

Status of plastic waste and solutions on mechanism, policy and management in Vietnam

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ABSTRACT

The paper has applied some research methods to assess the current status of plastic waste and propose solutions on mechanism, policy and management to limit 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 necessary 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; Promote activities of classifying, collecting and recycling plastic waste; encouraging the production and use of environmentally friendly goods...

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 1 μ 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.

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 "Status of plastic waste and solutions on mechanism, policy and management in Vietnam" was conducted to provide more database on plastic waste in Vietnam, and propose some useful

solutions on mechanism, policy and management 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.

II. 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.

III. RESULTS AND DISCUSSION

3.1. Status of plastic waste in Vietnam

Plastic wastes 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... 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 μ 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. Some limitations and inadequacies in management policies in Vietnam

Although waste management in general and plastic waste in particular have achieved many positive results, plastic waste management still has many gaps, shortcomings and limitations. 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.

3.3. Solutions on mechanism, policy and management in Vietnam

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. One of the solutions that should be given top priority is solutions on mechanisms, policies and management.

Firstly, it is necessary 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.

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. 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, 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...

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