

International Journal of Management and Organizational Research

Assessment of plastic waste status and proposing some positive solutions to reduce plastic waste in Vietnam

Gioi Ngo Van ¹, Tuat Nguyen Thi Nham ^{2*}

¹⁻² Thai Nguyen University of Sciences (TNUS)-Thai Nguyen University, Tan Thinh Ward, Thai Nguyen City, Thai Nguyen 250000, Vietnam

* Corresponding Author: **Tuat Nguyen Thi Nham**

Article Info

ISSN (online): 2583-6641

Volume: 03

Issue: 02

March-April 2024

Received: 10-02-2024;

Accepted: 12-03-2024

Page No: 62-66

Abstract

The paper has applied some research methods to initially assess the current status of plastic waste and propose some practical solutions to reduce plastic waste in Vietnam. Research results showed that plastic waste in Vietnam arises from many different sources; The total amount of plastic waste in Vietnam is 3.27 million tons/year, accounting for about 8-12% of household solid waste and about 5% of medical waste; The treatment and recycling of plastic waste is still limited, up to 90% of plastic waste is burned, buried or discharged into the environment, only about 10% of plastic waste is recycled. To reduce plastic waste, it is essential to implement many synchronous measures from mechanisms and policies; raise community awareness; minimize the use of plastic bags and single-use plastic products; strengthen research, application of science and technology and international cooperation in plastic waste management.

Keywords: plastic, waste, pollution, environmental management, Vietnam

1. Introduction

Plastic pollution is one of the biggest challenges facing countries around the world. Each year, the amount of plastic waste generated by humans globally is enough to cover four times the Earth's surface area, of which 13 million tons of plastic waste is dumped into the ocean. The abuse of plastic products, especially non-degradable plastic bags and single-use plastic products, has left serious consequences for the environment. Most plastic waste has a very slow biodegradation rate, will break into smaller particles and then become microplastics - plastic particles with a diameter of 1µm - 5mm. The amount of plastic waste discharged into the environment is increasing, causing harm to the environment and ecosystems. Microplastic particles accumulate in organisms along the food chain, causing adverse effects on human health.

Currently, microplastics are found everywhere in the world from rivers, ponds, lakes, canals, streams, to coastal sandbanks, present in groundwater, seawater, oceans, and layers. Sediment on the sea bottom. Microplastics are also found in the air, in mangrove forests, both in the Arctic and Antarctica and in streams on Mount Everest and remote Tibet...

Recent studies show that the total amount of virgin plastic produced from the year plastic was mass produced (1950) to 2015 was 8,300 million tons. As of 2015, about 6,300 million tons of plastic waste were generated, about 9% of which was recycled, 12% was burned and 79% was sent to landfills, accumulating in the natural environment.

It is estimated that each year the amount of plastic waste generated is about 12 million tons, of which 2 million tons accumulates inland; 8 million tons of plastic fragments (> 5 mm) and 1.5 million tons of primary microplastics poured into the ocean; and 0.6 million tons of fishing nets were thrown into the sea ^[1].

Microplastic pollution in oceans and seas varies by geographical region globally, highest in India and South Asia (18.3%), North America (17.2%), followed by Europe and Central Asia (15.9%), China (15.8%), East Asia and Oceania (15.0%), South America (9.1%), Africa and the Middle East (8, 7%) ^[2].

It is estimated that by 2050, if the amount of plastic waste increases at the rate of increase in annual plastic production worldwide in the period 2005-2015 and there are no active measures to reduce plastic waste, the number of plastic fragments on ocean and coastal surfaces could double compared to 2020 (about 4.5 million tons). At that time, nearly 3 million tons of plastic pieces will be decomposed into microplastics.

If the amount of plastic waste entering the ocean is kept constant from 2020 onwards, the volume of plastic debris on ocean and coastal surfaces continues to increase albeit at a slower rate due to the breakdown of old plastic debris into smaller plastic particles^[3,4].

Currently, although there is still no specific international maritime law on microplastics, many responses have been implemented through voluntary or legally binding measures at the international, regional and national levels.

Many countries around the world have begun to pay attention and promulgate measures and policies to prevent and control environmental pollution caused by plastic and microplastics. In 2015, the United States issued a ban on cosmetics that use microplastics. The UK also introduced a ban on the use of microplastics in toothpaste and detergents in 2017^[5]. In Taiwan, from 2018, it is prohibited to produce or distribute cosmetics and personal care products containing microplastics. Italy bans the sale of cosmetic products containing microplastics from January 1, 2020. On January 18, 2019, the European Union Chemicals Agency (ECHA) also proposed to ban manufacturers from adding microplastics to products such as cosmetics, detergents and agricultural fertilizers from 2020. Currently, the United Nations Environment Program (UNEP) is continuing its efforts to call on countries to ban the use of microplastics in personal care products and cosmetics^[6].

Vietnam is a country with a long coastline and is one of the countries with the highest amount of plastic waste in the ocean in the world. In 2010, Vietnam was the country with the fourth highest amount of plastic waste dumped into the ocean in the world, after China, the Philippines and Indonesia. Recognizing the environmental risks of plastic waste, the State has issued many documents regulating plastic waste management as well as action plans to reduce plastic and microplastic pollution. However, plastic waste management in Vietnam still has many shortcomings, so the study "Assessment of plastic waste status and proposing some positive solutions to reduce plastic waste in Vietnam" was conducted to provide more database on plastic waste pollution in Vietnam, and propose some solutions to reduce plastic waste in Vietnam. At the same time, it contributes to minimizing the negative impacts of plastic waste on human health, animals and nature.

2. Research subjects and methods

Research subjects: The paper focuses on researching the issue of plastic and microplastic pollution in Vietnam and some solutions to reduce plastic waste.

Research Methods:

- Method of collecting documents and primary data: Collect documents related to the research content of the article, such as the Law on Environmental Protection, legal documents, and Decisions of the Prime Minister, research projects on plastic waste and legal policies related to plastic and microplastic pollution management in Vietnam and some countries around the world as well as some solutions to reduce plastic waste.

- Data analysis and synthesis method: Synthesize research documents on plastic waste and legal policies related to plastic waste, plastic and microplastic pollution management in Vietnam and some other countries as well as some solutions to reduce plastic waste.

3. Results and discussion

3.1. Status of plastic waste in Vietnam

Plastic waste in Vietnam arises from many different sources, mainly plastic bags, dirty plastic bottles, single-use plastic products, plastic products that are difficult to recover, difficult to recycle, arising from daily activities, consumption, and socio-economic activities... Vietnam is facing many potential risks from plastic waste. The amount of plastic waste is increasing rapidly. According to statistics from the Ministry of Natural Resources and Environment, in 2014 Vietnam had about 1.8 million tons of plastic waste discharged into the environment, in 2016 there was about 2.0 million tons of plastic waste generated and currently there are about 3.27 million tons of plastic waste are generated each year in Vietnam. The volume of plastic waste dumped into the ocean each year is about 0.28 - 0.73 million tons (accounting for nearly 6% of the world's total amount of plastic waste discharged into the ocean). In two large cities, Hanoi and Ho Chi Minh City, an average of about 80 tons of plastic waste and nylon bags are discharged into the environment every day^[7].

The classification, recovery, recycling and treatment of plastic waste is still limited. The amount of plastic waste and nylon bags in Vietnam accounts for about 8-12% of household solid waste. But only about 11-12% of plastic waste and nylon bags are processed and recycled, the rest is mainly buried, burned and discharged into the environment. This is one of the basic causes of plastic pollution in Vietnam. Besides, about 5% of medical waste is plastic waste. Every day, about 22 tons of plastic waste is discharged from medical activities, some of which is mixed with hazardous waste (medicines, chemicals, etc.). Collecting, recycling and burying this type of plastic waste all affect public health and environmental pollution.

Up to now, Vietnam has not had official statistics on the current status of microplastic pollution nor has there been an overall assessment of its sources (from cleaning products, cosmetics, laundry activities, and textiles, traffic...) and the current situation of microplastics in the environment (soil, water, air) in Vietnam.

However, recently there have been a number of studies determining the distribution and content of microplastics in some sediment and water environment samples. Research on the level of microplastic pollution in water and sediment of the Saigon – Dongnai river, which provides up to 94% of raw water to produce drinking and domestic water for the people of Ho Chi Minh City, with 18 researchers. Sampling and analysis of microplastics in surface water and sediment environments (including 13 locations on the Saigon River and 5 locations on the Dong Nai River) shows that the water is not only polluted with organic and physicochemical parameters but also polluted due to microplastic emissions. The results showed the appearance of microplastics in the form of pieces, fibers and microplastics from 0.1–5 mm in size. In water, fibrous microplastics have from 228,120 to 715,124 fibers/m³ of water, while fragmented microplastics have 11 to 222 pieces/m³ of water. In sediment, microplastics ranged from 6.47 ± 1.45 to 52.32 ± 4.92 mg/kg, with an average of 21.77 ± 6.9 mg/kg. In which PE (51.2%), PP (27.1%), PVC (13.4%) and other plastics (8.3%)^[8].

Microplastics were also found in all three sea areas of Tien

Giang, Can Gio and Ba Ria - Vung Tau with densities ranging from 0.04 to 0.82 pieces/m³ of seawater, lowest in Can Gio and highest in Tien Giang. The common characteristics of microplastics in these three sea areas are flakes and fibers, concentrated sizes between 0.25-0.5mm and 1-2.8mm, with quite diverse colors^[9, 10].

In tidal flat sediments in Hau Loc district, Thanh Hoa province, the content of microplastics in the sediment ranges from 0.002 - 0.0798 g/kg with an average value of 0.0229±0.0089 g/kg, corresponding to 2532-6875 pieces of plastic /kg sediment^[11].

In the Ba Lat Estuary (Red River estuary), Northern Vietnam, the distribution of microplastics varies widely, with densities ranging from 70 to 2,830 microplastics per kilogram of dry surface sediment. Microplastics measuring 300 - 5,000 µm account for more than 88% of the total number of particles. Fibers are the dominant shape in all samples, followed by membranes and granules. The detected microplastics were mainly transparent, red and blue. Polyethylene (PE), polyamide (PA) and polypropylene (PP) are the three main types of plastic found in surface sediments in the Ba Lat estuary^[12].

3.2. Some solutions to limit plastic waste in Vietnam

3.2.1. Solutions on mechanism, policy and management

One of the useful methods of reducing plastic waste is to complete synchronous mechanisms and policies from production, consumption, collection and treatment of plastic waste. The main principles for developing policies and laws to reduce plastic waste are to promote circular economy. In the production of plastic products, it is necessary to synchronously deploy the expanded responsibility of manufacturers in collecting, recycling, and treating waste of the products they produce, thereby reducing the financial burden of waste management and increase recycling rate. In addition, there should be instructions on using materials to replace plastic packaging. Take steps from encouraging the use of biodegradable plastic materials to replace traditional plastic materials in the production of plastic bags and disposable plastic items to banning the production of plastic bags and single-use plastic products.

Develop guidelines to implement the provisions of the Law on Environmental Protection 2020 in classifying and disposing of waste such as single-use plastic products and non-degradable plastic packaging. In particular, strictly implement regulations on classifying household solid waste into three types: organic waste, recyclable waste and other types of waste. Have a policy to develop a system for collecting, transporting and treating classified waste, regulating the collection of all types of plastic waste. Implement household solid waste fees from households, production, business and service establishments based on the volume of waste generated.

Develop regulations on environmental protection for goods containing microplastics. Complete technical regulations for eco-labeling of environmentally friendly plastic products.

Develop mechanisms, policies and management apparatus to promote socialization of plastic waste collection and recycling activities. Attract the private sector in investment and cooperation to improve waste management infrastructure; Purchasing and using recycled plastic for product packaging. The State only plays the role of collecting household solid waste and developing mechanisms and policies to operate Organize inspection, examination and

audit if necessary.

Review and complete regulations on taxes, fees and handling of violations related to plastic waste. It is necessary to research and amend the 2010 Environmental Protection Tax Law to expand the list of taxable plastic products, set appropriate environmental protection tax rates, and contribute to encouraging the production and use of environmentally friendly goods; Limit the production and use of plastic products that cause negative impacts on the environment.

Develop legal regulations to monitor and handle administrative violations, handle with appropriate measures the use of plastic bags, single-use plastic products and littering. Especially in crowded areas, tourist areas, scrap recycling craft villages, seaports, and fishing grounds.

3.2.2. Minimize the use of plastic bags and single-use plastic products

The majority of plastics found in household solid waste are plastic bags, plastic packaging and disposable plastic products that are difficult to decompose. Therefore, to effectively reduce plastic waste, it is necessary to implement solutions according to the roadmap, from limiting production and use, to imposing taxes on plastic products that are difficult to decompose. Solutions to limit the use of plastic products to promote environmentally friendly consumer behavior and develop the market for environmentally friendly alternative products. Some solutions to limit the use of plastic bags and single-use plastic products can be applied in the following directions:

- Organizations, individuals, traders, and businesses at supermarkets, stores, markets, business establishments... need to limit the distribution to customers of plastic bags and single-use plastic products such as trays, food containers, bowls, chopsticks, cups, knives, spoons, forks, straws, and other eating utensils.
- Accommodation establishments, tourist areas, and services limit the distribution to customers of plastic bags and single-use personal hygiene products.
- Households and consumers need to refuse and minimize the use of plastic bags and single-use plastic products. Form the habit of using products made of reusable and environmentally friendly materials.
- Raise environmental protection tax rates on non-biodegradable plastic bags and single-use plastic products. At the same time, charging high prices to consumers aims to change usage needs and raise awareness about the impact of plastic bags and single-use plastic products on the environment.
- Restriction and charging solutions need to be applied according to a roadmap to raise public awareness and for establishments that produce and import plastic bags and disposable plastic products to gradually convert technology to produce environmentally friendly products. However, ministries, branches and the government need to soon issue regulations and complete legal documents to promote reducing the production and consumption of single-use plastic products in particular and reduce non-degradable plastic waste in general.

3.2.3. Raise community awareness

One of the extremely important solutions to strengthen the management and reduction of plastic waste in Vietnam is to

raise community awareness.

First, it is necessary to take measures to raise awareness and community responsibility in the production, distribution, use, collection and recycling of plastic waste. In particular, it is necessary to especially raise community awareness in classifying plastic waste at source, creating favorable conditions for the collection, transportation, reuse, recycling and treatment of plastic waste.

In addition, propaganda solutions need to be implemented in many different forms, suitable for each audience (elementary school, middle school, high school and students, urban and rural residents, civil servants, officials, workers...).

Next, it is necessary to strengthen propaganda so that people can change their habits of using plastic products, especially refusing and minimizing the use of plastic bags and single-use plastic products is one of the very important solutions to reduce plastic waste emissions.

Furthermore, propaganda solutions aim to raise community awareness, helping the community understand the harmful effects of using plastic bags and single-use plastic items, thereby giving up the habit of using plastic items and switching to using environmentally friendly products. Propaganda methods can be done through articles, slogans, banners, leaflets, on radio and television. These propaganda activities must have long-term, clear, focused, and scripted strategies and campaigns to orient the community. For people, minimize the use of single-use plastic items, and strictly implement activities of collecting and classifying plastic waste, and do not litter the environment. For civil servants and public employees in the system of state agencies, socio-political organizations, and international organizations, they must be exemplary, proactive, and take the lead in reducing plastic waste; Limit and then not use single-use plastic products and non-biodegradable plastic bags;

Another practical solution is to use banners and slogans not to use single-use plastic products at the workplace and in entertainment services, restaurants, hotels, markets, supermarkets, conferences and seminars., meetings and holidays, anniversaries and other events; Encourage the use of recycled and environmentally friendly products.

3.2.4. Research and application of science - technology

Researching and applying science and technology throughout the entire life cycle of plastic to improve the ability to recycle, reuse and reduce plastic waste emissions is an urgent requirement. During the production process, it is necessary to conduct research into the design of plastic packaging to increase the ability to recover, reuse and recycle. Promote research to produce biodegradable and environmentally friendly plastic bags.

Research and apply advanced technology in collecting and transporting plastic waste in urban areas, rural areas and coastal areas, especially focusing on cleaning plastic waste in water bodies such as ponds and lakes, rivers and beaches.

Research and develop technology to recycle plastic waste into fuel, construction materials, road paving and other products.

Applying information technology in monitoring and managing production, collection, transportation, recycling and treatment of plastic waste; Build, update and integrate the database on plastic waste management into the national environmental database system.

3.2.5. International cooperation

Enhance exchange and cooperation with international organizations and non-governmental organizations on implementing global commitments and agreements in reducing plastic waste emissions, moving towards ending plastic pollution. Strengthen international cooperation in training to improve capacity and learn from experiences in models of collecting, classifying, recycling and reusing plastic waste.

Strengthen international cooperation to attract organizations, individuals and funding sources to carry out training, research and technology transfer tasks in recycling and producing environmentally friendly plastic products, produces environmentally friendly products to replace plastic products. Strengthen cooperation with countries to manage illegal flows of plastic scrap imported into Vietnam.

4. Conclusion

Plastic and microplastic waste in Vietnam are generated from many different sources. Every year Vietnam has about 3.27 million tons of plastic waste discharged into the environment. The amount of plastic waste and nylon bags in Vietnam accounts for about 8-12% of household solid waste and about 5% of medical waste. The treatment and recycling of plastic waste is still limited, up to 90% of plastic waste is burned, buried and discharged into the environment, only about 10% of plastic waste is recycled. Vietnam has not had official statistics on the current status of microplastic pollution nor has there been an overall assessment of its sources (from cleaning products, cosmetics, laundry activities, and textiles, traffic...) and the current situation of microplastics in the environment (soil, water, air) in Vietnam. However, recently there have been a number of studies determining the distribution and content of microplastics in some sediment and water environment samples. To reduce plastic waste, it is necessary to implement many synchronous measures from mechanisms and policies; raise community awareness; Minimize the use of plastic bags and single-use plastic products; Strengthen research, application of science and technology and international cooperation in plastic waste management: (1) One of the top priority solutions is to improve mechanisms and policies for managing plastic waste and plastic products such as: Promoting a circular economy; regulates the responsibilities of manufacturers from the design, production, and distribution of plastic products to effectively collect and recycle plastic waste; Develop regulations on environmental protection for goods containing microplastics; Encourage the production of biodegradable plastic products that are not harmful to the environment; Strongly deploy mechanisms, policies and management apparatus to promote classification, collection and recycling of plastic waste; Review and add disposable plastic products to the list of taxable environmental protection taxes to contribute to encouraging the production and use of environmentally friendly goods; (2). It is essential to implement solutions according to the roadmap, from limiting production, free distribution, use to imposing high taxes on single-use plastic products and non-degradable plastic products; Business and service establishments need to limit giving customers free plastic bags and single-use plastic products; Households and consumers need to refuse and minimize the use of plastic bags and single-use plastic products. Form the habit of using products made from

reusable, environmentally friendly materials; Increase environmental protection tax on non-degradable plastic bags and single-use plastic products; Complete legal documents to promote reduction of production and consumption of single-use plastic products in particular and reduction of non-degradable plastic waste in general; (3). Raising awareness and community responsibility in the production, distribution, use of plastic products and in the collection and classification, recycling and treatment of plastic waste. Propaganda solutions need to be implemented in many different forms (through articles, slogans, banners, flyers, on radio and television), suitable for each audience. Propaganda activities must have long-term, clear, focused, and scripted strategies and campaigns to orient the community and help the community understand the harmful effects of plastic and microplastic waste, thereby changing consumption habits (refuse and minimize the use of plastic bags and single-use plastic products at the workplace and in entertainment services, restaurants, hotels, markets, supermarkets, conferences, seminars, meetings and holidays, anniversaries and other events); Encourage the use of recycled, environmentally friendly products to replace toxic plastic products; (4) Develop and transfer science and technology solutions to improve the ability to recycle, reuse and reduce plastic waste emissions; (5) Enhance exchange and cooperation with countries around the world, international organizations and non-governmental organizations on implementing global commitments in reducing plastic waste emissions; training to improve capacity, learn from experience on models of collecting, classifying, recycling and reusing plastic waste; attract funding sources to carry out training, research and technology transfer tasks in recycling and producing environmentally friendly plastic products; Actively participate in the process of building a legally binding Global Treaty on plastic pollution and organize its implementation after it is ratified by other countries and Vietnam.

Funding: This study received no specific financial support.

Competing Interests: The authors declare that they have no competing interests.

Acknowledgement: Both authors contributed equally to the conception and design of the study.

5. References

1. Geyer R, Jambeck JR, Law KL. Production, use, and fate of all plastics ever made. *Science Advances*. 2017 Jul 19; 3(7):e1700782.
2. Jambeck JR, Geyer R, Wilcox C, Siegler TR, Perryman M, Andrady A, et al. Plastic waste inputs from land into the ocean. *Science*. 2015 Feb 13; 347(6223):768-71.
3. Boucher J, Friot D. *Primary Microplastics in the Oceans: A Global Evaluation of Sources*. Gland, Switzerland: IUCN; 2017.
4. Boucher J, Billard G, Simeone E, Sousa J. *The marine plastic footprint*. Gland, Switzerland: IUCN; 2020.
5. SAM. *Microplastic Pollution: The Policy Context - Background Paper*. The Scientific Advice Mechanism Unit of the European Commission. 2018. 68 p.
6. Nguyen TT. *Current status of policies and laws on microplastic pollution management in Vietnam*. Hanoi, Vietnam: IUCN Vietnam National Office; 2021.
7. Manh H. *Plastic waste in Vietnam: Current situation and solutions*. *Communist Magazine*. 2022 Sep 29. Available

from:

<https://www.tapchicongsan.org.vn/web/guest/bao-ve-moi-truong/-/2018/826009/rac-thai-nhua-o-viet-nam--thuc-trang-va-giai-phap.aspx> [Accessed on November 20, 2023].

8. Phu H, Han HTN, Thao NLN, Dong DV, Han TG. Research on the level of microplastic pollution in water and sediment of the Saigon – Dongnai river. *Journal of Hydro-Meteorology*. 2021; 731:69-81.
9. Nguyen NT, Ngan NTK, Nhu H, Dong HK, Nhon NTT. Characteristics of microplastic pollution in three coastal areas of Can Tho, Tien Giang and Ba Ria Vung Tau. *Plastic waste workshop, Institute of Environmental Resources, Hanoi National University*. 2019.
10. Nhon NTT, Vy DTY, Nguyen NT, Hien TT. Microplastics in Can Gio beach sand, Ho Chi Minh City. *Conference proceedings Plastic waste pollution in Vietnam's sea: Current status and solutions*. 2019. p. 139–148.
11. Dung LV, Duc TH, Ha NTH, Tung ND, Tue NT, Hieu PV, et al. Research on methods to identify microplastics in coastal tidal sediments, applied experimentally in Da Loc commune, Hau Loc district, Thanh Hoa province. *Journal of Hydro-Meteorology*. 2020; 715:1–12.
12. Hien HT, Lan HT, Trang TDM, Cuc NTT, Sen TM, Long NT. Initial results of microplastics on the sediment surface in the Balat river mouth, Northern Vietnam. *Conference proceedings Plastic waste pollution in Vietnam's seas: Current situation and solutions*. 2019. p. 130–138.