The 3rd International Conference on Materials Chemistry and Environmental Engineering
DOI: 10.54254/2755-2721/3/20230405

# Research of the Pollution in Ocean

**Yuancheng Gao**

Queen Mary University of London,London, E14 9ZW, UK

2136831249@qq.com

**Abstract.** The ocean is boundless and provides resources for the survival of creatures on the earth, so the development of human beings is inseparable from the ocean. However, with the development of human society, marine pollution is an inevitable global problem that has not been fully understood and controlled. It has threatened human health and the environment. Among them, marine plastic pollution caused by humans is present in all oceans around the world and is a concern due to its persistence, complexity, steady growth and its pervasive impact on all aspects of ecosystems. This problem requires holistic environmental remediation solutions on a global scale. Solutions to marine plastic pollution can be divided into two categories: environmental and artificial. In human society, the production of plastic can be reduced by making laws. At the same time, promote progress in plastic recycling, thereby reducing the flow of plastic waste into the ocean. In addition, equipment for cleaning pollution can also be invented and put into the governance of marine environmental problems. This article summarizes the scientific knowledge of the impacts of marine plastic pollution and methods to save the marine environment through a literature review and qualitative analysis.

**Keywords:** Ocean pollution, Plastic, Oil spills, reasonable methods.

## 1. Introduction

With the advancement of technology, the problems of pollution should be focused on around the world. Human beings produced a large amount of pollution and waste, no matter how technology makes lives more convenient, people still have to pay attention to waste and reuse in daily life. Obviously, the ocean has been a place that always releases waste and pollution. The ocean covers more than 70% of the earth's surface, holds 97% of the world's water, hosts some of the planet's most diverse ecosystems, and supports economies in countries around the world" [1]. The ocean is also an essential diverse ecosystem. It provides food such as fish and natural resources for humans to use. As a result, the environment of the sea is both important for humans and the earth. There are several kinds of pollutants in the ocean, and can list them into 5 main kinds: Petroleum and its produces, Heavy metal, Pesticide, Radioactive contamination, and Nutrients.

The pollution in the ocean becomes a serious problem in recent years. "Pollution – unwanted, often hazardous waste material released into the environment by human activity – is one of the existential challenges of the present age" [2]. The ocean has provided a large number of resources to use but humans never focused on the protection of the marine environment. By focusing on the several kinds of pollutants in the ocean, the relatively serious one is plastic pollution. Approximately 10% of solid waste is plastic. The reason that plastic becomes a serious issue of pollution is that plastic is cheap, strong, and

© 2023 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2755-2721/3/20230405

hard to biodegradable which means it can exist for a quite long time, usually by years. Plastic production has increased from 0.5 to 260 million tonnes per year since 1950, accounting today for approximately 8% of world oil production [3].

Serious pollution has caused serious damage to the marine ecological environment and also brought serious negative impacts on marine life and human beings that depend on marine resources for survival, even threatening their lives. Therefore, it is necessary to pay attention to the maintenance and restoration of the marine environment and its resources. This paper analyzes plastic pollution in marine pollution by means of review and qualitative analysis, including causes, effects, and solutions. The author hopes to provide some information support for the popularization of marine pollution hazards and governance.

## 2. Plastic pollution

### *2.1. Current conditions*

According to the data in the report by OCEANA, it has been pointed out that 21 billion to 34 billion PET beverage bottles enter the ocean every year [4]. The report emphasizes that plastic bottles produced and sold by beverage companies are the main source of marine pollution. According to Oceana's global ocean cleaning data, plastic bottles ranked first among the ten most common plastic items for beach cleaning in 2017 by weight. In addition, the "Break Free From Plastic" plastic reduction environmental protection organization conducted a survey in 51 countries and found that soft drink companies ranked first and third among the world's top ten polluting brands, while PET bottles ranked third among the most common plastic pollutants. A study published in Science in 2015 estimated that 4.8 million to 12.7 million tons of plastic enter the ocean every year. Combining the national level data of the study and the 2018 sales information of non-alcoholic ready to drink beverages from 76 coastal countries provided by Global Data, the report found that 21 billion to 34 billion 1-liter PET beverage bottles flowed into the sea in 2018, with a total weight of 706000 to 1.1 million tons.

### *2.2. The influence on marine animals and human beings*

The damage to the ocean's lives is vast and irreversible. As mentioned before, there are many kinds of pollutants, especially for the plastic pollution, that can be harmful to the ocean environment and also to lives. It is responsible for an estimated nine million premature deaths per year, enormous economic losses, erosion of human capital, and degradation of ecosystems. For example, the Islands of the North/South Atlantic and the Caribbean Sea were influenced by different sources of macroplastics, being marine-based sources (such as fishing activities) predominant in the Atlantic Ocean basin.

*2.2.1. Human beings.* It cannot be avoided that human beings depended on the ocean for food. Plastic will decompose into smaller and smaller pieces, eventually becoming micro plastic, constantly attracting harmful chemical pollutants, and eventually becoming a potential component of human food as the food chain continues to flow. The report points out that all human foods, from salt to honey to beer, contain micro plastics. The evidence of microplastic posing a direct medical threat to humans is still lacking albeit substantial literature has reported the health hazards of microplastic-associated monomers, additives, and pollutants [5].

*2.2.2. Marine animals.* The toxicity, sorption, and bioaccumulation of plastic are the main reasons which distribute *to* the health problems of marine animals [6] .It is not only damage to the lives in ocean but also can threat to human health. It affects at least 267 species worldwide, including 86% of all sea turtle species, 44% of all seabird species, and 43% of all marine mammal species. This problem has been always missed, and is lack solutions. Marine mammal species are more vulnerable to the existential threat of plastic pollution than their predators. In addition, the ocean environment can also be influenced by the accumulation of plastic debris on the sea level. It will prevent the sunshine from entering the sea floor, which may affect the growth of plankton and sea plants. The gas change between the overlying and pore water will be inhibited so it causes a lack of nutrition for plants under the sea.

DOI: 10.54254/2755-2721/3/20230405

For plastic pollution, Plastic waste will have adverse effects on marine life. It is estimated that 90% of seabirds and 100% of sea turtles have taken plastic. At the same time, whales, sea fish, plankton and other marine organisms are also suffering from being entangled or taking plastic. In addition, some organisms such as corals are more attracted to plastics than their natural nutrient sources. Studies have shown that when corals are in direct contact with plastic, the probability of corals infecting diseases will surge from 4% to 89%. Among the observed species affected by plastic waste, 17% are listed as endangered species by the World Conservation Union. With the continuous influx of plastic into the sea, the list of marine species affected by plastic waste is still expanding.

### *2.3. Oil Pollution*

According to statistics, the annual discharge of oil and petroleum products into the sea through various channels is increasing year by year, and plastic products as one of the petroleum products account for most of them, accounting for about 0.5% of the world's total oil production. This further aggravates the pollution and marketing of plastics to the ocean. And plastic products are difficult to be biodegradable, so they will float on the sea with oil and other pollution, affecting the solar radiation in seawater. And the oil film produced by direct oil spills also weakens the solar radiation energy that penetrates into seawater. The reduction in solar radiation can negatively affect the photosynthesis of marine plants and microorganisms, which further reduces the decomposition process of oil pollution and plastic pollution. In addition, oil and petroleum product pollution interferes with the ability of organisms to feed, reproduce, grow, behave, and biotrophy, and the delayed growth of organisms increases the process and duration of natural degradation of marine pollutants. Also petroleum can adhere to plastic molecules, making it difficult to treat petroleum pollution in a short period of time.

### *2.4. The influence on the climate*

Plastics also have an impact on the climate. Plastics will emit greenhouse gases in the whole life cycle of its production, transportation and waste management. If plastic is regarded as a country, it will be the fifth largest greenhouse gas emitter in the world.

## 3. Methods

In the last decades, the development of techniques can help to decrease the effect of the pollution human makes. The natural density stratification of the ocean has been used to great benefit in keeping waste discharges submerged in the lower layer of the ocean [7]. Obviously, “disposal” is the main factor and solution about the pollutants such as sewage disposal. In addition, human machines can help on the problem. For example, multiple -jet diffusers increase the dilution of sewage effluent with seawater, and dilutions of 200 parts of seawater to one part of sewage effluent are now commonly achieved [7].

In the case of environmental leakage that is easy to cause plastic waste, degradable plastic is suitable to be a substitute for traditional plastic. Compared with the soil environment, the marine environment is characterized by high salinity and low microbial density. Plastic products that can be degraded by microbial enzymatic reaction on land will often be degraded in the marine environment. Studies have shown that the degradation rate of biodegradable materials PLA, PBAT, PHA and PCL in seawater is less than 10%, and the degradation rate of major materials PLA in the market in seawater is less than 1%. This puts forward high requirements for degradable plastics suitable for use in fisheries. It is necessary to speed up the research and development of sea water degradation products and expand relevant fields.

## 4. Conclusion

The problem of ocean pollution is already a global warning. And based on the ocean's plastic pollution problem, addressing PET plastics and addressing polyester are interrelated. Countries should take parallel actions to gradually reduce the use of fossil carbon and toxic chemicals, while increasing the use of recycled parts and renewable carbon. Also governments must require transparent information from all supply chains, which will help drive down the demand for petrochemical plastics. In responding

DOI: 10.54254/2755-2721/3/20230405

to consumer demands, business and government leaders should take a range of immediate and long-term actions to prevent petrochemical plastic pollution. It is vital that solutions have to be made in controlling ocean pollution. There is strong evidence that when correct measures are taken, not only the ocean but also land and many organisms are spared from the consequences of chemical pollutants, especially for petrol and its products. Continued research on the impacts of plastic on the ocean environment and human health is likely to conclude the problem is worse than currently understood. Plastic pollution are going to increase all over the world. The solution to the problem of PET plastic and polyester is interrelated. Parallel actions should be taken to gradually reduce the use of fossil carbon and toxic chemicals, while increasing the use of recycled components and renewable carbon. All supply chains must be required to provide transparent information, which will help drive down the demand for petrochemical plastics. When responding to consumer requirements, business and government leaders should take a series of immediate and long-term actions to prevent petrochemical plastic pollution. Through the introduction of the hazards and treatment methods of marine plastic pollution, this paper further shows the threat of marine pollution to marine life and human generation. However, this paper does not consider the impact of natural ecosystems such as ocean currents and marine microorganisms on pollution, and does not empirically investigate the current status of marine environmental pollution. In the future study and research, we will better understand the circulation mechanism of marine and other environmental resources in the natural environment system, and further protect the earth's resources and environment based on this circulation mechanism.

## References

[1] Landrigan PJ, Stegeman JJ, Fleming LE, Allemand D, Anderson DM, Backer LC, Brucker-Davis F, Chevalier N, Corra L, Czerucka D, Bottein MD, Demeneix B, Depledge M, Deheyn DD, Dorman CJ, Fénichel P, Fisher S, Gaill F, Galgani F, Gaze WH, Giuliano L, Grandjean P, Hahn ME, Hamdoun A, Hess P, Judson B, Laborde A, McGlade J, Mu J, Mustapha A, Neira M, Noble RT, Pedrotti ML, Reddy C, Rocklöv J, Scharler UM, Shanmugam H, Taghian G, van de Water JAJM, Vezzulli L, Weihe P, Zeka A, Raps H, Rampal P. Human Health and Ocean Pollution. Ann Glob Health. 2020 Dec 3;86(1):151. doi: 10.5334/aogh.2831. PMID: 33354517; PMCID: PMC7731724.

[2] Landrigan PJ, Fuller R, Acosta NJ, et al. The Lancet Commission on pollution and health. The Lancet. 2018; 391(10119): 462–512. DOI: 10.1016/S0140-6736(17)32345-0

[3] Colette Wabnitz & Wallace J. Nichols， Fisheries Centre, AERL, University of British Columbia, 2202 Main Mall, Vancouver, BC, V6T 1Z4, Canada (E-mail: colette.wabnitz@gmail.com); California Academy of Sciences & OceanRevolution.org, PO Box 324, Davenport, CA 95017, USA (E-mail: wallacejnichols@me.com)

[4] Popescu, A. (2004). Structural ambiguity in trimorphemic English words: Morphological processing and lexical access in structurally ambiguous words presented in isolation.

[5] Amelia, T. S. M., Khalik, W. M. A. W. M., Ong, M. C., Shao, Y. T., Pan, H. J., & Bhubalan, K. (2021). Marine microplastics as vectors of major ocean pollutants and its hazards to the marine ecosystem and humans. Progress in Earth and Planetary Science, 8(1), 1-26.

[6] Derraik, J. G. (2002). The pollution of the marine environment by plastic debris: a review. Marine pollution bulletin, 44(9), 842-852.

[7] Brooks, N. H. (1966). Controlling ocean pollution. Engineering and Science, 29(6), 12-17.

[8] Ren, X. (2003). Biodegradable plastics: a solution or a challenge?. Journal of cleaner Production, 11(1), 27-40.