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Article

The Legal dilemmas and pathways for managing plastic waste pollution in China: An assessment of current regulations and a vision for future governance frameworks

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Abstract: This paper aims to systematically analyze the current state of plastic waste legal supervision in China and to propose a vision for future governance frameworks. In recent years, along with the vigorous rise of emerging industries such as the express delivery industry and takeaway services, the consumption of plastic products has increased sharply. This trend has triggered profound reflection and high vigilance on the issue of plastic waste supervision. This trend has triggered profound reflection and acute vigilance regarding the regulation of plastic waste. Although the Chinese government has initiated multiple regulatory measures and achieved certain outcomes, from a macroscopic perspective, the issue of plastic waste pollution remains grave, and the relevant legal and regulatory system presents a complex situation with limited enforcement efficacy. Hence, it is exceptionally urgent and significant to deeply explore and formulate legislative strategies aimed at alleviating and regulating plastic waste pollution. This paper is dedicated to systematically analyzing the current state of plastic waste legal supervision from both international and domestic dimensions, and meticulously outlining the regulatory framework for plastic waste governance in China. Through the application of legal norm research methods, this paper dissects the flaws and challenges existing in the current governance mechanisms and further conducts a comparative study of the successful practices in this field in developed countries like the United States, with the intention of drawing valuable experiences. On this basis, this paper not only offers a forward-looking outlook on China's future legislative tendencies in plastic waste pollution but also innovatively proposes a series of new insights and recommendations. These explorations aim to provide a more solid theoretical foundation and practical guidance for the governance approach to plastic waste pollution in China, promote the improvement and enhancement of the enforcement effectiveness of environmental regulations, and thereby effectively confront the global challenge of plastic pollution.

Keywords: plastic pollution; environmental regulations; plastic waste management; environmental pollution supervision and governance

1. Introduction

Over the past few decades, along with the rapid economic expansion and the accelerated advancement of industrialization, the plastic industry in China has accomplished remarkable feats that have garnered worldwide attention. Such an extraordinary panorama is not only manifested in the sharp expansion of manufacturing capacity but also permeates numerous domains such as packaging, construction, automobiles, and electronics. Plastic products, with their unique advantages, have been extensively utilized in every aspect of the national economy. Despite the brief shock to the manufacturing sector caused by the COVID-19

pandemic, in 2022, the total output of plastic products in China still amounted to a whopping 77.716 million tons, and the total export value reached an astonishing $107.81 billion (Ma, 2023). Undoubtedly, this data indicates the colossal scale and the stable development momentum of China's plastic industry. However, the imbalance in the technological development of the plastic industry has inevitably exerted a profound influence on the environment, particularly manifested in the fact that some plastic products, due to their distinctive physicochemical properties, are hard to be effectively recycled and reused (Zhang et al., 2022). The core issue of plastic waste pollution lies in that the plastic garbage that has not been recycled and processed is extremely difficult to decompose in the natural environment, thereby triggering a series of chain reactions such as visual pollution, disruption of soil structure, and the permeating hazards of microplastic particles to the ecosystem (Economic daily, 2021). Further, even if plastic waste is recycled, if there is a lack of environmentally friendly treatment technologies and methods, and only traditional incineration is relied upon, this process will release a large quantity of air pollutants, including carcinogenic compounds and heavy metal elements. This undoubtedly exacerbates the environmental problems and further intensifies the challenge of the harmonious coexistence between human beings and nature.

Additionally, academic research reveals that plastic products used in daily life potentially conceal non-negligible safety hazards for human health and the ecological environment. Various plastic products, to varying degrees, may exert negative influences on people's healthy lives and even carry the risk of causing cancer, a risk that cannot be underestimated (Rodrigues et al., 2019). Particularly noteworthy is the "2022 Bulletin on China's Marine Ecological Environment" issued by the Ministry of Ecology and Environment of China in 2022, which clearly states that plastic products account for more than 80% of beach pollutants, floating debris on the sea surface, and seabed waste, making them the primary culprit of marine pollution (Lan and Shi, 2023). From this perspective, although plastic products have been deeply ingrained in the daily needs of Chinese society, the risks and challenges behind them are equally huge and complex, urgently demanding that we deal with them with a more prudent attitude.

China, as a major player in the global plastic consumption market, is also a country that generates a vast amount of plastic waste. In the case of plastic packaging bags alone, China's daily consumption amounts to a staggering 3 billion, and by 2019, the cumulative annual usage of plastic packaging bags had exceeded 1.8 million tons (China IRN, 2023). This figure undoubtedly highlights the huge demand for plastic packaging in China. Nevertheless, it is a matter of concern that the construction of China's system for plastic waste treatment and supervision is still relatively weak, and there are notable deficiencies in legal system construction, with frequent loopholes. Although the concept of green development has gained increasing popularity since 2018, prompting the Chinese government to start strengthening strict control over the use of plastic products and promulgating a new "plastic restriction order" in 2020, such government-led restrictive measures encounter severe challenges at the implementation level. Due to the interweaving of multiple factors such as market demand, economic interests, and the lack of supporting legal systems, these administrative orders often become mere formalities

and are difficult to be effectively implemented. This not only reflects the complexity and arduousness of China's environmental governance path but also calls for more meticulous legal construction and practical exploration (Wu, 2021).

Moreover, within the framework of international law, particularly regarding the transboundary movement of plastic waste, China, as a signatory to the Basel Convention, has made significant progress in fulfilling its obligations under the treaty (Kerueger, 2001). The formal entry into force of the "Basel Convention Amendment on Plastic Waste" in 2021 marked a stricter phase of international regulation on plastic waste. This development has provided strong international legal support for developing countries to formulate and implement corresponding environmental protection policies. In fact, even before the amendment took effect, China had already actively responded to global environmental trends. Since 2019, based on the "Implementation Plan for the Reform of the Management System for the Import of Solid Waste by Banning Foreign Garbage" issued by the State Council in 2017, China has completely banned the import of plastic waste, demonstrating the country's determination and action in the field of environmental protection (Wang and Chen, 2022). However, it is notable that, despite the continuous improvement of the international legislative system, China's domestic legal regime in plastic waste management has demonstrated a certain degree of retardation. As of now, China has not promulgated any substantive laws specifically targeting plastic waste. This current situation undoubtedly constitutes a challenge in strengthening the binding force of the law and enhancing the efficiency of law enforcement, highlighting the urgency for domestic legal system construction to keep abreast of international standards and evolve with the times. Therefore, China needs to continue to deepen its legal reform and address the complex challenges brought about by plastic waste management with a more refined legal system.

Consequently, this article aims to conduct an in-depth analysis and exploration of the numerous issues and challenges that China's legal system encounters in the process of responding to the supervision of plastic waste, striving to reveal the complexity of its internal mechanisms and external influences. On this basis, this article will further offer a series of forward-looking and feasible recommendations and governance concepts of philosophical depth for China's legal construction in the domain of plastics. Through this series of endeavors, we anticipate being able to provide solid theoretical support and practical guidance for advancing the legalization process of plastic waste management in China.

2. Plastic waste pollution in China

In May 2023, the United Nations Environment Programme (UNEP) released its latest in-depth research report titled Turning off the Tap: How the World Can End Plastic Pollution and Create a Circular Economy (Fletcher et al., 2023). This report profoundly reveals the severe damage that plastic pollution inflicts on human health and the global ecological environment. According to statistics, globally, the total annual production of plastics amounts to approximately a colossal 430 million tons, among which an astonishing 139 million tons are disposable plastic products. The rampant use of such products undoubtedly exacerbates the complexity and

arduousness of plastic pollution governance to a great extent, constituting the primary crux of the plastic pollution problem. Even more alarmingly, scientific research has confirmed that the marine ecology is being indirectly infringed upon by plastic garbage. Marine animals and seabirds are encountering survival threats due to mistakenly ingesting plastic. It is predicted that by 2050, up to 99% of seabirds will be detected to have microplastics within their bodies, a datum that is shockingly disturbing (Wilcox et al., 2015). What is even more serious is that studies point out that even in the depths of the Atlantic Ocean, far removed from human activities and the hinterland of the continents, high concentrations of plastic debris can be detected. This discovery not only shatters the traditional perception that plastic pollution is directly correlated with population density but also indicates that plastic pollutants have presented a ubiquitous and global severe situation, posing unprecedented challenges to the future of humanity and the entire biosphere (Kuhn et al., 2015).

Furthermore, the investigation into the interrelationship between plastic waste and human health has progressively emerged as a prominent focus in the academic domain. Such inadequately treated plastic waste has a high propensity to permeate the human body through multiple pathways and subsequently accumulate in crucial organs like the lymphatic system, liver, and brain. Relevant research indicates that this phenomenon might intensify the risks of human beings contracting cardiovascular diseases, inflammatory responses, and respiratory disorders (Vethaak and Legler, 2021). These plastic microparticles that are readily absorbed by the human body mainly stem from improper disposal practices of plastic waste. Notably, China, being a major global producer of plastics, still witnesses relatively rare instances of direct recycling for safe disposal of plastic waste. According to statistics, approximately 70% of plastic waste is dealt with directly through measures such as landfill, incineration, or haphazard discarding (Li et al., 2022). This not only aggravates environmental pollution but also accentuates the severity of the plastic pollution issue. Hence, the current status of plastic pollution in China urgently demands heightened attention, and effective measures must be adopted to enhance the supervision and management of the correct disposal of plastic waste, thereby blocking the access of plastic pollutants to the natural environment from the source, with the aim of attaining the dual goals of environmental protection and safeguarding human health.

2.1. Plastics production in China

Since the birth of the People's Republic of China, throughout the lengthy historical course, China did not hold a dominant position in plastic production and usage. Nevertheless, with the successful implementation of the economic policy of reform and opening up, within merely over four decades, by 2017, China had ascended to become a mainstay in global plastic product manufacturing, with its annual output accounting for 30% of the world's total, achieving an astonishing growth of over 150 times (Ning, 2020). After weathering the three-year ordeal of the COVID-19 pandemic, the production potential of China's plastics industry remains profound and continues to play an indispensable role in fulfilling the daily demands of the nation's populace. At present, China's plastic products not only enjoy a stable

development in traditional domains such as agriculture, automotive manufacturing, household appliances, medical and health care, but are also gradually exploring and exploiting new market opportunities in emerging and high-end fields such as new energy, new materials, optics, and communications (China Plastics Processing Industry Association, 2023). According to prospective studies and predictions, by 2040, the output of plastic products in China is projected to reach 340 million tons, more than tripling the output compared to 2017, suggesting that plastic production is likely to maintain a rapid growth trend for some time in the future (Li, 2022). In 2021, the China Plastics Processing Industry Association released the "Guiding Opinions on the 14th Five-Year Development Plan for the Plastics Processing Industry", which provides directional guidance for the development of China's plastics processing industry over the next five years and serves as an action blueprint for various sectors within the industry. The guiding opinions emphasize that China's plastics industry must accelerate its transformation and upgrading amidst an environment of both opportunities and challenges. By continuously fostering technological innovation to spark new growth momentum and promoting the establishment of a high-standard market system, the document aims to drive China's transition from a major plastics manufacturing country to a global leader in plastics manufacturing (Xie, 2021). However, the environmental protection requirements and plastic waste management issues that have been drawing increasing public attention still constitute the most severe tests and challenges for China's plastics industry. Whether the established goals can be genuinely achieved, the efficacy of plastic pollution prevention and governance will serve as a crucial metric. This demands that on the development path of the plastics industry in China, not only should economic benefits be pursued, but also environmental protection should be taken into account to achieve sustainable development.

2.2. The influence of plastic waste in China on social life

The total amount of plastic waste generated in China every year is approximately 40 million tons, among which domestic plastic waste and agricultural plastic waste constitute its main components (Xue et al., 2022). In-depth research indicates that in regions with a relatively developed economy in China, the proportion of domestic plastic waste in daily garbage is particularly remarkable. Behind this phenomenon lies the vigorous rise of modern service industries such as takeout services and express delivery businesses in these areas. The concomitant large quantities of disposable plastic packaging waste have thereby exacerbated the generation and accumulation of plastic waste (Wei et al., 2018). This finding not only reveals the close connection between economic development and plastic consumption but also reflects the potential pressure that modern lifestyles exert on the environment.

In recent years, accompanied by the extensive application of food ordering applications, the food delivery service in China has undergone an unprecedentedly rapid growth. Nevertheless, this enhancement in convenience has also given rise to the environmental pollution challenge induced by takeaway plastic meal boxes. Back in 1986, the peripheral areas of Chinese train stations were already beset by plastic

waste pollution. A large number of passengers' casual discarding of disposable plastic meal boxes severely undermined the local ecological environment and the quality of life of residents. This phenomenon was vividly termed "white pollution" by the academic circle (Hu et al., 2001). Despite the fact that the government adopted a series of governance measures at that time, effectively alleviating the severe situation of "white pollution", with the current resurgence of the food delivery industry, the governance issue of plastic waste has once again come to the fore in the purview of the Chinese people. According to authoritative research data, the food delivery industry in China achieved a remarkable growth of nearly 40% in 2019 (Chinese Journal of Food, 2020). Approximately 50% of internet users, that is, roughly 500 million people, frequently ordered food delivery services. This massive consumption base has resulted in the discarding of approximately 65 million takeaway plastic meal boxes in China every day, and the total amount is sufficient to cover an area of 168 standard football fields, vividly revealing the severity of the plastic waste problem (Zhang et al., 2018). Moreover, the majority of plastic products currently circulating in the Chinese market are made from non-biodegradable materials, primarily consisting of expanded polystyrene (EPS), polyvinyl chloride (PVC), polyethylene (PE), and polypropylene (PP). These materials have an extremely long natural degradation cycle, taking at least 200 years, which further exacerbates the complexity and persistence of the plastic pollution problem (Qu, 2010).

Similar to discarded plastic lunch boxes, discarded plastic bags, as a major constituent of environmental pollution caused by plastic waste in China, are also regarded as one of the core sources of "white pollution" (Zhou and Wang, 1999). To address this issue, the Chinese government issued the "Notice on Restricting the Production, Sale, and Use of Plastic Shopping Bags" in 2007, which explicitly banned the free provision of plastic bags in markets and other public places, aiming to curb their excessive use and misuse. This initiative, widely known as the "Plastic Ban", was a significant step forward (Cao, 2022). However, the 2018 "Survey Report on the Implementation of the 'Ten-Year Plastic Ban' by Businesses" revealed a grim reality: only 3.7% of Chinese businesses strictly adhered to the policy since its implementation, indicating that the "Plastic Ban" faced major challenges at the enforcement level and had far from achieved its expected results (Wang and Du, 2022).

In light of this, in 2020, China's National Development and Reform Commission and the Ministry of Ecology and Environment jointly issued the "Opinions on Further Strengthening Plastic Pollution Control", marking the beginning of the "New Plastic Ban" era. This policy actively promotes the use of new biodegradable plastic bags in an effort to reduce environmental pollution. Nonetheless, the effectiveness of the "New Plastic Ban" in terms of public awareness and adoption has been less than satisfactory. Survey data shows that 25% of the public was completely unaware of this new policy, and nearly 50% of respondents expressed unwillingness to purchase the recommended environmentally friendly biodegradable plastic bags, which are relatively more expensive (Wang et al., 2021). This phenomenon reflects that, despite clear policy guidance, the problem of plastic bags as a source of environmental pollution has not been fundamentally resolved,

and it remains a formidable challenge in the field of plastic waste management, requiring more comprehensive and in-depth strategies and measures to deal with.

Furthermore, in the agricultural domain, agricultural plastic film has currently emerged as an indispensable and crucial equipment in China's rural production system. Nevertheless, its advent has concurrently given rise to the prevalently existing "white pollution" issue. In agricultural production, the application of plastic film not only significantly facilitates the planting process of grain crops but also conspicuously enhances production efficiency (Luo, 2022). It effectively shortens the reproductive cycle of crops, enabling the production of grain crops in non-traditional planting areas and thereby providing a novel approach to construct a competitive advantage for agricultural development and progress. Nevertheless, the improper handling of plastic film post-usage poses a latent threat to agricultural soil. These abandoned plastic wastes not only induce water loss in the soil, thereby influencing the normal growth of crops, but also the toxic substances contained therein have the potential to be absorbed by crops and ultimately passed on to humans through the food chain, posing risks to public health (Zhou, 2016). According to pertinent data, the current correct recovery rate of agricultural plastic film in China merely amounts to 50%, signifying that nearly half of the plastic film is persistently exerting negative impacts on the environment (Luo, 2022). Of particular severity is that when these plastic films are randomly discarded in farmlands, they will gradually disintegrate into minute plastic particles. The prolonged retention of these harmful substances in the soil might require several decades for complete degradation, which grossly contravenes the fundamental principles and requirements of the sustainable development of China's farmland ecosystem (Guo, 2023).

The several typical types of white pollutants mentioned above share several common features. The primary one is that they are often disposed of carelessly and are not incorporated into adequate and efficient recycling and reuse systems. Secondly, these substances demonstrate extreme recalcitrance to decomposition in the natural environment. Even after a prolonged period of degradation, they give rise to harmful chemicals and microplastic particles. Ultimately, the presence of these pollutants not only erodes the environmental matrix on which human beings rely but also harbors latent risks to human health. As depicted in **Figure 1**, once such plastic wastes permeate the ecological environment, they tend to accumulate in the soil layer and water bodies. The harmful components and microplastics released by them can reach and accumulate in the human body through the intricate food chain mechanism, posing a substantive threat to health. Further, even when recycling measures are adopted, the traditional incineration treatment approach is not a panacea as it releases harmful gases. Once absorbed by the human body, it undoubtedly adds additional health risks. Therefore, confronted with the disposal predicament of an annual 63 million tons of waste plastics in China, if effective management and disposal cannot be achieved, the potential implications for national health would be incalculable and profound (Xinhua News, 2024). These plastic remnants not only exist in food as microplastics but are also widely distributed in water and air, thereby making food intake, respiration, and skin contact the primary routes for human exposure to the microplastic environment.

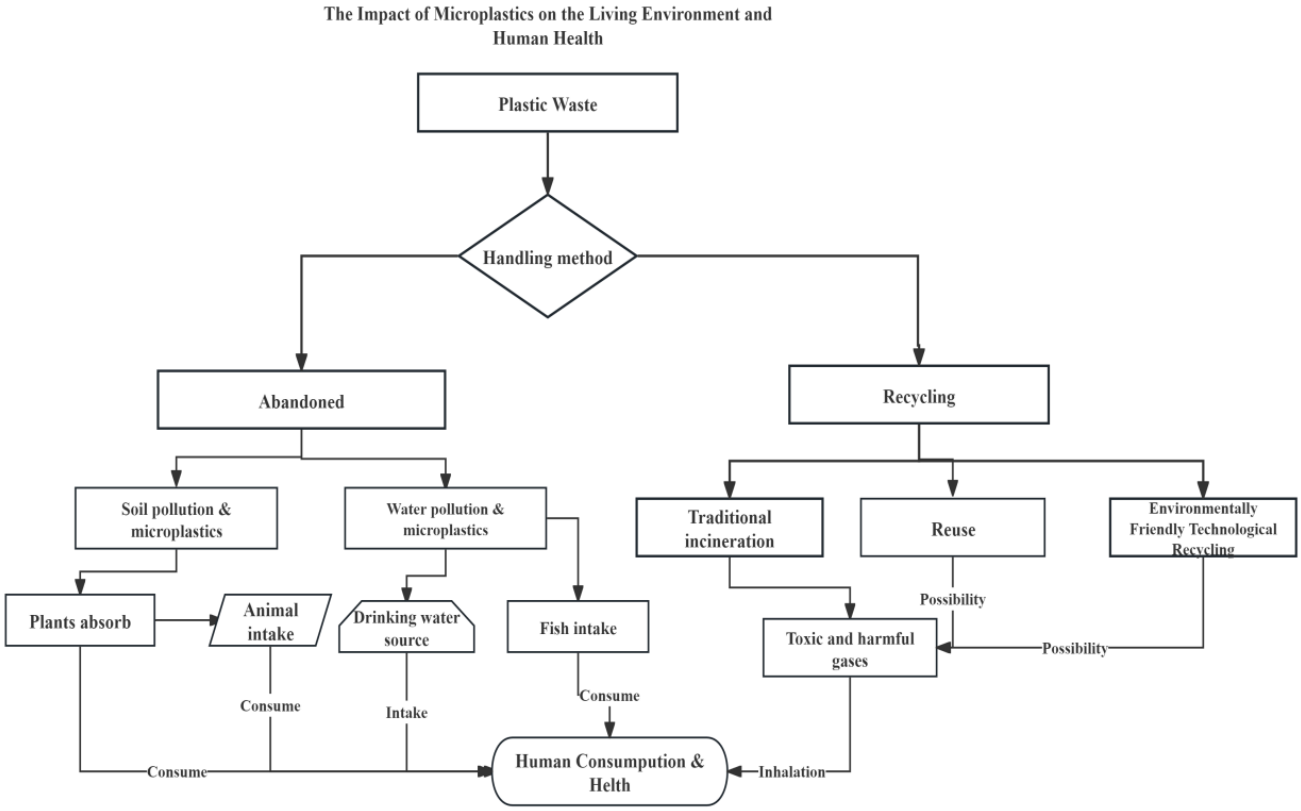


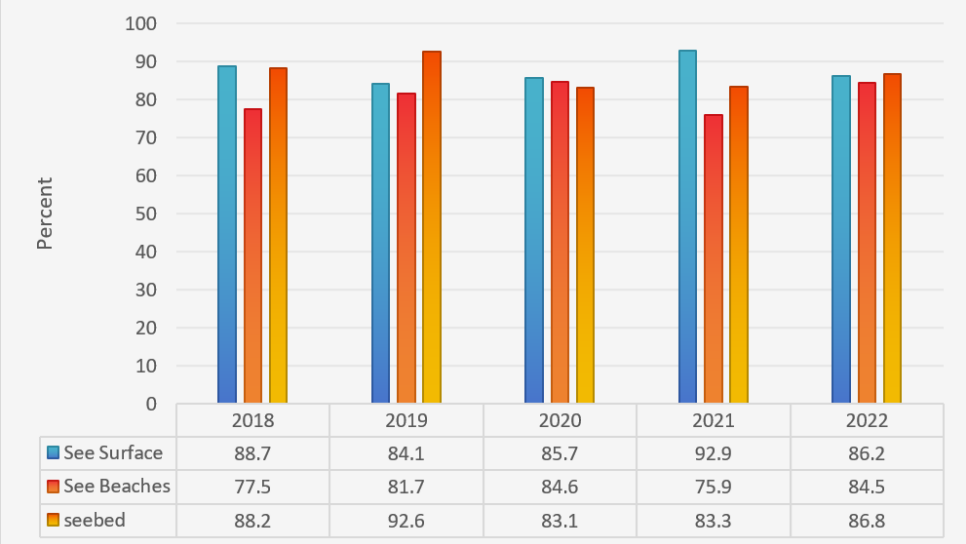
Figure 1. The impact of plastic waste on human living environment and physical health.

To sum up, the current state of plastic waste in China has pervasively permeated every domain of social life, manifesting the extensiveness of its application, the inefficiency of its recycling, the limited value of its reuse, the laxity of the regulatory mechanism, and the propensity to be discarded at will. This array of problems interweaves to constitute the complex challenge of plastic waste management. Further, these plastic wastes continuously accumulate in the environment and gradually disintegrate into plastic debris and even microplastics, posing a latent threat to the equilibrium of the ecosystem and concurrently bringing non-negligible risks to human health and agricultural security. The extensive dissemination of plastic debris and microplastics not only undermines the purity of the natural environment but also potentially transmits through the food chain, exerting long-term influences on the survival and development of humans and other organisms. Hence, in the face of the multiple challenges brought about by plastic waste, there is an urgent need to construct a comprehensive, systematic, and highly efficient plastic waste management system to enhance the recycling efficiency, facilitate reuse, intensify the regulatory strength, and fundamentally alter the public's attitude and behavior towards plastic usage, thereby effectively containing plastic pollution and safeguarding the sustainable development of the ecosystem and human health.

2.3. The impact of plastic waste on China's marine environment

The plastic waste pollution in the surrounding seas of China is extremely severe. Research indicates that China, as a populous and economic giant, is also the largest

source of marine plastic pollution. Each year, the plastic waste flowing into the ocean from China accounts for one-third of the total plastic waste discharged into the ocean by all coastal countries worldwide (Jambeck et al., 2015). As depicted in **Figure 2**, as of the publication date, plastic has been the primary pollutant of marine waste in China over the past five years. Particularly on the ocean surface and seabed, plastic waste has consistently accounted for over 80% for many years. Even though the proportion has fluctuated, it still presents an upward trend. This implies that China's pollution control efforts regarding marine plastic waste over the past five years have been unsuccessful or even stagnant. Undeniably, the ineffective regulatory policies are intensifying the threat of plastic waste to China's marine environment. If we continue to disregard the escalating proportion of marine plastic waste without reflection, as Zac Goldsmith, the UK's Minister for the Pacific and the Environment, stated, the plastic waste we have forgotten and discarded will ultimately become the legacy we have to confront (Earth.ORG, 2021). In fact, plastic pollution has already exerted a negative influence on the survival of marine organisms. For instance, it is estimated that 300,000 cetaceans, including whales, dolphins, and porpoises, die each year due to entanglement in fishing nets and ropes, the majority of which are plastic products (Johnson, 2021). Simultaneously, a group of scientists from Stanford University conducted an extensive study on the plastic intake by fish and discovered that the rate of plastic intake by fish has doubled over the past decade, growing at an annual rate of 2.4% (Backman, 2021). Evidently, plastic pollution has become a pervasive problem in the entire marine ecosystem and may indirectly imperil human health. These studies and findings also serve as a warning for the development of China's marine fishery and the stability of its coastal ecosystem.



	2018	2019	2020	2021	2022
See Surface	88.7	84.1	85.7	92.9	86.2
See Beaches	77.5	81.7	84.6	75.9	84.5
seebed	88.2	92.6	83.1	83.3	86.8

Figure 2. The proportion of plastic waste in the sea surface, beaches, and seabed in China from 2018 to 2022.

Source: China's Ministry of Ecology and Environment, China Marine Ecological Environment Report from 2018 to 2022.

Furthermore, the microplastic pollution in the ocean is highly severe. Microplastics refer to plastic microparticles formed in the environment through

specific means (Thompson, 2015). Research has indicated that microplastic ocean pollution in China has become ubiquitous, encompassing nearly all Chinese waters (Wang et al., 2018). Even in coastal mudflats and submarine sediments, microplastics can be detected. Moreover, in some coastal areas of China's nearshore, the concentration of microplastics has exceeded international levels (Wang et al., 2018). In reality, the impact of microplastic pollution is no less than that of large-scale plastic pollution; in fact, it even has certain toxic effects on marine organisms, influencing their survival and health (Kershaw and Rochman, 2015). When the quantity of microplastics increases, marine organisms, especially those small ones that feed on plankton, are likely to mistakenly take microplastic particles as food. This can cause physical or chemical harm to these organisms. For instance, plastic particles can not only clog the intestinal tract and scratch the body but also potentially trigger various inflammatory reactions in the internal organs (Setala et al., 2016). Additionally, it has been discovered that microplastics have the capacity to adsorb heavy metals, meaning that marine organisms may ingest microplastics, thereby allowing heavy metals to enter their bodies (Rochman et al., 2013).

It is worrisome that China is a traditional major fishing country, and the consumption of seafood products has a history of thousands of years. The data released by the Ministry of Agriculture and Rural Affairs of China in 2023 indicates that the total marine fishing catch in China amounted to 9.5 million tons in 2022 (Ministry of Agriculture and Rural Affairs, Fishery and Fisheries Administration Bureau of the People's Republic of China, 2023). Simultaneously, China is the largest consumer of marine products. In 2019, the average annual seafood consumption per person among the 1.4 billion Chinese was 30 kilograms. Even in 2020, the year when the COVID-19 pandemic was most severe, the average consumption still reached 27 kilograms per person (Shangyou News, 2021). Meanwhile, some marine organisms that might be contaminated by microplastics are posing health risks to the Chinese population. Hence, for China, which has long regarded seafood as a food source, it is necessary to heighten vigilance against microplastic pollution in the ocean.

3. The impact of the Basel convention on the control of transboundary movements of hazardous wastes and their disposal on China's plastic waste management

3.1. Basic situation and concepts

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (hereinafter referred to as the Basel Convention) was established in 1989, aiming to create a global regulatory framework to govern the transboundary movement of hazardous wastes from one jurisdiction to another (Hackett, 1989). As the first international agreement to formally incorporate the international transfer of hazardous waste into the governance framework of international law, the "Basel Convention" holds milestone significance. The convention defines three core objectives: firstly, to reduce the generation of hazardous waste at its source; secondly, to impose strict control over the

transboundary transportation of waste; and thirdly, to ensure that waste is disposed of in a manner that does not harm environmental health. These three objectives not only provide fundamental guidelines for the international transfer of hazardous waste but also offer profound guidance and philosophical insights for the development and improvement of waste management laws in the member states. This demonstrates the international community's shared commitment and determination in the fields of environmental protection and sustainable development (Wang and Chen, 2022).

However, the vigorous rise of global trade, while driving plastic production capacity and cross-border transactions to unprecedented prosperity, has also quietly incubated a severe challenge of global plastic waste environmental pollution. Plastic, a product of modern civilization, has quietly risen to the third place among global waste sources. Its growth trajectory shows a significant positive correlation with the expansion of the world's population and the increase in personal consumption rates, mirroring the increasingly tense interaction between human activities and the natural environment (Chen et al., 2021). The root cause of this predicament lies not only in the extensive circulation and exchange of plastic products within the global trade network but, more profoundly, involves the complex phenomenon of cross-border transfer of plastic waste from global northern countries to southern countries, further intensifying the multi-dimensionality and complexity of the issue (Parajuly and Fitzpatrick, 2020). Such transfer behavior undoubtedly imposes an extra burden on the receiving countries in both social development and environmental protection, thereby triggering a cross-border plastic environmental pollution crisis. This is not only a severe test for the current global environmental governance system but also a profound call for the common destiny of humanity and the profound philosophy of the concept of sustainable development (Thapa et al., 2023).

In response to the aforementioned challenges, the Norwegian government took the lead by submitting a forward-looking proposal to the Secretariat of the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (referred to as the "Basel Convention")". This proposal suggested the removal of clause B3010 (related to solid waste) from Annex IX of the convention and the innovative inclusion of clause Y48 in Annex II to specifically address the issue of plastic waste. Although the proposal underwent multiple rounds of in-depth negotiations, discussions, and some revisions, it was ultimately adopted at the 14th Conference of the Parties to the "Basel Convention" in 2019 and became legally binding on member states on 1 January 2021. This revision was historically referred to as the "Basel Convention Plastic Waste Amendment" (Wingfield and Lim, 2022).

Compared to Norway's original submission, the amendment added the A3210 listing in Annex VIII, which is a key supplement that helps clearly define which plastic wastes should be considered hazardous, ensuring that such wastes must comply with the prior informed consent procedures outlined by the "Basel Convention" during transboundary movements. This strengthens the implementation of ecological sustainability principles, ensures strict compliance with packaging and labeling standards, and guarantees that the obligation for re-importation, when necessary, is duly fulfilled (Wang and Chen, 2022). Additionally, the amendment innovatively revised Annex IX by replacing the original clause B3010 with B3011,

which clearly defines the types of plastic waste presumed to be non-hazardous and exempt from the prior informed consent procedure (Wingfield and Lim, 2022).

The revisions to Annex II also provided flexibility for member states, allowing them to establish stricter classification standards or control measures based on these guidelines. These innovative provisions reflect the core intent of the "Basel Convention Plastic Waste Amendment": by imposing stricter legal regulations on the international transport of plastic waste, the amendment not only provides a solid legal foundation for current global environmental governance but also leaves room for more stringent measures in the future. It highlights the wisdom and determination of the international community in addressing global environmental challenges.

3.2. The impact of the Basel convention on China

Throughout the development and evolution of the "Basel Convention", China has actively participated with a proactive attitude and a deep sense of responsibility. The country's rigorous and cooperative approach to controlling the transboundary movement of hazardous waste aligns closely with its current government's strategy of promoting sustainable development. This not only demonstrates China's deep commitment to ecological protection and the global governance system but also reflects the nation's practical wisdom and determination in advancing global environmental security. In fulfilling its obligations under the Basel Convention, China has consistently strengthened its capacity-building efforts. Domestically, it has established an extensive network of infrastructure for the recycling and reuse of hazardous and other wastes, promoted environmentally sound management practices, and gradually built a comprehensive legal framework to prevent plastic waste pollution (Duan and Li, 2020). Notably, after the "2019 amendments to the Basel Convention regarding plastic waste" were adopted, China, alongside Japan and the UK, led international discussions on developing guidelines for the identification, environmentally sound management, and disposal of plastic waste (Wang and Chen, 2022). Additionally, through the implementation of the "Action Plan for Prohibiting the Entry of Foreign Garbage and Promoting Reform in the Management of Solid Waste Imports", China explicitly banned the transboundary movement of plastic waste. "Article 4" of the Basel Convention profoundly emphasizes the importance of environmentally sound management of hazardous and other wastes, urging member states to take the necessary measures to ensure that waste management and disposal activities meet the broader goals of protecting human health and the environment. In this context, China, drawing on "Annex I" of the Basel Convention, compiled the "First Edition of the National Catalogue of Hazardous Wastes" and issued the "Hazardous Waste Identification Standards", providing a scientific basis for the precise identification and standardized management of hazardous wastes. Moreover, in advancing the process of environmentally sound waste management, China has introduced a series of laws and regulations, including the "Regulations on the Administration of Hazardous Waste Operating Licenses", "Regulations on the Management of Medical Waste", and the "Regulations on the Recycling and Disposal of Waste Electrical and Electronic Products", along with corresponding pollution control standards, thereby forming a relatively comprehensive legal system.

Provinces and cities such as Shanghai and Tianjin have actively responded by enacting local hazardous waste management regulations, further refining and reinforcing regional management measures. This reflects China's all-encompassing and multi-level governance approach to environmental protection.

China has demonstrated remarkable determination and initiative in promoting the construction of hazardous waste and other waste treatment facilities. As early as 2003, the State Council approved and implemented the "National Plan for the Construction of Hazardous Waste and Medical Waste Disposal Facilities". Subsequently, in 2004, the former State Environmental Protection Administration, in collaboration with the National Development and Reform Commission, jointly issued the "Notice on the Issuance of the National Plan for the Construction of Hazardous Waste and Medical Waste Disposal Facilities", which explicitly proposed investing 14.92 billion yuan over the next three years to build 31 comprehensive hazardous waste centralized disposal facilities and 300 medical waste centralized disposal facilities. This was aimed at establishing a nationwide network for the safe disposal of hazardous and medical waste (BCRC China, 2023). Fast forward to April 2020, the National Development and Reform Commission, together with the National Health Commission and the Ministry of Ecology and Environment, issued the "Implementation Plan for the Capacity Building of Medical Waste Centralized Disposal Facilities". This plan not only provided detailed arrangements for accelerating the optimization of medical waste treatment facilities and establishing a sound system for the collection, transportation, and disposal of medical waste, but also urged regions across the country to expedite the construction of projects. The goal was to comprehensively enhance the capacity for medical waste disposal, ensuring a swift and efficient response to public health emergencies, thereby protecting the lives, health, and environmental safety of the people.

In addition, in adherence to the spirit of the "Basel Convention", the People's Republic of China established the "National Environmental Protection Agency's Waste Import Registration and Management Center", marking a significant step forward in China's international cooperation on waste management. Building upon this foundation, in 2006, the "Solid Waste Management Center of the National Environmental Protection Agency" was established. Later, in 2019, in response to evolving needs and functional optimization, it was renamed the "Solid Waste and Chemicals Management Technology Center of the Ministry of Ecology and Environment", assuming the role of technical support and think tank for solid waste management at the national level. Meanwhile, this system expanded downward, gradually establishing a network of provincial and municipal solid waste management centers across the country, achieving multi-level penetration and reinforcement of the management mechanism. In summary, the "Basel Convention" has not only provided China with a solid international legal framework and guiding principles for its waste management system but has also stimulated innovation and progress in China's waste management legislation and practices. It has become a powerful driving force for achieving environmental protection and sustainable development goals, reflecting the profound philosophy of the positive interaction between international conventions and domestic actions.

4. Overview of the current plastic waste legal system in China

4.1. Key term definition

4.1.1. Plastic waste

Generally speaking, plastic waste refers to discarded materials that contain plastic components. According to the amendment to the Basel Convention on plastic waste, such waste is precisely classified into two major categories: non-hazardous plastic waste and hazardous plastic waste. In reference to China's "Regulations on the Recycling and Reuse of Waste Plastics", the scope of plastic waste is clearly defined as discarded plastic products and their raw materials, including by-products, scraps, and defective products generated during the processing of plastic raw materials and the production of plastic products (Liu, 2020). Given the inherent properties of plastic materials, even so-called non-hazardous plastic waste may degrade into microplastic particles in the environment. As previously mentioned, microplastics have become a significant factor threatening the ecological environment and public health. Therefore, when conducting an in-depth analysis of China's legal framework for the regulation of plastic waste, this paper adopts a broader qualitative perspective, treating plastic waste as a general term for all discarded materials containing plastic components.

4.1.2. Recycling of plastic waste

In China, according to the "Technical Specifications for Pollution Control of Waste Plastic Recycling and Reuse" (HJ/T 364), waste plastic recycling is defined as the systematic collection of waste plastics generated from consumer activities, production processes, and various social activities, with the goal of promoting resource recycling and regeneration. However, this definition framework is somewhat limited, as it does not fully account for the complex destinations and fate of plastic waste after recycling. In reality, not all recycled plastics can directly return to the production chain for material reuse; some plastic waste undergoes specialized treatments, such as incineration for energy recovery or environmentally safe landfill disposal, which are also part of the recycling process. In light of this, the "National Standard for Guidelines on Recycling and Reuse of Plastic Waste" (GB/T 30102-2024), issued in 2024, adopts a more comprehensive and insightful approach by categorizing plastic waste recycling into two major types: material recovery and energy recovery. This paper agrees with this classification, arguing that plastic waste recycling should be viewed as a holistic process encompassing everything from waste collection to various post-recycling treatment paths, including but not limited to material regeneration and energy conversion. This not only broadens the boundaries of the recycling concept but also deeply reflects the pursuit of maximizing resource value under the circular economy model.

4.2. The current state of legal regulatory systems

Table 1. Core provisions of China's national laws and administrative regulations on plastic waste management.

National Laws	**Main Provisions**
Environmental Protection Law of the People's Republic of China. (2014 Revision)	The general principles of environmental protection. It is prohibited to apply solid waste or wastewater to farmland if it does not meet agricultural standards and environmental protection standards. Governments at all levels shall coordinate the collection of solid waste.
Solid Waste Pollution Environment Control Law of the People's Republic of China. (2020 Revision)	Article 44: Avoid overpacking Article 65: Pesticide films and pesticide packaging Article 68: Packaging design and manufacturing Article 69: Disposable plastic products
Water Pollution Prevention and Control Law of the People's Republic of China. (2017 Revision)	It is prohibited to pile up and store solid wastes and other pollutants on the beaches and slopes of rivers, lakes, canals, channels and reservoirs below the line of the highest water level.
Marine Environmental Protection Law of the People's Republic of China. (2023 Revision)	Article 56: Preventing solid waste from entering the sea Article 63: Prohibition of new production projects in the coastal land area that do not comply with the national industrial policy Article 71: No individual or non-approved unit may dump any waste into the maritime areas under the jurisdiction of the People's Republic of China.
Circular Economy Promotion Law of the People's Republic of China (2018 Revision)	Article 15: Enterprises producing products or packaging included in the list of mandatory recycling must be responsible for the recycling of discarded products or packaging; for those that can be utilised, the production enterprises shall be responsible for their utilisation; for those that are unsuitable for utilisation due to the lack of technological and economic conditions, the production enterprises shall be responsible for their environmentally sound disposal. Article 37: The State encourages and promotes waste recycling systems.
Administrative regulations and policy documents	**Main Provisions**
Urban Domestic Waste Management Regulations (2007)	The management of urban household waste is based on the principles of reduction, resourcing and harmlessness, and on the principle of whoever generates it is responsible for it in accordance with the law. It also encourages the full recycling and rational use of urban domestic waste.
Notice on Restricting the Production, Sale, and Use of Plastic Shopping Bags (2008)	Prohibition of the production, sale and use of ultra-thin plastic shopping bags Implementation of a system of paid use of plastic shopping bags Strengthening the supervision and inspection of the restriction on the production, sale and use of plastic shopping bags Improving recycling of waste plastics
Regulations on Pollution Prevention and Control in the Processing and Utilization of Waste Plastics (2012)	Scrap plastics processing and utilisation activities in the People's Republic of China must comply with the requirements of this regulation.
Opinions on Further Strengthening the Control of Plastic Pollution (2020)	By 2025, the management system for the production, circulation, consumption and recycling and disposal of plastic products will be basically established ..... Plastic pollution is effectively controlled. Prohibition, restriction of production, sale and use of some plastic products. Promoting the application of alternative products and models Regulating the recycling and disposal of plastic waste Improvement of the support and guarantee system

Source: Environmental Protection Law of the People's Republic of China. Solid Waste Pollution Environment Control Law of the People's Republic of China. Water Pollution Prevention and Control Law of the People's Republic of China. Marine Environmental Protection Law of the People's Republic of China. Circular Economy Promotion Law of the People's Republic of China. Urban Domestic Waste Management Regulations. Notice on Restricting the Production, Sale, and Use of Plastic Shopping Bags. Regulations on Pollution Prevention and Control in the Processing and Utilization of Waste Plastics. Opinions on Further Strengthening the Control of Plastic Pollution.

In the realm of substantive law, China's legislative bodies appear to have yet to place sufficient emphasis on the issue of plastic waste management, with only limited mentions in certain laws and policy documents closely related to

environmental protection. Specifically, at the national legal level, laws such as the "Environmental Protection Law of the People's Republic of China", the "Law on the Prevention and Control of Environmental Pollution by Solid Waste", the "Water Pollution Prevention and Control Law of the People's Republic of China", the "Marine Environmental Protection Law of the People's Republic of China", and the "Circular Economy Promotion Law" all touch upon the issue of plastic waste management to varying degrees. At the level of administrative regulations and policy documents, the "Regulations on the Management of Urban Domestic Waste", the "Opinions on Further Strengthening Plastic Pollution Control", the "Regulations on Pollution Prevention and Control in Waste Plastic Processing and Utilization", and the "Notice on Restricting the Production, Sale, and Use of Plastic Shopping Bags" also include provisions related to the control of plastic waste. However, these legal provisions are scattered across multiple laws and regulations, creating a fragmented state, which may pose certain challenges and confusion in legal practice.

The "Environmental Protection Law of the People's Republic of China", as a comprehensive law encompassing various aspects of environmental protection, is centered on maintaining the overall equilibrium and sustainable development of the ecological environment. Nevertheless, it is notable that the specific treatment and disposal mechanisms for plastics are not explicitly defined in the legal text. The content primarily focuses on expounding on the fundamental conceptual framework of environmental protection, institutional establishment, supervision and management mechanisms, pollution prevention and control strategies, and legal obligations at the macro level, providing overarching guiding principles and legal bases for environmental protection endeavors. As clearly demonstrated in **Table 1**, although the law pays significant attention to the prevention and disposal of solid waste, plastic waste is merely categorized broadly within the generalized category of "solid waste" and has not received more meticulous and specialized legal regulations.

Therefore, to address the environmental challenges posed by "solid waste", China formally adopted and promulgated the "Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste" in 1995. This law underwent its fourth revision in 2020 in an effort to continuously adapt to the new requirements of environmental protection. Through an in-depth review of the content in **Table 1**, it can be observed that in this law, the specific term "plastic waste" and its concept are not explicitly referred to. Instead, only explicit legal regulations have been made for the control of disposable plastic products. Meanwhile, the law has put forward several guiding principles regarding the use and recycling of packaging materials. These provisions can, in a broad sense, be interpreted as covering plastic packaging materials, although not directly named. Thus, it can be seen that for the specific category of "plastic waste", this law has not formulated an independent and specific treatment plan or regulatory measure, reflecting the limitations of legislation at that time in the management of plastic waste and the need for further improvement in the future.

In the text of the "Water Pollution Prevention and Control Law of the People's Republic of China", the specific term "plastic waste" does not directly manifest itself but remains implicitly subsumed under the broader concept of "solid waste". The

law merely stipulates relevant provisions in Article 38 regarding the collection, storage, transportation, utilization, and disposal of solid waste. Although these provisions can be indirectly associated with the treatment of plastic waste, they do not specifically elaborate on its characteristics. Likewise, within the framework of the "Law of the People's Republic of China on the Protection of the Marine Environment", the supervision of plastic waste is also classified within the category of solid waste. As presented in **Table 1**, although Article 63 of this law to a certain extent touches upon the field of plastic production, its content is largely general descriptions and lacks specific details, making it difficult to form effective and reasonable norms and constraints for plastic production activities.

The "Law of the People's Republic of China on Promoting Circular Economy" is a comprehensive legislation aimed at propelling sustainable economic development in China by giving equal weight to incentive mechanisms and regulatory measures to facilitate efficient utilization of resources and environmental protection. Within the framework of this law, several explicit stipulations regarding resource recycling have been made, embodying the specific application of the circular economy concept at the legislative level. Although "plastic waste" is not directly stipulated as an independent and explicit entity in the text of this law, its broad principles and guiding policies concerning resource recycling can still be regarded as having indirect legal guiding significance for the production and recycling activities in the plastics industry. These provisions offer potential legal support for the effective management of plastic waste and lay an initial legal foundation for the subsequent further development of regulations on plastic waste.

In China's administrative regulatory framework, the "Regulations on the Management of Urban Domestic Waste", issued in 2007, holds significant implications for plastic waste management. The principle of "whoever generates the waste is responsible for its disposal," established in this regulation, not only provides a fundamental guideline for waste management but can also be seen as an important part of the concept of plastic waste management, emphasizing the direct link between responsible parties and environmental protection. Subsequently, in 2008, China issued the "Notice on Restricting the Production, Sale, and Use of Plastic Shopping Bags", the country's first administrative regulation directly targeting plastic products, marking the birth of China's "Plastic Ban" (Wu, 2009). This regulation not only standardized the production, sale, and use of plastic shopping bags but also introduced an innovative paid-use system for plastic bags, aiming to reduce plastic consumption through economic incentives. However, the implementation results did not fully meet expectations, with the regulation largely regarded as a policy-oriented and educational legal document, reflecting the complex relationship between policy enforcement and practical needs. In 2012, the issuance of the "Regulations on Pollution Prevention and Control in Waste Plastic Processing and Utilization" further strengthened efforts to prevent environmental pollution during the processing and utilization of waste plastics. According to the analysis in **Table 1**, these regulations comprehensively cover waste plastic reprocessing activities within China, aiming to mitigate the adverse environmental impacts caused by these activities, reflecting a deeper and more refined approach to plastic waste management in the country. By 2020, China's Ministry of Ecology and Environment

and the National Development and Reform Commission jointly issued the "Opinions on Further Strengthening Plastic Pollution Control", a milestone policy document that the industry has referred to as the "New Plastic Ban." (Wang and Zhang, 2020). Compared to previous policies, this document is not only China's first comprehensive policy focusing on the prevention of plastic pollution, but it also has a broader scope, covering a wide range of plastic products. As shown in **Table 1**, the "New Plastic Ban" places greater emphasis on prohibition measures in its strategy, marking a significant shift in the Chinese government's approach to plastic waste management—from merely restricting usage to more stringent prevention and control measures. This demonstrates China's determination and proactive stance in addressing the challenges posed by plastic pollution.

As of the time of submission, local governments across China have also formulated a number of policies, action plans, and administrative regulations concerning the issue of plastic waste. These policies feature distinct characteristics in accordance with the economic development levels and management capabilities of different regions. Comparatively representative ones include: "Key Work Points of the 2022 Action Plan for Plastic Pollution Governance in Beijing", "Implementation Plan for Further Strengthening Plastic Pollution Governance in Shanghai", and "Implementation Plan for Plastic Pollution Governance in Jiangsu Province".

5. Problems with China's legal regime on plastic waste

5.1. Serious confusion in the plastic waste legal system

From the aforementioned analysis, it is not hard to discern that the legal framework and system in the field of plastic waste governance in China appears rather complex and lacks systematicity. Particularly prominent is that an accurate legal definition of "plastic waste" has not been clearly defined thus far, and it is mostly inclusively classified within the broad scope of "solid waste". Nevertheless, it must be pointed out that the traditional treatment methods for solid waste do not always perfectly apply to the specific nature of plastic waste. In view of this, relevant research indicates that there are significant differences in the environmental risks that may be triggered during the processing of plastic waste and conventional solid waste; specifically, if non-biodegradable means such as incineration are adopted, plastic is more prone to generating toxic substances, thereby constituting a severe threat to the ecological environment (Singh and Sharma, 2016). Even if the landfill approach is chosen in the expectation that plastic waste can naturally degrade, its inherent durability implies that this process will be protracted, potentially lasting for hundreds or even thousands of years. During this period, it will constantly decompose and generate minute plastic particles, undoubtedly exerting a persistent and profound influence on the environment (Chen et al., 2021). Although Articles 17, 43, and 60 of the "Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste" directly or indirectly emphasize the importance of waste classification prior to disposal, the reality in China is that the implementation of waste sorting has fallen far short of expectations. A large amount of recyclable plastic products is being wasted and not effectively utilized. Additionally, an in-depth exploration of the content of this legal provision reveals

that it employs more principle-based and advisory expressions. Coupled with the numerous deficiencies in China's specific systems and standards regarding plastic waste treatment, these factors collectively result in the law's incapacity and difficulty in exerting its due regulatory role when it comes to governing plastic waste, a specific type of solid waste (Zhu et al., 2022). Hence, both the legal and practical aspects of plastic waste management in China still await further refinement and innovation.

When discussing the "Water Pollution Prevention and Control Law of the People's Republic of China" and the "Law of the People's Republic of China on the Protection of the Marine Environment", it is not difficult to discover that in terms of the disposal strategies for plastic waste, these two laws essentially follow the treatment norms for solid waste. Despite the fact that their foci are respectively concentrated on the protection of inland waters and marine environments, regrettably, the relevant legal provisions have failed to fully differentiate between plastic waste and common solid waste, as well as the distinctive hazards posed by plastic waste. Of particular concern is that both laws have remained silent on the increasingly severe problem of microplastic pollution in water areas and have not explicitly addressed it. Further scrutiny of the "Law of the People's Republic of China on Promoting Circular Economy" reveals that, in dealing with plastic waste, this law leans towards employing an excessive number of guiding and macroscopic expressions. To a certain extent, this approach weakens the specificity and enforceability of legal regulations. What is even more serious is that this law is sometimes regarded as an embodiment of policy-oriented law, that is, policy intentions are endowed with the form of law, while the substantive content is more inclined towards policy guidance (Yu, 2019). The name of the law, 'Circular Economy', for example, refers more to a model of economic development centred on environmental protection and aimed at maximising the efficiency of resource use. Within the framework of the law, 'circular economy' is clearly defined as:

"Article 2: The circular economy referred to in this Law is a general term for the activities of reduction, reuse and resourcing in the processes of production, distribution and consumption....."

However, the addition of the word "promoting" to this definition renders the "Law on Promoting Circular Economy" deficient in the normativity that laws should possess. Just as some scholars have pointed out, the terminology of "circular economy + promoting" significantly reduces the enforceability, binding force, and safeguarding capacity of this law, making it more akin to a policy document with incentive measures (Xie, 2009). Although this law encompasses aspects such as waste utilization, industrial development, and government conduct, the chaotic logic and policy-oriented proclamations will undermine its institutional functionality in the governance of plastic waste and, conversely, impede the implementation of substantive laws related to plastic waste management.

In terms of administrative regulations, the policies and measures employed by various local provinces in China to address plastic waste pollution vary significantly. In the absence of substantive nationwide legislation on plastic waste, the implementation of plastic pollution control efforts in different regions is unbalanced, and the overall plastic pollution situation across the country remains pessimistic

(Ren, 2009). For instance, Beijing promulgated the "Administrative Measures of Beijing on Restricting the Sale and Use of Plastic Bags and Disposable Plastic Tableware" as early as 1999. However, it was not until 2022 that Shanxi Province in China began to implement a similar administrative regulation, namely the "Regulations of Shanxi Province on Prohibiting Non-biodegradable Disposable Plastic Products". Undeniably, economic factors are the primary cause of this disparity. The more developed regions have more comprehensive legal systems for governance, while less developed regions are inclined to develop their economies in a relatively lax regulatory environment. For example, the "Implementation Plan for Further Strengthening Plastic Pollution Control in Shanghai" released in 2020 by Shanghai has already determined to ban nearly all disposable plastic products and non-biodegradable plastic packaging materials by the end of 2023. Nevertheless, Article 3 of the "Regulations of Shanxi Province on Prohibiting Non-biodegradable Disposable Plastic Products" implemented in 2022 stipulates:

"Article 3 The prohibition and restriction of non-degradable single-use plastic products follows the principles of source control, comprehensive management, orderly promotion and public participation".

This "orderly advancement" and gradual manner are evidently relatively weak in plastic governance compared to Shanghai's determination. Furthermore, economic underdevelopment is not an excuse for a feeble legal system. Just as American economist Claudine Schneider states: "A healthy ecology is the basis of a healthy economy". (Marsh, 2023). This indicates that the prerequisite for economic development is the need for a favorable environmental ecology. Hence, such chaos in regional legal systems will undoubtedly impede the prospects of plastic waste governance and even give rise to regional environmental crises.

5.2. Too many policy documents have not been effective

From a broad perspective, both policies and laws undertake the core functions of social governance and rights protection. Herein, the flexibility of policies and the authoritative nature of laws complement each other and jointly act on the adjustment and equilibration of diverse social relationships. Under the current unique institutional framework of China, there exists a complex interaction between policies and laws. In social governance practices, the transformation of the legal efficacy of policies and the policy-oriented permeation of laws frequently manifest. During the process of interweaving and restricting each other, they jointly construct a framework of the policy and legal normative system with distinctive Chinese characteristics. Nevertheless, it is noteworthy that some American scholars have presented the view that multiple factors drive people to incline towards adopting policy tools to facilitate social governance (Li and Li, 2017). However, this approach might potentially, and even unconsciously, impede the flexible transformation and upgrading of governance mechanisms. This viewpoint resonates with the assertion of Feng Xingyuan, a Chinese scholar, who emphasizes that China's governance model often tends to employ administrative means as the primary tool (Campbell et al., 1991). Against this backdrop, policies are frequently endowed with functions and

roles similar to those of laws. This phenomenon profoundly reflects the specific logic and characteristics of China's governance practices (Feng, 2013).

In China at present, the governance of plastic waste is still dominated by policies and administrative regulations serve as the primary approach, while laws have taken a secondary role. In 2021, the National Development and Reform Commission and the Ministry of Ecology and Environment of China issued the "Action Plan for Plastic Pollution Control during the 14th Five-Year Plan Period". In this policy document, a total of three main tasks were listed:

a. Actively promote the reduction at the source of plastic production and usage.

b. Expedite the standardized collection, utilization, and disposal of plastic waste.

c. Vigorously conduct the cleanup and rectification of plastic waste in key areas.

These three tasks do not show significant changes in content compared to the plastic pollution control measures that the Chinese government has consistently emphasized before. For instance, there are numerous similar policies guiding descriptions in the "Notice on Restricting the Production, Sale and Use of Plastic Shopping Bags" issued in 2007 and the "Opinions on Further Strengthening Plastic Pollution Control" released in 2020. However, these descriptions carry a strong political symbolic meaning and, conversely, due to an excessive use of administrative terms, they are less likely to yield substantive effects. Admittedly, the flexibility of policies can exert certain governance influences when confronted with the complexity of plastic pollution (Sun, 2005). However, as a result of practice, it is difficult to control the reduction and recycling of waste at source, and this, coupled with the fact that administrative work and citizens' biased understanding of the policy, makes it difficult to promote the implementation of the policy in an effective manner (Ran, 2022). Furthermore, during the implementation of these policy documents and administrative regulations, the administrative management institutions are cumbersome and chaotic, and there is a lack of effective supervisory institutions. Based on the existing documents, the involved administrative agencies include: the National Development and Reform Commission, the Ministry of Ecology and Environment, the Ministry of Agriculture and Rural Affairs, the Ministry of Commerce, the Ministry of Industry and Information Technology, and the Customs, etc. Each of these agencies is only responsible for a certain portion, and almost no unified implementation and supervision mechanism has been formed, lacking cohesion in the governance of plastic waste (Li, 2021). Moreover, the professional personnel and resources possessed by each department are unequal. When resources and responsibilities do not match, it is bound to affect the actual effect of policy implementation. In Article 16 of the "Opinions on Further Strengthening Plastic Pollution Governance", it is emphasized that all regions and relevant departments should attach great importance to the work of plastic pollution governance, carefully organize and arrange, and earnestly implement it. However, due to the differences in administrative capabilities among various regions in China, this clause is more of a propaganda significance.

For example, Guizhou Province in China has clearly issued policies aimed at regulating and restricting the use of non-degradable plastic bags in farmers' markets

to promote sustainable environmental development. However, during field research at the Yingjia Farmers' Market in Yunyan District, Guiyang City, it was unfortunately found that all vendors reported that the use of eco-friendly plastic bags had not yet been popularized in the market (Chen et al., 2021). All merchants in the market still rely heavily on traditional plastic bags. This phenomenon undoubtedly poses a severe test to the enforcement of the policy. Similarly noteworthy is the situation at the Liaocheng Road Convenience Market in Jinan City, where stalls provide consumers with disposable shopping bags in a variety of bright colors, including red, green, white, and black (Chen et al., 2021). Unfortunately, most of these free plastic bags are substandard "three-no" products—lacking clear information on production, distribution, and usage—that do not meet environmental protection standards and operate outside of environmental regulations. Market regulators, citing the difficulty of supervision, have adopted a laissez-faire attitude toward these clear violations of administrative regulations. This situation reflects that due to the low hierarchical level of relevant policies and the lack of specific, enforceable regulations, the implementation of plastic restrictions has been significantly undermined, failing to achieve the expected goals. Additionally, some local law enforcement officers admitted that the legal and regulatory system in the area of plastic waste management remains disorganized, leading to confusion and challenges in the enforcement process, making it difficult for them to effectively perform their duties. Moreover, because the time required to investigate and address violations related to plastic waste is lengthy, the fines are low, and the legal procedures are cumbersome and time-consuming, many law enforcement officers lack enthusiasm for this type of work. In some cases, an implicit "understanding" has even developed between certain enforcement agencies and vendors, where vendors temporarily close their businesses to avoid inspections during enforcement activities, only to resume operations after the inspections have passed (Li, 2018). This phenomenon further weakens the seriousness and effectiveness of enforcement.

At the same time, the policies and administrative regulations currently designated by China for the issue of plastic waste pollution are rather one-sided and do not completely cover the types of plastic waste pollution. In the "Opinions on Further Strengthening Plastic Pollution Governance", the plastic products that are comprehensively prohibited from production and sale include:

a. The production and sale of ultra-thin plastic shopping bags with a thickness of less than 0.025 millimeters and polyethylene agricultural film with a thickness of less than 0.01 millimeters are prohibited.

b. The manufacture of plastic products using medical waste as raw materials is prohibited.

c. The import of waste plastic is completely banned.

d. By the end of 2020, the production and sale of disposable foamed plastic tableware and disposable plastic cotton swabs were prohibited; the production of daily chemical products containing plastic microbeads was also prohibited.

e. By the end of 2022, the sale of daily chemical products containing plastic microbeads was prohibited.

Prohibited and restricted plastic products include:

a. Non-biodegradable plastic bags.

b. Disposable plastic tableware.

c. Disposable plastic items in hotels and inns.

d. Delivery plastic packaging.

Although this encompasses almost all the common major plastic wastes, it fails to stipulate the harmful components in plastics. Even though the use of some plastic products is restricted, the material composition and treatment methods of non-restrictive plastics are not addressed. For instance, plastic pollution in automotive interiors, (Yiren, 2004) pollution from children's plastic toys, (Zhang et al., 2022) and microplastic pollution (Yan et al., 2022). Particularly regarding the treatment and prevention of the increasingly severe microplastic pollution, China has not yet introduced corresponding policies and administrative regulations to date. Thus, a rather general policy that merely focuses on common plastic pollution is apparently prone to disregarding other, though less obvious yet very serious pollution behaviors. Moreover, the usage and pollution degree of plastics vary in different regions and communities, which makes it challenging to implement a single strategy applicable to all circumstances. For example, not all regions in China possess good and advanced plastic treatment equipment. Even if some specific plastics are effectively processed, due to insufficient capacity, other plastics might be subject to harmful treatment, thereby causing environmental damage.

In essence, policies and administrative regulations do play a certain role in resolving the issue of plastic waste pollution, but their influence is limited. It should be pointed out that policies themselves can assist the law but cannot substitute for legislation. In order to effectively tackle the long-term challenges in the prevention and control of plastic waste, it is necessary to elevate a series of policies and administrative legal documents to the level of law, which would be an effective and sustainable solution.

6. Outlook for the development of plastic waste regulation in China

6.1. Enhancement of regional legal cooperation on the basis of the Basel convention plastic waste amendment

The pollution of plastic waste not only undermines the balance of the natural ecosystem but also poses a threat to global human health and exacerbates the complexity of the management of hazardous substances internationally. In view of this, enhancing the depth and breadth of constructive international exchanges and cooperation is indeed the key to alleviating the risks faced by various countries. China, as the largest developing country in the fields of production, processing, sales, and cross-border transfer of plastic products and waste, should actively engage in international collaborative actions within the framework of the "Amendment on Plastic Waste Management" and contribute strategic plans that are both self-beneficial and altruistic, in order to promote the common well-being of developing countries within the region and globally. For a considerable period of time, developed countries have displayed a relatively high level of maturity in the standardized management of plastic waste and the application of technologies. Taking the norms established by the Institute of Scrap Recycling Industries (ISRI) of

the United States as an example, they have been adopted by over 1600 enterprises and more than 40 non-US countries, becoming an industry benchmark (Institute of Scrap Recycling Industries, 2023). However, these stringent standards and advanced recycling technologies may pose insurmountable obstacles for developing countries, limiting their possibilities for learning and replication (Tudor and Dutra, 2020). In addition, the rise of highly concentrated new technology-based plastics recycling enterprises may have an impact on the small-scale recyclers that are prevalent in developing countries, and instead of helping them to combat plastic pollution, they may be restricted by developed countries in the field of technology, thus affecting their own sustainable development process. Therefore, it is urgent for China to strengthen its voice in the international arena and promote the construction of an international standard system for plastic waste management adapted to the actual situation of developing countries. The aim is to balance technological progress with global equity and to ensure that all countries can work together to create a green and sustainable future in the fight against plastic pollution.

Moreover, China and Southeast Asia are geographically connected by shared maritime zones, forming a key region in the global plastic industry landscape. This geographical feature gives the region a significant role in global plastic governance. Based on this, China should actively advocate for and promote the formation of regional agreements under the overarching framework of the "Plastic Waste Amendment" to effectively address the issue of developed countries transferring plastic waste to this region, thereby ensuring the safety of the regional environment and marine ecosystems. For instance, the "ASEAN Regional Action Plan for Combating Marine Debris in the ASEAN Member States (2021–2025)", released in 2021, serves as an important milestone in this regard (World Bank, 2021). Although China is not a member state of ASEAN, as a leading power in the field of environmental protection within the region, it has the responsibility and ability to actively participate in and support the implementation of this plan, demonstrating its leadership and commitment in regional environmental governance. Further, China should be dedicated to deepening cooperation with ASEAN countries in aspects such as reducing the generation of plastic garbage, curbing cross-border transfer of plastic waste, improving plastic recycling technologies and standardization levels, and establishing a regional supervision system for marine litter, thereby creating a synergy effect. Through such cooperation, not only can the global challenge of plastic pollution be effectively tackled, but also the enhancement of environmental protection awareness and the sharing of technologies within the region can be promoted. Together, we can safeguard our shared blue homeland and showcase human wisdom and unity in the face of environmental crises.

6.2. Promote special legislation on plastic waste pollution prevention and control

The effective governance of environmental pollution issues is fundamentally based on the establishment of a comprehensive and rigorous legal system to provide solid support. Plastic pollution, as a complex environmental challenge, is characterized by the fact that at every stage of the life cycle of plastic products, from

their emergence to their disappearance, there exists the potential risk of causing environmental damage (Wang et al., 2020). Admittedly, the improper disposal of plastic waste is the direct and primary cause of the plastic pollution problem. However, upon in-depth exploration, it is not difficult to discover that various aspects such as the selection and standard setting of plastic materials, the sales and transportation processes of plastic products, as well as the recycling and reuse mechanisms of plastic waste, may all constitute the fundamental reasons for the occurrence of plastic pollution. Currently, the deficiencies in China's legal system construction have resulted in significant deficiencies in the supervision of the entire life cycle of plastic products, from production to circulation, use, and recycling. This current situation not only aggravates the plastic pollution problem but also highlights the urgency of perfecting the relevant legal and regulatory framework. Hence, it is necessary and urgent for China to construct a legal framework specifically aimed at the entire process management of plastic waste pollution to ensure that every link from the source to the end is subject to strict and effective legal regulations, thereby achieving a systematic and comprehensive solution to the plastic pollution problem and demonstrating the power and value of the rule of law in the field of environmental protection.

In 2022, Japan officially enacted and implemented the "Plastic Resource Circulation Act", a legislation tailored specifically for the plastics sector, marking a new phase of legal regulation in plastic management. This law comprehensively covers the entire lifecycle of plastics, from production to disposal, and establishes clear, instructive guidelines for businesses, municipal authorities, and individual users. It urges all parties to integrate higher levels of environmental consciousness into their plastic usage practices (High Level Panel for a Sustainable Ocean Economy, 2022). The core objective is not limited to packaging materials but seeks to widely mobilize municipal authorities and the business sector to actively participate in the systematic collection and recycling of plastic waste. The law actively promotes the "3R principles" (Reduce, Reuse, Recycle), aiming to improve the efficiency of industrial plastic waste utilization and alleviate marine pollution, while addressing public concerns about the potential accumulation of microplastics in marine ecosystems. Additionally, the law involves numerous stakeholders, including national and municipal government agencies, the commercial sector (encompassing product manufacturers and retailers), and the general consumer base. It is designed to foster collaboration among these various entities, with the shared goal of reducing plastic waste generation and optimizing recycling processes. Through this cooperative mechanism, the law not only aims to enhance the sustainability of plastic use within Japan but also reflects a deeper philosophical commitment to environmental protection and resource recycling, offering a thoughtful approach to addressing these pressing global challenges.

Japan's "Plastic Resource Recycling Law" offers a complete framework that can offer significant inspirations for China in formulating and strengthening its legislation on plastic pollution. This paper holds that the construction of China's future legal system for plastic waste can draw lessons from the following aspects:

a. Comprehensive strategies covering the entire life cycle of plastics

b. Involving multiple stakeholders

c. Encouraging innovation of alternative products when reducing plastic usage
d. Focusing on regulations for plastic recycling
e. Establishing a powerful enforcement mechanism
f. Addressing the hazards of microplastics and marine pollution

6.3. The construction of a multi-stakeholder governance system

The construction of a diversified and collaborative governance system for plastic waste in China is a complex systematic project that is deeply embedded in multiple dimensions of the social structure, demanding profound coordination and extensive participation from government institutions, enterprise entities, industry associations, as well as the general public. In this grand governance framework, the government assumes a crucial role by elaborately designing and stringently implementing a series of laws and regulations, thereby delineating clear normative boundaries for the production, circulation, and disposal of plastic products. In the blueprint for the governance of plastic pollution in China in the future, regional governments should meticulously formulate operational rules and local regulations in line with their local actual conditions within the framework of national-level plastic-specific laws and regulations, or adopt corresponding policy measures. For instance, in highly economically developed urban regions, due to the high living standards of residents and relatively stable and affordable prices, the restrictive measures on plastic packaging materials, such as the ban, have a relatively minor impact on people's daily lives and encounter less resistance during implementation. In contrast, in economically less-developed areas, ordinary people are particularly sensitive to the cost variations of plastic products. Against this backdrop, the rational application of economic means becomes the key to regulating consumer behavior. Specifically, measures such as moderately raising the prices of plastic products, levying relevant taxes and fees, and strictly prohibiting the random discarding of plastic waste can effectively guide consumer behavior towards an environmentally friendly direction.

In the exploration of the deep strategies for source reduction, the government ought to implement a series of measures to effectively rein in the rampant production and irrational consumption of disposable plastic products. Specifically, through legislative means, the government has explicitly prohibited the production and sale of typical disposable plastic products such as ultra-thin plastic shopping bags and polyethylene agricultural films. This move not only directly addresses the crux of the plastic pollution issue but also manifests the nation's resolute attitude towards environmental protection and resource conservation. Meanwhile, the government also needs to actively guide and vigorously promote a series of innovative alternative products, such as recyclable "shared shopping bags" and biodegradable materials. The promotion of these products not only constitutes an elegant substitution for traditional plastic products but also vividly interprets and implements the concept of green consumption. Through these measures, the government aims to fundamentally reverse the public's reliance on disposable plastic products, reduce their consumption volume, and thereby establish a new trend of green consumption at the social level.

The construction and improvement of the plastic waste recycling system is undoubtedly a key aspect in addressing the global environmental challenge of plastic pollution. In this process, the government should assume the role of a leader and facilitator, actively encouraging and supporting the application and integration of cutting-edge technologies such as the Internet and intelligent recycling machines (Zhang et al., 2022). These can serve as significant driving forces for enhancing recycling efficiency and promoting the modernization of the recycling system. The introduction of these technologies not only enables the optimization and intellectualization of the recycling process but also effectively stimulates the public's enthusiasm for participating in recycling activities, thereby promoting the circular utilization of resources on a broader scale.

Furthermore, enhancing the public's profound awareness of the latent perils of plastic pollution constitutes the bedrock for establishing a multi-stakeholder and collaborative governance pattern for plastic pollution. The government ought to assume the roles of a knowledge disseminator and a concept guider. Through extensive and in-depth publicity and education activities, as well as the vigorous advocacy of a green and low-carbon life philosophy, it should stimulate the public's initiative and creativity in participating in plastic pollution governance. To achieve this objective, the government needs to construct a set of long-term activity mechanisms. By establishing multi-dimensional and multi-level practical platforms such as green government agencies, green hotels, green schools, and green communities, it should incorporate the relevant knowledge of plastic pollution and environmental protection into the public's daily work and life in a more vivid and life-related form (National Development and Reform Commission and Ministry of Ecology and Environment, 2020). These activities should not only focus on the scientific rigor and authority of the content but also on the innovativeness and engagement of the form, making them sources of information that are favored by the public and thereby imperceptibly elevating the public's recognition of the potential hazards that plastic and microplastics pose to ecosystems and human health. Further, the government should be dedicated to fostering the public's behavioral habit of consciously resisting plastic pollution, encouraging the public to actively reduce the use of disposable plastic packaging and instead adopt reusable packaging materials, thereby promoting a shift in the public's choice of plastic packaging materials from a sole consideration of price to a greater emphasis on environmental factors.

Enterprises occupy a core position in the production and usage chain of plastic products. Consequently, they bear inescapable social and environmental responsibilities. The government should actively guide and require enterprises to implement the Extended Producer Responsibility system. This is not merely an effective means to reduce the utilization of disposable plastic packaging and promote the construction of green supply chains, but also a significant path for enterprises to fulfill their social responsibilities and achieve sustainable development. To accomplish this goal, the government needs to comprehensively implement policies from multiple dimensions, such as finance, innovation, and technology. It should encourage and direct private capital to flow into innovative technology fields, increase investment in research and development, and endeavor to fully consider the convenience and efficiency of end-of-life recycling in the front-end design of plastic

products. This design concept based on the entire product life cycle not only helps alleviate environmental pressure but also conveys the urgency of plastic ban and restriction in the supply chain, driving the entire industry to transform in a greener and more sustainable direction. Take PepsiCo as an example. It plans to reduce the use of virgin plastic in its beverage business by 20% by 2025 (Yu, 2019). This measure not only reflects the company's commitment to environmental protection but also sets a commendable model for the industry. While reducing plastic usage, enhancing the capacity for plastic recycling and sorting is equally crucial. This requires enterprises to continuously explore and make breakthroughs in technological innovation and process optimization to achieve efficient recycling and reuse of plastic resources. Chinese enterprises should take this as a reference and actively learn from international advanced experiences. They should not only make efforts to reduce plastic at the source but also devote significant efforts to improving the capacity for plastic recycling and sorting, thereby comprehensively elevating their level of social responsibility.

In conclusion, the construction of a multi-stakeholder governance system for plastic waste in China is indeed an extensive process that integrates multiple forces and adopts diverse measures. This process is led by the government and based on the improvement of laws and regulations as the cornerstone. It focuses on the reduction at the source and the promotion of alternative products, is dedicated to the establishment and improvement of the recycling system, actively mobilizes the extensive participation of the public, strengthens the implementation of corporate responsibilities, and expands the breadth and depth of international cooperation. The construction of a multi-stakeholder governance system for plastic waste in China is not only an active response to domestic environmental issues but also a profound reflection and practice on global sustainable development topics.

7. Conclusion

China, as a global giant in the plastic production sector, is facing severe challenges in plastic pollution control, especially in the management of plastic waste, where it has been deeply entangled in the threats of environmental pollution and governance difficulties. On the international governance stage, China's performance is commendable. The 2021 entry into force of the "Basel Convention Plastic Waste Amendments" provided China with an opportunity to introduce international standards, not only promoting the enhancement of domestic governance standards but also offering a solid legal foundation to combat related illegal activities. Moreover, this amendment has opened new pathways for China to deepen cooperation with ASEAN countries to jointly safeguard regional marine environmental security. However, upon examining the current state of domestic governance, there are still many shortcomings in China's legal framework regarding plastic waste pollution. Although laws and regulations like the "Environmental Protection Law of the People's Republic of China" have addressed plastic governance, none have made specific provisions directly targeting plastic waste, nor do they offer clear legal definitions. Currently, China's practice in governing plastic waste mainly relies on policy documents and administrative regulations. Yet, these

administrative provisions are somewhat limited in regulating the types of plastic waste, and their simplified legal language and design may not achieve the desired governance outcomes. In light of this, this paper suggests that, in constructing its legal framework to address plastic waste pollution, China should prioritize promoting regional legal cooperation and propose China-specific solutions by negotiating and building regional standards and treaties. Secondly, it should accelerate the legislative process for special laws addressing plastic pollution, drawing on the successful experience of Japan's "Plastic Resource Circulation Act" to formulate a comprehensive law specifically addressing plastic-related issues. Lastly, the establishment of a multi-stakeholder governance system will help mobilize the joint participation of the government, enterprises, industry associations, and the public, enabling all parties to cooperate effectively in solving plastic waste issues and enhancing governance outcomes.

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