

## Plastic Waste and Difficulties in Management in Vietnam

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**ABSTRACT:** The paper has applied a number of traditional research methods to preliminarily assess plastic pollution and some difficulties in plastic waste management 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. Although the system of legal documents on waste management is increasingly being improved, there are still many difficulties and inadequacies: there are no in-depth studies and legal regulations, standards and regulations. techniques for controlling microplastics in products and goods such as cosmetics, detergents... as well as in wastewater treatment; There are no specific legal regulations on microplastic waste management, reducing waste from single-use plastic products; Plastic waste recycling has not been officially implemented, it is still mainly carried out by private units; The application of environmental protection tax on plastic bags and the EPR mechanism still have many problems and shortcomings. To improve management efficiency, it is necessary to apply a combination of solutions from raising public awareness, completing legal documents and properly managing production sources and disposal of waste containing plastic and microplastic.

**KEYWORDS:** plastic, waste, pollution, environmental management, Vietnam

### I. 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 1 $\mu$ m - 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. People.

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 "*Plastic waste and difficulties in management in Vietnam*" was conducted to provide more database on plastic waste pollution in Vietnam, difficulties in management. Research results are an important premise to help scientists and authorities at all levels propose effective solutions to reduce waste. plastic waste and their negative impacts in the future.

## II. RESEARCH SUBJECTS AND METHODS

*Research subjects:* The paper focuses on researching the issue of plastic and microplastic pollution and difficulties in management in Vietnam.

*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 pollution management in Vietnam and some countries around the world.

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

## III. RESULTS AND DISCUSSION

### 3.1. Current status of plastic waste in Vietnam:

The types of plastic waste generated in Vietnam are 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 including:

- Packaging: 40% of plastic produced is used for packaging, food packaging, household appliances, and industrial products;

- Agriculture: plastic waste can arise from the farming process such as plastic covering soil and wrapping fruit, fertilizer packaging, pesticide packaging - exists in the form of plastic bottles and zinc-coated plastic bags, which are difficult to decompose and is classified as hazardous waste;

- Construction: plastic is used a lot to make door frames, plastic doors, gates, scaffolding, tables and chairs, cabinets, and plastic fabric covering construction projects;

- Tourism: plastic waste from tourist activities, boats, and tourism businesses;

- Plastic recycling: plastic loss from the recycling process, eliminating non-recyclable plastic products mixed in recycled plastic.

Land-based industries that generate microplastics in Vietnam include:

+ Cosmetics and personal care products manufacturing industry: In addition to the plastic ingredients used to contain and package products, each time a person uses an exfoliating product, there will be about 4,600-94,500 microplastics are released;

+ The textile industry also releases large amounts of microplastics during the washing process; + Transport industry: microplastic dust is mainly smaller than 80  $\mu\text{m}$  in size and is generated from worn tires;

+ Plastic production and manufacturing: plastic flow is lost due to the plastic transportation process;

+ Ship maintenance and demolition: cleaning ship hulls and storage compartments creates a lot of microplastics;

+ Wastewater treatment: conventional wastewater treatment facilities cannot retain or process microplastics. Meanwhile, the source of microplastics at sea is due to the accidental loss of goods, the use of personal care products and cosmetics by passengers on cruise ships.

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/m<sup>3</sup> of water, while fragmented microplastics have 11 to 222 pieces/m<sup>3</sup> of water. In sediment, microplastics ranged from  $6.47 \pm 1.45$  to  $52.32 \pm 4.92$  mg/kg, with an average of  $21.77 \pm 6.9$  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/m<sup>3</sup> 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  $0.0229 \pm 0.0089$  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  $\mu$ m

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. Difficulties in plastic waste management in Vietnam:**

Plastic waste management in Vietnam still has many gaps, inadequacies, and limitations, specifically as follows:

- There is a gap in knowledge, understanding and legal policies on managing microplastic pollution from primary sources. There are no in-depth studies and legal regulations, standards, and technical regulations on controlling microplastics in products and goods such as cosmetics, detergents, etc. In addition, there are no specific legal regulations on microplastic waste management.

The overall management of sources of microplastic pollution from products and goods (such as cosmetics, detergents...), air environment, traffic activities (due to tire wear) ... has not been specifically regulated. Regulations on products and goods such as cosmetics, washing powder, paint... have not yet clarified the control of the use of ingredients that indicate products containing microplastics. Ingredients representing microplastics in cosmetics include Polyethylene/Polythene (PE); Polypropylene (PP); Polyethylene terephthalate (PET); Polymethyl methacrylate (PMMA); Nylon [13]; Polytetrafluoroethylene (PTFE) [14]. There are no specific standards or regulations on microplastic ingredients in products and goods of these industries.

As for legal policies on waste management, microplastics have not been regulated and given detailed and specific management instructions in legal documents.

- Although policies and laws on plastic waste management are increasingly improving, the actual implementation still has many problems and inadequacies. There are no regulations on reducing waste from single-use plastic products; Waste classification has not been implemented; Plastic waste recycling has not been officially implemented, it is still mainly carried out by private units.

The system of legal documents on plastic waste management is still incomplete and has not been effectively enforced. The revised Law on Environmental Protection 2020 takes effect from January 1, 2022, currently guiding documents are being developed. There is currently a lack of guidance on choosing recycling and solid waste treatment technologies; lack of national technical regulations for recycled products. There is a lack of specific mechanisms on incentives for recycling, reusing waste, and recovering energy from waste treatment; lack of guidance on implementing preferential policies, investment capital support, and post-treatment product consumption support; the number of solid waste treatment projects that receive loans from preferential capital sources is very small; There is a lack of mechanism to promote the socialization of

solid waste collection and treatment, and it has not attracted investment resources for solid waste collection and treatment.

The management of solid waste in general and plastic waste in particular has not been applied in an integrated management method, and regional solid waste management planning has not been effective among provinces, cities, regions, and planned districts. Solutions to reduce waste, especially plastic waste, have not been promoted. Most waste is not classified at source; Classification programs in localities are still experimental, not yet synchronized, and not yet formalized. Essential infrastructure, equipment, and vehicles serving the collection, transportation, and treatment of solid waste have not received synchronous investment. Recycling activities of solid waste and plastic waste are still small and spontaneous, mainly carried out by the informal sector in craft villages, causing environmental pollution.

- Tools and mechanisms in waste management in general and plastic waste in particular have not been applied effectively; There are still many problems and inadequacies in applying environmental protection tax on plastic bags and the EPR mechanism.

Vietnam has applied the environmental protection tax tool for plastic bag products since 2010, with a tax rate of 50,000 VND/kg. However, in practice, the implementation of this tool still encounters some difficulties and problems that need to be resolved, specifically as follows:

- First, the tax rate is still low so it has not had much impact on limiting the production and use of plastic bags.

- Second, monitoring and managing plastic bag production and business activities is very difficult because the majority of plastic bag manufacturers (about 70%) are small production establishments that pay flat tax, so the number The environmental protection tax collected from plastic bags in recent years is insignificant and gradually decreasing, plastic bag products are still widely consumed at low prices.

- Third, the production of a plastic product and its delivery to consumers goes through a process with the participation of manufacturers, suppliers and consumers, including intermediate products. Therefore, only imposing environmental protection tax as currently is not truly fair and does not cover relevant groups, especially manufacturers.

- Fourth, the revenue from the environmental protection tax is not a direct reimbursable revenue, and is not regulated to be used for specific environmental protection spending tasks, but to carry out spending tasks according to the provisions of the State Budget Law and approved by the National Assembly every year. Therefore, the environmental protection tax collected will be mixed into the budget stream to balance national spending goals, not directly to support environmentally friendly plastic bag production facilities. Therefore, it does not create incentives for businesses to change product production orientation [15].

- Finally, because many households produce non-biodegradable plastic bags on a small scale and do not have to pay taxes according to actual production, the price of regular plastic bags

is lower. Therefore, environmentally friendly plastic bags are not able to compete with regular plastic bags, leading to ineffective State support policies [15].

Regarding the EPR mechanism, the recall of products in the list of Decision 16/QĐ-TTg has almost not been implemented in practice. Many companies have set up recall points such as LG, Toyota, Ford, Honda, Apple, Canon, Toshiba, Dell, HP, but these are just formalities. Companies usually only set up 01-02 recall points, only Vietnam's Honda Company set up 52 recall points for products used for motorbikes (such as batteries, accumulators, tubes, tires) and 3 recall points for car products (batteries, tires, camcorders, CD/DVD players, air conditioners, car key batteries) in Ho Chi Minh City; Ford Company established 34 points for automobile products. However, there are no statistics on the number of products recalled at these locations in recent times. According to reports from several companies, no discarded products have been delivered to the collection point since they were established. In fact, the collection of valuable waste products including plastic components has been carried out informally in Vietnam. These products are collected and transported for recycling in craft villages. This activity is relatively developed because waste recycling brings economic benefits, but it causes serious environmental pollution due to outdated recycling technology and weak infrastructure.

- In environmental quality management, Vietnam has general regulations on air pollution management but are not effective; Dust pollution is increasing and is exacerbated by microplastics in the air. Microplastic pollution has not been researched and regulated in environmental standards, technical regulations and in wastewater treatment.

Although there are guidelines, policies and legal regulations on air environment management, air quality in large cities continues to decline. Dust pollution is currently a prominent problem, mainly from transportation vehicles, construction activities and industrial facilities. Among these, dust from worn tires in transportation also contributes to the increase in microplastics released into the environment.

Environmental standards and technical regulations have been issued for the quality of the surrounding environment and waste (wastewater, exhaust gas) of some specific industries. However, microplastic components are not mentioned in the maximum allowable values of pollution parameters in these environmental regulations and standards.

#### IV. 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.

Although the system of legal documents on waste management is increasingly being improved, there are still many shortcomings, plastic waste management still faces many difficulties, and there is no in-depth research and Laws, standards, and technical regulations on microplastic control in products and goods such as cosmetics, detergents, etc; There are no specific legal regulations on microplastic waste management; There are no regulations on reducing waste from single-use plastic products; Waste classification has not been implemented; Plastic waste recycling has not been officially implemented, it is still mainly carried out by private units; Tools and mechanisms in waste management in general and plastic waste in particular have not been applied effectively; There are still many problems and inadequacies in applying environmental protection tax on plastic bags and the EPR mechanism; Microplastic pollution has not been researched and regulated in environmental standards, technical regulations and in wastewater treatment.

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