

# Overview of Marine Plastic Debris in Vietnam in Relation to International Context

Mr. Le Dai THANG, Viet Nam

**Keywords:** marine plastic debris, plastic pollution, cooperation.

## ABSTRACT

Among the approximately 2.5 billion tonnes of solid waste produced globally in 2010, about 275 million tonnes was mismanaged plastic waste generated from coastal countries, and it is estimated that between 4.8 million tonnes to 12.7 million tonnes of this plastic waste entered the oceans. Inadequate management of plastic waste has led to increased contamination of freshwater, estuarine and marine environments.

Current management plans for solid waste include: open dumps or tips into landfill, incineration, waste to energy and recycling. However, not all plastics are recyclable or recycled which can be the result of insufficient waste streams.

Vietnam with a coastline of more than 3260km runs along the length of the country, with dozens of estuaries flowing into the sea. Plastic waste is really a very serious problem in Vietnam. In the beaches where garbage is regularly collected, plastic still floats a lot in the sea. In some beach areas like mangrove forests, mudflats.... where garbage is not collected, plastic debris forms a thick layer on bottom mud, covering roots and branches, causing great harm to the ecosystem.

However, Vietnam considers strong development of the marine economy must be accompanied with marine environmental protection, do not trade the environment for hot and unsustainable growth. So far, Vietnam has issued and implemented many strategies, policies and regulations on environmental protection to limit marine plastic debris. Therefore, it has achieved many encouraging results, but there are still many difficulties ahead.

In order to reduce the quantity of plastic entering the ocean, existing management instruments need to be made more effective and all aspects of waste treatment and disposal need to be improved. Vietnam needs further cooperation, support and funding from other countries and international organizations.

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## 1. INTRODUCTION

Plastic production has increased exponentially since the early 1950s and reached 322 million tonnes in 2015, this figure does not include synthetic fibres which accounted for an additional 61 million tonnes in 2015. It is expected that production of plastics will continue to increase in the foreseeable future and production levels are likely to double by 2025. [6]

Almost all aspects of daily life involve plastics. One of the most appreciated qualities of plastic products is their durability. Mass production and mass consumption of plastics have led to the accumulation of plastics in natural habitats, and adverse impacts on biota and the economy. Environmental impacts include habitat damage, entanglement and ingestion of marine litter by biota, and the introduction of non-native species, mainly microorganisms, seaweeds and invertebrates, through rafting on floating litter (Barnes and Milner, 2005; Calder et al., 2014; Kiessling, Gutow and Thiel, 2015; Kühn, Rebolledo and van Franeker, 2015).

It has been estimated that in 2010 between 4.8 million to 12.7 million tonnes of plastic waste entered the oceans. Abandoned, lost or otherwise discarded fishing gears (ALDFG) are considered the main source of plastic waste by the fisheries and aquaculture sectors, but their relative contribution is not well known at regional and global levels. [6]

Among the approximately 2.5 billion tonnes of solid waste produced globally in 2010, about 275 million tonnes was mismanaged plastic waste generated from coastal countries, and it is estimated that between 4.8 million tonnes to 12.7 million tonnes of this plastic waste entered the oceans (Jambeck et al., 2015).

However, this quality when combined with improper waste management, plastic waste may escape waste streams, enter the environment leads to environmental contamination on land, in freshwater and in marine environments. . Inadequate management of plastic waste has led to increased contamination of freshwater, estuarine and marine environments.

Appropriate waste management strategies are necessary in order to mitigate the effects and impacts of marine plastic debris pollution in coastal and aquatic habitats.

## 2. SOME FIGURES OF MARINE PLASTIC DEBRIS IN THE WORLD

Nowadays, plastics make up at least 10 percent of solid waste by mass in 58 percent (61 out of 105) of countries with available data (Hoornweg and Bhada-Tata, 2012). Plastics may be buried in landfills, recycled, incinerated (with or without energy generation), accidentally lost or deliberately littered. Except for the incinerated component of waste, it is estimated that all plastics produced since the beginning of mass plastic production remain in the environment in whole or in fragmented forms. The percentage of recycled plastics has increased every year since at least 1990, but it is far behind other materials including paper (58 percent) and iron and steel (between 70 percent and 90 percent) (WEF, 2016).

Several management options have been implemented to manage the waste stream of large plastic items. Current management plans for solid waste include: open dumps or tips into landfill, incineration, waste to energy and recycling (Bernardo, Simões and Pinto, 2016).

However, not all plastics are recyclable or recycled which can be the result of insufficient waste streams.

With specific reference to plastic packaging materials (78 million tonnes in 2013), 14 percent was recycled, 14 percent incinerated, 40 percent landfilled and 32 percent reached the environment globally (WEF, 2016). Of the available waste streams, recycling is widely regarded as the preferential treatment option. It allows end of life items to have a value rather than becoming waste.

Treatment of waste is different by country, some rely heavily on landfill, whereas other focus on recycling and energy production (in the form of heat, steam and electricity). However, this requires sophisticated and expensive separation infrastructure which is less available in developing countries. According to estimations, 5 of 192 countries contribute more than 50 percent to the mismanaged plastic waste (Jambeck et al., 2015). These are mainly developing countries, experiencing rapid economic growth, but not yet having efficient waste-management infrastructures.

Defining the marine litter problem is complex as there are many different sources and forms of litter that can enter the oceans. Plastic items are consistently the most abundant type of marine debris identified around the globe, and can amount to more than 80 percent of reported debris (e.g. UNEP, 2016). Both sea and land-based activities are responsible for the continued input of plastic, making it a ubiquitous pollutant as it has been reported globally.

Coastal waters and shorelines often contain a considerable amount of plastics debris. They are subjected to anthropogenic pressures including: land based input of debris, tourism, aquaculture, shipping, fisheries and high coastal population.

Floating marine debris can reach densities over 600 items per km<sup>2</sup>. Seabed deposition of plastic is very dependent on location and densities range from 0 items to more than 7 700 items per km<sup>2</sup> (Galgani, Hanke and Maes, 2015). 80 percent of the floating debris was composed of plastics items (PS, plastic bags and plastic fragments) [Hinojosa and Thiel (2009)].

### **3. OVERVIEW OF MARINE PLASTIC DEBRIS IN VIETNAM**

According to some research results, Vietnam is among the top 5 countries in the world with the estimated amount of plastic waste discharged into the sea from 0.28 to 0.73 million tons/year. Plastic waste is really a very serious problem in Vietnam. In the beaches where garbage is regularly collected, plastic still floats a lot in the sea. In some beach areas like mangrove forests, mudflats.... where garbage is not collected, plastic debris forms a thick layer on bottom mud, covering roots and branches, causing great harm to the ecosystem.

According to the 2015 National State of Environment Report, about 46% of solid waste in Vietnam is urban solid waste, 17% from industrial production, the rest is rural solid waste, craft villages and health care solid waste. The collection rate of solid waste in urban areas is quite high, about 84% to 85%. The collection rate of domestic solid waste in rural areas is only about 40% and mainly in towns. Solid waste is mainly treated by open dumping or incineration. [11]

Currently, in Vietnam there are about 2,000 plastic enterprises, mainly situate in the South. Among 2,000 enterprises in the plastic industry, most are small and medium enterprises (SMEs), private enterprises (accounting for 90%). With the number of businesses and diverse product categories, Vietnam plastic production in 2008 reached 2.3 million tons, the average growth rate of 15%/year. At present, this number is about 4 million tons/year. In particular,

packaging plastic products (including plastic bags, plastic bottles, goods packaging ...) accounted for about 36%; Plastic materials for construction, household appliances and other types for other industries such as electronics, electricity and transportation account for about 16%, 36% and 12%, respectively.

With the proportion of products in the total volume of plastic products produced annually as above, plastic packaging in Vietnam has an average output of about 1 million tons/year. According to previous data, the average consumption of plastic is about 25 - 35kg plastic/person/year. Up to now, with the growth rate of plastic industry of about 15 - 20% /year, at the same time the economic life is growing, the average plastic consumption reaches more than 40kg/person/year.

Along with the increase in domestic solid waste, the amount of plastic waste and plastic bags arises. According to a survey by the Ministry of Natural Resources and Environment, the amount of plastic waste and plastic bags accounts for about 8 - 12% of domestic solid waste. According to the World Bank report, the proportion of plastic waste generated for middle-income countries like Vietnam accounts for about 12% of the generated solid waste. If an average of 10% of the amount of plastic waste and plastic bags is not reused but completely disposed, the amount of plastic waste and plastic bags discharged in Vietnam is approximately 2,500,000 tons/year. Plastic waste and plastic bags is mainly treated together with domestic solid waste mainly in the form of landfill, then incinerating and finally recycling. For plastic waste and plastic bags from industrial activities, most of them are classified and withdrawn for production or sold to other units for recycling.

These types of plastic bags currently used in Vietnam are mainly produced from polyethylene (PE), others are made of polypropylene (PP) or poly vinyl chloride (PVC) ...The products produced from these materials are all of a kind that are difficult to decompose and are likely to cause long-term environmental pollution. The widespread use of plastic products and plastic bags in social activities, mainly and especially ultra-thin bags, shows not only in very popular, number of bags used. but also in the ease of both the supplier and the user: the seller is willing to add one or several plastic bags to the buyer when requested; buyers rarely carry containers (bags, baskets, etc.) because they know for sure that when buying goods, there will be plastic bags attached to carry on.

#### **4. THE RESPONSES AND ACHIEVEMENTS**

Vietnam considers strong development of the marine economy accompanied with marine environmental protection, do not trade the environment for hot and unsustainable growth. Promoting clean energy, green growth projects and sustainable development; resolutely against pollutant discharge to pollute green, healthy waters.

Resolution No. 09-NQ/TW dated February 9, 2007 "About Vietnam Sea Strategy to 2020", National Strategy on Green Growth (Decision No. 1393/QD-TTg dated September 25, 2012) , National Environmental Protection Strategy to 2020, vision to 2030 (Decision 1216/QD-TTg dated December 5, 2012), Integrated Coastal Management Strategy of Vietnam to 2020, vision by 2030 (Decision No. 2295/QD-TTg dated December 17, 2014), the National Action Plan to implement Chapter 4 of the 2030 Agenda for sustainable development issued under Decision No. 622/QD-TTg dated May 10, 2017. Especially, The strategy of sustainable exploitation and use of marine resources and environmental protection until 2020, vision to 2030 (Decision No. 1570/QD-TTg dated September 6, 2013) provides strategic orientations in

resource management and marine environmental protection, in which the strategic tasks is to control the sources of pollution of the marine environment, on islands to achieve the goal of "curbing the rate of increase environmental pollution in coastal areas and on islands ". Decree No. 19/2015/ND-CP dated February 14, 2015 encouraging waste recycling activities, including both plastic waste and plastic bags. Decree No. 155/2016/ND-CP dated November 18, 2016 of stipulating penalties for administrative violations in the field of environmental protection; Decree No. 130/2013/ND-CP dated October 16, 2013 on manufacturing and supplying public products and services. Decree No. 38/2015/ND-CP on waste and scrap management, which requires classification of recycled plastic waste in domestic solid waste and industrial solid waste; The waste must be managed from generation to collection, transportation and handling.

National Environmental Protection Strategy to 2020, vision to 2030 indicates contents and measures aiming to increase the rate of solid waste collected, recycled and reused; gradually reduce the production and use of persistent bags and packages (including plastic and plastic bags); Research, produce various types of easy-to-decompose bags and packages to replace bags, packages that are difficult to decompose.

In order to unify the treatment of environmental pollution due to persistent plastic bags, on April 11, 2013, the Prime Minister issued Decision No. 582/QD-TTg approving the Scheme enhance environmental pollution control due to difficult to degrade plastic bags in daily life until 2020, which identifies groups of tasks, synchronous solutions on economy and society as well as treatment of environmental pollution. The Scheme has set specific objectives: "In 2015, 40% reduction of difficult-to-decompose plastic bags used at supermarkets, commercial centers compared to 2010" and "2020 will reduce 65% of volume difficult-to-decompose plastic bags at supermarkets and commercial centers compared to 2010".

By April 2018, on average, the rate of using non-biodegradable plastic bags in supermarkets by 2017 has basically decreased by 50% compared to 2010. In special urban areas and grade 1 cities, 90% of supermarkets and commercial centers used environmentally friendly plastic bags to replace difficult-to-decompose plastic bags. However, in grade 2 or lower urban areas, where the number of supermarkets and commercial centers accounts for a low proportion, the use of persistent plastic bags is still relatively common.

+ Enterprises also aim to produce environmentally friendly plastic bags to gradually replace difficult-to-biodegradable plastic bags for consumers. Companies have implemented pollution prevention and control measures according to environmental protection regulations. They have printed labels and product codes so that consumers can identify the types of environmentally friendly plastic bags that are recyclable (thickness > 30 micrometers) or biodegradable plastic bags.

Currently, some domestic solid waste treatment facilities have installed a sorting line to recover recyclable substances, including plastic waste and plastic bags.

Circular No. 07/2012/TT-BTNMT dated July 4, 2012 regulating criteria, order and procedures for recognizing environmentally friendly plastic bags, recognizing all types of environmentally friendly plastic bags through the market to gradually reduce the use of non-biodegradable plastic bags, promote businesses to adopt new technologies to produce recyclable or biodegradable plastic bags. After 5 years of implementation, the country has 43 plastic-bag products of 38 recognized enterprises that are environmentally friendly.

The system of TCNVs for evaluating environmentally friendly plastic bags, including: TCVN 11317:2016 - Guidance on exposure and testing of plastics for decomposition in

environments combining oxidation and biodegradable process (ASTM 6954:2004); TCVN 11318:2016 - Determination of complete aerobic biodegradability of plastic materials in water environment - method of measuring oxygen demand in a respiratory meter (respirometer) (ISO 14851:1999); TCVN 11319:2016 - Determination of complete aerobic biodegradability of plastic materials in water environment - method of analyzing the amount of carbon dioxide produced (ISO 14852: 1999); TCVN 11320:2016 - Plastics - cadmium - wet decomposition method (EN 1122: 2001); TCVN 11796:2017 - Method of exposure plastic capable of optical decomposition under the influence of fluorescent UV (UV) (ASTM D5208:2014); TCVN 11797:2017 Labeling requirements for plastics are capable of aerobic composting at municipal or industrial waste treatment facilities (ASTM 6400:2012); TCVN 11798:2017 - Packaging - Requirements for recoverable packaging through composting and biodegradation - Test scheme and evaluation criteria for accepting packaging (EN 13432:2000)

Many localities have carried out the propagation, dissemination of information and education to raise awareness for the community about the harmful effects of plastic bags that are difficult to decompose, organize movements and campaigns such as "day without plastic bags". "Say no to plastic bags"

Decision No. 491/QĐ-TTg dated May 7, 2018 approving the adjustment of the National Strategy on Integrated Solid Waste Management to 2025, vision to 2050, in which one of the key tasks is to summarize and evaluate the results of the implementation of Decision No 582/QĐ-TTg dated April 11, 2013 approving the Scheme on strengthening environmental pollution control due to the use of difficult-to-biodegradable plastic bags until 2020; limit and proceed to terminate the import, production and supply of difficult-to-biodegradable plastic bags from 2026 at commercial centers and supermarkets for domestic purposes.

Specific objectives for urban domestic solid waste: (i) All special-class and grade-I urban centers with solid waste recycling facilities appropriate with classification at households; 85% of the remaining cities have solid waste recycling facilities in accordance with household classification; enhance recycling, reuse, and combination of energy recovery; (ii) Using 100% environmentally friendly plastic bags at commercial centers, supermarkets for living purposes to replace difficult-to-biodegradable plastic bags.

In the past, one of the efforts to reduce plastic bags waste is to encourage the production and use of environmentally friendly packaging through preferential policies on environmental protection tax. For plastic bags, environmental protection tax is both a tool to increase budget revenue, to limit the production of difficult-to-decompose plastic bags and change consumption habits (the current level is 40,000 VND/kg). The Law on Environmental Protection Tax stipulates that plastic bags meeting environmental friendly packaging criteria do not have to pay environmental protection tax.

In addition, the Government of Vietnam has participated in many international treaties and conventions related to waste management such as Basel Convention on cross-border waste control and their destruction; United Nations Convention on the Law of the Sea (UNCLOS); 2030 Agenda for sustainable development; United Nations Framework Convention on Climate Change (COP22) and Viet Nam's Paris Implementation Plan on Climate Change; United Nations Environment Program (UNEP).

## 5. DIFFICULTIES AND PROBLEMS ENCOUNTERED

Scientific and practical understanding of the process of generating, dispersing and transforming plastic waste as well as their impacts on the environment, ecosystems and marine resources is still limited.

Vietnam does not have much practical experience in assessing the status of controlling and managing plastic waste at sea. "Plastic waste" is just regulated (Decree 38/2015/ND-CP) in the group is capable of reusing and recycling, but there are no specific regulations and guidelines on management, collection and handling this waste group to suit the current serious pollution of plastic.

Resources for implementing propaganda and dissemination programs to raise awareness as well as implementing tasks and programs in the Scheme on enhancing environmental pollution control due to the use of non-biodegradable plastic bags to 2020 have not been fully allocated, not meeting the practical requirements resulting in the lack of synchronous and inefficient implementation of tasks.

Propaganda, dissemination and public awareness raising have not been continuous and synchronous, leading to low efficiency; Investigation and statistics activities are still limited, leading to incomplete information and data to serve management.

The coordination among relevant agencies in the process of implementing the Scheme on enhancing environmental pollution control due to the use of non-biodegradable plastic bags until 2020 is not continuous and ineffective, especially in inspection and examination of the implementation of policies and remedies for pollution control due to plastic bags, so it has not had a strong impact on difficult-to-biodegradable plastic bag production enterprises.

The Law on Environmental Protection Tax is still not the only solution to change the behavior of the community, plastic bags are still used and disposed at a high level. Currently, in supermarkets and markets, sellers sell plastic bags to buyers free of charge because the prices of these goods are much cheaper than other goods.

Infrastructure for classification, recycling, reuse and waste treatment in general, plastic bags waste has not been invested synchronously. While the demand for using plastic waste in the country is high, but most localities have not done well the classification of waste at source, so the collection for recycling waste plastic bags is not guaranteed to meet the demand of production materials of the plastic industry.

Investment policy and application of recycling technology of plastic bag waste is still limited, so it is not attractive to all economic sectors involved in collecting and recycling plastic bags, leading to difficulties in privatizing waste recycling activities in general, plastic bag waste in particular.

Some enterprises still have not really paid attention to environmental protection requirements or technical requirements to ensure their products are environmentally friendly, such as changing the density and composition of raw materials input but not yet informed the certificate issuer, not yet printed the label and product code in accordance with the commitment in the registration profile for recognition of environmentally friendly plastic bags.

The supply of environmentally friendly bag production has not met the demand of designs, has not yet competed on price compared to conventional plastic bags, so it is not encouraging consumers to change their habit of using difficult-to-decompose plastic bags to environmentally friendly bags.

Awareness of manufacturing enterprises as well as communities about environmentally friendly plastic bags is confusion, many individuals and enterprises understand rigidly environmentally friendly bags that plastic bags are possible biodegradability, even biodegradable bags, leads to many difficulties in producing and creating markets for biodegradable plastic bags.

## **6. NEX STEPS TO SOLVE MARINE PLASTIC DEBRIS**

By Resolution 36-NQ/TW dated October 22, 2018 on the strategy of sustainable development of Vietnam's marine economy to 2030, with a vision to 2045, Vietnam has identified a key task in the coming period is to prevent, control and reduce marine environmental pollution significantly; 100% of hazardous wastes and domestic solid wastes in coastal provinces and cities shall be collected and treated to meet environmental standards; Regional pioneer in reducing ocean plastic waste.

- Develop and implement the National Plan for the management of ocean plastic waste by 2030 with a vision to 2045.

- Promote global cooperation in ocean and ocean data sharing, training and development of human resources, focusing on technology transfer and sustainable use and utilization of marine and ocean resources by establishment an international center for ocean plastic waste located in Vietnam.

- Promote the formation of a global cooperation mechanism for reducing plastic waste that the Prime Minister stated at the G7 Summit in Canada in 2018 and was very welcomed by the Summit.

- Develop a state-level science and technology program framework to solve the problem of ocean plastic waste pollution.

- Develop a regional project on establishing regional partnerships in the East Asia Seas on ocean plastic waste management. This is an initiative of Vietnam presented at the Roundtable of the 6th Meeting of the General Assembly of the Global Environment Fund held in Da Nang on 27-28 June 2018 with the aim of promoting cooperation and increasing, strengthening regional coordination in plastic waste reduction for the East Asia Seas region, creating a driving force for the shift of growth model on the basis of a circular economy on the principle of reducing consumption, increasing recycling and reusing plastic; establishing knowledge base on ocean plastic waste and especially raising community awareness, changing behavior in dealing with plastic products and plastic waste.

Raise awareness of ocean plastic waste. Training on methods of monitoring, sampling and analysis of micro-plastics. Observation and monitoring of micro-plastic on coastal beaches and estuaries (movement of micro-plastic originating from land). Develop common standards for all countries on methods of monitoring, sampling and analysis of micro-plastics.

Support for the media and NGOs in Vietnam as well as a number of ministries, sectors, mass organizations and localities have been conducting necessary activities to prevent and prevent dumping of plastic waste into the ocean.

Increasing the tax rate for non-biodegradable plastic bags, especially thin bags that cannot be recycled. The high taxation aims to increase the price so that sellers will not continue to distribute plastic bags, gradually reducing the single use of difficult to decompose plastic bags. Since then, plastic bag manufacturers must have a conversion plan to produce more environmentally friendly products.

Close inspection and supervision of tax collection/payment activities is an important factor to ensure fairness for environmentally friendly plastic bag manufacturers to limit the production of difficult to decompose bags.

Continuing to propagate in various forms, through the media, newspapers and maintaining propaganda activities on the harmful effects of difficult to decompose plastic bags, raising awareness and disseminating information to community to change community habits from using persistent bags to environmentally friendly products.

Continuing to prioritize the consideration or implementation of national scientific and technological tasks on the development of technologies for treating difficult to decompose plastic bags; strengthen the application and technology transfer program to produce environmentally friendly products to replace the persistent plastic bags.

Organize to guide and supervise activities of sorting waste at source to collect and recycle difficult to decompose plastic bags with high efficiency; building models and self-management programs on environment including contents of minimizing use and classification, collection and recycling of difficult to decompose bags.

Enhance and diversify capital sources to implement environmentally friendly projects on production and recycling the plastic bags; concentrating resources on research, application and transfer of plastic bag recycling technologies and produce low-cost environmentally friendly products that meet the technical criteria for universalization in the market [2]

## **7. CONCLUSION AND RECOMENDATION**

Plastic contamination of marine environment has been increasing since industrial high volume polymer production commenced in the 1950s. As production levels continue to increase, it is likely that plastic related contamination will continue to increase in the foreseeable future.

Currently, ocean plastic debris is a global issue, which is of great concern to many countries and international organizations, including Vietnam. Managing and controlling marine plastic debris pollution is both a challenge for Vietnam and a great opportunity to open a new area of management. However, at present, Viet Nam has very little information exists on the relative contribution of different types of plastics and associated chemicals, and how this has varied with time. And also, very little information exists on distribution of plastics in the Vietnam waters. And data collection is problematic, especially in deeper waters. There is very limited information on the distribution of plastics in sediment.

In order to prevent, control and reduce marine environmental pollution significantly, especially the regional pioneer in reducing ocean plastic debris as required by Resolution 36-NQ/TW dated October 22, 2018 on The strategy of sustainable development of Vietnam's marine economy up to 2030, with a vision to 2045, apart from implementing the contents mentioned in Section 6 above, Vietnam needs the cooperation and support of countries and financial institutions to solve the problem of ocean plastic debris.

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Le Dai THANG (Mr).

Deputy Director

Bureau for resources control and environmental protection of seas and islands.

Vietnam Administration of Seas and Islands (VASI).

Ministry of Natural Resources and Environment (MONRE).

No 83 Nguyen Chi Thanh Street, Dong Da District, Ha Noi, SR Vietnam.

Tel: (84-24) 37741806

Fax: (84-24) 37549732

Cellphone: (84) 93.616.62.26

Email: [ldthang@monre.gov.vn](mailto:ldthang@monre.gov.vn)

and/or

[ldtthang@gmail.com](mailto:ldtthang@gmail.com)

Website: [www.monre.gov.vn](http://www.monre.gov.vn)