258408 plastic particle m⁻² was discovered. Because of the high population density and the lifestyles of the people who live there, the beaches of Hong Kong have the highest number of pieces of plastic (such as polystyrene), as an example, insulated boxes are frequently used for the transportation of food. The quantities of microplastics in the beach sediment along the coast of Belgium were estimated to be approximately 92.8 particles kg⁻¹ and are steadily rising. During the time period of 1993-1996 to 2005-2008, the concentrations of plastic waste on the marine sand at Groenendijk increased three times, with 54.7 8.7 and 156.2 6.3 particles kg⁻¹, respectively.

Marine waterbody

There is a significant risk to the quality of the water posed by detritus of a personal and medical nature, like condoms and tampon applicators, that makes its way into rivers through improper sewage treatment systems or direct sewage outflows. As a result, this debris can impact the water throughout the entire ocean. The fact that these plastic goods are readily available is a strong indicator of bacterial contamination, which may contain E. coli as well as other pathogenic bacteria and viruses. When these toxins and pathogens come into contact with water, it can lead to infectious hepatitis, diarrhoea, bacillary dysentery, skin rashes, typhoid, and cholera.

Marine animals

Plastic pollution has an adverse effect on marine life at every level, from plankton to whales. Both large and small pieces of plastic, known as macro and micro, have the potential to be harmful to specific species, either by entanglement or ingestion. The ingestion of fragmented macro and micro plastic by 170 marine vertebrate and invertebrate species is also a problem. Large plastic waste are to blame for entanglement, while smaller plastic pieces cause ingesting. Plastic, and particularly microplastic, make their way into every marine food chain, where they are followed by invertebrates, fishes, turtles, and even mammals. Recent research has shown that zooplankton consume plastics in their environment. Microplastics, when ingested, can cross trophic levels and become a problem for crustaceans and other eaters.

Entanglement can cause injuries such as abrasions, constriction, scoliosis, and even the loss of limbs, in addition to an increased inability to avoid being eaten by a predator. The ages of marine animals are a factor in the rates at which they become entangled. In general, animals that are younger or less mature are more likely to become entangled. Again, it is possible that younger animals, such as seal pups and juveniles, are more prone to become entangled in nets, whereas sub-adults and adults are more likely to become entangled in fishing line. On the other side, ghost nets can catch cetaceans, turtles, sharks, crocodiles, crabs, lobsters, and a variety of other marine animals. Another danger that coastal animals face is having plastic as part of their diet or accidentally ingesting it. Plastic pellets can look like fish eggs, and plastic shopping bags can look like jellyfish to a hungry sea turtle. Likewise, jellyfish can look like plastic pellets. Because of the way they eat, sea turtles are at a greater risk of ingesting trash from the ocean because of the risk it poses to their digestive systems. There are a significant number of species of animals that mistake garbage for food and are unable to bring an object back up to their mouths after they have already eaten it. This material frequently becomes trapped in their digestive tracts as well as their throats. Some animals will stop eating due to the mistaken impression of cessation caused by debris that is unable to pass out of the stomach. This will eventually lead to

the animal's death from starvation. According to the United States Marine Mammal Commission, there is an ingestion problem affecting six out of seven species of sea turtles and twenty-six types of marine mammals.

Marine birds

Around the world, marine birds have been found dead after being trapped in abandoned fishing nets. A gill net that was 1500 metres long had around 99 seabirds caught in it. When marine birds come into contact with abandoned fishing nets, they put themselves at danger of drowning. Plastic waste poses a greater threat to the health of marine birds since it can be consumed. Ingestion of plastic could also result in a blockage or a harm to the internal organs. The United States Marine Mammal Commission estimates that about 111 marine bird species are affected by an ingesting problem brought on by marine trash. 15 out of 37 species of marine birds in Alaska were found to have plastic waste in their stomachs.

Tourism

Broken glass, medical waste, fishing line and discarded needles can pose a threat to beachgoers and water sports enthusiasts, including tourists, swimmers, divers and snorkelers. They are sometimes at risk of becoming entangled by the trash that is either submerged or floating above them. The tourism industries always bring significant economic benefits to the local population and government that are located in close proximity to marine ecosystems. However, the debris makes the seaside area less attractive and increases the risk that tourists face as a result of their visit. People are dissuaded from fishing, boating, swimming, diving, and visiting coastal areas because of the presence of marine plastic particle.

Global Initiatives to Reduce Marine Plastic Pollution

The International Coastal Cleanup (ICC) is an organisation that aims to reduce the amount of marine plastic waste by cleaning up coastal areas all around the world. They do this by involving other non-governmental organisations and volunteer organisations. The Honolulu approach lays out some general guidelines for the prevention of and management of marine plastic pollution. The city of Honolulu has implemented two tactics for reducing waste, the first of which is the use of market-based instruments (such as taxes on new plastic bags) and the second of which is the creation of laws, regulations, and legislation to minimise the amount of marine plastic or debris. The drafting of laws and other legislation On land as well as at sea, there are a number of laws and international agreements that manage litter and debris. The current laws that are applicable to the problem of marine debris include the London Dumping Convention (LCD) from 1972 and the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78). The latter convention offers a comprehensive solution to the problem of ocean dumping by developing international guidelines to prevent ship pollution. The United Nations Convention on the Prevention of Pollution from Ships (MARPOL) places restrictions on the dumping of rubbish at sea and prohibits the discharge of products made of plastic. In addition to this, MARPOL mandates that all ports and terminals provide facilities for boats and ships to deposit their rubbish. There are also regional agreements that manage marine debris, one of which being the Cartagena Convention from 1987, which was created with the purpose of protecting and developing the marine ecosystem of the wider Caribbean region.

Marine Plastics

Plastics are organic polymers that are synthetic or semi-synthetically produced and are made from petroleum. They are inexpensive, lightweight, durable, and resistant to corrosion. Plastic garbage in the ocean has the potential to pose a risk to human health, economies, aquatic habitats, and marine wildlife, in addition to a wide variety of ecosystems that are comprised of freshwater and saltwater. This is because plastic is so pervasive and stays in the environment for such a long time. In spite of the fact that its impacts have been overlooked for a considerable amount of time, plastic pollution has evolved into a widespread threat to ecosystems and has received a significant amount of attention in the past few years. The entire amount of plastics produced has now topped 10 billion metric tonnes, and this number is only expected to keep climbing. According to research conducted by the Plastic Ocean Foundation (2018), each year, more than 8 million tonnes of plastic are flushed into the oceans around the world.

How Plastics End Up in the Ocean

According to the findings of many studies, eighty percent of the plastics originate from land. The incorrect management and disposal of sewages and plastic wastes, coastal landfill activities, and litter carried by streams and rivers are all factors that contribute to the introduction of landfill plastics into the ocean. Spills that occur by accident during handling or any number of other operations are another source. The remaining twenty percent consists of trash that was produced by ships and boats as a result of leisure activities, the discharge of marine litter during nautical activities, fishing activities, and aquaculture. That being said, the majority of the effects can be attributed to commercial fishing. This consists of used fishing equipment that has been thrown away, as well as monofilament lines and nylon netting. The buoyancy of marine plastics makes it easier for them to be transported across long distances by the winds, ocean currents, and tides that are prevalent. As a result of this, plastic debris can collect along shorelines, even on the islands that are the most remote, as well as in the open sea and the deep sea. River networks and wastewater treatment plants are the means by which plastics are carried from the places where they are produced to the marine ecosystem. In addition, natural disasters of a severe nature, such as hurricanes and floods, may enhance the likelihood that debris from land may be washed out to sea. Ocean currents converge and allow the plastic materials to gather over time at the centre of big ocean vortices, forming a huge mass of ever-lasting floating debris fields across the seas. These fields are commonly referred to as "garbage patches."

Methodology

Data Collection

A questionnaire served as the primary research tool for the purpose of collecting responses for this study. In order to have an idea of how people living along the coast feel about the problem of marine plastic pollution, primary data were gathered by having questionnaires filled out by those living in coastal towns. Because the information that was wanted was condensed and did not include any contentious debate, the questionnaire was the most appropriate device to utilise. The research required standardised data, and the questionnaire made it possible for respondents to swiftly and easily comprehend what was being asked of them, which made the data gathering process more effective. The respondents were provided with instructions for the questionnaire at the very beginning of the study process. These instructions included a purpose statement and a research description. In addition, a confidentiality statement was provided to each of the participants to ensure that their comments would remain anonymous. If any of the respondents had any inquiries or wanted clarification on any of the questions, they were able to receive assistance from the researcher who was conducting the study.

In spite of the fact that the questionnaire was written in English, respondents' mother tongues were utilised to provide explanations of the questions wherever it was deemed necessary by the 8 American Journal of Marine Science. The survey questions were written to be as succinct as possible so that the respondents wouldn't become disinterested and so that everyone could readily comprehend them.

Results and Discussion

Characteristics of Those Who Have Responded A total of 96 people participated in the questionnaire process, and their answers came from eight different coastal regions. The 96 people who answered the survey were all nationals of India. For the purpose of gaining an accurate picture of the features of the sample population, data was gathered relative to the demographics of the population that served as the sample. According to Van Rensburg et al., understanding the characteristics and demographics of the sample population of the research study is important because it is an influential factor manipulating the willingness of participants to respond, and more importantly, it can impact how participants respond to the questions that were chosen to ask them.

Knowledge on Marine Ecosystems

This mostly included determining how familiar the respondents were with ecosystems found in the Indian marine. The findings are presented in the form of information and insights on the various types of marine environments that the respondents are aware of or have visited. The vast majority of responders, 92%, have either been to beaches or possess an exceptional level of expertise regarding beach resources. 76% of those polled were aware of lagoons and estuaries, whereas only 60.4% were conversant with mangroves and sea grasses as components of coastal ecosystems. The respondents who took part in the poll had the lowest level of knowledge (40.6% or lower) on sand dunes.

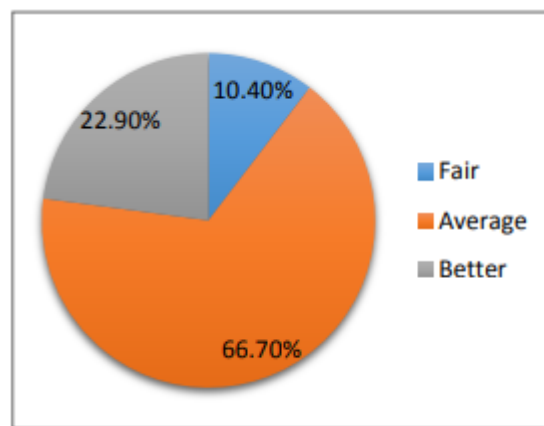


Figure 1. Respondents' knowledge on India marine ecosystems.

Consumption Habits

The attitudes of consumers towards the purchase and use of products made of plastic were the focus of this investigation and evaluation. The consumption patterns were analysed in terms of the use of plastic items, the respondents' preferences regarding the usage of plastic products, and their level of awareness regarding the potential risks that plastics pose to the marine ecosystem. One of the most important takeaways from this poll was the discovery that the majority of respondents (80.2% and 70.8%, respectively) make regular use of plastic

bags and plastic bottles in their day-to-day lives. One possible explanation for this is that they are increasingly adopting modern lives. The significance of this tendency becomes clear when one considers that the other proportions were significantly smaller in contrast. Another aspect that was taken into consideration for the purpose of this study was the behaviour of consumers in relation to the elements that influence the usage of plastic items. The convenience of obtaining plastic products is cited as the most common reason for their use, while the absence of suitable alternatives was cited by 35.4% of those polled as the primary factor in their selection of plastics. "Plastics are very long-lived products that could potentially have service over decades," said Richard Thompson, lead editor of Scientific American, in an interview. "And yet, our main use of these light-weight, inexpensive materials is as single-use items that will go to the garbage dump within a year, where they'll persist for centuries," Thompson added. "Plastics are a product that could potentially have service over decades." There is an increasing body of evidence suggesting that the chemical building blocks that give plastics their incredible versatility are also the same components that have the potential to cause harm to people and the ecosystem.

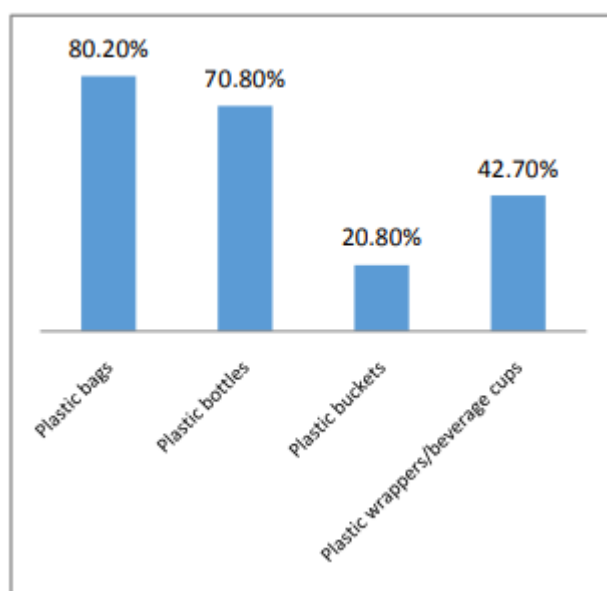


Figure 2. Consumption behavior of respondents.

Awareness of Ecosystemal Impacts

This purpose is to gain a knowledge of the level of awareness held by the community living along the coast of India regarding the harm produced by plastics. Their comprehension of the breadth of the impacts made on marine ecosystems, the gravity of the problem, the medium via which they were made aware of the existence of such problems, the steps that needed to be taken, and the manner in which they disposed of garbage were used to evaluate their level of awareness. This evaluation was conducted taking the consumption patterns described in section 3.3 into consideration in order to determine whether or not there is a connection between ecological consciousness and unfavourable attitudes towards plastic products. In addition, rivers and oceans are two of the most frequently listed ecosystems around the world that are suffering from the effects of plastic pollution.

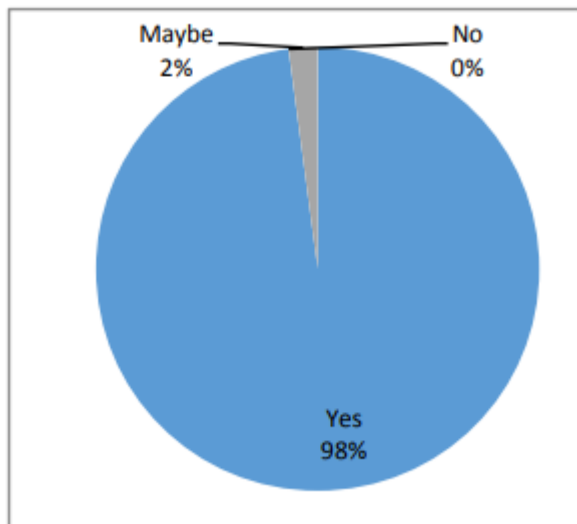


Figure 3. Public awareness about impacts of plastics on marine ecosystem.

As a result, pollution of the world's rivers and oceans is a widespread problem on both a national and international basis. Consequently, the disseminations of information concerning the effects of plastic pollution are available in all formats of the platform. Despite this, the predominant method by which the respondents have attracted attention in today's globalised world is through the use of social media (95%). The next most common source of information, at 66.3%, is traditional media such as TV, radio, and newspapers, followed by published materials (65.3%) and then professionals (64.2%). This realisation is highly significant since it hints that the communities living along the coast of India are aware of the gravity of the problem posed by plastic pollution.

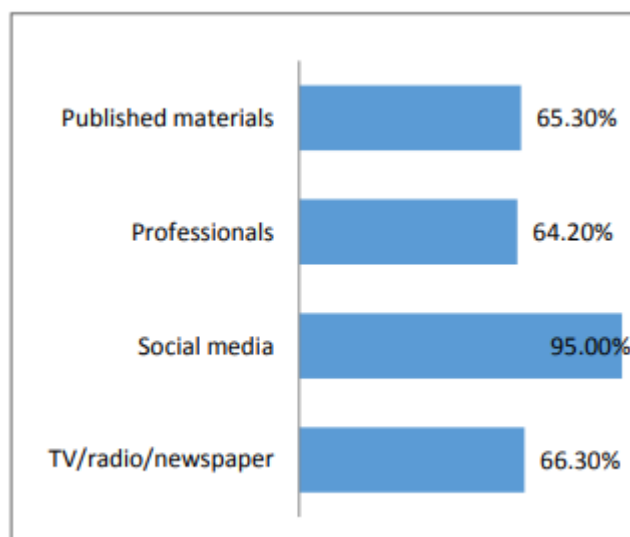


Figure 4. Platforms via the respondents received awareness.

Trend of Plastic Pollution

This purpose is to determine whether or if the people of India are aware of the growing problem of plastic pollution, and if so, to what extent, as well as to speculate on the possible causes of the problem. The majority of respondents (89.6%) agreed that there is a current upward trend in the amount of pollution caused by plastic. Nearly 74.2% of respondents have claimed that it is due of the low cost of the plastic products, while 55.1% of respondents have stated that it is because of the durability of plastic.

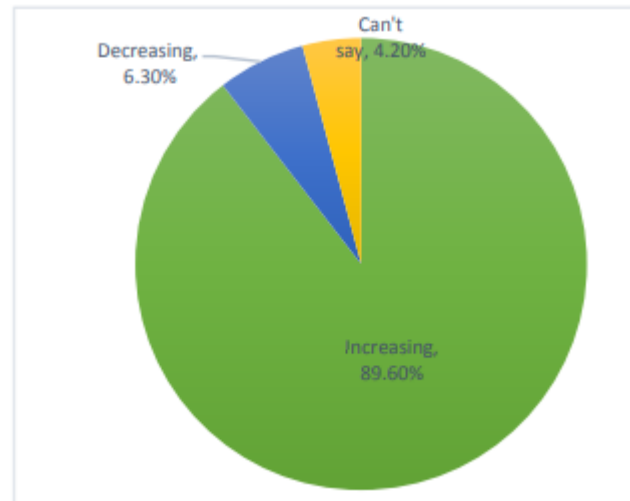


Figure 5. Trend of plastic pollution.

Plastics typically have additives that make them more durable, flexible, and strong than they would otherwise be. However, many of these chemicals can extend the life of items, even if the products end up as trash; some estimates place the amount of time necessary for their decomposition at at least 400 years. Plastic materials are utilised in the creation of a wide variety of goods, ranging from containers to beverage bottles, packing straps and tarps, and synthetic nylon materials used in fishing line. Despite the fact that plastic materials are long-lasting and take a long time to breakdown, they eventually turn into litter. Plastic does not break down in the same way that a lot of other things do, therefore it ends up in landfills. Additionally, the majority of these plastic trash objects have a high buoyancy, which enables them to travel in currents for thousands of kilometres, threatening marine ecosystems and species along the way; as a result, it is considered to be a worldwide transboundary pollution. According to Bill Henry of the Long Marine Laboratory at the University of Southern California, "Plastics are a contaminant that goes beyond the visual."

Willingness to Reduce Consumption

This aim intended to understand the desire of the Indian public to limit their use of plastic products and to determine whether or not they would participate in and support measures to help minimise the misery of plastic pollution in marine ecosystems. Specifically, this objective sought to understand the willingness of the Indian public to reduce their consumption of plastic products in India. The respondents indicated a strong readiness to cut back on their own usage and put an end to the pollution caused by plastic. It is clear that this is the case given that 91.6% of those surveyed want to see an end to the pollution caused by plastic.

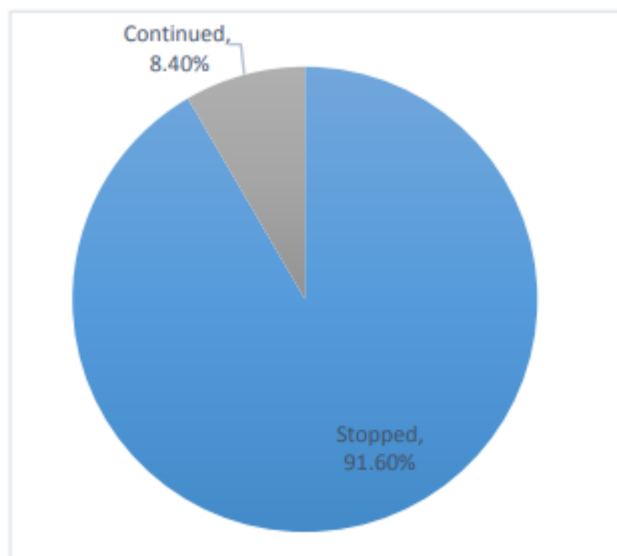


Figure 6. Willingness on the future use of plastics.

Alternatives to Plastics

Paper (32%) and cloth (30%) were chosen as the materials of preference by a number of respondents who were asked about their preferences for an alternative to plastics (32% and 30% respectively). Having their individual benefits and drawbacks, this is a clean and environmentally friendly option. Paper bags can decompose naturally over time and are simple to recycle or compost after use. However, in order to manufacture them in big quantities, a significant amount of water, fuel, and forests must be destroyed. Cotton, which is commonly used to make cloth bags, is a crop that requires a significant amount of pesticides and consumes a lot of water. Plastics, regardless of their reputation, have the smallest carbon footprint, at least in terms of the creation of a single unit. Having said that, this is merely the beginning. Even more important is the manner in which we utilise and dispose of bags.

Willingness to Change Behavioral Traits

In this section of the questionnaire, the focus was on determining whether or not the respondents were willing to make adjustments to the way they went about their daily use of plastics. It seems that the majority of those who responded are open to making changes to the way they live their lives. The fact that there is neither an adequate nor a steady supply of an alternative to plastics is the constraining factor behind this situation. 77.1 percent of people who responded said they would bring their own shopping bag with them when they went shopping, and 76.2 percent said they would use refillable water bottles rather than single-use plastic bottles in the future. This research addresses a vacuum within the behavioural traits and attitudes of individuals towards making a change, and its primary focus was on the fundamental factors that contribute to the widespread problem of plastic pollution. This issue, however, needs to be dealt with in conjunction with other aspects of the problem, such as the enhancement of waste management, the provision of financial incentives to manufacturers, and the enactment of stricter rules to permit greater recycling. This study's worth rests in the fact that it provides a vital beginning point to understand how consumers in Sri Lanka feel about single-use plastics, and that is the primary reason for the study's significance. The elimination of the unsustainable

consumption of plastics is not a simple undertaking, but its success is heavily contingent on the citizens' willingness to make adjustments to their consumption patterns

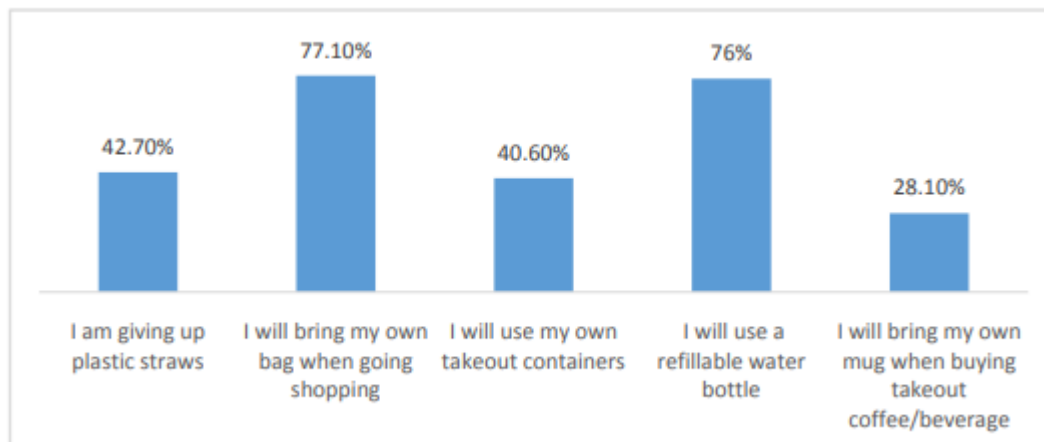


Figure 7. Willingness to change their routine lifestyle to reduce individual plastic footprint.

CONCLUSION

The plastic waste that is typically found in marine ecosystems originates from both land and ocean and can be found in places like water bodies and beach sediment. The debris that is left behind after this process is extremely difficult to biodegrade and will therefore stay in the ecosystem. The marine biota and their food chain are negatively impacted by these garbage as a result of the marine life ingesting plastic or becoming entangled in it. Some marine species, such as fish, sea birds, and sea lions, have been shown to have hydrophobic contaminants in their bodies after having consumed plastic. This is because plastic is typically connected with hydrophobic contaminants. In addition, these organisms run the risk of becoming entangled in the plastic, which is a potentially hazardous situation. At long last, it has been discovered that governments enact laws to regulate the sources of plastic waste as well as the ways in which plastic trash is used. In the same vein, industries that work with plastics should accept responsibility for the end of life of their products by implementing recycling or upgrading programmes for plastics..

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