Preventing plastic pollution – from slogans to practical actions

NGUYỄN MINH CƯỜNG
Department of Environment, Ministry of Agriculture and Environment

In an era of remarkable scientific and technological advancements, plastics, with their superior properties, were once considered a revolutionary invention, significantly contributing to socio-economic development. However, the rapid increase in plastic production and consumption, especially single-use plastic products, coupled with inadequate waste management systems, has transformed plastics from a convenient solution into a global "crisis." The international and Vietnamese communities' awareness of the harmful effects of plastic pollution has significantly shifted. Numerous commitments, initiatives, and policies have been introduced at global, regional, and national levels. Nevertheless, to address a systemic and complex issue like plastic pollution, general "slogans" or superficial movements are insufficient; more practical and specific action plans are required.

1. OVERVIEW OF THE PLASTICS INDUSTRY

1.1. The global plastics industry

Since the first synthetic polymers were discovered in the early 20th century, the plastics industry has experienced explosive growth. Global plastic production surged from about 2 million tons in 1950 to nearly 460 million tons in 2019, and it is projected to double by 2040 without strong interventions [1]. Common plastics like Polyethylene (PE), Polypropylene (PP), Polyethylene terephthalate (PET), Polyvinyl chloride (PVC), and Polystyrene (PS) have become indispensable materials in various sectors, from packaging (the largest share), construction, automotive, electronics, textiles, to healthcare and agriculture.

This robust growth is driven by several factors. Firstly, plastics possess outstanding properties: lightweight, durable, flexible, easy to mold, good electrical and thermal insulation, and, most importantly, relatively low production costs. The increasing consumer demand from a growing global population, along with urbanization trends and lifestyle changes favoring convenience, has created a massive market for plastic products, particularly single-use plastics. Plastics also play a crucial role in optimizing many industrial value chains, from reducing vehicle weight to save fuel to extending food preservation times.

The global plastic supply chain is a complex system, starting with the extraction of fossil fuels. According to a report by Stand.earth Research Group (SRG) and the Center for International Environmental Law (CIEL), a significant portion of petrochemical feedstocks for plastic production originates from fracking activities, especially in regions like the Permian Basin in the United States. The report indicates, "Over 25 of the world's largest household brands are driving fossil fuel expansion in Texas through their demand for plastic packaging." From these raw materials, giant petrochemical corporations produce plastic resins (polymers), which are then supplied to thousands of companies manufacturing finished plastic products worldwide, catering to the needs of major consumer brands [2].

The plastics industry makes substantial contributions to economic development by creating millions of direct and indirect jobs and significantly contributing to the GDP and export turnover of many countries. In 2022 alone, the global plastic value chain generated an estimated revenue of USD 1.7 trillion and created 6.3 million jobs [3].

However, the development of the plastics industry also reveals many systematic limitations: (i) heavy reliance on non-renewable fossil fuels (oil and gas account for about 99% of raw materials for plastic production [4]), depleting resources and contributing to the climate crisis through greenhouse gas emissions throughout the plastic lifecycle, from raw material extraction, production, to disposal. (ii) The dominant economic model in the plastics industry is still linear: extract – produce – consume – dispose. This model generates a large amount of waste and fails to utilize the value of materials after use, leading to resource waste and an increased burden on the environment. (iii) The responsibility of manufacturers for plastic products throughout their lifecycle, especially in the post-consumer phase, is often lacking or insufficient. This results in the costs of managing and treating plastic waste being typically shifted to society and local authorities, instead of being internalized into the product price.

1.2. Global plastic waste management status

The world is facing a colossal and ever-increasing volume of plastic waste. Between 1950 and 2017, the world generated approximately 6.9 billion tons of primary plastic waste, with an estimated 19-23 million tons leaking into aquatic ecosystems, from ponds, lakes, and rivers to the oceans [5]. Developing countries and emerging economies in Asia and Africa are often hotspots for plastic pollution due to rapid urbanization, increased consumption, and inadequate waste management systems. Global plastic waste management remains largely deficient, with estimates suggesting that only about 9% of all plastic waste ever produced has been recycled, 12% incinerated, and the vast majority (79%) accumulated in landfills or directly discharged into the natural environment [6].

From a socio-economic perspective, the tourism industry is severely affected as beaches and natural landscapes become polluted by plastic waste, reducing destination attractiveness and revenue. The fisheries sector also suffers losses due to declining resources (marine life ingesting plastics or getting entangled in plastic nets) and the risk of seafood contamination with microplastics, eroding consumer confidence. The costs of cleaning up polluted areas, treating plastic waste, and restoring the environment are enormous, burdening state budgets and communities. UNEP estimated the global economic cost of marine plastic pollution to sectors like tourism, fisheries, and aquaculture to be around USD 6-19 billion in 2018, with a forecast of up to USD 100 billion by 2040 [7]. Socially, plastic pollution directly impacts public health, especially in poor, vulnerable communities living near open dumpsites or unsanitary waste treatment areas. This situation also exacerbates social inequality, as the burden of pollution often falls heaviest on the most disadvantaged. Furthermore, the livelihoods of millions of informal workers in the waste collection and trading sector are affected by the volatility of the plastic scrap market and unsafe working conditions.

2. GLOBAL CONCERN OVER PLASTIC POLLUTION

2.1. Cooperative mechanisms to address plastic pollution: from awareness to action commitments

In recent decades, plastic pollution has transformed from a local environmental issue into a global crisis, attracting increasing international attention. At the 5.2 session of the United Nations Environment Assembly (UNEA) in March 2022, a historic resolution was adopted to initiate negotiations for an international legally binding agreement to end plastic pollution (UNEA Resolution 5/14) [8]. The goal of this treaty is to address the entire lifecycle of plastics, from product design, production, and consumption to waste management, to prevent plastic pollution in the environment, especially marine environments. Expectations for this treaty are high, but it also faces numerous challenges due to the diverse interests and capacities of nations.

Besides UNEP, organizations like the United Nations Development Programme (UNDP), the World Bank (WB), and the World Economic Forum (WEF) are actively implementing programs, projects, and initiatives to support member states. Regional intergovernmental organizations such as the European Union (EU) with its European Strategy for Plastics in a Circular Economy, and the Association of Southeast Asian Nations (ASEAN) with its ASEAN Regional Action Plan for Combating Marine Debris, have also made specific commitments and action roadmaps.

The private sector and international civil society organizations also play a pioneering role. The Ellen MacArthur Foundation's New Plastics Economy Global Commitment, involving hundreds of businesses, governments, and organizations, sets ambitious targets for eliminating problematic plastic packaging, innovating so that plastics can be reused, recycled, or composted, and circulating plastics in the economy. NGOs like WWF, Greenpeace, CIEL, and SRG continuously conduct advocacy campaigns, research, and monitoring, pressuring governments and businesses to take stronger actions.

2.2. Key approaches to addressing plastic pollution towards a Circular Economy (CE)

Transitioning from a linear economic model to a circular economy (CE) model is one of the most fundamental and widely recognized solutions to address the plastic pollution crisis. For the plastics industry, the core principles of CE include: (i) Designing out waste and pollution from the outset, meaning avoiding the use of harmful plastics and chemicals, and designing products for reusability, repairability, or recyclability; (ii) Keeping products and materials in use for as long as possible at their highest value, prioritizing solutions like reuse, repair, and refurbishment before considering recycling; (iii) Regenerating natural systems, ensuring that materials, after their end-of-life, can safely return to the cycle or biodegrade without harming the environment.

Technology and innovation are crucial drivers for realizing a CE for plastics. In recycling, besides improving mechanical recycling processes for better quality and efficiency, chemical recycling is gaining significant attention. Chemical recycling technologies

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like pyrolysis, gasification, and depolymerization can potentially process mixed plastics and contaminated plastics that are difficult for mechanical recycling and can produce feedstock of quality comparable to virgin plastics.

Sustainable alternative materials are also an important area of innovation. Bioplastics, including bio-based plastics and biodegradable plastics, are expected to reduce reliance on fossil fuels and address the long-term persistence of plastics in the environment. Additionally, optimizing and using traditional materials like paper, glass, and metal is also a significant direction.

Eco-design plays a pivotal role from the very beginning of a product's lifecycle. This includes minimizing material use, prioritizing mono-materials for easier recycling, eliminating toxic or hard-to-recycle components (like certain inks, labels, and adhesives), and designing products for easy disassembly, repair, or reuse.

New business models and policies promoting CE need to be developed. Business models such as Deposit-Return Schemes (DRS) for beverage containers, product-as-a-service models, sharing and collaborative consumption platforms, and systems for remarketing used products are increasingly being adopted.

Regarding economic policy instruments, Extended Producer Responsibility (EPR) is a crucial tool, requiring producers to bear financial and/or physical responsibility for managing their products post-consumption. Taxes or fees on hard-to-recycle plastics, single-use plastics, or plastic bags are also applied in many places to curb consumption. Conversely, subsidies and incentives for using recycled materials, environmentally friendly products, and green public procurement can create market drivers for CE. The development and enforcement of standards and technical regulations for mandatory recycled content in new products, for the quality of recycled plastic resins, and for the recyclability of packaging are also essential to promote the market and ensure quality.

Transitioning to a CE offers significant economic benefits. It helps create new markets for secondary raw materials, reduces dependence on imported or virgin raw materials, thereby saving production costs. CE also helps reduce waste treatment costs and minimizes economic damage from environmental pollution. More importantly, CE promotes innovation, creates new industries and jobs in sustainable design, repair, recycling, and related services, thereby enhancing the competitiveness of businesses and the economy. According to the World Economic Forum (WEF), the shift to a CE has the potential to add USD 4.5 trillion in additional production efficiency by 2030 [9]. Socially, CE contributes to minimizing the negative impacts of plastic pollution on public health and the living environment. It also fosters responsible consumption awareness, encourages community participation in environmental protection activities, and can create more sustainable livelihood opportunities for informal sector workers if properly integrated.

3. VIETNAM AND OTHER NATIONS IN PREVENTING PLASTIC POLLUTION

3.1. Vietnam's legal framework and strategic orientation

Recognizing the severity of the issue, the Vietnamese Government has issued and implemented numerous important policies and laws to strengthen the management and reduction of plastic waste pollution. The Law on Environmental Protection 2020 is considered a major step forward, with many new groundbreaking provisions demonstrating Vietnam's strong commitment to addressing environmental issues, including plastic pollution. Noteworthy are the regulations on municipal solid waste management towards enhancing source separation, promoting reduction, reuse, and recycling; regulations on Extended Producer Responsibility (EPR) for certain types of packaging (including plastic packaging) and products likely to cause pollution; and framework regulations to promote the development of a circular economy.

To concretize these orientations, the Government and the Prime Minister have issued many sub-law documents such as Decree No. 08/2022/ND-CP providing guidelines to several articles of the Law on Environmental Protection, and Decree No. 05/2025/ND-CP amending and supplementing several articles of Decree No. 08/2022/ND-CP, which include specific regulations on EPR. Important action plans and schemes have also been approved, such as the National Action Plan on Marine Plastic Debris Management by 2030 (Decision No. 1746/QD-TTg dated December 4, 2019), and the Scheme to Strengthen Plastic Waste Management in Vietnam (Decision No. 1316/QD-TTg dated July 22, 2021). Many national strategies and target programs on green growth and sustainable development also integrate content related to plastic waste reduction.

It is obvious that Vietnam's policy and legal framework for plastic waste management has made clear progress, demonstrating proactivity and strong political commitment in addressing this issue, while gradually aligning with international practices and standards such as EPR and CE.

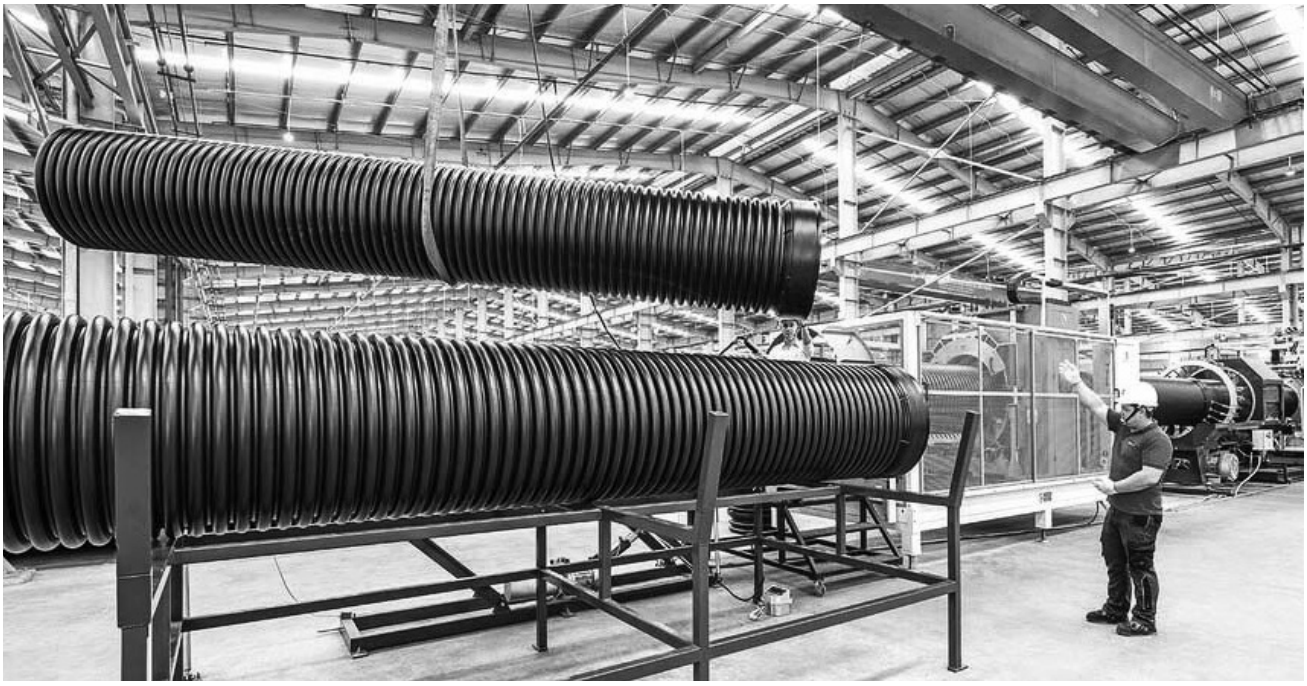
3.2. Vietnam's efforts in reducing plastic pollution

State management agencies from central to local levels have actively implemented national programs and schemes on plastic waste management. The Ministry of Natural Resources and Environment (now the Ministry of Agriculture and Environment) has chaired many activities to raise awareness, develop technical guidelines, and promote international cooperation. Many localities have issued their own action plans, piloting models for source separation, collection, and recycling of plastic waste. Initial results show a certain shift in awareness among a segment of the community and businesses; however, scaling up successful models and maintaining the sustainability of activities remain challenges.

The State has also made efforts to invest or call for socialized investment in infrastructure for collecting, sorting, and recycling plastic waste, although the scale and progress are still slow compared to demand. Inspection and examination activities regarding compliance with environmental protection laws related to the generation and management of plastic waste have also been strengthened. Many large-scale communication campaigns to raise public awareness about the harmful effects of plastic waste and the benefits of reduction, reuse, and recycling have been organized, attracting the participation of mass media and social organizations.

The Vietnamese business community, especially large enterprises and multinational corporations, is increasingly playing a more active role in reducing plastic pollution. Many businesses have pioneered research and application of solutions to change packaging design towards greater sustainability (using recycled materials, reducing packaging weight, eliminating hard-to-recycle components), using environmentally friendly alternative materials, and minimizing the use of plastics in products and production processes. Some businesses have boldly invested in modern recycling technology to treat plastic waste and develop new value-added products from recycled plastics. The emergence of alliances and voluntary initiatives such as the Packaging Recycling Organization Vietnam (PRO Vietnam), with the participation of leading consumer goods and packaging companies, or commitments to reduce plastic waste by the Vietnam Chamber of Commerce and Industry (VCCI), are positive signals. Corporate Social Responsibility (CSR) activities related to environmental protection, collection, and recycling of plastic waste are also becoming more common.

The participation of the residential community and social organizations plays an extremely important role. Many movements and campaigns to collect plastic waste and clean up the environment at beaches, rivers, and residential areas have been initiated and widely spread, attracting the participation of numerous volunteers, especially young people and students. Noteworthy is the formation and development of sustainable consumption models such as refill stores, alternative products to single-use plastics (bamboo/grass/stainless steel straws, cloth



Plastic pollution is one of the most pressing environmental challenges

bags, reusable food containers), and initiatives to reduce plastic bags at traditional markets. Non-governmental organizations (NGOs) and social organizations such as the Vietnam Women's Union and the Ho Chi Minh Communist Youth Union have been implementing many educational, communication, and behavior change advocacy programs, while also participating in community monitoring and policy advocacy activities.

Overall, promoting the reduction, reuse, and recycling of plastics is gradually creating new business models and niche markets for environmentally friendly and recycled products, thereby creating new job opportunities, especially in the collection, sorting, recycling, and green product manufacturing sectors. Businesses conscious of their environmental responsibilities and proactively applying sustainable solutions often build a better image and brand in the eyes of consumers and investors, thereby enhancing their competitiveness. Socially, these activities contribute to raising community awareness, improving the quality of the living environment in some areas, and promoting a more responsible lifestyle.

However, the implementation of activities still faces limitations, such as the small scale of many activities, especially from the community and social organizations, often being movement-based, lacking sustainability, and not yet creating a widespread impact nationwide. Financial, technical, and human resources for these activities are still very limited, often dependent on short-term funded projects. Coordination among stakeholders (Goverment - Business – Community) is sometimes not tight and synchronous. Changing the consumption behavior of a large part of the population is a long-term process, requiring perseverance and more creative and effective communication and education solutions. For businesses, transitioning to sustainable production and business also requires considerable time and investment resources.

3.3. Proposed solutions for reducing plastic pollution to ensure sustainable development in Vietnam

Perfecting institutions, policies, and enhancing enforcement effectiveness: Continue to review, amend, and supplement the system of legal documents related to plastic waste management towards synchronicity, clarity, feasibility, with clear roadmaps and effective enforcement sanctions. Issue more detailed regulations on EPR implementation, including mechanisms for managing and using the EPR fund transparently and effectively. Develop and implement effective economic instruments such as progressive environmental taxes on plastic products based on pollution levels or low recyclability; apply waste treatment fees based on generated volume to encourage source reduction. Concurrently, establish financial support and incentive mechanisms (taxes, credit, land) for businesses investing in cleaner production technologies, advanced recycling technologies, and the production of environmentally friendly products. Build and effectively operate a national database on

the generation, collection, transportation, treatment, and recycling of plastic waste to serve management, policymaking, and effectiveness evaluation.

Substantively promoting the development of a CE in the plastics industry: Encourage and further support research, development, transfer, and application of advanced recycling technologies (including chemical recycling if environmental standards and economic efficiency are ensured) and technologies for producing sustainable alternative materials. Develop markets for recycled and sustainable products through preferential policies in green public procurement, reputable eco-labeling programs, and support for supply-demand connections between recycled product manufacturers and businesses needing recycled materials. Support startups and innovative enterprises in this field.

Strengthening communication, education, raising awareness, and comprehensively changing behavior: Develop and implement long-term, systematic communication and education strategies with clear messages, engaging content, and diverse formats suitable for specific target groups (students, households, small traders, businesses, managers). Integrate educational content on environmental protection, sustainable consumption, the harmful effects of plastic pollution, and the benefits of CE into the formal education curriculum at all levels. Maximize the role of mass media and social media platforms in spreading positive messages, sharing knowledge, skills, and good examples in reducing plastic waste. Build and replicate programs and campaigns to encourage and honor individuals, groups, and businesses with practical initiatives and actions in reducing plastic pollution.

Enhancing international cooperation and resource mobilization: Vietnam needs to continue to proactively and actively participate in global and regional initiatives and commitments to reduce plastic pollution, especially in the negotiation and implementation of the International Agreement on Plastic Pollution. Fully implement committed national responsibilities. Maximize financial, technical, technological, and experiential support from international organizations, developed countries, and capable private partners. Promote scientific research cooperation, information sharing, and technology transfer in the field of plastic waste management and recycling. Effectively mobilize resources from society, including domestic and foreign private sectors, for investment projects in infrastructure and technology for treating and recycling plastics.

4. CONCLUSION

Moving from general "slogans" to "practical actions" in preventing and reducing plastic pollution is an urgent requirement and an inevitable path to ensure sustainable development. This is not merely an environmental protection responsibility but also an opportunity for us to restructure the economy towards a greener, more circular model, creating new economic values, jobs, and improving people's quality of life. For a green, clean, beautiful, and sustainably developed Vietnam, for the health of ourselves and future generations, let every individual and organization join hands, unite, and turn awareness and commitments into concrete, practical actions starting today to prevent and repel the plastic pollution disaster■

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