

Report on China's Plastic Pollution Control and Recycling Policies and Practices

Overview and Prospect



中华环保联合会
All-China Environment Federation



Green Recycling Public Support Chain Group
绿色再生资源利用联盟工作组



About the Project

This report is part of the project of Plastic Pollution Prevention and Control Through the Entire Value Chain Modality (SGP Grant Project - CPR/SGP/OP6/Y7/CORE/PLA2022/O1).

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About the Project of Plastic Pollution Prevention and Control Through the Entire Value Chain Modality

The Global Environment Facility (GEF) Small Grants Programme implemented by United Nations Development Programme (UNDP) launched the Plastic Innovation Programme (PIP) at the end of 2021 to solicit systematic solutions to plastic pollution globally. After a public call for proposals and a vetting and selection process, the project of Plastic Pollution Prevention and Control Through the Entire Value Chain Modality, co-designed by the All-China Environment Federation (ACEF) and the GRPG, was selected by the National Steering Committee of GEF SGP in China in April 2022. The project will work with stakeholders in the plastic value chain to explore and practise solutions to upstream, midstream and downstream management of plastic pollution. It will analyze the baseline of the entire plastics industry chain, and identify the key challenges and problems in China's plastic pollution control; develop demonstration sites for zero-waste management system and plastic pollution reduction models at the community level; organize policy communication and advocacy to address the key issues in plastic pollution control, and facilitate the formulation and implementation of relevant policies; and at the same time carry out publicity and communication campaigns with stakeholders to increase the public awareness on the issue of plastic pollution and spur the public actions on reducing plastic pollution. The outputs of the project will serve as a reference for relevant policymakers, city administrators, businesses and citizens at home and abroad, and therefore enable stakeholders from all sectors of society to gain insights into the state of plastic pollution and take effective measures to put an end to pollution and waste of resources from the source. Meanwhile, the project will also contribute non-governmental Chinese solutions to the conclusion of a legally binding international agreement on plastic pollution by 2024, as proposed by the United Nations Environment Assembly (UNEA).

GEF Small Grants Programme (SGP)

Established in 1992 as a corporate programme of the Global Environment Facility (GEF), the GEF Small Grants Programme is implemented by the United Nations Development Programme (UNDP). SGP funds sustainable development projects implemented by local non-governmental organizations, especially for the good of indigenous peoples, women and youth, in 125 countries around the world to promote community-based innovation, capacity building and empowerment. SGP has supported over 20,000 community projects globally in biodiversity conservation, climate change mitigation and adaptation, prevention of land degradation, protection of international waters, and reduction of the impact of chemicals, while developing sustainable lifestyles.

ACEF

Founded in 2005, the All-China Environment Federation (ACEF) is a nationwide non-profitable civil society organization (CSO) composed of individuals, businesses and public institutions that are enthusiastic about and support environmental protection on a voluntary basis. ACEF is approved by the State Council of the People's Republic of China, registered with the Ministry of Civil Affairs, and guided and regulated by the Ministry of Ecology and Environment and the Ministry of Civil Affairs. With the aim of building a platform for unified effort to protect the ecological environment in China, ACEF has been committed to liaison and coordination, international exchanges, and environmental rights protection for environmental non-governmental organizations (NGOs) nationwide since its founding, by keeping in mind the philosophy of uniting all the people of the whole China to protect the environment. It strives to promote the development of environmental undertakings in China and for all humanity by giving full play to its role as a bridge between the government and society.

Green Recycled Plastic Supply Chain Joint Working Group (GRPG)

The Green Recycled Plastic Supply Chain Joint Working Group (GRPG) is China's first collaborative industrial chain platform, co-initiated by China Petroleum and Chemical Industry Federation (CPCIF), China National Resources Recycling Association (CRRA) and China Plastic Processing Industry Association (CPPIA) in partnership with leading enterprises in the industrial chain in June 2020. GRPG aims to address bottlenecks in the circular plastics economy through collaboration among upstream and downstream enterprises in the plastics industry, including those engaged in production, processing, branding, recycling and disposal. It has strong policy advocacy and industrial influence on plastics-related issues.

About the Report

Plastic products are almost everywhere in modern life, bringing great convenience to people's production and life. Global plastic production recorded some 1.5 million tons in 1950 and has reached 400 million tons annually in recent years, an economic scale comparable with steel and cement industries. With the large-scale production consumption of plastic products, pollution caused by plastic waste has become increasingly prominent and received wide attention from the international community. The linear economic model of "production-use-disposal" that people have long been accustomed to has created a global challenge of plastic pollution. To tackle this problem, we need a systematic change which involves the entire life cycle of plastics, ranging from production, consumption to recycling, from raw materials acquisition, product design and production to the research and development (R&D) of alternatives, and then to the collection, recycling and disposal of plastic waste. This requires active response and joint action of the industry, businesses and social organizations. This report elaborates on the distribution and main content of national policies for different parts of China's plastics industry chain, such as production, consumption, collection, recycling and disposal, and analyzes the development of China's plastics management policies against the international legal process with regard to plastic pollution control. The aim is to provide stakeholders with a relatively systematic, comprehensive report on the evolution of policies concerning plastic pollution control and circular economy in China. Based on CRRA's resource network and platform advantages in China's plastics recycling industry, this report identifies and analyzes the weaknesses in policy guidance from the perspective of implementation, especially from an industry perspective, guided by the thinking of life cycle and circular economy. Also, it explores and makes prospects for the future trend and direction of China's policies in light of recent developments in international policies, which can be used for reference by stakeholders in the plastics industry chain.

Methodology

Data collection, literature review, comparative analysis

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I. International Law Process on Plastic Pollution Control

(i) International policies and initiatives addressing plastic pollution

Currently, the world produces around 430 million tons of plastics each year (OECD 2022), of which over two-thirds are short-lived products (including single-use products) which soon become waste, and a growing amount after one single use. Approximately 9.2 billion tons of plastics were produced globally between 1950 and 2017, of which 7 billion tons have become plastic waste. Most of the plastic waste has not been recycled, with about 14% incinerated, 76% sitting in landfills, dumps or in the environment, and only 8% recycled (UNEP 2021)^[1]. Under a business-as-usual (BAU) scenario, plastic production and consumption could emit 19% of global greenhouse gas (GHG) emissions allowed under a 1.5°C scenario by 2040, making it more difficult to achieve the goal of global warming of 1.5°C above pre-industrial levels by 2040^[2]. Plastic production is set to triple by 2060 if BAU continues^[3].

In order to offer a clearer understanding of the grim reality of global plastic pollution, especially marine litter pollution, the United Nations Environment Programme (UNEP) published a report *From Pollution to Solution: a global assessment of marine litter and plastic pollution* in 2021. By reviewing the development history of international laws, important initiatives and international actions concerning marine litter and plastic pollution over the past 60-70 years, the report concludes through extensive data analysis that the unsustainable plastic production and consumption patterns of human beings are the root cause of today's plastic pollution, including marine pollution.

International concern for marine pollution and hazards from plastic waste can be traced back to around 1960, when scale production and consumption of plastics almost began. By the late 1980s and early 1990s, the international concern for plastics focused on two areas: on the one hand, continued concern about marine litter and marine pollution and on the other hand, the integration of plastic waste itself, as a waste stream, into the international waste management agenda. A landmark event was the adoption of the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* as an international convention in 1989, whereby some kinds of plastic wastes are categorized as hazardous wastes, other general wastes and household waste, depending on their sources and other chemical substances they might contain.

In the two to three decades since then, the international society continues to focus its attention on marine litter and plastic waste. With increasing levels of plastic pollution, the problem of plastic pollution has gradually developed into a serious global environmental problem that is negatively impacting the environmental, economic, social and health dimensions of the Sustainable Development Goals (SDGs). Under a BAU scenario and in the absence of necessary interventions, the amount of plastic waste entering aquatic ecosystems could nearly triple from some 9-14 million tons per year in 2016 to a projected 23-37 million tons per year by 2040^[4].

By around 2010, marine litter, especially marine pollution caused by single-use plastics, had gradually entered the public eye, and attracted wide attention all over the world. In 2016, the UNEA included marine plastic debris and microplastics as an important environmental issue for formal consultations at UNEA sessions. The UNEA, as the world's highest decision-making body on the environment, adopted unanimously a historic resolution^[5] on ending global plastic pollution at its fifth session in 2022, after four sessions of deliberation over six years, to launch the developing of an international legally binding instrument aimed at

[1] UNEP 2021. *From Pollution to Solution: A global assessment of marine litter and plastic pollution*. Nairobi.

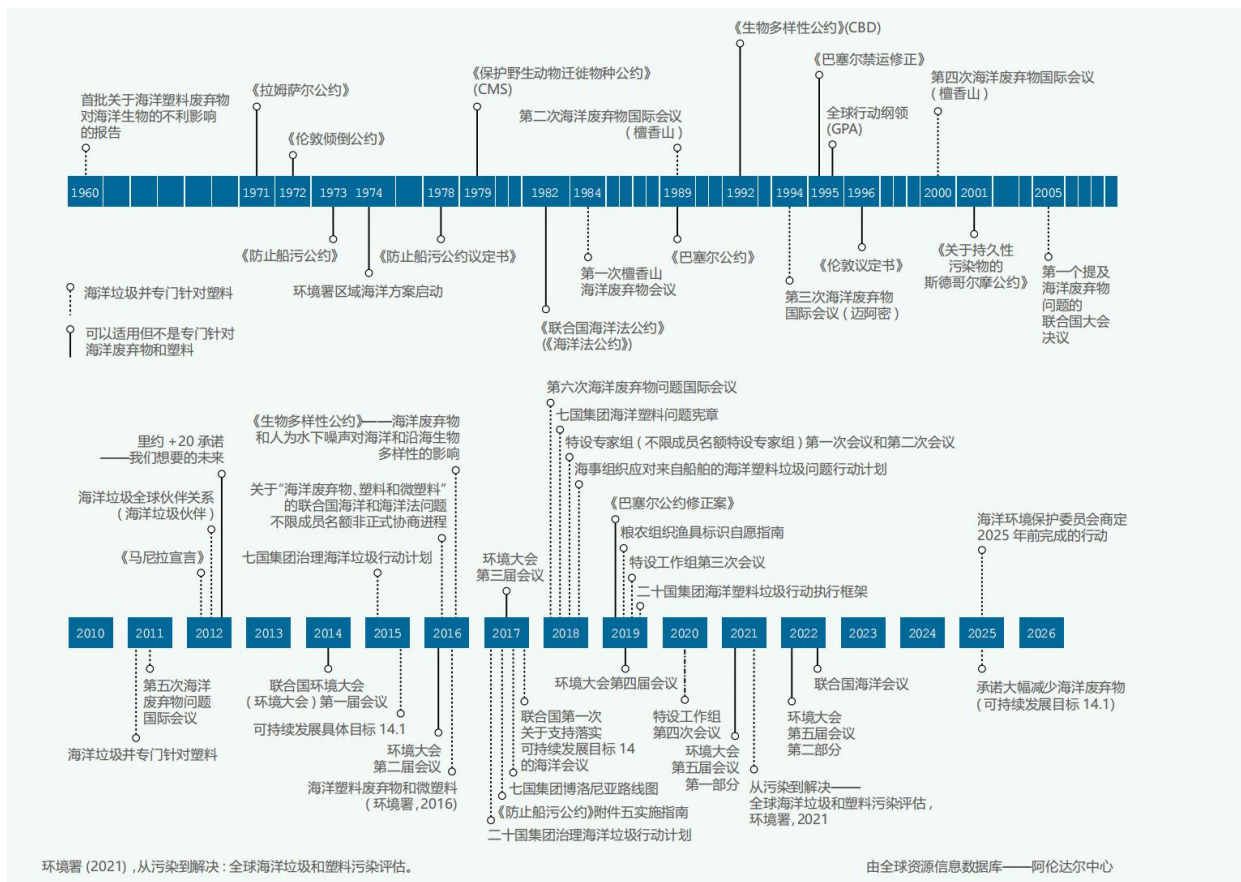
[2] The Pew Charitable Trusts and Systemiq 2020. *Breaking the plastic wave: A comprehensive assessment of pathways towards stopping plastic pollution*. <https://www.systemiq.earth/breakingtheplasticwave/>.

[3] United Nations Environment Programme (2023). *Turning off the Tap. How the world can end plastic pollution and create a circular economy*. Nairobi.

[4] UNEP 2021. *From Pollution to Solution: A global assessment of marine litter and plastic pollution*. Nairobi.

[5] <https://unea.unep.org/monitoring/viewreport/292>

ending plastic pollution, including in the marine environment.



Key words for the flow chart above :

环境大会第五届会议第二部分	UNEA-5, part 2
《生物多样性公约》——海洋废弃物和人为水下噪声对海洋和沿海生物多样性的影响	<i>Convention on Biological Diversity (CBD)</i> - impacts of marine debris and anthropogenic underwater noise on marine and coastal biodiversity
关于“海洋废弃物、塑料和微塑料”的联合国海洋和海洋法问题不限成员名额非正式协商进程	UNICPOLOS on "Marine Debris, Plastics and Microplastics"
七国集团治理海洋垃圾行动计划	G7 Action Plan to Combat Marine Litter
里约+20 承诺——我们想要的未来	Rio+20 commitment - The Future We Want
海洋垃圾全球伙伴关系(海洋垃圾伙伴)	Global Partnership on Marine Litter (GPML)
《马尼拉宣言》	Manila Declaration
环境大会第三届会议	UNEA-3
《巴塞尔公约修正案》	Basel Convention Amendments
粮农组织渔具标识自愿指南	FAO Voluntary Guidelines for the Marking of Fishing Gear
特设工作组第三次会议	AHEG-3
二十国集团海洋塑料垃圾行动执行框架	G20 Implementation Framework for Actions on Marine Plastic Litter
第六次海洋废弃物问题国际会议	Sixth International Marine Debris Conference
七国集团海洋塑料问题宪章	G7 Ocean Plastics Charter
特设专家组(不限成员名额特设专家组)第一次会议和第二次会议	AHEG 1&2 (Ad-hoc open-ended expert group)
海事组织应对来自船舶的海洋塑料垃圾问题行动计划	IMO Action Plan to Address Marine Plastic Litter from Ships
环境大会第四届会议	UNEA-4
特设工作组第四次会议	AHEG-4
联合国海洋会议	UN Ocean Conference
承诺人幅减少海洋废弃物(可持续发展目标 14.1)	Commitment to a significant reduction of marine debris (SDG 14.1)
环境大会第五届会议第一部分	UNEA-5, part 1
联合国第一次关于支持落实可持续发展具体目标 14 的海洋会议	First UN Conference on SDG 14
七国集团博洛尼亚路线图	G7 Bologna Roadmap
二十国集团治理海洋垃圾行动计划	G20 Action Plan on Marine Litter
海洋塑料废弃物和微塑料	Marine plastic debris and microplastics
(环境署, 2016)	(UNEP 2016)
海洋塑料废弃物和微塑料	Marine plastic debris and microplastics
(环境署, 2016)	(UNEP 2016)
环境大会第二届会议	UNEA-2
可持续发展具体目标 14.1	SDG Target 14.1
联合国环境大会(环境大会)第一届会议	UN Environment Assembly (UNEA) -1

第五次海洋废弃物问题国际会议	Fifth International Marine Debris Conference
海洋垃圾并专门针对塑料	Marine litter and plastic specific
环境署(2021),从污染到解决:全球海洋垃圾和塑料污染评估。	Source: UNEP (2021), From Pollution to Solution: a global assessment of marine litter and plastic pollution.
由全球资源信息数据库——阿伦达尔中心	Illustrated by GRID-Arendal
从污染到解决——全球海洋垃圾和塑料污染评估,环境署, 2021	From Pollution to Solution - A global assessment of marine litter and plastic pollution, UNEP, 2021
海洋环境保护委员会商定 2025 年前完成的行动	The Marine Environment Protection Committee agreed actions to be completed by 2025
第三次海洋废弃物国际会议(迈阿密)	Third International Conference on Marine Debris (Miami)
《伦敦议定书》	London Protocol
《关于持久性污染物的斯德哥尔摩公约》	Stockholm Convention on Persistent Organic Pollutants (POPs)
第一个提及海洋废弃物问题的联合国大会决议	First UN General Assembly Resolution referring to the issue of marine debris
《巴塞尔公约》	Basel Convention
《联合国海洋法公约》(《海洋法公约》)	United Nations Convention on the Law of the Sea (UNCLOS)
第一次檀香山海洋废弃物会议	First Honolulu International Marine Debris Conference
《防止船污公约议定书》	MARPOL Protocol
环境署区域海洋方案启动	UNEP Regional Seas Programme launched
《防止船污公约》	MARPOL Convention
海洋垃圾并专门针对塑料	Marine litter and plastic specific
可以适用但不是专门针对海洋废弃物和塑料	Applicable but not specific to marine debris and plastic
全球行动纲领(GPA)	Global Program of Action (GPA)
第四次海洋废弃物国际会议(檀香山)	Fourth International Conference on Marine Debris (Honolulu)
《巴塞尔禁运修正》	Basel Ban Amendment
《生物多样性公约》(CBD)	Convention on Biological Diversity (CBD)
第二次海洋废弃物国际会议(檀香山)	Second International Conference on Marine Debris (Honolulu)
《保护野生动物迁徙物种公约》(CMS)	<i>Convention on the Conservation of Migratory Species of Wild Animals (CMS)</i>
《伦敦倾倒公约》	London (Dumping) Convention
《拉姆萨尔公约》	RAMSAR Convention
首批关于海洋塑料废弃物对海洋生物的不利影响的报告	First reports of adverse impacts of marine plastic debris on marine species

Based on the timeline for global marine litter and plastic initiatives, laws and policies^[6], the international development on plastics can be divided into four stages since its production in 1950, with each stage lasting 20 years or so. Below is a summary of the changing trends and international concerns for plastic production and plastic waste.

During the first 20 years from 1950 to around 1970, plastic production was relatively low and the problem of plastic pollution and waste was relatively controllable. During this period, the international community began to pay attention to the problem of marine pollution by plastic waste. Typical representative advances include the release of *the first report on adverse impacts of marine plastic debris on marine species* in 1960 and the adoption of the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (London Convention) in 1972, whereby the Contracting Parties shall take effective measures to prevent pollution of the marine environment caused by dumping at sea; and shall not dump plastic netting into the sea to prevent interference with fishing or navigation.

Between 1970s and around 1990s, plastic waste generation more than tripled, reflecting a similar rise in plastic production⁷. During this period, the international community, on the one hand, continued to focus on marine litter. On the other hand, the *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* brought some kind of plastic waste under its management.

Between 1990s and around 2010s, plastic waste increased dramatically, with the increase in the decade from 2000s to 2010s exceeding the combined level over the previous 40 years, indicating a period of rapid growth for plastic waste⁸. During this period, the international community paid increasing attention and attached growing importance to marine litter by putting this issue on the international agenda. A landmark event was the adoption of the first UN General Assembly Resolution referring to the issue of marine litter in 2005.

From 2010 to present, the global annual production of plastic products is about 400 million tons. Marine litter pollution, especially its threat to marine life, has entered the public eye. Meanwhile, the international agenda on marine litter and plastic pollution has been gradually advanced and deepened. With regard to marine litter, the Global Partnership on Marine Litter (GPML) was launched in 2012, and the Group of Twenty (G20) released the G20 Action Plan on Marine Litter in 2017. With regard to marine plastic pollution, the United Nations Environment Assembly (UNEA) has listed marine litter and plastic pollution as a formal issue for discussion and deliberation since 2016. With regard to plastic waste management, the *Basel Convention Amendments* were adopted in 2019, gradually standardizing the principles for international management of plastic waste, including environmentally sound management and control of transboundary movements of plastic waste.

With the rapid growth of plastic production and the emergence of large amount of plastic waste, marine pollution caused by plastic waste has received increasing attention from the international community and has been gradually institutionalized, driving the adoption of a resolution on ending plastic pollution: towards an international legally binding instrument (marine litter and plastic pollution) at the resumed fifth session of the United Nations Environment Assembly (UNEA-5.2) in 2022. Since the 2016 United Nations Environment Assembly began to focus on the issue of plastic, the UNEP has conducted a series of scientific research and published a number of reports, including *Single-Use Plastics: A Roadmap for Sustainability* (2018), *Addressing Single-Use Plastic Products Pollution using a Life Cycle Approach* (2021), and *From Pollution to Solution: a global assessment of marine litter and plastic pollution* (2022), to advance the implementation and promote the development of the issue. These reports provide factual and scientific evidence through methodologies such as data analysis, questionnaires and life cycle analysis, to give

^[6] United Nations Environment Programme (2021). *From Pollution to Solution: a global assessment of marine litter and plastic pollution*

⁷ <https://www.unep.org/interactives/beat-plastic-pollution/>

⁸ <https://www.unep.org/interactives/beat-plastic-pollution/>

policymakers from all sectors a more objective understanding of plastic pollution and how to tackle it.



Plastic production and plastic waste	International plastic pollution control policies, initiatives and actions
<p>1950s-1970s Plastic production was low and the problem of plastic pollution and waste was relatively controllable.</p> <p>1970s-1990s Plastic waste generated was more than triple what it used to be, reflecting a corresponding increase in plastic production.</p> <p>1990s-2010s Plastic waste increased dramatically, with the increase in the first decade since 2000s exceeding the combined level over the previous 40 years.</p> <p>2010s-present The global production of plastic products is about 400 million tons per year.</p>	<p>Began to pay attention to the problem of marine pollution by plastic waste First reports of adverse impacts of marine plastic debris on marine species in 1960 <i>London (Dumping) Convention</i> in 1972</p> <p>The First International Conference on Marine Debris in 1984, including the inclusion of some plastic waste in an international convention on plastic waste (the 1989 Basel Convention)</p> <p>The first UN General Assembly Resolution referring to the issue of marine debris in 2005</p> <p>Ongoing international marine debris conferences</p> <p>Marine litter and plastic pollution gradually placed on the international agenda after 2010 In terms of marine litter: the Global Partnership on Marine Litter (GPML) in 2012, the G20 Action Plan on Marine Litter in 2017; in terms of marine litter and plastic pollution: resolutions of UNEA-2 in 2016 and other sessions; in terms of plastic waste management: the Basel Convention Amendments adopted in 2019 to further regulate waste management</p>
	
<p>A resolution adopted at UNEA-5.2 in 2022 to initiate the developing of an international legally binding instrument aimed at ending plastic pollution, including in the marine environment</p>	

Figure 1.1 International plastic policies, initiatives and actions v.s. plastic production and waste (compiled based on UNEP 2022 *From pollution to solution – a global assessment on marine litter and plastic pollution*)^[9]

[9] Zheng Lixia. What We Are Doing – Addressing Plastics Pollution. An expert report at the third session of the Dialogue on Green Plastic (Lv Se Su Shuo, a live program initiated by the GRPG and the ACEF). 2022. https://mp.weixin.qq.com/s/4I4_jCVH43QK0RXLnHMcNA

(ii) Policy decision-making thinking for plastic pollution control

1. Analysis of the problem of single-use plastic pollution

The mode of production, use and consumption of single-use products is a way of production and living that has gradually gained popularity and grown from rapidly industrialized and economically developed countries and cities as a result of rapid economic growth and urbanization. Characterized by "rapid production, rapid consumption and rapid discarding", and known for its fast and convenient nature, such mode is expanding on a global scale. Therefore, such mode of production and consumption of products intended for single use is the root cause of the problem of single-use plastic pollution. A review of domestic and international reports and information on single-use plastic pollution easily reveals the following characteristics of the single-use plastic problem:

- **Plastics are mass-produced.** The world produces about 400 million tons of plastic annually, of which 36% are used in packaging. If current growth trends continue, global production of primary plastics is expected to increase to 1,100 million tons by 2050. Currently, 98% of plastic packaging, including disposable plastic packaging products, is produced from primary plastic ^[10].
- **Plastic waste is generated quickly.** Plastics become waste very quickly after they are produced and consumed, especially single-use plastic products, which become waste after one single use or a very short period of time, leading to rapid generation of plastic waste. A UNEP 2021 report shows that if current consumption patterns and waste management practices are not upgraded, 12 billion tons of plastic waste would be discarded to landfills or the natural environment by 2050.
- **Most of the plastic waste has not been recycled.** Most of the plastic world around the world has not been recycled, with 9% recycled, 12% incinerated and 79% sitting in landfills, dumps or in the environment (UNEP, 2018).

It should be noted that the problem of one-single plastic pollution is a widespread public concern, but it is not the whole of plastic pollution, but the most visible part of the environmental pollution caused by plastic waste to oceans and soil. In response to this thorny problem of great concern, countries around the world have introduced relevant policies. To date, more than 60 countries have introduced relevant policies (including bans and levies) to curb single-use plastic products, primarily plastic bags and Styrofoam, mainly because these plastic products are the most visible forms of plastic pollution and leaked in large quantities into the environment, including city streets, farmland, mountains, beaches and oceans. An analysis of relevant UNEP reports reveals that these countries' policies on banning or restricting plastics are generally effective in the short term (within around a year), and the environmental benefits of these policies are yet to be assessed due to the limited timeframe of their implementation ^[11].

2. Policy thinking based on the life cycle analysis method

Globally, the most visible form of plastic pollution is the plastic waste resulting from the leakage of single-use plastic packaging into the environment, which is partly due to individuals' behavioral habits and primarily due to unsound plastic waste management. As shown in Figure 1.3 waste management hierarchy, the most preferred option for plastic waste management is prevention from the source, which prevents the generation of plastic waste, and disposal is the least preferred or last option; recycling plays a role in the middle to facilitate the re-entry of waste, through processing, into the production system. The economic model of single-use products is typically linear, that is, production-use and consumption-discarding-landfill/incineration, which is also the origin of single-use plastic pollution. Hence, addressing the problem of single-use plastic pollution requires systematic changes in current production and

^[10] United Nations Environment Programme (2021). From Pollution to Solution: a global assessment of marine litter and plastic pollution

^[11] UNEP (2018). SINGLE-USE PLASTICS: A Roadmap for Sustainability

consumption systems, a holistic approach that takes into account the entire industrial chain, which covers product design, production and consumption, and collection, and a life-cycle analysis methodology to guide science-based decision-making, thus preventing problem transferring. It is also essential to explore ways of making use of limited resources to meet the needs of production and life.

A related UNEP report ^[12] analyzes the environmental impacts of single-use plastic products and their alternatives, such as single-use plastic bags, beverage cups and face masks, and puts forward relevant policy recommendations based on scientific analyses, including:

- (1) **The single-use pattern needs to change.** In policymaking guided by life-cycle thinking, the first step is to reduce the use of single-use products, as products intended for single use are the problem, regardless of their material. A single-use product is bound to produce greater full life-cycle environmental impacts than a product that can be reused many times. Therefore, it appears more important to consider how to phase out the single-use pattern from a design perspective before considering and making decisions on alternative raw materials, which is a fundamental solution to the problem. To promote the reuse of products, policymakers may on the one hand encourage the design and production of products that can be reused many times. On the other hand, they can provide policy incentives for the development of market tools and innovation in business models to ensure that products that can be reused many times can truly realize their reuse value.
- (2) **Environmental burden shifting should be avoided.** There will always be environmental impacts from products that we produce and use. Life-cycle thinking can help us scientifically identify which links produce environmental impacts in a transparent and quantitative way, thus guiding decision-makers to take corresponding measures to avoid environmental burdens and environmental hazards shifting. For instance, replacing single-use plastic cups with single-use paper cups would only result in a superficial reduction in plastic waste generated, but at the same time increase the amount of paper waste, which is in nature environmental burden shifting, rather than a fundamental solution to environmental pollution.

(1)

Therefore, to solve the problem of single-use beverage cups, promoting reusable cups and multiple uses of cups is the best alternative or choice, and this requires collaboration across different links including product design, material selection, business models and daily consumption and washing habits, and even the awareness and behavioral habits of decision-makers and consumers. From this point of view, addressing this problem requires joint action of all components of the entire industrial chain, and only the relevant countermeasures and actions make difference.

Globally, plastic pollution is mainly owed to unsound management of plastic waste. To end plastic pollution, it is far from enough to rely on plastic waste recycling at end-of-life alone and it is necessary to adopt a life-cycle approach which builds decision-making on the results of the analysis of products throughout their life cycles. Policy design needs to take into account all things, including product design, selection of materials, reusability, collection, recycling and regeneration, to make policymaking more scientific and drive the participation of all stakeholders to effect systematic changes.

^[12] UNEP (2021). Addressing single-use plastic products pollution using a life cycle thinking

II. Evolution of China's Plastic Pollution Control Policies

China's plastic management can be dated back to the alarming "white pollution" problem in the 1990s, when the country's policies focused on the management of single-use plastic packaging. Representative policies include: the *Opinions on Strengthening the Management of Plastic Packaging Waste in Key Traffic Lines, Watersheds and Tourist Scenic Spots*, the *Emergency Notice on Immediately Stopping the Production of Disposable Foamed Plastic Tableware*, and the *Circular of the General Office of the State Council on Restricting the Production, Sale and Use of Plastic Shopping Bags*. These policies were mainly intended to restrict or prohibit the use of plastic packaging waste, disposable foamed plastic tableware and plastic bags [13]. Since then, China has gradually introduced the concept of circular economy and in 2009, the country formally enacted the *Circular Economy Promotion Law*, kicking off the construction of a society-wide resource recycling system on all fronts.

Policies introduced for plastics recycling in China show different priorities in different stages. Beginning with a ban on the use of disposable foamed lunch boxes, government departments have gradually intensified the management of plastics recycling by repeatedly unveiling policies to restrict the production and consumption of disposable plastic bags and issuing regulations concerning plastic waste imports. While always focusing on main areas such as cleaner production, energy conservation and emission reduction, recycling system, and comprehensive utilization of resources, the relevant policies have gradually incorporated new concepts such as circular economy, green design and consumption, "dual-carbon" economy, and deem plastic waste recycling as an integral part of "Zero Waste Cities" and "Urban Mines". With the implementation of the ban on plastic waste imports in 2017, and the subsequent expansion of garbage classification in major cities, the focus of policymaking has gradually shifted to building a complete and closed-loop plastics recycling industry chain to facilitate the recycling of plastic products and enable high-value utilization of recycled plastics and plastic pollution control. In addition, recycling policies have also been introduced for key areas such as express packages, low-value recyclables, agricultural films and medical plastics. The emergence of new models, e.g., the "integration of two networks", has provided stronger technical support for the improvement and upgrading of the plastics recycling system. Moreover, with the advent and practice of new techniques such as chemical recycling, it has become clearer how we should prioritize and manage the ways of disposing of and recycling plastic waste, and the policies have also been introduced accordingly.

On the whole, China began to establish a plastic pollution control system in the 1990s and after decades of efforts, has built a basic policy framework that enables plastic pollution prevention and control throughout the industrial chain [14]. Driven by the international legal process on plastics, China will steer its plastic pollution prevention and control management towards the development and improvement of a policy system for circular plastics economy using a life-cycle approach and built upon the rationale of environmentally sound management.

1995-2006: the first decade

The 'white pollution' problem aroused widespread concern in society, with disposable foamed plastic tableware first drawing the attention of policymakers [15]. The former State Economic and Trade Commission

[13] Institute of Economic Systems and Management, Academy of Macroeconomic Research, National Development and Reform Commission, and Institute of Quantitative & Technological Economics, Chinese Academy of Social Sciences. *Plastic Pollution Prevention and Control in China: Principles and Practice* (Extracted version). 2022

[14] Institute of Economic Systems and Management, Academy of Macroeconomic Research, National Development and Reform Commission, and Institute of Quantitative & Technological Economics, Chinese Academy of Social Sciences. *Plastic Pollution Prevention and Control in China: Principles and Practice* (Extracted version). 2022

[15] This is because disposable foamed plastic tableware presents serious problems in all processes including production, use and collection. Some of the foaming agents used in the production process could destroy the atmospheric ozone layer, while some pose serious safety risks. If misused at high temperatures, they are likely to produce substances harmful to human health; if randomly discarded after use, they would cause heavy environmental pollution; if buried underground, in which case they can hardly be

(SETC) was the first to issue a policy to stop the production and use of disposable foamed plastic tableware and restrict the production and use of ultra-thin plastic bags (with a thickness of less than 0.015mm). Main policy documents include the *Emergency Notice on Immediately Stopping the Production of Disposable Foamed Plastic Tableware* (GJMCY[2001]No.382) and the *Circular on Stopping the Use of Disposable Foamed Plastic Tableware by Catering Enterprises* (2001, former SETC).

2007-2016: the second decade

In 2007, China adopted a plastic bag ban, namely, the *Circular on Restricting the Production, Sale and Use of Plastic Shopping Bags* (GBF[2007]No.72) of the General Office of the State Council, which made it clear that the production, sale and use of disposable ultra-thin plastic shopping bags (with a thickness of less than 0.025mm) are prohibited, and established the system of paid use of disposable plastic shopping bags^[16]. After the policy was issued, government departments laid down in succession specific measures for the implementation of restricted production and use of disposable plastic shopping bags, including provisions prohibiting excessive packaging. At this point, the system of restricted production and use of disposable plastic bags was formally established. Under the guidance of this policy, the production and use of ultra-thin plastic bags were strictly restricted, with such bags phased out. As estimated by the National Development and Reform Commission (NDRC), the ban resulted in an around 2/3 reduction in plastic bags used in supermarkets nationwide and a reduction of some 270,000 tons^[17] in plastic consumption during the first year of its implementation, yielding notable results within a short time. Meanwhile, the importance of plastic waste recycling was gradually recognized by all sectors of society, and the focus of policymaking gradually shifted to plastic waste recycling, as well as the establishment of a recycling system and the upgrading of recycling standards. Main policies include the *Administrative Measures for the Recovery of Renewable Resources* (2007), the *Opinions on Establishing a Complete and Advanced Waste Commodity Collection System* (2011), and the *Administrative Regulations on Pollution Prevention and Control of Plastic Waste Processing and Utilization* (2012), among others. Under the guidance of these policies, the plastic waste recycling industry developed rapidly and was gradually standardized. From 2008 on, China began to overhaul the recycled plastics processing market on a regular basis for environmental protection purposes, and reached consensus on technical upgrading and environmentally friendly development of the industry, officially pushing the country's recycled plastics industry into the stage of transformation and upgrading^[18].



1995-2006	<ul style="list-style-type: none"> • Focus of policies: restricting the production and use 	2007-2016	<ul style="list-style-type: none"> • Focus of policies: • Restricting the production and 	2017-present	<ul style="list-style-type: none"> • Focus of policies: • Ban on plastic waste imports;
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degraded, they would contaminate soil and groundwater; and it is quite difficult to recycle and dispose of them.

^[16] The Circular puts a ban on the production, sale and use of plastic shopping bags thinner than 0.025mm (ultra-thin plastic shopping bags for short) nationwide from June 1, 2008 on, and requires all supermarkets, shopping malls, marketplaces and other retail establishments to implement a system of paid use of plastic shopping bags and not to provide free plastic shopping bags from that date on.

^[17] https://www.ndrc.gov.cn/fggz/hjzy/stwmjs/200908/t20090826_1160731.html

^[18] UNDP Project of Plastic Pollution Prevention and Control Through the Entire Value Chain Modality, Plastic Baseline Report: From the Globe to China: Plastic Production, Consumption, Waste, Recycling, 2022

	<p>of ultra-thin plastic bags (with a thickness of less than 0.015mm)</p> <ul style="list-style-type: none"> • Main policies: • The <i>Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste</i> encourages the production of easily recycled or degradable commodity packaging • The <i>Emergency Notice on Immediately Stopping the Production of Disposable Foamed Plastic Tableware</i> (GJMCY (2001) No.382) 		<p>use of disposable plastic products; establishing the system of paid use of disposable plastic bags</p> <ul style="list-style-type: none"> • Recycling plastic waste • Main policies: China's plastic bag ban, the <i>Circular on Restricting the Production, Sale and Use of Plastic Shopping Bags</i> (2007) • The <i>Administrative Measures for the Recovery of Renewable Resources</i> (2007), the <i>Administrative Regulations on Pollution Prevention and Control of Plastic Waste Processing and Utilization</i> (2012) 	<ul style="list-style-type: none"> • Plastic pollution control • Circular plastics economy • Plastic packaging • Main policies: • <i>Catalog of Solid Waste Banned from Import</i> (2017) • The <i>Opinions on Further Strengthening Plastic Pollution Control (the new plastic bag ban)</i> • The <i>Opinions on Accelerating the Green Transformation of Express Packaging</i> (2020)
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Figure 2.1 Evolution of China's plastic pollution control policies

2017-present: the past five years

Policies focus during this period was on the prohibition of the import of plastic waste to reduce adverse environmental impacts on the one hand, and the pollution control and recycling system of domestic plastic waste on the other.. The year 2020 witnessed the release of a new plastic bag ban, namely the *Opinions on Further Strengthening Plastic Pollution Control* (FGHZ[2020]No.80) issued by the NDRC and the Ministry of Ecology and Environment (MEE), which became the policy basis of circular plastics economy and life-cycle management. Besides, e-commerce express packaging, as an emerging form of plastic waste during this period, has aroused attention from all walks of life, and competent authorities have introduced policies on plastic express packaging to promote green design, source reduction, improvement of resource efficiency, green procurement, recycling and environmental pollution reduction in the field of express packaging. Main policies include the *Opinions on Accelerating the Green Transformation of Express Packaging* (GBH[2020]No.115) and the *Measures for the Administration of Express and Mail Packaging* (2021, Ministry of Transport), among others.

III. Analysis of China's Plastic Pollution Control Policies: from a top-level design perspective

(i) Implementation of the UN 2030 Agenda for Sustainable Development

In September 2015, President Xi Jinping attended the United Nations Sustainable Development Summit, where he and the heads of other countries unanimously adopted the *Transforming our world: the 2030 Agenda for Sustainable Development*, ushering in a new era of global sustainable development and pointing out the direction for the development of countries and international cooperation on development. China attaches great importance to the implementation of this Agenda, and has organically integrated the implementation of the Agenda into its medium- to long-term development strategies such as the *13th Five-Year Plan for Economic and Social Development of the People's Republic of China* (the 13th Five-Year Plan). In September 2016, the Chinese government released *China's National Plan on Implementation of the 2030 Agenda for Sustainable Development* ^[19], which provides a work plan for the full implementation of the Agenda. According to the plan, in order to implement SDG 12 (Responsible Consumption and Production), China will adopt such important implementation paths as vigorously developing the circular economy to improve the recycling of waste, encouraging and promoting a conservation-oriented consumption pattern, pursuing the extended producer responsibility system, and improving the green government procurement policy. The production and management of industrial solid wastes and urban wastes will be preliminarily controlled.

In 2017, the Ministry of Foreign Affairs (MOF) released *China's Progress Report on Implementation of the 2030 Agenda for Sustainable Development*, where the part concerning Goal 12 "Ensure sustainable consumption and production" states that China will take measures to advocate circular economy, including developing a circular economy action plan on "Internet Plus Resources", and improve the green government procurement policy, with the aim to develop a set of green government procurement standards and regulations regarding recycling, renewable development and other connotations by 2020. This has also reaffirmed and verified that the "circular" development model is an important initiative and direction of alignment to guide the fulfillment of SDG12 (Responsible Production and Consumption) in China's different sectors, and strategically confirmed again that the development of circular economy, including plastics recycling, in China is an important program for implementation of the global sustainable development agenda.

[19] https://www.gov.cn/xinwen/2016-10/13/content_5118514.htm

(ii) Green and low-carbon development strategy

The development of cleaner production and circular economy is an important implementation path to promote green and low-carbon development in China. In 2019, the Ministry of Industry and Information Technology (MIIT) and China Development Bank (CDB) jointly issued the *Circular on Accelerating Industrial Energy Conservation and Green Development*, identifying the comprehensive utilization of plastic waste and other renewable resources as a key area of green development. Article 3 of the 2020 revision to the *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste* states that the State pursues eco-friendly growth models and promotes the development of cleaner production and circular economy.

In 2021, the State Council released a circular on issuing the Action Plan for Carbon Dioxide Peaking Before 2030, which incorporates carbon emissions peaking into the entire process and all aspects of economic and social development. In terms of resource recycling, including plastics recycling, the action plan emphasizes the requirements of refining systems for resource recycling, including: improving recycling networks for used materials and waste, and putting an "Internet +" recycling model into practice, thus realizing the reclamation of renewable resources to the fullest possible extent; strengthening the standardized management of industries related to the comprehensive utilization of renewable resources in order to foster industry clusters; advancing the high-standard construction of modernized centers for recovering mineral resources from urban waste, and promoting the clean, standardized and large-scale use of renewable resources; expanding the use of remanufactured products and products made from recycled resources, etc. The action plan also sets an ambitious target that the total amount of nine major reusable resources including plastic waste and waste rubber will top 450 million metric tons by 2025, and reach 510 million by 2030. It has been established at the national level that the recycling of renewable resources, including plastic waste, is an important way to have carbon emissions peak and promote green development ^[20].

^[20] https://www.miit.gov.cn/xwdt/szyw/art/2021/art_32ef5e1affb8483e96ae6189f7f86922.html

(iii) The 14th Five-Year Plan and related work plans

Plastic pollution control is an important task for China during the 14th Five-Year Plan period, and has been incorporated into corresponding strategic plans for economic, social and environmental development. In 2021, the *Outline of the 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives through the Year 2035 of the People's Republic of China* set forth the general principles and requirements of plastic pollution prevention and control, including addressing environmental issues at the root with comprehensive measures, working harder to control multiple pollutants in a coordinated way with all regions working together, stepping up the prevention and control of plastic pollution in all respects, and attaching importance to the treatment of new pollutants. This was followed by a number of strategic plans issued by ministries in succession, which specify the targets, tasks, paths and measures of plastic pollution control during the 14th Five-Year Plan period from different angles.

These documents include: The *Action Plan for Plastic Pollution Control during the 14th Five-Year Plan Period* emphasizes ensuring that all parties involved perform their responsibilities and duties and promoting plastic pollution control in key links, key sectors and key regions. It states that by 2025, the plastic pollution control mechanism will operate more efficiently, the responsibilities of local governments, departments and enterprises will be effectively implemented, more significant results will be achieved in the whole chain of production, circulation, consumption, recycling and terminal disposal of plastic products, and white pollution will be effectively contained.

The *14th Five-Year Plan for Circular Economy Development* includes a campaign on whole-chain plastic pollution control as part of the key projects and campaigns, and sets main targets that by 2025, green design will be widely promoted, recycling networks for used materials and waste will be improved, and the substitution of primary resources with renewable resources will be further increased.

The *14th Five-Year Plan for Green Industrial Development* encourages high-quality recycling of plastic waste and its chemical recycling, and building of a recycled resources supply chain that operates online and offline to meet both domestic and international needs through information technologies such as the Internet, blockchain and big data.

The *14th Five-Year Plan for Marine Environmental Protection* lists promoting marine plastic litter control as an important task in the protection of the marine environment, and will carry out marine plastic litter and microplastics monitoring and investigation, organize special clean-ups of plastic litter in areas such as bays, estuaries and beaches, and promote the establishment of a long-term mechanism for the clean-up of marine plastic litter in coastal cities and counties to keep key coastal areas free of visible plastic litter.

The *Implementation Plan for New Urbanization during the 14th Five-Year Plan Period* requires cities at the prefecture level and above to basically establish household waste sorting and disposal systems that ensure all household waste can be discarded, collected, transported and disposed of in a well-sorted manner according to local conditions. By 2025, the urban household waste incineration capacity will reach around 800,000 tons per day ^[21]. Plastic waste is one of the most important forms of recyclable waste in household waste sorting.

The *Work Plan for "Zero Waste Cities" Construction during the 14th Five-Year Plan Period* proposes to promote "Zero Waste Cities" construction in around 100 cities at the prefecture level and above, and clearly sets out the main tasks for plastic pollution control in the construction process, including advancing whole-chain plastic pollution control, slashing the use of single-use plastic products, promoting the application of degradable alternatives, strengthening the recycling of abandoned plastic products, accelerating the green transformation of express packaging, expanding the application of recyclable green packaging, and launching clean-ups of marine plastic litter.

^[21] https://www.ndrc.gov.cn/fggz/fzzlgh/gjjzxgh/202207/t20220728_1332050.html?code=&state=123

The *Action Plan for Pollution Control in Agriculture and Rural Areas (2021-2025)* identifies further implementing recovery of waste agricultural films as one of the main tasks, and puts forward requirements such as implementing a stricter agricultural film management system, strengthening the regulation over the entire chain of agricultural films including production, sale, use, recovery and reuse, and continuing the ongoing joint campaigns to control plastic pollution ^[22].

No.	The 14th Five-Year Plan/work plan	Core content concerning plastic pollution prevention and control
1	The Outline of the 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives through the Year 2035 of the People's Republic of China	General principles and requirements of plastic pollution prevention and control, including: <ul style="list-style-type: none"> • Address environmental issues at the root with comprehensive measures, work harder to control multiple pollutants in a coordinated way with all regions working together; • Step up the prevention and control of plastic pollution in all respects; • Attach importance to the treatment of new pollutants.
2	The 14th Five-Year Plan for Circular Economy Development	A campaign on whole-chain plastic pollution control; By 2025, green design will be widely promoted, recycling networks for used materials and waste will be improved, and the substitution of primary resources with renewable resources will be further increased.
3	The 14th Five-Year Plan for Green Industrial Development	Encourage high-quality recycling of plastic waste and its chemical recycling; Build a recycled resources supply chain that operates online and offline to meet both domestic and international needs through information technologies such as the Internet, blockchain and big data.
4	The Implementation Plan for New Urbanization during the 14th Five-Year Plan Period	Require cities at the prefecture level and above to basically establish household waste sorting and disposal systems that ensure all household waste can be discarded, collected, transported and disposed of in a well-sorted manner according to local conditions.
5	The Work Plan for "Zero Waste Cities" Construction during the 14th Five-Year Plan Period	In the Zero Waste Cities construction, efforts will be made to advance whole-chain plastic pollution control, including: <ul style="list-style-type: none"> • Slash the use of single-use plastic products; promote the application of degradable alternatives; • Strengthen the recycling of abandoned plastic products; • Expand the application of recyclable green packaging;

^[22] https://www.mee.gov.cn/xxgk/2018/xxgk/xxgk03/202201/t20220129_968575.html

		<ul style="list-style-type: none"> • Launch clean-ups of marine plastic litter.
6	The Action Plan for Pollution Control in Agriculture and Rural Areas (2021-2025)	<p>Implement a stricter agricultural film management system;</p> <p>Strengthen the regulation over the entire chain of agricultural films including production, sale, use, recovery and reuse.</p>
7	The 14th Five-Year Plan for Marine Environmental Protection	<p>Promote marine plastic litter control;</p> <p>Carry out marine plastic litter and microplastics monitoring and investigation;</p> <p>Organize special clean-ups of plastic litter in areas such as bays, estuaries and beaches;</p> <p>Promote the establishment of a long-term mechanism for the clean-up of marine plastic litter in coastal cities and counties.</p>

IV. Analysis of China's Plastic Pollution Control Policies: from a ministerial functional distribution perspective

From the perspective of functional distribution and relevant policies and regulations formulated by different ministries, China's plastic management covers the entire chain ranging from production, consumption to recycling and ultimate disposal, and involves multiple ministries. In general, National Development and Reform Commission (NDRC) and Ministry of Ecology and Environment (MEE) are two leading ministries on plastic pollution control. Below figure is an introduction to the functions of key departments in the process of plastic pollution control.

National Development and Reform Commission (NDRC)

As China's macroeconomic regulator, in terms of resources and the environment, the NDRC is responsible for making every effort to fight pollution, facilitating economical, intensive and cyclic utilization of resources, fostering new drivers of green development, accelerating the construction of a spatial pattern, industrial structure, mode of production and lifestyle that conserve resources and the environment, by staying committed to the development of an ecological civilization and focusing on promoting green development. In terms of plastic management, the NDRC is mainly responsible for coordinating the implementation of circular economy policies and, in accordance with the basic principles of developing a circular plastics economy and preventing and controlling pollution, formulating basic policy measures that guide the development of the plastics recycling sector and overarching policies involving all aspects of production and life, which typically target single-use plastic pollution (e.g., the plastic bag ban), and coordinating the implementation of these policies ^[23].

Ministry of Ecology and Environment (MEE)

The policies and regulations issued by the MEE are mainly intended to address the environmental impacts of plastics recycling, especially in the field of pollution prevention and control, and various policy documents focusing on the implementation of the policies and regulations have been issued, both against a single type of plastic waste and bulk solid waste^[24]. In addition, the MEE has included plastic waste pollution prevention and control by amending top-level systems and plans such as the catalogs of imported wastes management, the guidelines on promoting the development of circular economy, and the implementation plan for "Zero Waste Cities" pilot program.

^[23] See the attached Table 7.1 List of related regulations and policies issued by the National Development and Reform Commission

^[24] See the attached Table 7.2 List of related regulations and policies issued by the Ministry of Ecology and Environment

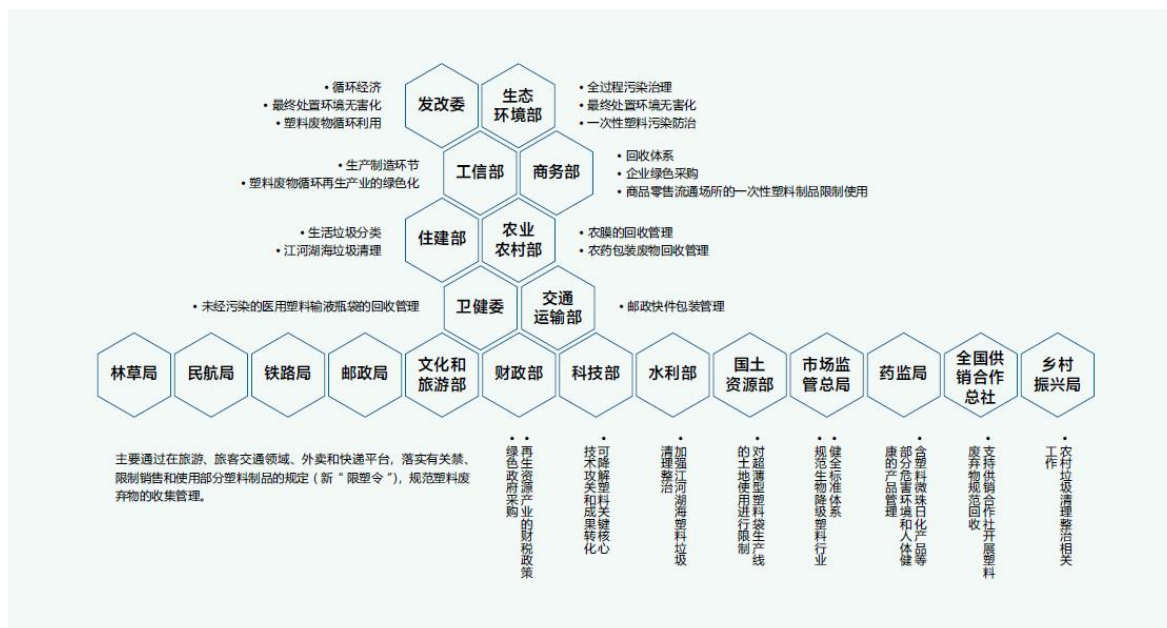


Figure 4.1 Division of functions of key departments in charge of plastic pollution control in China (only including those directly in charge of or involved in plastic pollution control, in no particular order)

循环经济	Circular economy
最终处置环境无害化	Environmentally sound ultimate disposal
塑料废物循环利用	Plastic waste recycling
生产制造环节	Production and manufacturing
塑料废物循环再生产业的绿色化	Greening of the plastic waste recycling industry
生活垃圾分类	Domestic waste sorting
江河湖海垃圾清理	Clean-up of litter in rivers, lakes and oceans
未经污染的医用塑料输液瓶袋的回收管理	Management of the collection of uncontaminated plastic infusion bottles and bags for medical purposes
主要通过旅游、旅客交通领域、外卖和快递平台，落实有关禁、限制销售和使用部分塑料制品的规定（新“限塑令”），规范塑料废弃物的收集管理。	Regulate the management of the collection of plastic waste, mainly by implementing the provisions concerning the banned or restricted sale and use of some plastic products (e.g., the new plastic bag ban) in the field of tourism and passenger transport as well as on takeaway and express delivery platforms.
全过程污染治理	Whole-process pollution control
最终处置环境无害化	Environmentally sound ultimate disposal
一次性塑料污染防治	Single-use plastic pollution prevention and control
回收体系	Recycling system
企业绿色采购	Enterprises' green procurement
商品零售流通场所的一次性塑料制品限制使用	Restricted use of single-use plastic products at commodity retailing and circulation places
农膜的回收管理	Management of the collection of agricultural films
农药包装废物回收管理	Management of the collection of pesticide packaging waste
邮政快件包装管理	Management of mail and express packaging
发改委	NDRC
生态环境部	MEE
工信部	MIIT
商务部	MOFCOM
住建部	MOHURD
农业农村部	MARA
卫健委	NHC
交通运输部	MOT

林草局	NFGA
民航局	CAAC
铁路局	NRA
邮政局	SPB
文化和旅游部	MCT
财政部	MOF
科技部	MOST
水利部	MWR
国土资源部	MLR
市场监管总局	SAMR
药监局	NMPA
全国供销合作总社	ACFSMC
乡村振兴局	NRRA
绿色政府采购	Green government procurement
再生资源产业的财税政策	Fiscal and tax policies for the renewable resources industry
可降解塑料关键核心技术攻关和成果转化	Promote breakthroughs in key and core technologies for degradable plastics and achievement transformation
加强江河湖海塑料垃圾清理政治	Strengthen the clean-up of plastic litter in rivers, lakes and oceans
对超薄型塑料袋生产线的土地使用进行限制	Restrict land use for ultra-thin plastic bag production lines
健全标准体系	Improve the standards system
规范生物降解塑料行业	Regulate the biodegradable plastics industry
含塑料微珠日化产品等部分危害环境和人体健康的产品管理	Manage products containing plastic microbeads, which harm the environment and human health
支持供销合作社开展塑料废弃物规范回收	Support supply and marketing cooperatives with standardized recycling of plastic waste
农村垃圾清理整治相关工作	Work related to rural waste clean-up

V. Analysis of China's Plastic Pollution Control Policies: from a life-cycle management perspective

(i) Basic principles

The National People's Congress (NPC) is responsible for enacting various basic laws and regulations closely related to environmental impact, cleaner production and recycling. The *Cleaner Production Promotion Law of the People's Republic of China*, the *Environmental Protection Law of the People's Republic of China*, the *Circular Economy Promotion Law of the People's Republic of China*, and the *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste* are the basic laws on the management of plastics, which establish the basic principles of plastics management, including:

The basic principles of reduction, reuse, recycling and harmless treatment: The *Circular Economy Promotion Law* has established the basic principle of reduction, reuse and recycling^[25], with the aim of improving the efficiency of resource utilization, protecting and improving the environment, and realizing sustainable development. Article 4 of the *Law on the Prevention and Control of Environmental Pollution by Solid Waste (2020 Revision)* states that the principles of quantity reduction, recycling wastes as resources and making wastes harmless through treatment shall be adhered to in the prevention and control of environmental pollution by solid wastes. The second paragraph of Article 20 of the *Cleaner Production Promotion Law* stipulates that enterprises shall package products in a reasonable manner; the materials, structure and costs of packaging shall be compatible with the quality, specifications and costs of the products contained therein to reduce the generation of packaging wastes and refrain from excessive packaging.

The principle of restricting or banning single-use plastic products: Article 69 of the *Law on the Prevention and Control of Environmental Pollution by Solid Waste (2020 Revision)* stipulates that "the State prohibits or restricts the production, sale, and use of non-degradable bags and other disposable plastic products according to law."

The principle of polluter's responsibility: Article 5 of the *Law on the Prevention and Control of Environmental Pollution by Solid Waste (2020 Revision)* stipulates that "the principle that whoever causes pollution must be held accountable for it shall be adhered to in the prevention and control of environmental pollution by solid wastes. Entities and individuals that generate, collect, store, transport, utilize, or treat solid wastes shall take measures to prevent or reduce the environmental pollution by solid wastes, and shall be held accountable in accordance with law for environmental pollution caused thereby."

Giving priority to reduction: The *Circular Economy Promotion Law* confirms at the legal level that the development of a circular economy shall follow the principle of giving priority to reduction under the precondition of being technically feasible, economically rational and good for saving resources and protecting the environment.

Fiscal and tax incentives for recycled products: The *Cleaner Production Promotion Law* has established tax incentives for the production of products using recycled wastes as raw materials. Article 33 of the *Cleaner Production Promotion Law* stipulates that those who utilize wastes and produce products by recycling raw materials from wastes according to law shall enjoy tax incentives in accordance with State regulations.

Government procurement prioritizing recycled products: The *Circular Economy Promotion Law* makes it clear that the State adopts a government procurement policy that is good for the development of circular economy. Article 47 of the *Circular Economy Promotion Law* stipulates that the State adopts a government procurement policy that is good for the development of circular economy. Entities and individuals purchasing goods with funds from the public finance shall give preference to energy-saving, water-saving,

^[25] For the purposes of the Circular Economy Promotion Law, reduction means reducing resource consumption and waste generation in processes such as production, circulation and consumption. Reuse means using wastes as products directly or after they are repaired, refurbished or reproduced, or using part or all of wastes as components of other products. Recycling means using wastes as raw materials directly or after they are recycled.

material-saving and environment-friendly products and recycled products.

Table 5.1 Basic laws and regulations and major provisions applicable to plastic pollution prevention and control in China

No.	Law/Regulation	Time	Core principle/system	Related major provision
1	The Cleaner Production Promotion Law of the People's Republic of China (2012 Revision)	February 29, 2012	Reduction of excessive packaging. Tax incentives for waste recycling. Establishment of supply and demand information service systems for recyclable waste.	Article 10 The relevant departments of the State Council and the people's governments of provinces, autonomous regions, and municipalities directly under the central government shall organize and support the establishment of information systems and technical consulting service systems for cleaner production to provide the public with methods and technologies for cleaner production as well as information and services regarding recyclable waste supply and demand and cleaner production policies. The second paragraph of Article 20: Enterprises shall package products in a reasonable manner; the materials, structure and costs of packaging shall be compatible with the quality, specifications and costs of the products contained therein to reduce the generation of packaging wastes and refrain from excessive packaging. Article 33 Those who utilize wastes and produce products by recycling raw materials from wastes according to law shall enjoy tax incentives in accordance with State regulations.
2	The Environmental Protection Law of the People's Republic of China (2014 Revision)	April 24, 2014	It incorporates the concepts of ecological progress and sustainable development. It identifies protecting the environment as a fundamental national policy and clarifies the basic principles.	Article 4 Protecting the environment is a fundamental national policy of the State. The State shall adopt economic and technological policies and measures conducive to economically and cyclically utilizing resources, protecting and improving the environment and enhancing the harmony between mankind and nature to coordinate economic and social development with environmental protection. Article 36 The State shall encourage and direct citizens, legal persons, and other organizations to use products and recycled products conducive to protecting the environment to reduce wastes. Article 40 The State shall promote cleaner production and resource recycling.
3	The Circular Economy Promotion Law (2018 Revision)	October 26, 2018	It determines that improving the resource utilization efficiency is the fundamental purpose	Article 1 This Law is formulated for the purpose of promoting the development of the circular economy, improving the resource utilization efficiency, protecting and improving the

			<p>of the development of a circular economy.</p> <p>It establishes the basic principles of reduction, reuse and recycling.</p> <p>The development of a circular economy shall follow the principle of giving priority to reduction under the precondition of being technically feasible, economically rational and good for saving resources and protecting the environment.</p> <p>The production and sale of disposable consumer goods are restricted.</p>	<p>environment and realizing sustainable development.</p> <p>Article 2 The term "circular economy" as referred to in this Law is an umbrella term for the reducing, reusing and recycling activities in processes such as production, circulation and consumption. The term "reducing" as referred to in this Law means reducing resource consumption and waste generation in processes such as production, circulation and consumption. The term "reusing" as referred to in this Law means using wastes as products directly or after they are repaired, refurbished or reproduced, or using part or all of wastes as components of other products. The term "recycling" as referred to in this Law means using wastes as raw materials directly or after they are recycled.</p> <p>Article 47 The State adopts a government procurement policy that is good for the development of circular economy. Entities and individuals purchasing goods with funds from the public finance shall give preference to energy-saving, water-saving, material-saving and environment-friendly products and recycled products.</p>
4	The Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste (2020 Revision)	April 29, 2020	The principles of quantity reduction, recycling wastes as resources and making wastes harmless through treatment shall be adhered to in the prevention and control of environmental pollution by solid wastes	<p>Article 4 The principles of quantity reduction, recycling wastes as resources and making wastes harmless through treatment shall be adhered to in the prevention and control of environmental pollution by solid wastes.</p> <p>Article 5 The principle that whoever causes pollution must be held accountable for it shall be adhered to in the prevention and control of environmental pollution by solid wastes. Entities and individuals that generate, collect, store, transport, utilize, or treat solid wastes shall take measures to prevent or reduce the environmental pollution by solid wastes, and shall be held accountable in accordance with law for environmental pollution caused thereby.</p> <p>Article 68 The design and manufacture of products and packaging materials shall comply with the State regulations on cleaner production. The competent department of standardization under the State Council shall, on the basis of the</p>

				<p>national economic and technical conditions, in light of the situation of prevention and control of environmental pollution by solid wastes, and in compliance with the technical requirements of the products, organize the formulation of relevant standards to prevent environmental pollution by excessive packaging. ...E-commerce, express delivery, food delivery and other relevant industries shall give priority to the use of reusable and easily recycled packaging materials, optimize packaging of goods, and reduce the use of and actively recycle packaging materials. The competent departments of commerce, postal services and other relevant departments under local people's governments at or above the county level shall strengthen supervision and administration. The State encourages and guides consumers to use green packaging and reduced packaging.</p> <p>Article 69 The State prohibits or restricts the production, sale and use of non-degradable plastic bags and other disposable plastic products according to law. Retail establishment operators, e-commerce platform enterprises, express delivery enterprises and food delivery enterprises shall, in accordance with relevant State regulations, report to the competent departments of commerce and postal services on their use and recovery of plastic bags and other disposable plastic products. The State encourages and guides the public to reduce the consumption of and actively recycle plastic bags and other disposable plastic products, and promotes the wide use of alternative products that are recyclable, easily recycled, and degradable.</p> <p>Article 70 Tourism, accommodation and other industries shall, according to relevant State regulations, implement the initiative of not providing disposable supplies to customers without being asked to do so. In offices of State organs, enterprises and public institutions, products, equipment and facilities that are conducive to environmental protection shall be used, and the use of disposable office supplies shall be reduced.</p>
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(ii) Policies on single-use plastic products

China's first plastic bag ban is the *Circular on Restricting the Production, Sale and Use of Plastic Shopping Bags* issued by the General Office of the State Council on December 31, 2007, which aims to restrict and reduce the production and use of ultra-thin plastic bags to address the prominent environmental problem of "white pollution" at that time. Following that, ministries unveiled in succession policies to promote the implementation of the plastic bag ban, especially the *Administrative Measures for the Paid Use of Plastic Bags at Retail Establishments* (Ministry of Commerce, 2008), which lays down the requirement that retail establishments shall provide consumers with paid plastic shopping bags, and has established the system of paid use of plastic shopping bags.

In 2020, a new plastic bag ban was released, namely the *Opinions on Further Strengthening Plastic Pollution Control* (FGHZ[2020]No.80) issued by the NDRC and the MEE, which, in addition to applying stricter provisions on prohibiting or restricting the production and use of ultra-thin plastic shopping bags, contains a further detailed list of single-use plastic products prohibited or restricted from production and use, and establishes the policy thinking and basis of circular plastics economy and life-cycle management.

No.	Competent authority	Policy/regulation	Document number	Time	Type of plastic targeted	Target process/scope of management	Key points
1	Former SETC	<i>Catalog of Outdated Production Capacities, Processes and Products to be Eliminated</i>	Order No.6 of the State Economic and Trade Commission	January 1999	Disposable foamed plastic tableware	Production	Eliminate disposable foamed plastic tableware by the end of 2000
2	Former SETC	The Emergency Notice on Immediately Stopping the Production of Disposable Foamed Plastic Tableware	GJMCY[2001]N o.382	April 23, 2001	Disposable foamed plastic tableware	Production	Producers shall immediately stop the production of disposable foamed plastic tableware. Strengthen the supervision and inspection of enterprises producing disposable foamed plastic tableware. Facilitate the production and supply of alternatives to ensure the smooth running of replacement. Enterprises producing alternative products should work in strict accordance with two national standards, namely the <i>General Specification for Single Use and Degradable Lunch Container and Drinking Set</i> (GB18006.1-1999) and the <i>Test Method for Determining the Degradability of Single Use and Degradable Lunch Container and Drinking Set</i> (GB/T18006.2-1999), strive to increase the concentration of production, reduce costs and ensure product quality.
3	Former SETC	The Circular on Stopping the Use of Disposable Foamed Plastic Tableware by Catering Enterprises	-	May 29, 2001	Disposable foamed plastic tableware	Use (catering)	<ul style="list-style-type: none"> Catering enterprises should consciously abide by the relevant State regulations, implement national industrial policies, and immediately stop using disposable foamed plastic tableware. Catering enterprises across the country shall, in accordance with the national mandatory standard <i>General Specification for Single Use and Degradable Lunch Container and Drinking Set</i> (GB18006 1-1999), select various alternative products, while

							paying attention to recycling and disposal thereof.
4	MLR NDRC	The Notice on Issuing and Implementing the <i>Catalog of Restricted Land Use Projects (2006)</i> and the <i>Catalog of Prohibited Land Use Projects (2006)</i>	GTZF[2006]No.9 6	December 12, 2006	Ultra-thin plastic bags	Production	It includes "ultra-thin plastic bag (with a thickness of less than 0.015mm) production lines" in the national catalog of restricted land use projects, and stipulates that the competent departments of land resources and investment at all levels should not handle related procedures.
5	The State Council	The Circular of the General Office of the State Council on Restricting the Production, Sale and Use of Plastic Shopping Bags	GBF[2007]No.72	December 31, 2007	Plastic shopping bags (ultra-thin)	Production, sale and use	The first plastic bag ban, which strictly restricts the production, sale and use of ultra-thin plastic shopping bags, and has established the system of paid use of plastic shopping bags. It stipulates that from June 1, 2008, the production, sale and use of plastic shopping bags with a thickness of less than 0.025mm (hereinafter referred to as ultra-thin plastic shopping bags) would be prohibited nationwide.
6	MOFCOM, etc.	The Administrative Measures for the Paid Use of Plastic Shopping Bags at Retail Establishments	Order No.8 of the Ministry of Commerce, the National Development and Reform Commission and the State Administration for Industry and Commerce in 2008	May 15, 2008	Plastic shopping bags	Use (at retail places)	Retail establishments shall provide consumers with paid plastic shopping bags in accordance with these Measures.
7	MOFCOM, etc.	<i>The Opinions on the Handling of Issues Related to the Administrative Measures for the Paid Use of Plastic Shopping Bags at Retail Establishments</i>	SGZ[2008]No.41	July 4, 2008	Plastic shopping bags	Use (at retail places)	Retail establishments shall not accept free or paid provision of various bag products from unknown sources, with incomplete labels or images and text that do not comply with relevant national standards and regulations by any institution, organization and individual.
8	NDRC	The Notice of the General Office of the National	FGBHZ[2008]No .1554	July 11, 2008	Plastic shopping bags	Production, sale and use	Strengthen municipal solid waste sorting and collection, enhance the development and

		Development and Reform Commission on Further Implementing the <i>Circular of the General Office of the State Council on Restricting the Production, Sale and Use of Plastic Shopping Bags</i>					utilization of affordable alternatives to household garbage bags, and actively promote the recycling of discarded plastic bags and other film products.
9	NDRC	The Notice on Launching Intensive Campaigns to Restrict the Production, Sale and Use of Plastic Shopping Bags	FGHZ[2011]No. 1399	July 6, 2011	Plastic shopping bags	Production, sale and use	In order to summarize the implementation of the plastic bag ban, promote the work on plastic bag restrictions, focus on outstanding problems and further consolidate the achievements in this respect, the NDRC launched intensive campaigns to restrict the production, sale and use of plastic shopping bags nationwide in July to August 2021, three years after the roll-out of the plastic bag ban.
10	NDRC	The Notice on Deepening the Implementation of Restrictions on the Production, Sale and Use of Plastic Shopping Bags	FGHZ[2013]No. 758	April 17, 2013	Plastic shopping bags	Production, sale and use	The year 2013 marked the fifth anniversary of the implementation of the plastic bag ban, and related work should be further done to consolidate and build on what has been achieved.
11	NDRC MEE	The Opinions of the National Development and Reform Commission and the Ministry of Ecology and Environment on Further Strengthening Plastic Pollution Control	FGHZ[2020]No. 80	2020	Specific single-use plastic products ^[26] , plastic waste	Production Use Collection, clean-up and transportation Plastic waste clean-up	The new plastic bag ban, which is more well-rounded and includes the management of collection and recycling in addition to production, sale and use. 1. Prohibit or restrict the production, sale and use of some plastic products ^[27] . 2. Promote the application of alternative products and models. 3. Regulate the recycling and disposal of plastic waste.

^[26] Specific single-use plastic products: 1) plastic bags, 2) tableware and lunch boxes, 3) express packaging, 4) agricultural mulching films, and 5) other disposable daily supplies (in hotels)

^[27] Plastic products prohibited from production and sale (the production and sale of ultra-thin plastic shopping bags thinner than 0.025mm and polyethylene agricultural mulching films thinner than 0.01mm are prohibited. Manufacturing of plastic products using medical waste as raw materials is prohibited. Plastic waste imports are completely banned. By the end of 2020, the production and sale of disposable foamed plastic tableware and disposable plastic cotton swabs would be prohibited; the production of household chemicals containing plastic microbeads would be prohibited. By the end of 2022, the sale of household chemicals containing plastic microbeads would be prohibited. Plastic products prohibited or restricted from use (non-degradable plastic bags, disposable plastic tableware and straws, disposable plastic supplies in hotels, plastic express packaging).

							4. Improve the support system.
12	Nine ministries [28]	The Notice on Solidly Promoting Plastic Pollution Control, including the Detailed Standard on Prohibiting or Restricting Relevant Plastic Products (2020)	FGHZ[2020]No. 1146	July 10, 2020	Specific single-use plastic products ^[29] Non-degradable single-use plastic products ^[30] Plastic waste	Production, use, collection, clean-up and transportation, use of waste as resources and energy, plastic waste clean-up	To promote the implementation of the <i>Opinions of the National Development and Reform Commission and the Ministry of Ecology and Environment on Further Strengthening Plastic Pollution Control</i> , and ensure that the plastic pollution control targets and tasks by the end of 2020 can be completed on schedule, the document requires localities to develop provincial implementation plans and break down the tasks. Promote implementation in key areas, including by strengthening the supervision and inspection of plastic products prohibited from production, sale and use; strengthening the supervision and management of plastic bag bans or restrictions in retail, catering and other areas; promoting agricultural film management; regulating the collection and disposal of plastic waste; launching plastic waste clean-ups.

^[28] The National Development and Reform Commission, the Ministry of Ecology and Environment, the Ministry of Industry and Information Technology, the Ministry of Housing and Urban-Rural Development, the Ministry of Agriculture and Rural Affairs, the Ministry of Commerce, the Ministry of Culture and Tourism, the State Administration for Market Regulation, the All China Federation of Supply and Marketing Cooperatives

^[29] Specific single-use plastic products: 1) ultra-thin plastic bags thinner than 0.025mm; 2) foamed plastic tableware; 3) plastic cotton swabs; 4) polyethylene agricultural non-degradable mulching films

^[30] Single-use non-degradable plastic products: 1) disposable non-degradable plastic bags (for retail and service uses), 2) disposable non-degradable plastic tableware (catering services), 3) disposable non-degradable plastic straws (catering services)

13	MOFCOM	The Notice on Further Strengthening the Plastic Pollution Control in the Commerce Field	SBLTH[2020]No .306	August 28, 2020	Plastic bags, plastic lunch boxes, etc.	Use (in the commerce field)	<p>Implement the requirements of the provisions on prohibiting or restricting plastic bags, and require competent local departments of commerce to fully understand and earnestly implement the specific requirements for prohibiting or restricting different plastic products, such as where and when the provisions apply, with focus on key areas such as shopping malls, supermarkets, marketplaces, catering, accommodation, exhibitions and conventions, and e-commerce. Put forward the requirement of reporting disposable plastic products.</p> <p>Propose to strengthen policy support. Accelerate the establishment of a centralized purchasing and selling system for shopping bags in marketplaces. Promote the use of bio-based, degradable plastic bags and other alternatives that meet performance and food safety requirements in the fields of catering and food delivery, such as straw-coated lunch boxes.</p>
14	MOFCOM	The Notice of the General Office of the Ministry of Commerce on Matters Concerning the Reporting of the Use and Recycling of Disposable Plastic Products		December 11, 2020	Single-use plastic products	Use (in the commerce field)	<p>Organize the implementation of the <i>Reporting Measures</i>, and promote the implementation in accordance with the requirements (see annex) specified in the <i>Reporting Measures</i>, such as who should report and what should be reported. Urge and guide the competent departments of commerce in provincial capitals, prefecture-level cities and counties to take practical measures for key areas and weak links in light of the relevant national provisions on prohibiting or restricting plastic bags, thereby ensuring the work of reporting is carried out in an orderly manner.</p>
15	MOFCOM	The Notice of the General Office of the Ministry of Commerce on the Second	SBLTH[2021]No .219	June 28, 2021	Single-use plastic products	Use (in the commerce field)	<p>Do the second phase reporting on the basis of a summary and analysis of the first phase reporting of the use and recycling of</p>

		Phase Reporting of the Use and Recycling of Disposable Plastic Products					disposable plastic products
16	NDRC MEE	The Notice on Issuing the Action Plan for Plastic Pollution Control during the 14th Five-Year Plan Period	FGHZ[2021]No. 1298			Production Design Sale Use Recycling	<p>Actively drive reductions in the production and use of plastic at the root: actively promote green design of plastic products (formulate standards concerning green design, with emphasis on disposable plastic products, to enhance the recyclability of plastic products); continuously advance reductions in the use of disposable plastic products.</p> <p>Promote alternatives to plastic in a scientific and prudential way (take into full account the full life-cycle environmental impacts of bamboo and wood products, paper products, degradable plastic products, etc., and improve the quality and food safety standards for relevant products).</p> <p>Accelerate the standardized recycling and disposal of plastic waste. Establish and improve the rural plastic waste collection, transportation and disposal system. Step up the recycling of plastic waste. Improve the environmentally sound disposal of plastic waste. Vigorously carry out plastic waste clean-up in key regions.</p>
17	MOFCOM	<i>The Administrative Measures for the Use and Reporting of Disposable Plastic Products by Business Operators</i>	Order No.1 of the Ministry of Commerce and the National Development and Reform Commission in 2023	May 10, 2023	Single-use plastic products	Use (in the commerce field)	<p>The supervision and management of the use and reporting of disposable plastic products in the commerce field. The commerce field includes commodity retailing, e-commerce, catering, accommodation, and exhibitions. It replaces the <i>Measures for Reporting of the Use and Recycling of Disposable Plastic Products in the Commerce Field (for Trial Implementation)</i> (Announcement No.61 of the Ministry of Commerce in 2020)</p>

(iii) Management of plastics in production phase

1. Cleaner production

The cleaner production has different names in different stages of development or in different countries. It is an important means of waste reduction and pollution prevention. Its connotation includes improved design, energy-saving and emission reduction technology, zero-waste technology, clean energy use, and improved management, etc. However, its basic connotation is consistent, that is, to reduce the production of pollutants by adopting pollution prevention strategies for products, production processes and services.

China's concept of cleaner production, derived from the *Cleaner Production Promotion Law*, refers to the continuous adoption of measures such as improving design, using clean energy and raw materials, adopting advanced technology and equipment, improving management and comprehensive utilization, to reduce pollution at the source, improve the resource utilization efficiency, reduce or avoid the generation and discharge of pollutants in the process of production, service and product use, and consequently reduce or eliminate hazards to human health and the environment.

China's cleaner production requirements for the plastic industry chain are mainly embodied in two aspects: one is to reduce excessive packaging at the source, and the other is to standardize the recycling process of plastic waste. The *Cleaner Production Promotion Law* (revised in 2012) is the basic regulation for cleaner production in China, which stipulates the requirements for reducing excessive packaging to reduce packaging waste and proposes the tax incentives for products which are manufactured through waste collection from raw materials. In 2010, the Ministry of Housing and Urban Rural Development issued the *Technical Guide for Domestic Waste Treatment* (JC[2010]No.61), which put forward directional and principled guidance for the production of plastic packaging, encouraging commodity manufacturers to design and manufacture product packaging materials according to relevant national regulations on cleaner production, produce packaging materials that are easy to recycle, dispose or degrade in the environment, limit excessive packaging, reasonably build up a product packaging recycling system, and reduce environmental pollution caused by domestic waste generated by disposable consumption. China's Plastic Restriction Order issued in 2007 and updated in 2020 also determines the classification regulations and lists of prohibitions and restrictions on the production of specific disposable plastic products (mainly plastic packaging and plastic daily necessities such as ultra-thin plastic bags and foamed plastic tableware), including the prohibition of the production of disposable foamed plastic tableware, disposable plastic cotton swabs, daily chemical products containing plastic beads, and ultra-thin plastic bags (of less than 0.025 mm thick), etc., restrictions... In addition, in 2021, the State Council issued the *Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development* (GF[2021]No.4), requiring promoting the governance of excessive packaging and driving the producers and operators to comply with mandatory standards restricting excessive packaging of commodities.

2. Green design

The "ecological design" is not an isolated art design or product design, but a system. Generally, the ecological design of a product refers to the concept of incorporating environmental factors into the product design, considering the environmental impact of the whole process of the product life cycle at the design stage, thus helping to determine the design decision-making direction and reducing the environmental impact of products to a minimum by improving the design. Thus, in general, the "ecological design" is an important means of intervention at the product manufacturing stage, aiming at reshaping design concepts, redesigning products to promote less resource extraction at the source, promoting the use of recycled materials, shifting the use model of disposable products to the reuse model, and promoting recycling, etc.

China's policies on plastic pollution prevention, waste management and circular economy mostly adopt the

concept of "green design". At present, there is no special policy to refine and standardize the principles of green design, and the green design has not been regarded as an independent means to reduce plastic pollution prevention. In some policies or technical documents, it can be found that the green design of plastic products is advocated and encouraged in principle. The *14th Five-Year Circular Economy Development Plan* published in 2021 puts forward the requirements for green design of key products to improve the whole-chain treatment of plastics. In the *Action Plan for Plastic Pollution Control during the 14th Five-Year Plan*, it is proposed to actively promote the green design of plastic products under the guidance of the circular economy principle and the whole-chain treatment idea of plastic pollution control, and the norms, standards and guidelines for the green design of plastic products need to be further refined and improved during the 14th Five-Year Plan period.

In addition, relevant standards have been issued for the green design of plastic products. For example, in order to improve the source reduction of plastic waste and the recycling rate, Section 4.1 of the national ecological and environmental standard - *Technical specification for pollution control of plastic waste* (HJ 364-2022) stipulates that, "the green design of plastic products shall be strengthened to facilitate reuse and utilization disposal". The green assessment requirements and assessment methods for plastic products are also specified in the *Green product assessment - Plastic Products* (GB/T 37866-2019).

(iv) Management of plastics in sales and use phase - advocating green consumption, a green lifestyle and education

Sustainable consumption is defined as "the provision of services and related products to meet basic human needs and improve the quality of life, while minimizing the use of natural resources and toxic materials and the generation of wastes and pollutants in the life cycle of services or products, so as not to endanger the needs of future generations", in the report of Element of policies for sustainable consumption developed by UNEP in 1994. According to the *Guiding Opinions on Promoting Green Consumption* (2016) of China, green consumption refers to the consumption behavior characterized by saving resources and protecting the environment, which is mainly manifested in advocating thrift, reducing loss and waste, selecting efficient and environmentally friendly products and services, and reducing resource consumption and pollution emission in the consumption process. It is an intervention means to reduce pollution and improve resource efficiency from the consumption link, and to drive the green transformation of the whole process of design, production, sales, circulation and recycling through the transformation of consumption concept and consumption behavior. The government green procurement system is an important policy to promote sustainable consumption.

The government green procurement system is an important policy tool to promote sustainable consumption. The Section 9 of the *Government Procurement Law* promulgated by the Government of China in 2003 stipulates that, the government procurement shall contribute to the realization of national economic and social development policy objectives, including environmental protection. The Section 16 of the *Cleaner Production Promotion Law* (2003) stipulates that, the people's government at all levels shall give priority to purchasing energy-saving, water-saving and waste-recycling products that are beneficial to the environment and resources. The *Circular Economy Promotion Law* (2008) stipulates that, the government procurement shall give priority to products that are conducive to environmental protection. The Section 100 of the *Law on Prevention and Control of Environmental Pollution by Solid Waste* (revised in 2020) stipulates that, the State shall encourage units and individuals to purchase and use products of comprehensive utilization and reusable products. These clauses have laid the legal foundation for the government green procurement policy in China.

In addition, the *Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development* (2021), the *Notice on the Guiding Opinions on Promoting Green Consumption* (2016), the *Implementation Opinions on Accelerating the Promotion of Green Lifestyle* (2015) and the *Green Procurement Guidelines for Enterprises (for Trial Implementation)* play an important role in promoting the whole society to reinforce the concept of green consumption and promote the supply, procurement and consumption of green products.

Guiding institutions and businesses - creating a social environment that help consumers make more sustainable choices

In the sales and use links of plastic products, such as in catering, retail stores, hotels and other places, the requirements for prohibiting and restricting the sales and use of certain types of disposable plastic products have been embodied in the relevant policy documents such as the "plastic bag ban", which are detailed in Section (II) of Chapter IV above. In addition, the *Opinions on Deepening and Winning the Battle Against Pollution* issued by the State Council in 2021 proposed to accelerate the formation of a green and low-carbon lifestyle, require the establishment of an incentive mechanism for green consumption, promote the construction of a green product certification and identification system, and create a new fashion of green and low-carbon life.

Guiding and educating consumers - promoting consumers to make more sustainable choices

Logo and label certification is an important market-oriented information tool to promote sustainable

consumption and plays an important role in guiding consumers to choose more environmentally friendly, low-carbon and sustainable products and services. China's label certification system consists of energy-saving and water-saving product certification, environmental label certification, green hotel certification, organic product label certification and many other label certification systems covering various industries. According to the China's Environmental Performance Evaluation Report of Environmental Labeling Products in 2019, the amount of plastic waste reduced by Chinese environmental labeling products in 2017 and 2018 reached 6,411 tons and 7,566 tons respectively.

At present, a number of laws, regulations, policies and technical documents encourage and advocate to guide residents and consumers to change their consumption patterns for the purpose of reducing plastic pollution, mainly requiring relevant departments to improve publicity, guidance and education for residents and consumers. In 2021, The *Opinions of the State Council on Deepening and Winning the Battle Against Pollution* required that the ecological civilization education shall be incorporated into the national education system and actions shall be implemented in depth for creating a green life.

In 2023, five national ministries, including the Ministry of Ecology and Environment and the Ministry of Education, jointly revised the Ten Rules for Citizens' Ecological and Environmental Behavior, proposing to advocate ten rules of conduct to guide the public to practice ecological and environmental protection obligations and responsibilities, including protecting resources and energy sources, reducing pollution generation, practicing green and low-carbon consumption, etc. Among them, Article 3 encourages and guides the public to give priority to green low-carbon products, purchase and use less disposable articles, bring their own shopping bags and water cups when going out and advocate the transformation and utilization of idle items, exchange or donations.

(v) Collection of plastic waste (collection and transportation system)

The collection system referred to in this section focuses on collection and transportation. An effective collection system is the premise and important guarantee of waste resource utilization. China has always attached the importance to the construction of a renewable resource collection system including the plastic waste. Many authorities such as the Ministry of Commerce have issued relevant policies and put forward goals and requirements on the establishment of a renewable resource collection system. Because collection is closely related to cyclic utilization, most policies focus on both collection and cyclic utilization^[31].

In 2007, the Ministry of Commerce published the *Administrative Measures for the Recovery of Renewable Resources*, which set out the basic principles for the collection management of renewable resources, in which the State encourages the collection of renewable resources in an environmentally sound manner and promote scientific research, technology development and technology popularization related to the collection of renewable resources.

In 2009, the Ministry of Commerce and the Ministry of Finance issued the *Notice on Accelerating the Construction of a Renewable Resource Collection System*, which required that the collection stations for community residents, sorting centers and terminal markets shall be transformed in a standardized manner, so that more than 90% of communities can have standardized recycling stations set up, more than 90% of renewable resources can enter designated markets for standardized trading and centralized treatment, and the collection rate of major varieties of renewable resources can reach 80%, thus gradually forming a renewable resource collection system that conforms to the urban construction, development and planning requirements in a reasonable layout with a sound network, applicable facilities, complete service functions and a scientific management mode to realize the industrialization of renewable resource recycling.

In 2011, the General Office of the State Council published the *Opinions on Establishing a Complete and Advanced Waste Commodity collection System*, proposing the goal of initially establishing a modern waste commodity collection system with a sound network, advanced technology, good sorting and treatment and standardized management by 2015, based on which the collection rate of waste commodities of all major varieties can reach 70%.

In 2012, the General Office of the State Council publish the *Notice on the Establishment of a Division of Work Plan for Key Work Departments in a Complete and Advanced Waste Commodity Collection System*, requiring to focus on the collection of key waste commodities, improving the sorting level, reinforce the scientific and technological support, play the leading role of large enterprises, promote the intensive and large-scale development of waste commodity collection and sorting, improve the collection network, strengthen industry supervision and environmental protection, increase fiscal and taxation support, improve land support policies, revise relevant systems and standards, prepare plans, establish an overall coordination and guidance mechanism, and carry out in-depth publicity and education.

In 2015, the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Land and Resources, the Ministry of Housing and Urban Rural Development and the All China Federation of Supply and Marketing Cooperatives jointly issued the *Medium- and Long-term Plan for the Construction of a Renewable Resource Collection System (2015 - 2020)*, encouraging the leading enterprises to integrate small- and medium-sized enterprises and self-employed households in modern organizational ways such as chain operation and franchise operation, and promoting the collection, sorting and processing of renewable resources.

In 2016, the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Ecology and Environment, the Ministry of Housing and Urban Rural Development, the All China Federation of Supply and Marketing Cooperatives jointly

^[31] See the attached Table 7.10 - List of Policies and Regulations Related to Plastics Recycling System Construction

published the *Opinions on Promoting the Transformation and Upgrade of Renewable Resource Collection Industry*, proposing to accelerate the transformation of development mode and promote the transformation and upgrade of the industry as the main line task, follow the development tendency of "Internet+", drive the innovation of a renewable resource collection mode, promote the transformation of the business model from extensive to intensive as well as of the organizational form from labor-intensive to labor-, capital- and technology-intensive, and establish and improve a sound collection system for renewable resources.

In 2021, the State Council issued the *Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development* (GF[2021]No.4), requiring to solidly promote the whole-chain treatment of plastic pollution, improve the recycling of plastic waste and other renewable resources, and enhance the resource output rate and recycling rate.

In 2022, the National Development and Reform Commission and other national ministries jointly issued the *Guiding Opinions on Accelerating the Construction of a Cyclic Utilization System for Waste Materials*, which required that by 2025, the waste material recycling policy system and the level of resource cyclic utilization shall be further improved, the waste material collection network shall be basically established, and more than 1,000 green sorting centers shall be set up; the circulation order and the trading behavior of second-hand commodities shall be more standardized, and the trading scale shall be obviously expanded.

In 2022, the General Office of the National Development and Reform Commission and Other National Ministries issued the *Notice on Organizing the Construction of Demonstration Cities for Waste Material Recycling System*, which proposed that, by 2025, about 60 large- and medium-sized cities will take the lead in building a sound waste material cyclic utilization system and creating a demonstration effect nationwide. the demonstration cities shall basically complete a waste material collection network that ensures convenient traffic and smooth transfer, realize full coverage of the collection network in urban areas and basic coverage in rural areas. The collection subjects are more professional, diversified and market-oriented, and the collection mode shall be more standardized and efficient. For the township residents, there shall be more abundant second-hand commodity trading channels and the second-hand transactions shall be more standardized and convenient. In addition, the construction of a collection system for plastic waste from domestic sources is closely linked to the sorting of domestic waste. The regulations and policies related to the sorting of domestic waste play an important role in the collection of plastic waste from domestic sources.

In 2000, the *Technical Policy for Municipal Solid Waste Treatment and Pollution Prevention* was published to encourage the recycling of waste paper, scrap metal, waste glass and plastic waste and require the gradual establishment and improvement of a waste material collection network. In 2010, the Ministry of Housing and Urban Rural Development issued the *Technical Guide for Domestic Waste Treatment* (JC[2010]No.61), which included the recycling of plastic waste into the sorting collection of domestic waste, required the establishment of a domestic waste resource recycling model with Chinese characteristics, and promoted the recycling and source reduction of domestic waste resources.

(vi) Cyclic utilization/comprehensive utilization/reuse/recycling/processing of plastic waste

The comprehensive utilization of resources is an integral part of sustainable circular development. In the field of plastics, the comprehensive utilization is mainly manifested in the processing of various kinds of plastic waste collected through the collection system for reuse. The comprehensive utilization of resources is conducive to opening up the field of reuse and promoting the improvement of the collection rate. China continues to attach importance to the comprehensive utilization of resources, and multiple relevant ministries have issued policies and regulations pertaining to the comprehensive utilization of resources^[32].

In 2007, the Ministry of Commerce published the *Administrative Measures for the Recovery of Renewable Resources*, which set out the basic principles for the management of renewable resources, in which the State encourages the recycling of renewable resources in an environmentally sound manner and promote scientific research, technology development and technology popularization related to the collection of renewable resources.

In 2009, in the *Notice of the General Office of the State Council on Transmitting the Implementation Plan of the National Development and Reform Commission and Other Ministries to Promote the Expansion of Domestic Demand and Encourage the Trade-in of Old Motor Vehicles and Home Appliances for New Ones*, it was proposed to effectively utilize resources, accelerate the improvement of the collection and dismantling system of motor vehicles and home appliances through the trade-in of old ones for new ones, and consequently promote the full and effective utilization of plastics and other resources from the motor vehicles and home appliances.

In 2012, the *12th Five-Year Plan for Development of Energy Conservation and Environmental Protection Industry* proposed to improve the reuse of plastic waste resources, requiring to develop the classification or direct utilization technologies for mixed plastic waste and promote the application of deep cleaning, recycling granulation and modification technologies.

In 2015, the Ministry of Industry and Information Technology issued the *Industrial Standard Conditions for Comprehensive Utilization of Waste Plastics* and the *Interim Measures for The Administration of Announcement of Industrial Standard Conditions for Comprehensive Utilization of Waste Plastics*, aiming to implement the *Circular Economy Promotion Law*, standardize the development order of the comprehensive utilization of waste plastics resources, promote the optimization and upgrade of enterprises, strengthen environmental protection, improve the comprehensive utilization of resources technology and management level, and guide the healthy and sustainable development of the industry.

In 2016, the Ministry of Industry and Information Technology, the Ministry of Commerce and the Ministry of Science and Technology jointly issued the *Guiding Opinions on Accelerating the Development of Renewable Resource Industry*, requiring to vigorously promote the construction of a plastic waste recycling system and support the diversified and high-value utilization of plastic waste of different qualities. In addition, in the *Industrial Green Development Plan (2016 - 2020)* issued by the Ministry of Industry and Information Technology in 2016, it was proposed to promote the efficient utilization of renewable resources and the standardized development of the industry, and accelerate the promotion and application of advanced applicable recycling technologies and equipment for major renewable resources such as plastic waste.

In 2022, the National Development and Reform Commission and other national ministries jointly issued the *Guiding Opinions on Accelerating the Construction of a Cyclic Utilization System for Waste Materials*, which required that by 2025, the waste material recycling policy system and the level of resource cyclic utilization shall be further improved; the scattered pollution shall be significantly improved in the renewable resource processing and utilization industry, and the entire industry shall achieve to a higher level of agglomeration, scale, standardization and informatization; the cyclic utilization volume of 9 major renewable

^[32] Table 7.9 - List of Policies and Regulations Related to Comprehensive Utilization of Resources/Cyclic Utilization of Plastics

resources, including scrap iron and steel, scrap copper, scrap aluminum, scrap lead, scrap zinc, waste paper, plastic waste, waste rubber and waste glass, shall reach 450 million tons; about 60 large- and medium-sized cities shall take the lead in building a sound cyclic utilization system for waste materials.

In 2022, the Ministry of Industry and Information Technology, the Ministry of Human Resources and Social Security, the Ministry of Ecology and Environment, the Ministry of Commerce and the State Administration for Market Regulation jointly issued the *Guiding Opinions on Promoting High-quality Development of Light Industry*, which required promoting the cyclic utilization of waste products in the plastic product industry and other related industries.

The "urban minerals" is also an effective means for cyclic utilization of plastic waste. For example, in 2010, the National Development and Reform Commission and the Ministry of Finance issued the *Notice on the Construction of Urban Mineral Demonstration Bases*, requiring to promote the large-scale, cyclic and high-value utilization of key "urban mineral" resources, including the plastic waste; to develop, demonstrate and promote a number of advanced applicable technologies and international leading technologies to enhance the technological level of "urban mineral" resources development and utilization; and to explore the management mode and policy mechanism for utilization of "urban mineral resources" that are suitable for China's national conditions, and realize the symbolic index of the utilization of "urban mineral" resources.

(vii) Prevention and control of plastic waste pollution

China's prevention and control work of plastic waste pollution started around 2000 and has been reflected in the whole process management requirements of plastic waste collection, cyclic utilization/reuse/processing and disposal. Key policies include:

In 2007, the former State Environmental Protection Administration issued the *Technical Specification for Pollution Control of Plastic Waste Collection and Reuse*, which put forward clear requirements for environmental protection related matters in the processes of collection, storage, transportation, pretreatment and reuse of plastic waste.

In 2012, the former Ministry of Environmental Protection, the National Development and Reform Commission and the Ministry of Commerce jointly formulated the *Administrative Regulations on Pollution Prevention and Control of Plastic Waste Processing and Utilization* to strengthen the pollution prevention and control of plastic waste processing and utilization.

In 2020, the Ministry of Ecology and Environment, the Ministry of Commerce, the National Development and Reform Commission and the General Administration of Customs jointly issued *the Announcement on Matters Related to the Banning of All Imports of Solid Waste*, proposing that the import of solid wastes such as plastic waste in any way shall be prohibited from January 1, 2021, aiming at comprehensively solving the pollution problem of imported solid waste such as plastic waste and fostering the healthy development of waste cyclic utilization and circular economy.

In 2020, the *Notice on Solid Promotion of Plastic Pollution Control* jointly issued by nine ministries required to promote agricultural film treatment standardize plastic waste collection and disposal and implement special cleaning of plastic waste.

In 2021, the National Development and Reform Commission and the Ministry of Ecology and Environment jointly published the *Action Plan for Plastic Pollution Control during the 14th Five-Year Plan* put forward the objectives and specific requirements for the prevention and control of pollution in the whole chain of plastic products. By 2025, the plastic pollution control mechanism shall operate more effectively, the responsibilities of local governments, departments and enterprises shall be effectively implemented, and the treatment shall be improved more remarkably in the whole chain of production, circulation, consumption, recycling and terminal disposal of plastic products, so that white pollution can be effectively contained.

In 2022, the national ecological and environmental standard *Technical Specification for Pollution Control of Plastic Waste* was revised and issued (HJ 364-2022), which stipulated the pollution control and environmental management requirements for the production, collection, transportation, storage, pretreatment, reuse and disposal of plastic waste, providing an important basis for full-lifecycle pollution prevention and control of plastic waste^[33].

The microplastics, as emerging pollutants, are attracting the policy attention. In 2022, the State Council published the *Action Plan for the Control of New Pollutants*, requiring to conduct the research on the mechanism of ecological and environmental hazards caused by microplastics, formulate "one-policy-for-one-product" control measures for key new pollutants such as microplastics, and implement technical feasibility and economic and social impact assessment of these control measures.

^[33] https://www.mee.gov.cn/ywdt/zbft/202206/t20220615_985675.shtml

(viii) Other focus areas

Considering the extensive and diversified application of plastic products, the treatment of plastic waste pollution needs to adapt to the characteristics of the application industries. China has formulated the guiding opinions and implementation plans for agricultural film and mulching film, express logistics packaging, electronics and electrical appliances, automobile and other industries.

1. Agricultural film and mulching film

As the agricultural film consumption and the service life of agricultural film is increasingly growing, some areas are suffered by "white pollution", which has become a prominent obstacle to the green development of agriculture. It is urgent and important to promote the action of agricultural film collection. In 2017, the Ministry of Agriculture and Rural Affairs issued the *Action Plan for Agricultural Film Collection*, proposing to accelerate the sorting of domestic waste and the recycling of agricultural film, promote resource recycling, improve urban and rural environment and foster green agricultural development. In 2020, the Ministry of Agriculture and Rural Affairs issued the *Measures for the Administration of Agricultural Film*, which stipulated that the collection of agricultural film shall be supported by the government and participated in by multiple interested parties, and all localities shall take measures to encourage and support units and individuals to collect the agricultural film.

In addition, in 2017, the Ministry of Industry and Information Technology revised the *Entry Criteria for Agricultural Film Industry* to formulate the *Normative Conditions for Agricultural Film Industry*, which further reinforced the management of agricultural film industry, standardized the production, operation and investment behavior of agricultural film industry, and guided the agricultural film industry to develop into a resource-saving and environment-friendly industry.

2. Reduction and recycling of express logistics packaging

In recent years, China's postal industry has achieved a great leap, with its scale of delivery business ranking first in the world. The resource consumption and environmental pollution caused by express and mail packaging have been widely concerned by the governmental administrations and all walks of life. The *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste* and the *Interim Regulations on Express Delivery* have formulated the basic provisions on optimizing, reducing and collecting the express packaging, and have identified the supervision and management responsibilities of postal administration departments. The Ministry of Transport, the State Post Bureau have successively published departmental regulations and relevant policies to guide the pollution prevention and green circular transformation of the express packaging.

In 2017, 10 national ministries, including the State Post Bureau, jointly issued the *Guiding Opinions on Coordinated Promotion of Green Packaging in Express Industry*, which put forward the requirements of improving the resource utilization efficiency and reducing the packaging consumption and the environmental pollution from the packaging in the express industry. In 2020, the *Opinions on Accelerating the Green Transformation of Express Packaging* (GBH[2020]No.115) was published, requiring to promote the modernization of express packaging management system and governance system, and proposing that by 2025, the e-commerce accounting shall basically eliminate the secondary packaging and achieve a quantitative target of 10 million recyclable express packaging applications. In 2021, the Ministry of Transport issued the *Measures for the Administration of Express and Mail Packaging*, which stipulated that the delivery enterprises shall package the mails and express items with environmentally friendly materials according to related regulations, give priority to reusable and easily recyclable packaging materials, optimize express and mail packaging, reduce the use of packaging materials, and actively recycle the packaging materials. The delivery enterprises shall be also encouraged to use recyclable, easily collectable and degradable alternative products.

In addition, in terms of the packaging reduction, the State Council issued the *Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development* (GF[2021]No.4) in 2021, requiring promoting the governance of excessive packaging and driving the producers and operators to comply with mandatory standards restricting excessive packaging of commodities. The Ministry of Agriculture and Rural Affairs issued the *Measures for the Administration of Recycling and Disposal of Pesticide Packaging Waste* (2020), which stipulates that the pesticide producers (including the enterprises exporting pesticides to China), operators and users shall actively fulfill their obligations of collecting and disposing of the pesticide packaging waste, and timely collect and dispose of the pesticide packaging waste.

3. Incorporating the requirements for plastics recycling into the management policy for waste electrical and electronic products

In July 2021, the National Development and Reform Commission issued the *Notice on Encouraging Home Appliance Manufacturers to Carry out Collection Target Responsibility System Actions*, proposing that the responsible enterprises shall purchase more recycled raw materials and establish a list of green suppliers, including recycled plastics; encouraging the responsible enterprises and the waste and old home appliance dismantlers to jointly establish technological research and development platforms, reinforce the research and development of recycled raw materials, recycled products and reusable parts of the products, and promote the product design to be optimized for easy recycling and dismantling; and continuously improving the quality and utilization level of renewable resources, and opening up the waste recycling and cyclic utilization channels.

4. Prevention and control of plastic pollution in carbon dioxide peaking-related policies

Reducing the production and consumption of disposable plastics and preventing the pollution from plastic cyclic utilization materials are important elements of energy-saving and carbon reduction policies. In 2013, the *Notice on Intensifying Efforts to Ensure the Achievement of 2013 Energy Conservation and Emission Reduction Targets* issued by the National Development and Reform Commission proposed to further promote the national action on energy conservation and emission reduction, including reducing the use of disposable products, control the excessive packaging of commodities, restricting the use of plastic shopping bags, and actively advocating civilized, economical, green and low-carbon consumption patterns. *The Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development* (GF[2021]No.4) regards solid promotion of plastic pollution control as an important task for low-carbon cyclic development, which consists of: promoting excessive packaging control and promoting producers and operators to comply with mandatory standards on restricting excessive packaging of commodities; accelerating the construction of a cyclic utilization system for waste materials, reinforcing the recycling of waste paper, plastic waste, waste and old tires, scrap metal, waste glass and other renewable resources, and improving the resource output rate and the recycling rate.

The *Action Plan for Carbon Dioxide Peaking Before 2030* published by the State Council regards the improvement of a resource cyclic utilization system as an important task, requiring to improve the waste and old material collection network, reinforce the standard industry management of comprehensive utilization of renewable resources and promote the standardization of renewable resources. It is proposed that, the cyclic utilization capacity of 9 major renewable resources, including the plastic waste, will reach 450 million tons by 2025 and 510 million tons by 2030.

In addition, China's system of plastic pollution control standards is also constantly improving with the implementation of relevant policies and regulations. In the design and production links of plastic products, China's relevant governmental authorities have formulated a series of national standards for ecological design, such as *the General principles for eco-design product assessment*, *the General assessment principles*

for electrical and electronic eco-design products, the Labeling for eco-design product and the General Rules for the Evaluation of Easy-to-Collect and Easy-to-Recycle Designs of Plastic Products, with a view to improving the collection rate of plastics. In the reuse and cyclic utilization links of plastic waste, specific requirements for environmental protection related matters in the processes of plastic waste collection and reuse have been put forward in *the Technical specifications for recycling of waste plastics, the Plastics - Recycled plastic - Part 1: General rules*, and *the Technical specifications for pollution control during collection and recycle of waste plastics (trial)*, etc.

5. Promotion mode for prevention and control of plastic pollution in the urban level

In December 2018, the General Office of the State Council published the *Pilot Work Plan for the Construction of "Waste Free Cities"*, proposing to conduct pilot construction of "Zero Waste Cities" in 11 cities including Shenzhen and 5 special areas including the Xiong'an New Area. The plastic waste comes from a variety of sources ^[34] and becomes a serious problem, so that it is one of the solid wastes that are under key control in the pilot construction of "Zero Waste Cities". During the pilot period, the pilot cities regarded the plastic pollution control as an important task in the construction of "Zero Waste Cities" and created a series of experiential models.

Under the framework of "Zero Waste Cities", the plastic pollution control mainly focuses on the formulation of "plastic ban and restriction" policies, as well as the reduction and substitution of plastic products, garbage sorting, waste plastics recycling and resource utilization, collection and disposal of agricultural film and pesticide packaging waste and public education and popularization, etc. For some coastal cities, the materials are required to be eco-upgraded for marine plastic products such as floats and fishing nets.

^[34] Including industrial scraps, domestic waste plastics, waste agricultural film, and packaging waste in circulation links, etc.

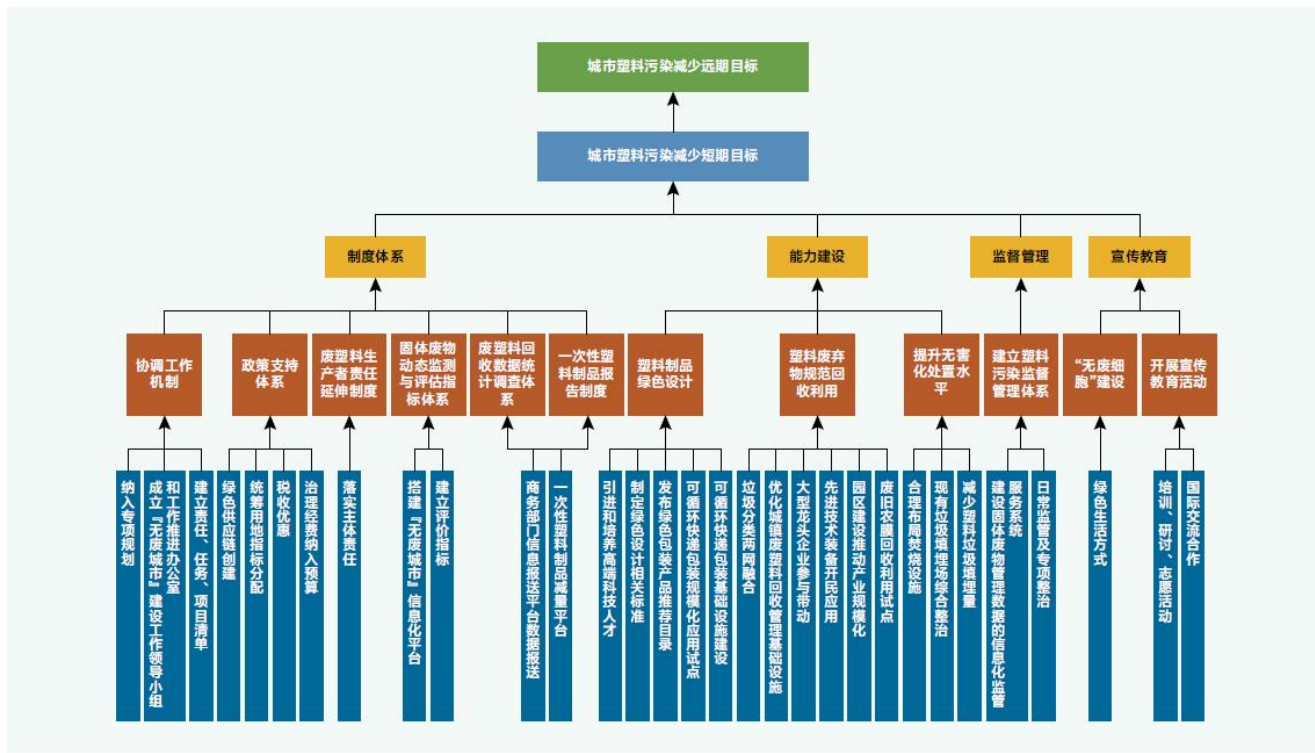


Figure 5.1 Roadmap of Plastic Pollution Prevention for Construction of "Zero Waste Cities" [35]

城市塑料污染减少远期目标	Long-term objective for reduction of urban plastic pollution
城市塑料污染减少短期目标	Short-term objective for reduction of urban plastic pollution
制度体系	Institutional systems
能力建设	Capacity building
监督管理	Supervision and administration
宣传教育	Publicity and education
调工作机制	Coordination mechanism
政策支持体系	Policy support system
废塑料生产者责任延伸支付	Extended plastic waste producer responsibility system
固体废物动态检测与评估指标体系	Index system for dynamic detection and evaluation of solid waste
废塑料回收数据统计调查体系	Statistical survey system of waste plastics recycling data
一次性塑料制品报告体系	Reporting system of disposable plastic products
塑料制品绿色涉及	Green design of plastic products
塑料废弃物规范回收利用	Standard recycling of plastic waste
提升无害化处置水平	Improvement of capacity in safe disposal of plastic waste
建立塑料污染监督管理体系	Establishment of plastic pollution supervision and management system
“无废细胞”建设	Construction of "zero waste cells"
开展宣传教育活动	Implementation of publicity and education activities
纳入专项规划	Incorporation of the special planning
成立【无废城市】建设工作领导小组和工作推进办公室	Establishment of a leading group for the construction of "Zero Waste Cities" and a work promotion office
建立责任、任务、项目抢单	Identification of responsibilities, tasks and lists of items
绿色供应链创建	Setup of a green supply chain
统筹用地指标分配	Overall allocation of land use indicators
税收优惠	Tax incentives
治理经费纳入预算	Include the governance fund in the budget
落实主体责任	Implementation of entity responsibilities
搭建【无废城市】信息化平台	Setup of an information platform for "Zero Waste Cities"

[35] The Solid Management Center of the Ministry of Ecology and Environment and the SWITCH-Asia Policy Advocacy Component (2022). The Research Report on the Roadmap of Plastic Pollution Prevention and Control in the Construction of "Zero Waste Cities in China

建立评价指标	Establishment of evaluation indicators
商务部门信息报送平台数据报送	Data submission by the information reporting platform of the business department
一次性塑料制品减量平台	Platforms for reduction of disposable plastic products
引进和培养 and 高端科技人才	Introduction and training of high-end scientific and technological talents
指定绿色涉及相关标准	Formulation of green design related standards
发布绿色包装产品推荐目录	Release of the catalogue of recommended green packaging products
可循环快递包装规模化应用试点	Large-scale pilot application of recyclable express packaging
可循环快递包装基础设施建设	Construction of recyclable express packaging infrastructure
垃圾分类两网融合	Integration of urban sanitation system and renewable resource system for garbage sorting
优化城镇废塑料回收管理基础设施	Optimization of urban waste plastics recycling management infrastructure
大型龙头企业参与带动	Engagement of large-scale leading enterprises
先进技术装备开民应用	Pilot application of advanced technology and equipment
园区建设推动产业规模化	Park construction to promote scale development of the industry
废旧农膜回收利用试点	Pilot recycling of waste agricultural film
合理布局焚烧设施	Reasonable layout of incineration facilities
现有垃圾填埋综合整治	Comprehensive rectification of existing landfill
减少塑料垃圾填埋量	Reduction of landfilled plastic waste
建设固体废物管理数据的信息化监管服务系统	Construction of an information supervision service system for solid waste management data
日常监管及专项整治	Daily supervision and special rectification
绿色生活方式	Green lifestyle
培训、研讨、志愿活动	Training, seminars and volunteering
国际交流合作	International exchanges and cooperation

(ix) Insight and analysis for current situation

- 1. Lack of guidelines and standards for the application of post-consumer recycled plastics.** From the perspective of the recycling industry of plastic waste, there is a lack of management policies and standards for the use of post-consumer recycled plastics. Plastic waste becomes the raw materials as recycled plastics after being produced and processed by the recycling factories. These recycled plastics as raw materials can be used for manufacturing new products, but are not regulated and guided by sufficient technical policies. At present, China has stipulated some regulation requirements on the use of recycled plastics mainly for packaging materials of express delivery, takeout and e-commerce platforms, but there are few management policies for the application of recycled plastics in textiles, electronics and electrical appliances and automobile, etc. The lack of systematic and powerful means to support recycled plastics caused degraded use of most recycled plastics currently.
- 2. Lack of policies and technical specifications on green design.** The circular economy model, as a sustainable economic development model, refers to that a product or a material is designed so that it can be reused, remanufactured, collected or recycled later, and thus it can remain in the economic chain for as long as possible, whilst minimizing the use of resources required for its manufacturing, avoiding or minimizing the generation of wastes, especially hazardous wastes, and preventing or reducing greenhouse gas emissions, to make a significant contribution to sustainable consumption and production processes^[36]. This conceptual statement further emphasizes the critical and leading role of the product design in the circular economy model. Although it is clear in China's relevant policies that source reduction is the most preferred choice for the prevention and control of plastic pollution, there is a lack of specific policy requirements and standard guidelines for green design (ecological design, circular design, etc.) in the actual policy implementation, which makes the key role of the design for plastic pollution prevention and control not played.
- 3. The responsibilities of group-consumers generating plastic waste are not clearly identified.** As the premise of standard cyclic utilization, sorted collection and transportation is always a major difficulty in plastic waste management and directly affects the efficiency and quality of cyclic utilization. For instance, in terms of the sorted collection, the responsibilities of group consumers, such as companies and office building, have not been specified in the existing relevant policies. The National Development and Reform Commission and the Ministry of Ecology and Environment jointly published the *Notice on the Issuance of the Action Plan for Plastic Pollution Control during the 14th Five-Year Period* in 2021, among the major task of accelerating the standardized recycling and disposal of plastic waste, requiring to promote the integration of urban renewable resources collection outlets and domestic waste sorting outlets, and to rationally arrange domestic waste sorting and collection facilities and equipment in large communities, office buildings, shopping malls and schools to improve the collection and transportation efficiency of plastic waste^[37]. However, the Plan did not specify that these organizations shall bear compulsory responsibility for the recycling of plastic waste, which brought great difficulties to the actual recycling of plastic waste and limited the cyclic utilization efficiency and quality of plastic waste.

^[36] Circular economy - one of the current sustainable economic models, in which products and materials are designed in such a way that they can be reused, remanufactured, recycled or recovered and thus maintained in the economy for as long as possible, along with the resources of which they are made, and the generation of waste, especially hazardous waste, is avoided or minimized, and greenhouse gas emissions are prevented or reduced, can contribute significantly to sustainable consumption and production (UNEP/EA.4/Res.1).

^[37] The specific text is: "Based on the sorting of domestic waste, promote the integration of urban renewable resources collection outlets and domestic waste sorting outlets, and rationally arrange domestic waste sorting and collection facilities and equipment in large communities, office buildings, shopping malls, hospitals, schools and venues to improve the collection and transportation efficiency of plastic waste and the standardization level of plastic waste collection." https://www.gov.cn/zhengce/zhengceku/2021-09/16/content_5637606.htm

4. **The green consumption policies have not been implemented effectively.** It is observed that in order to promote the realization of the UN Sustainable Development Goal 12 "Ensure sustainable consumption and production patterns" (SDG12), many countries have reported two problems on green consumption: one is that there are insufficient categories and options of green products or green consumption patterns in the market; the other is that some existing "environmental-friendly" or green products on the market have not been certified by third-party authorities, and their environmental protection performance or sustainability is doubtful. In addition, consumers are reluctant to and have insufficient motivation to buy green products or services. These problems are also the difficulties faced by domestic recycled plastic products. Although China has published regulations and policies to encourage the consumption of environmentally friendly recycled products, there is a lack of guidance and incentive measures at the implementation level, and no priorities are given to the recycled plastic products in the green government procurement policies. All the stakeholders in the industrial chains such as production, circulation and retailing mainly take spontaneous actions in promoting the use of recycled plastic materials without policy guidance and a coordinated action plan, resulting in consumers' lack of awareness of recycled plastic products and their labels. The consumer-driven role has not been played to reversely promote the production process yet.

5.

VI. Policy Outlook

In a historic decision adopted at the 5th UN Environment Assembly (UNEA5) in 2022, all 193 UN Member States unanimously decided to end plastic pollution. A global negotiation aiming at concluding a legally binding international convention by the end of 2024 is currently underway, initiating the process of making an international law on addressing plastic pollution.

There are many well-known technical solutions to the circular plastics economy, but the economic, financial and business models that can both address the negative impacts of plastics and protecting livelihoods are not understood by all parties. In 2023, UNEP released a report titled "*Turning off the Tap. How the world can end plastic pollution and create a circular economy*" [38], which deeply analyzed the root causes of plastic pollution and proposed a systematic change plan to guide all parties to solve plastic pollution at the source, not just to solve the apparent problems exposed by plastic pollution. The report also described a vision of a circular and pollution-free plastic economy that "eliminates unnecessary production and consumption, avoids negative impacts on the ecosystem and human health, keeps products and materials in the economic chain as much as possible, and safely collects and disposes of plastic waste that cannot be economically disposed of". Short-lived plastic products, both in terms of the plastic waste volume caused and the necessity, will be a focus area of international plastic governance. Figure 6.1 shows the category distribution of plastic waste.

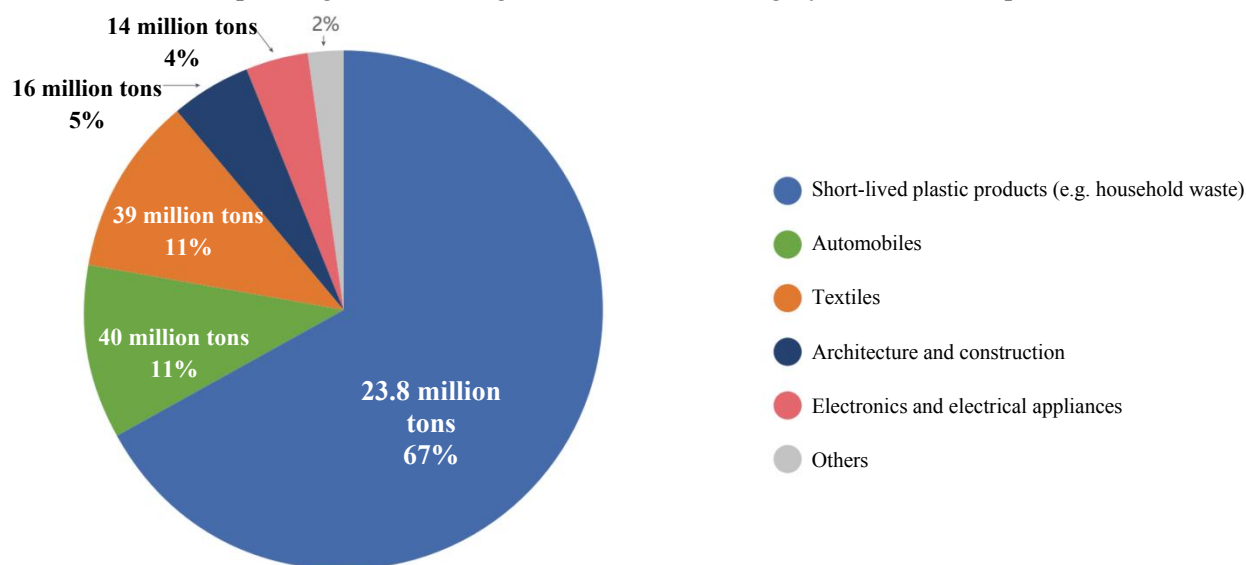


Figure 6.1 Category Distribution of Plastic Waste in 2019 (Source: OECD 2022 [39])

The three major goals of plastic pollution control are improving the circularity pattern of plastics, reducing greenhouse gas emissions and ending plastic pollution. To achieve these goals, policy decisions will need to play a leading role in promoting fundamental changes in the plastic economic system to ensure the achievement of responsible plastic production and consumption patterns. Looking back at the existing negotiation process over the international law on ending plastic pollution, future policy decisions on the circular plastics economy and plastic pollution prevention will focus on solving the root causes of plastic pollution problem, rather than only solving the apparent problems such as exposed plastic waste. Based on the whole life cycle thinking, systematic changes to the plastic linear economic model can ensure the realization of The grand vision of ending plastic pollution agreed by all countries at the 5th UN Environment Assembly in 2022 can be realized only if a systematic change is made to the linear economic pattern of plastics from the full-lifecycle perspective. Policy decisions drive the systemic change in the plastics

[38] UNEP 2023. Turning off the Tap. How the world can end plastic pollution and create a circular economy

[39] Organization for Economic Cooperation and Development [OECD] 2022. Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options. https://www.oecd-ilibrary.org/environment/global-plasticsoutlook_de747aef-en.

economy, especially in developing countries.

Looking ahead, in addition to the existing national policies and management of plastic waste, the international policies related to the development of circular plastics economy and the solution of plastic pollution will focus on improving the weak links such as recyclable and reusable product design and business models and alternative products from the full-lifecycle perspective. China is the world's largest producer and consumer of plastics, and the development trend of international policies will gradually impact Chinese domestic policy process.

1. **Focus on short-lived plastic products and inspire reusable business models.** Reuse is the fundamental way to solve the short service life of current plastic packaging and plastic products. However, there are now few policy incentives for reusable business models or for promoting the adoption of safe and sustainable alternative materials, such as reusable or refillable packaging [46]. The policy incentives for reusable products and business models and alternative materials will effectively address the current linear economy for plastics represented by short-lived plastic products or disposable plastic products, and drive the market to choose safe and sustainable alternative materials to replace those harmful and unnecessary plastic products, such as plastic packaging and other disposable plastic products.
2. **Improve the market competitiveness of post-consumer recycled products in plastic cyclic utilization.** At present, the market price of recycled plastics is quite higher than primary plastics, and the product manufacturers do not have the motivation to use recycled materials. Due to the lack of mandatory policies and technical specifications to require the use of recycled materials, most plastic waste are recycled with relatively low technology with which low quality of recycled plastic are produced. It results in structural defects in the cyclic utilization of recycled plastics, which cannot give full play to the environmental and economic benefits of recycled plastics. Therefore, future policy incentives will focus more on developing recycled plastics applications, promoting the stable development of the plastic cyclic utilization industry, increasing the economic benefits of the plastics recycling industry, and improving the market competitiveness of recycled plastics as compared with primary plastics.
3. **Develop and support alternative products for primary plastics.** The policy incentives will help address the challenges of high prices, insufficient consumer demand and lack of policies and technical specifications for the alternative products. In the future, decision makers at all levels of the industry chain will need to make decisions about sustainable alternative materials and products or models based on a full-lifecycle environmental impact analysis to avoid simple shifts of pollution or environmental burdens.
4. **Ensure the coordination and consistency among policies in the entire industry chain.** Considering the cross-border flow of plastics, responsibilities and risks, the systemic change cannot be carried out in isolation, and requires coordinated international actions, coordinated measures among countries and all the different links in the value chain, major shifts in the plastics policy landscape and a balance among policies and measures of all aspects to achieve synergy effect. For example, relevant policies will focus more on standardizing the collection system and improving the collection efficiency of low-value plastics. In the current collection system that mainly relies on informal market mechanisms, plastic waste collection practitioners are very sensitive to the price, which leads to the lack of effective collection of low-value plastics, while high-value plastics, although collected at a high rate, are doubted to be qualified for subsequent cyclic utilization and mostly flow into small and micro enterprises with low technological capability and low resource efficiency.
5. **Promote to incorporate the concept of "circular design" into the plastic packaging design and**

production. The concept of sustainability and the principle of reducing plastic pollution have been more or less recognized by product designers, such as in the design of packaging plastics. However, the product designers still spontaneously understand how to reduce plastic pollution at the product design stage without scientific and methodological guidance, focusing only on the recyclability of the material itself, rather than considering the local plastic waste recycling system and the actual treatment capacity. Meanwhile, manufacturers are also unable to connect with the back-end collection and cyclic utilization system. In the future, new policies will be expected to guide and require how to promote the product design to adapt to the actual recycling system, to promote more plastic packaging to be actually included into the standardized cyclic utilization system and consequently avoid plastic pollution.

6. **Focus on data collection and sharing. Scientific decision-making requires data support.** Data sharing is particularly important for plastic pollution prevention and control efforts that require coordination across all links of the industry chain and across departments. The effectiveness of plastic pollution prevention policies largely depends on the data sharing in the entire plastic industry chain from production, circulation, sales, collection, recycling to disposal. The initiatives to promote cross-departmental and cross-domain data and information exchange and collaboration is an important issue for policymakers to address in the future for prevention and control of plastic pollution.

Appendix 1 List of Major Laws, Regulations and Policies Related to Plastic Pollution Control in China

Table 7.1 List of Policies Related to Plastic Management Issued by the National Development and Reform Commission

No.	Policy/regulation	Document number	Time
1	The Circular on Stopping the Use of Disposable Foamed Plastic Tableware by Catering Enterprises	—	May 29, 2001
2	Notice of the National Development and Reform Commission, Ministry of Finance, and State Taxation Administration on Issuing the Catalogue of Comprehensive Resource Utilization (Revised in 2003)	FGHZ[2004]No.73	January 8, 2004
3	Notice of the General Office of the National Development and Reform Commission on Organizing the Implementation of Major Special Projects for High-Tech Industries in the Circular Economy	FGBGJ[2007]No.2289	September 21, 2007
4	Notice of the General Office of the National Development and Reform Commission on Organizing Applications for the Special Industrialization Projects of High-Tech Biobased Materials	FGBGJ[2007]No.3095	December 11, 2007
5	Announcement of the National Development and Reform Commission of the People's Republic of China	No.33, 2008	May 13, 2008
6	Notice Regarding the Arrangements for the 2008 National Energy Conservation Week Activities	FGHZ[2008]No.1223	May 19, 2008
7	The Notice of the General Office of the National Development and Reform Commission on Further Implementing the <i>Circular of the General Office of the State Council on Restricting the Production, Sale and Use of Plastic Shopping Bags</i>	FGBHZ[2008]No.1554	July 11, 2008
8	Notice of the National Development and Reform Commission and the Ministry of Finance on the Establishment of Urban Mineral Resource Demonstration Bases	FGHZ[2010]No.977	May 12, 2010
9	Notice Regarding the Arrangements for the 2011 National Energy Conservation Week Activities	FGHZ[2011]No.911	May 3, 2011
10	The Notice on Launching Intensive Campaigns to Restrict the Production, Sale and Use of Plastic Shopping Bags	FGHZ[2011]No.1399	July 6, 2011
11	The Notice on Deepening the Implementation of Restrictions on the Production, Sale and Use of Plastic Shopping Bags	FGHZ[2013]No.758	April 17, 2013
12	Notice of the National Development and Reform Commission on Intensifying Efforts to Ensure the Achievement of the 2013 Energy Conservation and Emission Reduction Targets	FGHZ[2013]No.1585	August 16, 2013
13	Notice of the General Office of the National Development and Reform Commission and the General Office of the Ministry of Finance on Organizing the Implementation of the 2014 Special Projects for Biobased Materials	FGBGJ[2014]No.1309	June 12, 2014
14	Notice of the General Office of the National Development and Reform Commission and the General Office of the Ministry of Industry and Information Technology on Promoting the Clustered Development of the Comprehensive Utilization of Bulk Solid Waste	FGBHZ[2019]No.44	January 9, 2019
15	The Opinions of the National Development and Reform Commission and the Ministry of Ecology and Environment on Further Strengthening Plastic Pollution Control	FGHZ[2020]No.80	January 16, 2020
16	Notice of Nine Government Departments on Solidly Advancing the Plastic Pollution Control Work	FGHZ[2020]No.1146	July 10, 2020
17	Notice of the National Development and Reform Commission and the Ministry of Ecology and Environment on the Issuance of the "14th Five-Year Plan" for Plastic Pollution Control	FGHZ[2021]No.1298	September 8, 2021
18	Notice of the General Office of the National Development and Reform Commission, the General Office of the Ministry of Commerce, and the Office of the State Post Bureau on Organizing the Large-scale Pilot Application of	FGBHZ[2021]No.963	December 6, 2021

	Recyclable Express Packaging		
19	Guiding Opinions of the National Development and Reform Commission and Other Ministries on Accelerating the Construction of a Cyclic Utilization System for Waste Materials	FGHZ[2022]No.109	January 17, 2022
20	Notice of the General Office of the National Development and Reform Commission on Organizing the Construction of Demonstration Cities for Waste Material Recycling System	FGBHZ[2022]No.35	January 19, 2022
21	Notice of the General Office of the National Development and Reform Commission on Issuing the List of Key Cities for the Construction of the Cyclic Utilization System for Waste Materials	FGBHZ[2022]No.649	July 19, 2022
22	The Implementation Plan for New Urbanization during the 14th Five-Year Plan Period	-	July 28, 2022

Table 7.2 List of Policies and Regulations Related to Plastic Management Issued by the Ministry of Ecology and Environment

No.	Policy/regulation	Document number	Time
Departmental Regulations (Ministerial Orders)			
1	Administrative Measures for the Import of Solid Waste	Order No.12 of the Ministry of Ecology and Environment	April 8, 2011
2	Administrative Measures for Pollutant Discharge Permits (Trial) (Revised in 2019)	Order No.48 of the Ministry of Ecology and Environment in 2018	August 22, 2019
Departmental Policies (Notices, Announcements, Letters, etc.)			
1	Notice on Publishing the Pilot Organizations for Clean Production Auditing and Commencing Pilot Work	State Environmental Protection Administration HF[2002]No.2	January 9, 2002
2	Reply to Issues Related to the Handling of Illegal Entry of Waste Materials	HH[2002]No.230	September 3, 2002
3	Notice on Strict Implementation of Environmental Protection Control Standards for Imported Plastic Waste	HB[2003]No.66	July 15, 2003
4	Notice on the Issuance of the Implementation Plan for Survey of Basic Situation of National Environmental Protection and Related Industries in 2004	State Environmental Protection Administration HF[2005]No.16	February 1, 2005
5	Notice on Issuing the "Guiding Opinions from the State Environmental Protection Administration on Promoting Circular Economy Development"	State Environmental Protection Administration HF[2005]No.114	October 10, 2005
6	Notice on the Release of the "Technical Policy on Pollution Prevention and Control of Waste Household Appliances and Electronic Products"	State Environmental Protection Administration HF[2006]No.115	April 27, 2006
7	Reply to the Solid Waste Environmental Protection Control Standards Applicable to Imported Waste Paper and Plastic Waste for Use as Raw Materials	State Environmental Protection Administration HH[2006]No.248	June 22, 2006
8	Announcement on the Release of the "Guidelines for the Release of Information on the Prevention and Control of Environmental Pollution from Solid Waste in Large and Medium-Sized Cities"	Announcement No.33 of State Environmental Protection Administration in 2006	July 10, 2006
9	Notice on Strengthening the Examination and Approval Administration for Restricted Imported Waste (Abolished as of June 1, 2011)	General Office of the State Environmental Protection Administration HB[2006]No.89	August 1, 2006
10	Announcement on the Release of the National Environmental Protection Industry Standard "Technical Specifications for Pollution Control in the Recycling and Reuse of Plastic Waste (Trial)"	Announcement No.63 of State Environmental Protection Administration in 2007	September 30, 2007

11	Notice on Explanations Regarding the Use of Waste Plastic Bags, Films and Nets as Mentioned in the Announcement of the State Environmental Protection Administration and Four Other Departments in November 2008	HB[2008]No.23	February 28, 2008
12	Announcement on the Release of the "Guidelines for Qualification Review and Licensing of Waste Electrical and Electronic Equipment Processing Enterprises"	Announcement No.90 of the Ministry of Ecology and Environment in 2010	December 9, 2010
13	Announcement on the Release of the "Environmental Protection Control Requirements for the Import of Waste PET Beverage Bottle Bricks (Trial)"	Announcement No.11 of the Ministry of Ecology and Environment in 2011	January 31, 2011
14	Notice on the Issuance of the "12th Five-Year Plan for Scientific and Technological Development of National Environmental Protection"	Ministry of Ecology and Environment HF[2011]No.63	June 9, 2011
15	Announcement on the Release of the "Administrative Regulations on Pollution Prevention and Control of Plastic Waste Processing and Utilization"	Announcement No.55 of the Ministry of Environmental Protection in 2012	August 24, 2012
16	Announcement on the Release of the "Regulations on Environmental Protection for the Import of Plastic Waste"	Announcement No.3 of the Ministry of Environmental Protection in 2013	January 18, 2013
17	Reply to the Definition of Solid Waste from Imported Shredded Waste Optical Discs	HBTRH[2016]No.1183	June 27, 2016
18	Notice on Joint Cleanup and Rectification of Reuse Industries for Electronic Waste, Scrap Tires, Plastic Waste, Used Clothing and Waste Household Appliances	HBTRH[2017]No.1240	August 2, 2017
19	Announcement on the Release of the "Imported Waste Management Catalogue" (2017)	Announcement No.39 in 2017	August 10, 2017
20	Letter Regarding the Issuance of the "Guidelines for the Formulation of Pilot Implementation Plans for 'Zero Waste Cities'" and the "Indicator System for the Construction of 'Zero Waste Cities' (Trial)"	HBGTH[2019]No.467	May 8, 2019
21	Notice on Issuing the "Comprehensive Control Plan for Volatile Organic Compounds in Key Industries"	Ministry of Ecology and Environment DQ[2019]No.53	June 26, 2019
22	Guiding Opinions on Deepening Law-based Administration in Ecological and Environmental Governance and Continuously Strengthening Law-based Pollution Control	HFG[2021]No.107	November 11, 2021
23	Announcement on the Release of the National Ecological and Environmental Standard "Technical Specification for Pollution Control of Plastic Waste"	Announcement No.12 of the Ministry of Ecology and Environment in 2022	May 31, 2022

Table 7.3 List of Policies and Regulations Related to Plastic Management Issued by the Ministry of Commerce

No.	Policy/regulation	Document number	Time
Departmental Regulations (Ministerial Orders)			
1	Administrative Measures for Renewable Resource Recycling	Order No.8 of the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Public Security, the Ministry of Housing and Urban Rural Development, the State Administration for Industry and Commerce, and the State Environmental Protection Administration in 2007	March 27, 2007
2	The Administrative Measures for the Paid Use of Plastic Shopping Bags at Retail Establishments	Order No.8 of the Ministry of Commerce, the National Development and Reform	May 15, 2008

		Commission and the State Administration for Industry and Commerce in 2008	
3	Administrative Measures for the Use and Reporting of Disposable Plastic Products by Business Operators	Order No.1 of the Ministry of Commerce and the National Development and Reform Commission in 2023	May 10, 2023
Departmental Policies (Notices, Announcements, Letters, etc.)			
1	Notice of the General Office of the Ministry of Commerce on the Use of the Renewable Resource Collection System Logo	SGZ[2007]No.86	August 16, 2007
2	Opinions on the Handling of Issues Related to the "Administrative Measures for the Paid Use of Plastic Shopping Bags in Retail Places" by the General Office of the Ministry of Commerce, the General Office of the National Development and Reform Commission, and the General Office of the State Administration for Industry and Commerce	SGZ[2008]No.41	July 4, 2008
3	Notice of the Ministry of Commerce and the Ministry of Finance on Accelerating the Construction of a Renewable Resource Collection System	SSMF[2009]No.142	March 27, 2009
4	Guiding Opinions of the Ministry of Commerce on Further Advancing the Development of the Renewable Resource Collection Industry	SSMF No.187	May 28, 2010
5	Notice of the General Office of the Ministry of Commerce on Conducting a Survey of the Renewable Resource Collection Industry	SBLTH[2012]No.316	May 8, 2012
6	Notice of the General Office of the Ministry of Commerce on Further Enhancing the Construction of A Waste Commodity Collection System	SBLTH[2012]No.831	July 27, 2012
7	Notice of the General Office of the Ministry of Commerce on Enhancing the Construction of A Renewable Resource Collection System in 2013		March 15, 2013
8	Notice of the General Office of the Ministry of Commerce on Further Strengthening the Project Management of Renewable Resource Collection System Construction		November 12, 2013
9	Notice of the Ministry of Commerce, the Ministry of Ecology and Environment, and the Ministry of Industry and Information Technology on Issuing the " <i>Green Procurement Guidelines for Enterprises (for Trial Implementation)</i> "		December 22, 2014
10	Notice of the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Land and Resources, the Ministry of Housing and Urban Rural Development, and the All China Federation of Supply and Marketing Cooperatives on Issuing the "Medium- and Long-term Plan for the Construction of a Renewable Resource Collection System (2015 - 2020)"	SLTF[2015]No.21	January 21, 2015
11	Opinions on Promoting the Transformation and Upgrade of Renewable Resource Collection Industry by the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Ecology and Environment, the Ministry of Housing and Urban Rural Development, and the All China Federation of Supply and Marketing Cooperatives	SLTH[2016]No.206	May 5, 2016
12	Notice of the General Office of the Ministry of Commerce on Further Strengthening the Plastic Pollution Control in the Commerce Field	SBLTH[2020]No.306	August 28, 2020
13	Announcement on the Release of the "Reporting Measures for the Use and Collection of Disposable Plastic Products in the Commerce Field (Trial)"	Announcement No.61 of the Ministry of Commerce in 2020	November 27, 2020
14	The Notice of the General Office of the Ministry of Commerce on Matters Concerning the Reporting of the Use and Recycling of Disposable Plastic Products		December 11, 2020

15	The Notice of the General Office of the Ministry of Commerce on the Second Phase Reporting of the Use and Recycling of Disposable Plastic Products	SBLTH[2021]No.219	June 28, 2021
16	Letter from the General Office of the Ministry of Commerce on Recommending Key Contacts with Renewable Resource Collection Enterprises	SBLTH[2021]No.338	October 20, 2021

Table 7.4 List of Policies and Regulations Related to Plastic Management Issued by the Ministry of Industry and Information Technology

No.	Policy/regulation	Document number	Time
1	The Emergency Notice on Immediately Stopping the Production of Disposable Foamed Plastic Tableware	GJMCY[2001]No.382	April 23, 2001
2	Key Points for Industrial Energy Conservation and Comprehensive Utilization in 2012	GXTJ[2012]No.56	March 16, 2012
3	Notice of the General Office of the Ministry of Industry and Information Technology and the General Office of China Development Bank on Recommending Key Projects of Industrial Energy Conservation and Green Development for 2015-2016	GXTLJH[2015]No.584	August 26, 2015
4	Announcement of the Ministry of Industry and Information Technology on the Release of the "Industrial Standard Conditions for Comprehensive Utilization of Waste Plastics" and the "Interim Measures for the Administration of Announcement of Industrial Standard Conditions for Comprehensive Utilization of Waste Plastics"	Announcement No.81 of the Ministry of Industry and Information Technology in 2015	December 4, 2015
5	Notice of the Ministry of Industry and Information Technology on Issuing the "Industrial Green Development Plan (2016-2020)"	GXBG[2016]No.225	June 30, 2016
6	Guiding Opinions of the Ministry of Industry and Information Technology, the Ministry of Commerce, and the Ministry of Science and Technology on Accelerating the Development of Renewable Resource Industry	GXBLJ[2016]No.440	December 21, 2016
7	Notice of the General Office of the Ministry of Industry and Information Technology and the General Office of China Development Bank on Accelerating Industrial Energy Conservation and Green Development	GXTLJ[2019]No.16	March 19, 2019
8	Announcement No.40 of the Ministry of Industry and Information Technology of the People's Republic of China in 2021	No.40, 2021	December 16, 2021
9	Guiding Opinions of the Ministry of Industry and Information Technology, the National Development and Reform Commission, the Ministry of Science and Technology, the Ministry of Ecology and Environment, the Ministry of Emergency Management and the National Energy Administration on Promoting the High-quality Development of the Petrochemical and Chemical Industry during the "14th Five-Year Plan" Period	GXBLY[2022]No.34	March 28, 2022
10	Guiding Opinions of the Ministry of Industry and Information Technology, the Ministry of Human Resources and Social Security, the Ministry of Ecology and Environment, the Ministry of Commerce and the State Administration for Market Regulation on Promoting High-quality Development of Light Industry	GXBLXF[2022]No.68	June 8, 2022
11	Notice of the Ministry of Industry and Information Technology, the National Development and Reform Commission, the Ministry of Science and Technology, and the Ministry of Ecology and Environment on the Recommendation Work for the "Catalogue of Advanced and Applicable Processes, Technologies and Equipment for Comprehensive Utilization of National Industrial Resources"	GXTLJH[2022]No.229	September 8, 2022

Table 7.5 List of Policies and Regulations Related to Plastic Management Issued by the Ministry of Housing and Urban Rural Development

No.	Policy/regulation	Document number	Time
1	Technical Policy for Municipal Solid Waste Treatment and Pollution Prevention	JC[2000]No.120	May 29, 2000

2	Notice on Publishing Pilot Cities for Household Waste Sorting and Collection	JCH[2000]No.12	June 1, 2000
3	Notice on Issuing the "Technical Guide for Domestic Waste Treatment"	JC[2010]No.61	April 22, 2010
4	Notice of the Ministry of Housing and Urban Rural Development and Other Ministries on the Comprehensive Implementation of Household Waste Sorting in All National Prefecture-level and Above Cities	JC[2019]No.56	April 26, 2019

Table 7.6 List of Policies and Regulations Related to Plastic Management Issued by the Ministry of Agriculture and Rural Affairs

No.	Policy/regulation	Document number	Time
1	Measures for the Administration of Agricultural Film	Order No.4 of the Ministry of Agriculture and Rural Affairs, the Ministry of Industry and Information Technology, the Ministry of Ecology and Environment and the State Administration for Market Regulation in 2020	July 3, 2020
2	Measures for the Administration of Collection and Disposal of Pesticide Packaging Waste	Order No.6 of the Ministry of Agriculture and Rural Affairs and the Ministry of Ecology and Environment of the People's Republic of China in 2020	August 27, 2020

Table 7.7 List of Policies Related to Renewable Resources Jointly Issued by the Ministry of Finance and the State Taxation Administration

No.	Policy/regulation	Document number	Time
1	Notice of the Ministry of Finance and the State Taxation Administration on Several Issues Regarding Value-Added Tax Refund Policies for Renewable Resources	CS[2009]No.119	September 29, 2009
2	Notice of the Ministry of Finance and the State Taxation Administration on Adjusting and Improving Value-Added Tax Policies for Products and Services Related to Comprehensive Utilization of Resources	CS[2011]No.115	November 21, 2011
3	Announcement of the Ministry of Finance and the State Taxation Administration on Improving the Value-Added Tax Policies for Comprehensive Utilization of Resources	Announcement No.40 of the Ministry of Finance and the State Taxation Administration in 2021	December 30, 2021

Table 7.8 List of Policies and Regulations Related to Plastic Management Issued by the National Health Commission

No.	Policy/regulation	Document number	Time
1	Notice on Issuing the Work Plan for Comprehensive Waste Management in Medical Institutions	GWYF[2020]No.3	February 24, 2020
2	Notice on Promoting Household Waste Classification Management in Medical Institutions	GWBYF (2017) No.30	2017

Table 7.9 List of Policies and Regulations Related to Comprehensive Utilization of Resources/Cyclic Utilization of Plastics

No.	Competent authority	Policy/regulation	Document number	Time
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1	MOFCOM	Administrative Measures for Renewable Resource Recycling	Order No.8 of the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Public Security, the Ministry of Housing and Urban Rural Development, the State Administration for Industry and Commerce, and the State Environmental Protection Administration in 2007	March 27, 2007
2	MOFCOM	Notice of the General Office of the Ministry of Commerce on the Use of the Renewable Resource Collection System Logo	SGZ[2007]No.86	August 16, 2007
3	NDRC	Notice of the General Office of the National Development and Reform Commission on Organizing the Implementation of Major Special Projects for High-Tech Industries in the Circular Economy	FGBGJ[2007]No.2289	September 21, 2007
4	The State Council	Notice of the General Office of the State Council on Transmitting the Implementation Plan of the National Development and Reform Commission and Other Ministries to Promote the Expansion of Domestic Demand and Encourage the Trade-in of Old Motor Vehicles and Home Appliances for New Ones	GBF[2009]No.44	June 1, 2009
5	Ministry of Industry and Information Technology	Key Points for Industrial Energy Conservation and Comprehensive Utilization in 2012	GXTJ[2012]No.56	March 16, 2012
6	The State Council	Notice of the State Council on Issuing the "12th Five-Year Plan" for Development of Energy Conservation and Environmental Protection Industry	GF[2012]No.19	June 16, 2012
7	The State Council	Notice of the State Council on Issuing the Circular Economy Development Strategy and the Near-term Action Plan	GF[2013]No.5	January 23, 2013
8	The State Council	Notice of the State Council on Issuing the National Sustainable Development Plan for Resource-based Cities (2013-2020)	GF[2013]No.45	November 12, 2013
9	MOFCOM	Notice of the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Land and Resources, the Ministry of Housing and Urban Rural Development, and the All China Federation of Supply and Marketing Cooperatives on Issuing the "Medium- and Long-term Plan for the Construction of a Renewable Resource Collection System (2015 - 2020)"	SLTF[2015]No.21	January 21, 2015
10	Ministry of Industry and Information Technology	Notice of the General Office of the Ministry of Industry and Information Technology and the General Office of China Development Bank on Recommending Key Projects of Industrial Energy Conservation and Green Development for 2015-2016	GXTLJH[2015]No.584	August 26, 2015
11	Ministry of Industry and Information Technology	Announcement of the Ministry of Industry and Information Technology on the Release of the "Industrial Standard Conditions for Comprehensive Utilization of Waste Plastics" and the "Interim Measures for the Administration of Announcement of Industrial Standard Conditions for Comprehensive Utilization of Waste Plastics"	Announcement No.81 of the Ministry of Industry and Information Technology in 2015	December 4, 2015

12	Ministry of Industry and Information Technology	Notice of the Ministry of Industry and Information Technology on Issuing the "Industrial Green Development Plan (2016-2020)"	GXBG[2016]No.225	June 30, 2016
13	Ministry of Industry and Information Technology	Guiding Opinions of the Ministry of Industry and Information Technology, the Ministry of Commerce, and the Ministry of Science and Technology on Accelerating the Development of Renewable Resource Industry	GXBLJ[2016]No.440	December 21, 2016
14	NDRC	Notice of the General Office of the National Development and Reform Commission and the General Office of the Ministry of Industry and Information Technology on Promoting the Clustered Development of the Comprehensive Utilization of Bulk Solid Waste	FGBHZ[2019]No.44	January 9, 2019
15	Ministry of Industry and Information Technology	Notice of the General Office of the Ministry of Industry and Information Technology and the General Office of China Development Bank on Accelerating Industrial Energy Conservation and Green Development	GXTLJ[2019]No.16	March 19, 2019
16	National Health Commission	Notice on Issuing the Work Plan for Comprehensive Waste Management in Medical Institutions	GWYF[2020]No.3	February 24, 2020
17	MARA	Measures for the Administration of Agricultural Film	Order No.4 of the Ministry of Agriculture and Rural Affairs, the Ministry of Industry and Information Technology, the Ministry of Ecology and Environment and the State Administration for Market Regulation in 2020	July 3, 2020
18	MARA	Measures for the Administration of Collection and Disposal of Pesticide Packaging Waste	Order No.6 of the Ministry of Agriculture and Rural Affairs and the Ministry of Ecology and Environment of the People's Republic of China in 2020	August 27, 2020
19	Ministry of Industry and Information Technology	Announcement No.40 of the Ministry of Industry and Information Technology of the People's Republic of China in 2021	No.40, 2021	December 16, 2021
20	Ministry of Industry and Information Technology	Guiding Opinions of the Ministry of Industry and Information Technology, the National Development and Reform Commission, the Ministry of Science and Technology, the Ministry of Ecology and Environment, the Ministry of Emergency Management and the National Energy Administration on Promoting the High-quality Development of the Petrochemical and Chemical Industry during the "14th Five-Year Plan" Period	GXBLY[2022]No.34	March 28, 2022
21	Ministry of Industry and Information Technology	Guiding Opinions of the Ministry of Industry and Information Technology, the Ministry of Human Resources and Social Security, the Ministry of Ecology and Environment, the Ministry of Commerce and the State Administration for Market Regulation on Promoting High-quality Development of Light Industry	GXBLXF[2022]No.68	June 8, 2022
22	NDRC	The Implementation Plan for New Urbanization during the 14th Five-Year Plan Period		July 28, 2022

23	Ministry of Industry and Information Technology	Notice of the Ministry of Industry and Information Technology, the National Development and Reform Commission, the Ministry of Science and Technology, and the Ministry of Ecology and Environment on the Recommendation Work for the "Catalogue of Advanced and Applicable Processes, Technologies and Equipment for Comprehensive Utilization of National Industrial Resources"	GXTLJH[2022]No.229	September 8, 2022
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Table 7.10 List of Policies and Regulations Related to Plastics Recycling System Construction

No.	Competent authority	Policy/regulation	Document number	Time
1	MOFCOM	Notice of the Ministry of Commerce and the Ministry of Finance on Accelerating the Construction of a Renewable Resource Collection System	SSMF[2009]No.142	March 27, 2009
2	MOFCOM	Notice of the General Office of the State Council on Transmitting the Implementation Plan of the National Development and Reform Commission and Other Ministries to Promote the Expansion of Domestic Demand and Encourage the Trade-in of Old Motor Vehicles and Home Appliances for New Ones	GBF[2009]No.44	June 1, 2009
3	The State Council	Opinions of the General Office of the State Council on Establishing a Complete and Advanced Waste Commodity Collection System	GBF[2011]No.49	October 31, 2011
4	The State Council	Notice of the General Office of the State Council on the Establishment of a Division of Work Plan for Key Work Departments in a Complete and Advanced Waste Commodity Collection System	GBH[2012]No.82	April 26, 2012
5	MOFCOM	Notice of the General Office of the Ministry of Commerce on Further Enhancing the Construction of A Waste Commodity Collection System	SBLTH[2012]No.831	July 27, 2012
6	MOFCOM	Notice of the General Office of the Ministry of Commerce on Enhancing the Construction of A Renewable Resource Collection System in 2013		March 15, 2013
7	MOFCOM	Notice of the General Office of the Ministry of Commerce on Further Strengthening the Project Management of Renewable Resource Collection System Construction		November 12, 2013
8	MOFCOM	Notice of the Ministry of Commerce, the National Development and Reform Commission, the Ministry of Land and Resources, the Ministry of Housing and Urban Rural Development, and the All China Federation of Supply and Marketing Cooperatives on Issuing the "Medium- and Long-term Plan for the Construction of a Renewable Resource Collection System (2015 - 2020)"	SLTF[2015]No.21	January 21, 2015
9	Ministry of Industry and Information Technology	Notice of the Ministry of Industry and Information Technology on Issuing the "Industrial Green Development Plan (2016-2020)"	GXBG[2016]No.225	June 30, 2016
10	The State Council	Notice of the State Council on Issuing the "13th Five-Year Plan" for Ecological and Environmental Protection	GF[2016]No.65	November 24, 2016
11	Ministry of Industry and Information Technology	Guiding Opinions of the Ministry of Industry and Information Technology, the Ministry of Commerce, and the Ministry of Science and Technology on Accelerating the Development of Renewable Resource Industry	GXBLJ[2016]No.440	December 21, 2016

12	The State Council	Guiding Opinions of the State Council on Accelerating the Establishment of a Sound Economic System with Green, Low-carbon and Circular Development	GF[2021]No.4	February 2, 2021
13	NDRC	Guiding Opinions of the National Development and Reform Commission and Other Ministries on Accelerating the Construction of a Cyclic Utilization System for Waste Materials	FGHZ[2022]No.109	January 17, 2022
14	NDRC	Notice of the General Office of the National Development and Reform Commission on Organizing the Construction of Demonstration Cities for Waste Material Recycling System	FGBHZ[2022]No.35	January 19, 2022
15	NDRC	Notice of the General Office of the National Development and Reform Commission on Issuing the List of Key Cities for the Construction of the Cyclic Utilization System for Waste Materials	FGBHZ[2022]No.649	July 19, 2022
16	NDRC	The Implementation Plan for New Urbanization during the 14th Five-Year Plan Period		July 28, 2022

Appendix 2 China's Plastic Recycling Solution - Practical Cases

This appendix contains 27 excellent cases from the call for action to "Beat Plastic Pollution". In 2023, with the support of the Global Environment Facility Small Grants Program of the United Nations Development Programme (UNDP), the China Environmental APP Production and Economics Channel, the Green Recycled Plastics Supply Chain Joint Working Group (GRPG) and the Carbon LIVE Platform jointly launched the "Call for Action to Beat Plastic Pollution - Solutions to Circular Plastics Economy" to exploit innovative, scientific, effective and referential advanced cases of waste plastics recycling nationwide, summarize and promote effective local experience and initiatives, and consequently make efforts to solve the difficult and hot issues of plastic pollution control. Based on the principles of openness, fairness and impartiality, a total of 27 excellent cases of "Beat Plastic Pollution" were evaluated through application organization, qualification examination, expert review and comprehensive evaluation.

I. Overview of Urban Cases

Case 1

Zhejiang "Blue Circle" Project

[Case Introduction]

The "Blue Circle" Project, organized and promoted by the Department of Ecology and Environment of Zhejiang Province, with Zhejiang Lanjing Technology Co., Ltd. as the innovation subject, establishes "Three Systems" and "Three Models" to jointly create a sustainable model for marine plastic pollution control. In 2020, a pilot project was launched in Jiaojiang District, Taizhou. It innovatively proposed a multi-governance system jointly led by the government, the enterprises and the public. Three systems were set up to respectively address three-dimensional collection, digital governance and whole-process supervision. With the establishment of a physical collection network and a digital management platform, a recyclable value chain was formed, covering from marine waste collection, transportation, recycling to high-value utilization, and the blockchain technology was adopted to achieve profit redistribution in the industrial chain. Thus, a closed-loop system consisting of "market-oriented garbage collection, high-value resource utilization and international value-added certification" was built up to create a new self-driven, sustainable and replicable model of "Blue Circle" for the "intelligent governance" of marine plastic pollution.

[Model Description]

The first one of the "Three Systems" is the three-dimensional collection system. Through the coordination among governmental departments, the coastal beach garbage, ship garbage, derelict fishing gear and other marine litter are included in the collection and governance system and connected to the marine litter digital governance platform; the original governance system will be enabled by including the beach sanitation and

marine sanitation in the "Blue Circle" platform, quantifying the collection effect and connecting the high-value utilization channels; new supplementary collection networks are expanded by building small blue homes through government-enterprise cooperation, guiding the engagement of fishing boats and the public and accepting low-income people who live in coastal villages. About 30% of the collected marine plastic waste that cannot be recycled is collected into the municipal system for harmless disposal, and the remaining 70% is recycled after deep processing, which forms a closed-loop governance system for the whole process of "collection-transportation-disposal-recycling" of marine plastic waste. The second is the digital governance system. According to the characteristics of marine litter generation and distribution, a digital governance platform is set up upon the high-value marine plastic utilization industry chain formed by the "Blue Alliance" enterprises, which uses big data to enable the formation of a recyclable value chain of "collection, transportation, recycling and utilization" of marine litter; through the multi-dimensional integration of comprehensive management, application and a visualization center, a cross-level, cross-department and cross-regional collaborative public database is created to achieve the digital governance goals of a transparent process, real data, intelligent supervision and evidence-based research and judgment. The third is the whole-process supervision system. The digital platform is integrated by closely adhering to the management and incorporating the application of government management mechanism, the carbon account application and other functions. Through the application of "intelligent control", the whole process of collection, storage, transportation and recycling for marine litter governance is supervised in a panoramic view, to visualize the whole process of closed-loop marine litter governance and the carbon footprint tracing and therefore achieve the digital and intelligent supervision of marine ecology and environment governance.

The first one of the "Three Models" is the new model of government-enterprise cooperation. The "Blue Circle" Project adopts a new model of government-enterprise cooperation in ecological and environmental governance, giving full play to the government-oriented function, providing dynamic incentives and interactive platforms for enterprises and the public, stimulating the sense of responsibility of enterprises as important environmental governance entities, mobilizing the public to participate in marine plastic waste management, and forming a sustainable scale effect. In this model, the traditional government-funded governance is transformed to a sustainable multi-governance model led by the government, coordinated by enterprises and participated by the public. The second is the new model of share richness in ecology. By using the high-value utilization premium and carbon trading dividends of marine plastics as the drivers and absorbing industrial chain resources such as the enterprises, brand merchants and certification agencies specializing in marine plastics collection and recycling, a non-profit organization named "Blue Alliance" is founded and the "Blue Share Richness in Ecology Fund" is set up, to formulate the methods for redistributing the value of marine waste industry, form a sustainable standard distribution system, focus on supporting low-income people such as special groups and idle labor for achieving the marine litter collection at the source and expand their income channels. Through the redistribution of industrial value, the share richness in ecology can be achieved. The third is the new model of low-carbon development. A whole industry chain of plastics collection and recycling is opened up to transform and recycle the marine plastics into valuable

treasures. Relying on the "Internet of Things + blockchain + big data" joint management platforms, the marine plastic products can be technically traced in the entire process by installing cameras in the collection, reprocessing and re-manufacturing links and assigning codes to the end products. The carbon footprint and carbon index certifications are implemented on processed green products jointly by international environmental protection organizations, scientific research institutions and leading plastic manufacturers, which promotes marine plastic products to open the international trading market at high prices.



[Promotion Results]

Up to now, the "Blue Circulation" model has achieved remarkable results. It has achieved full coverage of 6 coastal counties (cities and districts) in Taizhou City, attracting about 4,300 fishing boats, more than 5,300 fishermen and more than 500 people from coastal towns and villages, and forming a sound three-dimensional marine litter collection network; 53 "marine cloud warehouses", 16 temporary storage sites for marine litter, 11 "small blue homes", 4 marine sanitation stations and 3 land transit warehouses have been built. During the pilot period, about 5,580 tons of marine pollutants were collected and disposed of, including 3,460 tons of ship pollutants and 2,083 tons of plastic waste (including 8.55 million plastic bottles), reducing carbon emissions by about 1,875 tons. The overall income of the industry increased. Meanwhile, the high-value dividends were redistributed through the value redistribution system to increase the income of the first-line collection groups in coastal villages by more than 20% , and basic social security was also provided for them. Through the fishery credit evaluation system, 123.2 million yuan of green financial loans have been allocated cumulatively, which fully motivated the enterprises and individuals to participate in the marine litter collection, formed a sustainable multi-governance system, and finally achieved share richness in ecology.

Case 2

A Case from the Department of Ecology and Environment of Hainan Province

- Special Prevention and Control of Plastic Pollution

[Case Introduction]

In recent years, Lingao County of Hainan Province has actively carried out the prevention and control of plastic pollution, focusing on the cleanup of main land pollution sources - the agricultural plastic film and marine plastic waste. For the cleanup of the waste agricultural film, following measures were taken: firstly,

establish a multi-governance system of combining "scattered collection by farmers, centralized storage and transportation in towns and counties, and recycling and disposal by enterprises" through scientific layout of collection outlets; secondly, clean up the waste agricultural film and the pesticide packaging waste remaining in fields and rivers over the years, and include the collection of waste agricultural film into the scope of daily law enforcement; thirdly, encourage the demonstration and promotion of plastic film picking and collecting machines suitable for typical planting modes, and transform and upgrade various technologies and equipment related to the waste agricultural film. For the governance of marine litter, following measures were taken: firstly, spontaneously organize voluntary groups in the public to daily clean up and salvage the floating garbage in the port, and guide fishermen to form the habit of bringing domestic garbage ashore at hand, to contribute to the protection of the cleanliness of the fishing port; secondly, continue to carry out the "fishing boats salvaging garbage" actions and related practices for maintaining a plastic-free marine environment, encourage fishermen to participate in the governance of marine plastic waste in the daily fishery production process, and form a "fishermen-fishing boats-fishing ports-plastic recycling" work chain to create a green, efficient and sustainable marine plastic waste destocking solution.

[Model Description]

(1) Promote the cleanup of waste agricultural film

Firstly, scientifically set up the collection outlets and build a collection system. The Party members and cadres of towns and village committees were all mobilized to form volunteer service teams, who led the field agricultural film collection and cleanup actions by grids on the farmland throughout the county, to thoroughly remove the residual agricultural plastic film over the years; and a multi-governance system of combining "scattered collection by farmers, centralized storage and transportation in towns and counties, and recycling and disposal by enterprises" was established through scientific layout of collection outlets.

Secondly, identify key areas and incorporate them into the scope of daily law enforcement. The waste agricultural film and the pesticide packaging waste left in fields and ditches over the years were prioritized for cleanup, the collection of waste agricultural film was included in the scope of daily law enforcement, and severe punishment was given according to laws and regulations to any illegal acts which endanger the quality and safety of soil and agricultural products, such as failure to recycle waste agricultural film in time and carelessly discarding waste agricultural film, etc.

Thirdly, improve the collection capacity and realize efficient processing. The plastic film picking and collecting machines suitable for typical planting mode in the county were encouraged to be promoted, and the technologies and equipment such as sorting and crushing, cleaning and granulation, deep processing and utilization of waste plastic film were transformed and upgraded to improve efficiency and reduce cost.

(2) Implement the governance of marine plastic waste

Firstly, organize voluntary actions to remove the port garbage in the public. The volunteer service teams composed of the Party members, the Youth League members, the masses, returning college students and volunteers of Kunming Society often organized public welfare activities of "eliminating garbage on the sea

surface and striving to be an environmental protection guard" in Xinying Center Fishing Port, cleaned up and salvaged floating garbage in the port, influenced the fishermen group with environmental protection behavior, and guided the fishermen to form the habit of bringing domestic garbage ashore at hand spontaneously, to protect the cleanliness of the fishing port all together.

Secondly, remove the marine litter with the help of the public welfare team. The "Plastic-free Ocean" team of Hainan Research Academy of Environmental Sciences actively promoted the demonstration of "fishing boats salvaging garbage" in Huanglong Fishing Port, encouraged fishermen to participate in the governance of marine plastic waste in the daily fishery production process, and selected the sanitation workers familiar with fishermen's production and life to cooperate with fishermen to dispose of plastic waste ashore, and clarified the storage place and the transfer steps. After the marine plastic waste was salvaged and sorted by fishermen and then weighed and counted by sanitation workers, the recyclable part was recycled by local recyclers, the non-recyclable part entered the sanitation system for disposal, and the tools for collecting and storing the marine litter were returned to fishermen for reuse, thus forming a work chain of "fishermen-fishing boats-fishing ports-plastic recycling". In addition, the "Blue Star Guardian for Ocean Protection" project initiated by the Blue Ocean Protection Association, piloted in Lingao and Guicun, also encouraged local fishermen to collect marine litter during fishing operations and bring it back to shore for disposal, so as to destock the marine litter.

[Promotion Results]

(1) Remarkable results have been achieved in terms of the governance of agricultural film.

Under the continuous publicity and guidance, farmers consciously picked up the waste agricultural film in their own plots and placed it near the fields. Hainan Tianming Agricultural Environmental Protection Technology Service Co., Ltd. collected and temporarily stored the waste agricultural film at the collection outlet in Jialai Town, and then transferred it to Qiongzhong Tianming Processing Plant for standard disposal to complete the cyclic utilization of waste agricultural film. By the end of 2022, the full coverage of agricultural film collection outlets was achieved throughout Lingao County.

A total of 505.18 tons of waste agricultural film were collected, with a collection rate of 97.38%; 1.5 tons of degradable plastic film were demonstrated and promoted, with an application area of about 120,000 square meters; billboards and banners were set up, including 5 in Jialai fields, 5 in Nanbao fields, 1 each in Jinbo Village and Gufeng Village, Huangtong Town, and 12 banners.

(2) Marine plastic waste was effectively removed.

There is a lack of effective means to destock the marine plastic waste in the current marine litter governance system. Fishermen live with the ocean day and night and are closely related and mutually dependent on the ocean. They carry out production operations at sea for a long time. The fishing boats can reach a wide sea area, and fishing nets can penetrate deep into the water body or even the seabed over a large area of net casting. In this way, the marine litter enters the net along with the current, thus being carried away from the sea area. At the same time, this process neither produces additional fuel consumption nor increases the fuel

emissions of the boats, and costs very few materials and labor. The action of "fishing boats salvaging garbage" has given the powerful force of fishermen into full play, and it is a green, efficient and sustainable solution to the destocking of marine plastic waste. This pilot model of "fishing boats salvaging garbage" can be replicated and popularized, providing the possibility for innovative system integration for marine ecological and environmental governance.

As the demonstration action of "fishing boats salvaging garbage" continued in Huanglong Fishing Port for maintaining a plastic-free marine environment, the majority of fishermen gradually changed their attitude and behavior towards marine ecological and environmental protection, from initially maintaining neutrality or having doubts to actively participating in the action of "fishing boats salvaging garbage", and from throwing garbage into the sea conveniently to actively practicing the principle that "garbage shall not fall into the sea" and actively salvaging marine litter. Their sense of ownership has been continuously enhanced in terms of the marine ecological and environmental protection. As a part of the Hainan "plastic-free ocean" demonstration area, the "fishing boats salvaging garbage" action in Huanglong Fishing Port is a continuous on-going activity. The action stories of fishermen and various participants have inspired more people, inspired more citizens and enterprises in Hainan Province and even the whole country to pay more attention to marine litter governance and support the goal of "plastic-free ocean", and promoted the improvement of the consciousness of ecological progress on a larger scale.

II. Overview of Public Cases

Case 1

Green Partners - "No Plastic in Future"

[Case Introduction]



With the development of the social economy and the acceleration of industrialization, human beings are destroying the environment more and more severely. The impact of plastic pollution is of great concern to the international community, and the United Nations Environment Assembly adopted a resolution in 2022 that plans to develop a legally binding instrument on plastic pollution and sets a goal of completing negotiations on this instrument by the end of 2024. The first meeting of the Intergovernmental Negotiating Committee was held in December 2022 and the second meeting is expected to be held in Paris in 2023. The instrument will be based on a systematic approach to address the pollution throughout the lifecycle of plastics. The Chinese delegation submitted 9 recommendations on this first meeting, proposing to "strengthen public communication and education to enhance awareness of plastic pollution reduction" on the "core obligations" in the instrument. China has successively issued various plastic restriction and prohibition policies to support the research and development of alternative materials and promote the extension of corporate responsibility. In recent years, although the public awareness of plastic reduction has increased, the potential for participation has not been fully tapped.

With the support of the "Plastic Rethinking" program, China launched the public education project titled "No Plastic in Future" to explore how to promote a more three-dimensional public awareness of plastic pollution, find practical ways to improve their willingness to reduce the use of plastics, summarize relevant practical experiences, and provide actionable recommendations for stakeholders of the plastic reduction public

education project.

The "No Plastic in Future" project promotes the communication and action entry points of public no-plastic governance: 1. Effectively enhance public scientific understanding of plastic pollution; 2. Build effective paths for public participation in the prevention and control of plastic pollution at the community level; 3. Empower the governments at the grassroots level and the NGOs to promote the formation of channels and mechanisms conducive to public engagement at the community level.

[Model Description]

(1) Create a basic action network

In December 2021, a cooperative relationship was entered into with the official organization of Tiantongyuan (Asia's largest urban community) to jointly promote the implementation of public education for multiple audience groups (teenagers, college students and community volunteers), so as to form a basic action network at the community level.

(2) Develop public education activities and lead the public to participate in content co-creation

From December 2022 to April 2023, on the basis of public education activities, a mechanism was introduced for the public to co-create the no-plastic education content, to promote the integration of no-plastic environment education with the daily life of the public. In addition, the we-media influence was given full play in the public to promote the popularization of scientific knowledge about no-plastic education.

(3) Create actual influence online and offline

From April to June 2022, the cluster analysis was conducted on the co-creation content to extract the corpus and images that can most arouse public emotional resonance and action consciousness, so as to plan and implement popular science exhibitions with regional influence, and gather more participants from the community on the platform of exhibitions to form sustainable engagement.

(4) Form knowledge products and empower action partners

The above experiential paths will be summarized and refined, and knowledge toolkits and actions applicable to grassroots governments and NGOs will be respectively developed respectively, to provide action support for action partners.



[Specific Measures]

(1) Behavioral science-based project planning:

The model of responsible environmental behavior verifies that variables such as personal factors (attitude, control, personal responsibility), knowledge of environmental issues, knowledge of action strategies and action skills shape the willingness to act, and that situational factors are the most strongly correlated variables with responsible environmental behavior. Effective application of this model will be conducive to planning more effective action plans. In Hines' REB model, individuals must first be aware of the occurrence of environmental problems and have a general understanding of the reasons behind them before they can think about and take relevant actions. Environmental knowledge is a prerequisite for behavior to occur. The knowledge of environmental issues and action skills are indispensable. Action skills refer to the ability of individuals to apply the knowledge of action strategies. Only when they master relevant knowledge of action strategies and combine it with action skills can they be transformed into final behavior.

From June to October 2021, the project team planned the public education project titled "No Plastic in Future" based on the responsible environmental behavior model, focusing on improving the willingness to act around variables such as the knowledge of environmental issues, knowledge of action strategies and action skills of different audience groups, and improving the effectiveness of transforming environmental willingness into environmental behavior by introducing participation methods in different scenarios.

Through literature analysis, the project team conducted research on 152 target audiences in first-tier cities, interviewed 10 action partners, analyzed domestic and foreign implementation experience cases, and found that adolescent groups can effectively drive parents, peer groups in campus networks and carers of alternate generations. Adolescents are therefore identified as a priority group for intervention.

(2) Public education and content co-creation:

The knowledge toolkit of life plastic reduction was pushed to the families living in Tiantongyuan through a Wechat mini program, and online courses were also offered to convey the concept and action path of a

plastic reduction life to the public. Moreover, a series of activities were initiated to build following channels for intaking the knowledge and applying the knowledge into actions:

- Exhibition of no-plastic art works from adolescents: Invite young people to create handwork and painting works on plastic reduction, for popular science exhibition;
- The propaganda activity on no plastic for adolescents: Invite young people to act as propagandists for the plastic reduction action, convey ideas and drive the public to make plastic reduction commitments by making no-plastic propaganda in communities, food markets and schools.
- Creation of no-plastic themed stories by adolescents: Invite young people to present their reflections on plastic pollution by creating stories.

(3) Gather the public content to co-create achievements and create actual influence online and offline

- Popular science exhibition of "No Plastic in Future": The public education exhibition of "No Plastic in Future" was held in Tiantongyuan. Giant hand paintings and art works on no plastic theme made by adolescents were displayed on site, and the public could also participate in art creation on site. The exhibition attracted public participation in secondary communication through visual design.
- No-plastic themed short video competition: The families of adolescents and the college students were invited to jointly create short videos and establish no-plastic topics, to promotion the dissemination of the no-plastic content on short video platforms and consequently create online influence.
- Form knowledge products and empower action partners: The project team refined the experience and iterated the knowledge toolkit, to support Xingxingcao Youth Public Welfare for launching the public education project titled "Beautiful Shunyi, No Plastic in Future", support Changsheng Garden Community in Changping District of Beijing City to launch the action plan of school social plastic reduction for "No Plastic in Future", and support Qingdao Excellence Channel Cultural Media Co., Ltd. to launch the art practice project for "No Plastic in Future" in Qingdao City, Shandong Province.

[Practice Results]

The knowledge toolkit for public education was extracted, including PPT and handouts for no-plastic education, children's no-plastic works, no-plastic public education videos and family short videos on no-plastic actions.

Regional influence was created to promote continuous environmental protection activities in Tiantongyuan area. An action mechanism that consists of social organization incubation base, community public welfare foundation, partner network and action think tank has been developed in Tiantongyuan area, and the offline activities have directly affected more than 300,000 residents.

By creating #NoPlasticInFuture content tags on WeChat short video and Douyin platforms, channels were opened up for the public to continuously participate in the creation and recording of no-plastic short videos. Up to now, more than 1.2 million views have been generated cumulatively.

All the action experience was empowered to the action partners, which was expected to influence more than 500,000 people offline and create broader online influence.

An action path and effectiveness measurement tools with practical significance for operation have been formed. Activities can be themed on diverse environmental issues to promote in-depth discussion and public engagement, especially to address the sustainable development of community environmental volunteers. The knowledge toolkit, which includes policy background, the basic knowledge about no-plastic concept, the action cases and the information about plastic reduction actions for the year, has strong promotional value, allowing action partners to quickly grasp the basic knowledge needed to engage in discussing no-plastic related issues and apply it directly to public education activities.

Case 2

Zhoushan Green Marine Ecology Promotion Center

Reduction Control and Prevention of Marine Plastic Waste (Derelict Fishing Gear)

[Case Introduction]

The "derelict fishing gear" is a form of marine plastic waste in the marine litter that poses a deadly hazard to the marine ecology and environment. Since plastics have been used in fishing gear for more than 80 years, the "derelict fishing gear" has become a global marine ecological and environmental disaster, and it is a social concern that will be listed as a major livelihood issue by governments at all levels in coastal cities of China. However, the concealment of derelict fishing gear, the interaction between victims and perpetrators, and the complexity of governance determine that the reduction, management, and prevention of derelict fishing gear will be a long-term, comprehensive, and systematic governance project faced by governments at all levels in coastal areas. In addition to the government leadership, it is necessary and even more obligatory to mobilize social public forces including social organizations, enterprises, fishery operators and fishermen to participate in governance actions.

According to the investigation of some typical waters in Zhoushan fishing ground, the disposable crab gill net is the main type of derelict fishing gear in Zhoushan fishing ground. Although the crab gill net has only a development history of more than 20 years, its damages to and impact on the marine environment are far greater than that of any other kind of net. According to the investigation and research on the derelict fishing gear in Yue'ao Village, Zhujiajian, Zhoushan, where the crab gill net is used the most for fishing operations, it is concluded that the reason why there is disposable derelict fishing gear is mainly that the protrusion of submarine obstacles (including sunken ships, containers, abandoned fishing gear and bottom reefs, etc.) causes different kinds of fishing gear such as drift gill net to hook and entangle with each other, and the interaction of currents and waves produces additive effect, which makes the impact and scope of derelict fishing gear out of control.

The Center chose to explore the development mode of community participation in governance in the traditional fishing village of Changtu Town, Daishan County, and urged the fishing community to build a

normal governance mechanism for derelict fishing gear, mainly based on the following three aspects: Firstly, the gradient arrangement based on the core personnel of social organizations. At present, half or more of the population living on islands and in fishing villages are elderly people and women over 55 years old. Once there is a problem of generational replacement, they are worried that there will be no successors, so a sustainable gradient public welfare backbone team must be ensured; secondly, the consideration of improving the development ability of social organizations. The existing fishing sisterhood in the fishing village itself is a loose organization lacking binding force. To enhance the attraction of the organization, in addition to the Party building guidance, it is necessary to improve the self-consciousness of members and train the team five capabilities through a new mechanism; thirdly, the further actual need to promote the closed work loop in the community. It is essential to innovate the working mechanism by rationalizing the relations among fishery cooperatives, the fishing sisterhood, full-time social workers, and backbone volunteers, clarifying their responsibilities, identifying the division of labor, and achieving functional complementation, etc.



[Model Description]

The first is path innovation, to explore and propose a development path consisting of "policy leadership + community engagement + public welfare guidance + market power". The second is concept innovation. Combining with the local reality, put forward the pragmatic goal of "four modernizations" as the guiding principle for community organizations to participate in daily governance. The third is mechanism innovation. Under the leadership of Donghai Bay Fishery Cooperative, the Cooperative contributed to guarantee partial working fund, for further forming an internal closed-loop chain of collection, transfer, and disposal.

[Specific Measures]

- More than 95% of the local population acquired relevant knowledge and further enhanced their awareness of marine protection through science popularization and education on marine environment protection for the public;
- Improve the serviceability and level of the local volunteer team by offering training services to the local backbone volunteers;
- The investigation tasks (mainly including the social investigation of the fishery community in Changtu Town, the underwater investigation of derelict fishing gear in the project area, and the current situation investigation of disposal and management of derelict fishing gear) were accomplished, and special reports were generated, to provide support for submitting policy suggestions and influence the formulation and improvement of relevant policies of government

departments.

[Practice Results]

Taking Donghai Bay Fishery Cooperative as a pilot case, an innovative organizational structure and operation mechanism has been designed as "led by industrial authorities, implemented by operation subjects, overall planned by full-time social workers and coordinated by work teams". A governance model with a clear division of labor of social organizations, interdependence, and joint efforts was explored and developed, to further guarantee effective matching among resources, organizations, and mechanisms, and thus enable social organizations to finally participate in the sustainable closed loop for the reduction control and prevention of marine plastics (derelict fishing gear) and achieve the goal of building a rich and beautiful island for fishing communities.

The Center initiated the "Demonstration Project of Community Participation in Reduction and Prevention of Marine Plastics (Derelict Fishing Gear)" promoted by the Center and created the promotion model which is "led by industrial authorities, implemented by operation subjects, overall planned by full-time social workers and coordinated by work teams", which are not only in line with the development vision of governments at all levels to mobilize all sectors of society to participate in, but also adapt to the development progress of coastal areas in China, therefore providing certain reference and promotional value.

At the same time, the Center applied the market-oriented approach to promoting the industrialization of a high-value recycling value chain of "marine plastics" and achieving the transformation of low-value marine plastic products from social responsibility to economic value, which meets the needs of today's market development. Meanwhile, in the process of enhancing the value of "marine litter", fine classification was adopted for garbage sorting to find a way out for the vulnerable groups in the fishing community to gain self-respect and self-reliance and seek the support of fishermen, so that mobilizing fishing boats to bring back garbage is no longer a slogan, but a reality. In this way, while effectively repairing the current marine environment, it also has the certain significance of replication and popularization for the fishing communities in coastal areas of China to explore multiple paths for seeking share richness in fishing areas.

Case 3

Shenzhen Public Welfare Development Center for Zero Waste Environmental Protection

"Implementation of Social and Organizational Practice of Banning Illegal Plastic Products on E-commerce Platforms"

[Case Introduction]

This case is an e-commerce plastic reduction initiative, which advocates e-commerce platforms to stop

selling disposable plastic products that violate relevant national laws and regulations by means of submitting proposals, friendly communication, joint signature of an open letter and reporting to relevant authorities, etc. 4 e-commerce platforms, Taobao, Jingdong, 1688 and Pinduoduo have been driven to stop selling disposable foamed plastic tableware, which directly discontinued the operation of 476 prohibited foam tableware links, including 114 prohibited links with more than 1,000 items sold, 28 links with more than 10,000 items and 3 links with more than 100,000 items sold. The initiative finally reduced the detection rate of disposable foamed plastic tableware on the above 4 e-commerce platforms from the highest record of 68% to 0%. During the action, the special issue of foamed tableware was released on International Consumer Rights Day (March 15) of 2022, the joint signature of an open letter received the coverage of 5 media organizations, and more than 60,000 people learned about this information from the we-media. Part of illegal plastic products was prioritized to be withdrawn from the e-commerce market, based on which the policies were improved for the management of disposable plastic circulation.

[Model Description]

- Eliminate products that are explicitly prohibited or limited by laws and regulations but in fact for which laws and regulations have not been strictly enforced;
- Clarify the compliance responsibility of e-commerce platforms;
- Promote multi-party synergy.

[Specific Measures]

- 4 e-commerce platforms, including Taobao, 1688, Jingdong and Pinduoduo were driven to remove all the disposable foamed plastic tableware by means of submitting proposals, direct communication, joint signature of an open letter, and reporting to relevant authorities, etc.
- Major e-commerce platforms were investigated for their sales of disposable foamed plastic tableware that has been banned in China, and the investigational findings were disclosed to the public.
- All the stakeholders communicated with each other to explore ways to further improve relevant policies and strengthen government supervision.

[Practice Results]

In July 2021, with "foamed lunch box/foamed packing box/foam lunch box/foam food container" as search keywords, a great number of sales links of foamed plastic lunch boxes were discovered on 4 e-commerce platforms. In the random sampling test, 3 of 6 samples tested positive for fluorescent whitening agent, which indicated that these 3 samples contained the fluorescent whitening agent.

On October 18, 2022, the detection rate of 4 foamed tableware keywords was 0% on 4 e-commerce platforms, including Pinduoduo, Taobao, 1688 and Jingdong. The implementation of the ban on the sale of illegal plastic products on e-commerce platforms can encourage relevant enterprises to consider compliant alternative products and reuse schemes, effectively enhancing the output value of compliant products and the

industry status of the enterprises that insist on sustainable development.

Case 4

Beijing Chaoyang Public Environmental Research Center "Blue Map Plastic Reduction Observation Activity"

[Case Introduction]

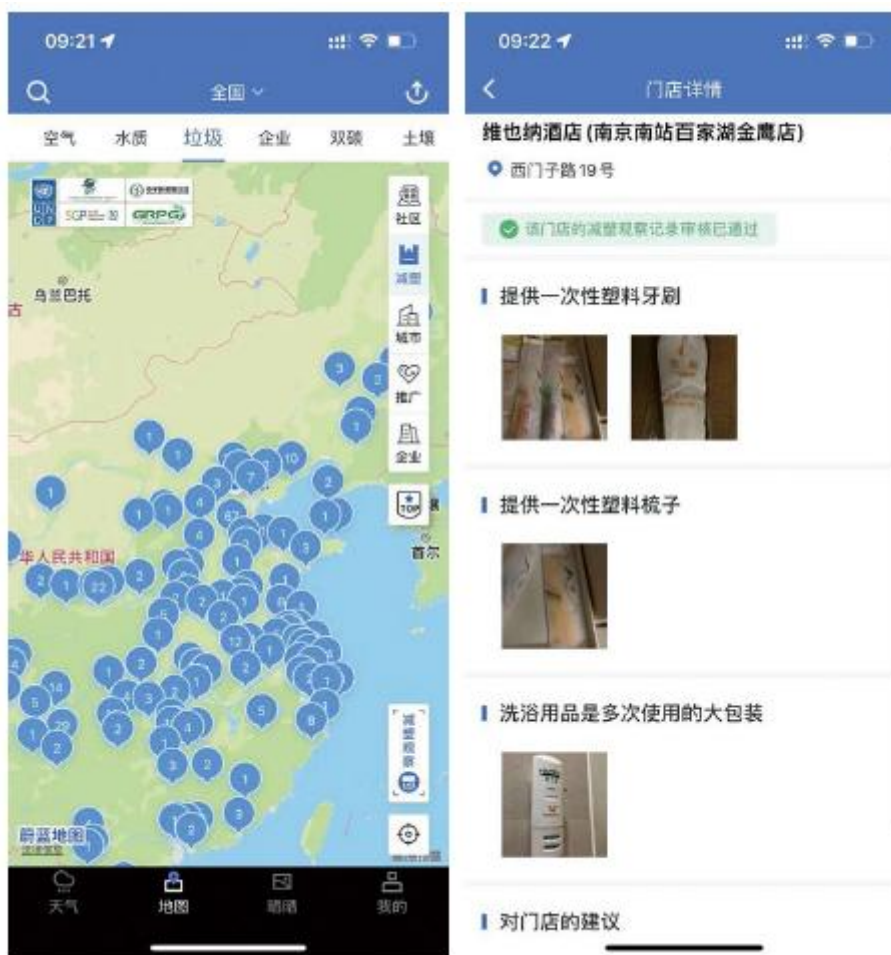
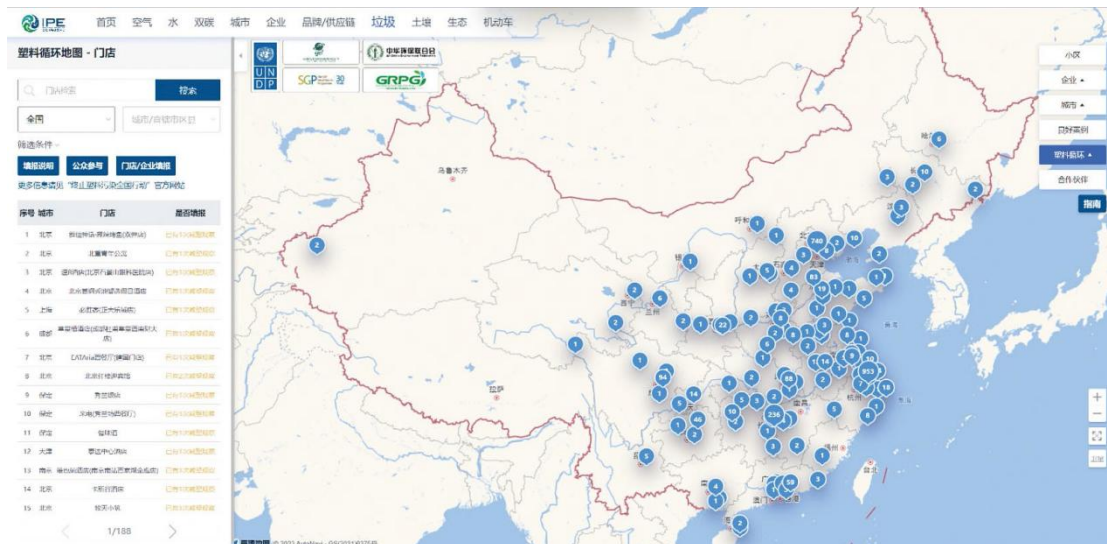
To develop circular plastics economy and carry out the prevention and control of plastic pollution, it is necessary to gather the strength of the government, enterprises and citizens. The role of the public in the prevention and control of plastic pollution is usually considered as the "consumer". People buy, use, and discard plastic products, and also intentionally or unintentionally experience the micro-implementation of the prevention and control macro-policies against plastic pollution, so that they can also become observers and supervisors of the performance of enterprises in plastic consumption. The categories and the number of enterprises involved in the plastic consumption link are the most in the whole plastic industry chain and also the closest to people's lives, and the "plastic bag ban" is the most difficult to supervise. Since June 2022, with the support of the All-China Environment Federation, UNDP, and other institutions, the Public Environmental Research Center (IPE) has organized the activity of "plastic reduction observation and casual shooting", inviting the public to use the Blue Map App to shoot and record the use of plastic bags, disposable tableware and "six small pieces" in offline consumption places such as supermarkets, farmers' markets, restaurants, and hotels, and present them on the "Plastic Recycling Map" to guide the public to pay attention to the use of plastic products in the consumption process and promote the business to comply with plastic restriction policies.

[Model Description]

The publicity, promotion, and shooting in the plastic reduction observation activities have driven environmental protection volunteers and the public to pay attention to plastic use in offline consumption places such as supermarkets, farmers' markets, restaurants, and hotels, and subtly guide them to reduce the use of disposable plastic articles.

[Specific Measures]

The stores photographed by users were marked on the public store plastic reduction map, showing the status of the implementation of the plastic bag ban in these stores, which played a supervisory role for stores, especially large chain brands, and can provide first-hand information for enterprise self-inspection and government inspection. Cooperation was developed with well-known consumer product brands to promote the offline recycling outlets for plastic bottles, which was conducive to college teachers and students to know and participate in campus plastics recycling activities. In the long run, it can drive other brands to recycle the packaging in similar ways and improve plastic packaging recycling efficiency.



[Practice Results]

On June 6, 2022, the "National Action to End Plastic Pollution"(hereinafter referred to as the National Action) was initiated, the "Plastic Recycling Map" developed by Blue Map was launched simultaneously, and the "Plastic Reduction Observation" activity of Blue Map was also launched simultaneously.

From June 10 to June 30, 2022, Blue Map launched the online challenge of "Plastic Reduction Observation

Attendance" to encourage the public to use the plastic reduction observation and casual shooting function of the Blue Map App to shoot photos in places such as supermarkets, farmers' markets, and restaurants and fill in the questionnaires. A total of 2,148 valid observation records from 84 cities were collected by the deadline of the activity.

In September 2022, IPE cooperated with Unilever to mark the locations of the campus Tmall stores where Unilever has set up plastic bottle recycling machines on the "Store" layer of the Plastic Recycling Map, and students were invited to throw in the used plastic bottles and report on the operation of the plastic cleaning machines.

In February 2023, the questionnaire of plastic reduction observation in the accommodation industry was launched in the Blue Map App.

At the end of April 2023, IPE launched the plastic reduction observation campaign in hotels.

Case 5

Shanghai Pudong Lefen Public Welfare Promotion Center for Environmental Protection

World Cleanup Day

[Case Introduction]

World Cleanup Day is one of the largest environmental awareness-raising campaigns in the world and is held regularly on the third Saturday of September each year. By advocating "Clean up our planet in one day", more people are called on to change their attitude towards garbage to deal with the problem of uncontrolled garbage on land and in rivers and oceans and to thus ultimately mitigate the impact of the climate crisis through diverse activities and large-scale engagement. Since 2018, Shanghai Pudong Lefen Public Welfare Promotion Center for Environmental Protection has been the organizer of the "World Cleanup Day" in China. By 2022, the cumulative number of participants has reached 1.11 million, and 1,558 tons of outdoor garbage have been cleaned up. The campaign has swept across 31 provincial administrative regions nationwide.

[Model Description]

A grand goal of tackling plastic waste pollution is transformed into an action that everyone can participate in; unique creative plans are adopted to stimulate public interest and engagement, allowing participants to see the existence of waste problems; a national joint action is initiated to inspire everyone to join the cleanup campaign; and a simple pick-up action can inspire real change and awareness raising. A "clean China" will be created all together through a unique model of public mobilization and publicity. In order to mobilize more people and teams to join the World Cleanup Day campaign more widely and efficiently, the Center will cooperate with famous environmental organizations in China during the mobilization every year, inviting

them to become co-sponsors of the World Cleanup Day, and further expand the environmental benefits of the World Cleanup Day through their influence in the field of environmental protection. In addition, the Center has also screened and trained several major local civil environmental organizations that have long cooperated with, so that they can become the coordinators of the World Cleanup Day campaign, give full play to their capacity of local mobilization, and attract more civil teams to join.



[Specific Measures]

- "Leadership Academy" training
- Celebrity endorsements

- Home events
- Collection of plastic waste data

[Practice Results]

- Increase public awareness
- Promote the mobilization of pluralistic social forces
- Promote garbage collection and recycling activities
- Impact the corporate social responsibility
- Building a platform for transnational exchanges
- Facilitate policy development

III. Overview of Technical Cases

Case 1

Beijing Aerospace Petrochemical -

"SHCP[®] Chemical Recycling Technology for Plastic Waste through Aerospace Pyrolysis"

[Overview]

The plastic waste is decomposed in the oxygen-free environment through mechanical circulating fluidization of solid heat carriers and converted into pyrolysis oil. The products can be further processed to obtain high-value-added products such as plastic monomer, BTX, ethylene, and propylene so that different kinds of waste plastics with low residual value can be harmlessly disposed of for high-value utilization. The SHCP[®] technology is characterized by continuous massive production (up to ~ 200t/d per set), high energy utilization rate of the system and environmental friendliness. At the same time, it can be widely applied to process domestic waste, medical hazardous waste, agricultural and forestry waste, municipal sludge, oily sludge, and other organic solid waste.



At present, a cumulative 5,000 h cycle of 3000 t/a pilot operation validation has been completed for domestic garbage, plastic waste, oily sludge, etc. The SHCP[®] technology has been gradually recognized by the market during the promotion process, a technology access license agreement has been signed with Saudi Basic Industries Corporation (SABIC) and the 90,000 t/a SHCP[®] Industrial Demonstration Project for Resource Utilization of Plastic Waste and Oily Sludge is under construction in Inner Mongolia.

[Technology Description]

The SHCP[®] technology can realize harmless resource processing of the plastic waste sorted from domestic

waste, industrial scrap, landfill obsolete plastics, express packaging materials, plastic waste from paper mills and hazardous waste packaging materials for various industrial applications.

(1) Technical route

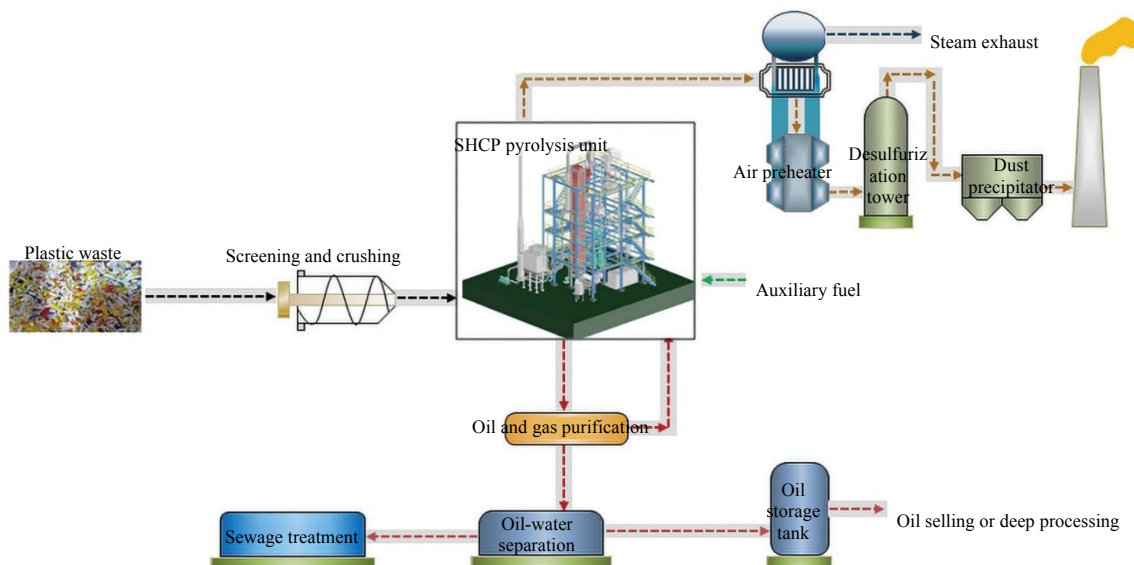
The main process flow of this technology is: plastic waste → pretreatment system → SHCP[®] pyrolysis system → oil-gas separation and purification system → flue gas purification system → chimney.

(2) Innovative thinking

The core innovation of SHCP[®] technology is that the solid heat carrier is used to heat materials. The plastic waste and the heat carrier are directly contacted and forced to mix in the reactor, which can realize rapid temperature rise and pyrolysis of the plastic waste, high heat exchange efficiency, large-scale pyrolysis of plastic waste, and effective elimination of coking. Specific innovative features are as follows:



- Mixed contaminated low-value waste plastic materials are used, which breaks the limitation of selecting raw materials.
- The unit can continuously operate to achieve large-scale treatment.
- The function of continuous temperature regulation can ensure optimal oil yield from plastic waste.
- The powerful anti-coking ability guarantees continuous and stable operation.



- The core unit solves key challenges and provides strong support for SHCP® technology.

Compared with traditional landfill and incineration technologies, the SHCP® technology can be used to process non-recycled plastic waste, which can effectively reduce carbon emissions. For instance, in a resource utilization project of 30,000 tons of plastic waste per year, carbon emissions of about 50,000 tons can be reduced per year, which is conducive to promoting the development of a green circular economy and has broad application prospects.

[Specific Measures]

- Gather superior R & D strength to accomplish core technology breakthrough
- Build small-scale and pilot-scale testing platforms to verify technical feasibility
- Implement iterative optimization of technology to improve intellectual property protection

[Practice Results]

- 3,000 t/a pilot demonstration unit for aerospace pyrolysis: The SHCP® technology has been successfully applied to the 3,000 t/a Hebei pilot demonstration unit. The pyrolysis gases obtained after the test from the plastic waste included alkenes such as hydrogen, methane and ethylene, which can be recycled into the system to reduce system energy consumption.

- 90,000 t/a engineering demonstration unit for aerospace pyrolysis: At present, the 90,000 t/a Industrial Demonstration Project for Resource Utilization of Plastic Waste and Oily Sludge that adopts SHCP® technology is under construction in Inner Mongolia is under construction. The reactor processing capacity is up to 200 t/d. The processed materials include oily plastic waste, hazardous waste packaging, oily sludge from clean tanks, and a small amount of waste oil and sludge, etc. The pyrolysis workshop (including the pretreatment area) covers an area of about 4,466 square meters and is expected to be completed and put into operation by the end of 2023.

- Promote the development of plastic waste chemical recycling industry. A technology access license agreement has been signed with Saudi Basic Industries Corporation (SABIC), a global leader in the chemical industry, which will further accelerate the application of aerospace SHCP® technology in the engineering field and will also contribute to the global layout of the circular economy industry of SABIC, playing an important role in promoting the development of the global plastic waste chemical recycling field and contributing to the global circular economy.

Case 2

Shanghai Ruiju - "High-value Recycling of Food Boxes"

[Overview]

The general idea of the high-value recycling case of takeaway boxes is reflected in the innovative development of recycling technology to enhance the recycling value of plastic waste resources from takeaway boxes, thus meeting the growing market demand for high-quality recycled plastics. The high-quality recycled polypropylene (r-PP) and the self-developed innovative equipment were adopted to reduce the cost and improve the efficiency, creating a benchmark for high-quality recycling and high-value application industry, continuously upgrading the whole industry chain based on high-quality recycling, and establishing standard production links; based on the benchmarking demonstration, the industry was led to realize high-value recycling of all kinds of recycled plastics and achieve green, low-carbon and sustainable development of recycled plastics industry.



High-value product - recycled pellets from food boxes



Intelligent food box identification and sorting line



High-value application - nonwoven fabric

[Specific Measures]

- Strict quality control of raw materials and high-precision sorting to ensure quality from the source
- A number of industry-leading technological innovations and process upgrades to achieve core competitiveness

- Ground-breaking automated digital production lines to reshape new recycled plastics
- A carbon footprint traceability and calculation platform to enable the reduction of carbon emissions from recycled plastics

[Practice Results]




The project achievements have been transformed into a number of key technologies with independent intellectual property rights, and 10 patents have been authorized, including 3 invention patents and 7 utility model patents. The innovative technology and strict quality control for the recycling of takeaway boxes have built high-quality recycled products and created high economic value. The ground-breaking application upgrade has broken traditional application barriers and pioneered many industry applications.

Case 3

P&G - "Green Packaging Innovation - Air Capsule"

[Overview]

In 2021, P&G independently developed and launched a kind of lighter, more convenient, and more reliable green innovative e-commerce packaging - "Air Capsule". The "Air Capsule" meets consumers' demand for packaging functions and enhances consumer experience, while making the plastic express packaging recyclable and renewable, hence reducing resource waste and environmental pollution.

100% recyclable material	Material weight 40% lighter	Less express freight and fuel consumption
No tape, no extra protection, and no padding	Material weight 40% lighter compared with traditional packaging	Average package weight reduced by 100 - 200 g per courier
		
2-in-1 integrated product packaging	75% reduction in material inventory volume	75% reduction in material transport volume
2-in-1 product packaging box + express packaging Combination of brand publicity and anti-theft function	75% reduction in the warehousing of traditional cartons and cushioning fillers	1 truck of air capsules = 4 trucks of corrugated boxes plus cushioning fillers



[Technology Description]

The Air Capsule is made of 100% single recyclable material and is designed with an integrated sealing and a tear line structure, with no fillers, no cartons wrapped and no tape but just the zero-cost and zero-waste air as the core resource, which replaces the combination of traditional cartons and filling protection, and enhances the compression resistance while weighing 40% lighter.

[Practice Results]

P&G innovatively developed a 100% single recyclable material in the design process to create an air barrier for a certain period, which meets the cushion protection need for express transportation and plays an innovative leading role in replacing traditional composite plastic materials (PA/PE) with a single material in the express industry to achieve cushion protection, thus further promoting the green, lightweight and 100% recyclable express packaging. The "Air Capsule" is the first express packaging material in China that has obtained "Double E" certification and is rated as the highest level of excellence.

Case 4

Jiangxi Green Recycling (GER) - "High-value full-lifecycle Utilization Model of WEEE Waste Plastics"



GER base for modification of plastic waste to recycled plastics

[Overview]

GER uses WEEE waste plastics as the main raw material for recycled plastic products. The e-waste recycling process was developed to improve the advanced level and efficiency of e-waste treatment; the technical challenge of efficiently cleaning and sorting e-waste plastics has been overcome by skillful multi-stage sorting (electrostatic sorting, color sorting, and material sorting) and superposition, multi-stage deep and efficient sorting, and removal of impurities, to obtain high-quality purified plastics; the modified formula was created and the production process was improved to focus on the development of the modified recycling technology for plastic waste, improve the level of modified recycling and consequently enhance the product performance. The technical challenge of recycling WEEE waste plastics was overcome to accelerate the industrialization process of the project and transform WEEE waste plastics into recyclable materials. In this way, a high-value full-lifecycle utilization model of "electronic products-plastic waste-modified recycled plastic pellets-recycled plastic products" was generated for intelligent treatment as well as green and complete resource utilization, which not only improved the utilization rate of environmental resources and reduced environmental pollution, but also helped to build and improve the application market of recycled materials, promote the green development of recycled plastics industry, and lead the industry to develop towards higher quality.



Front end of waste refrigerator crushing and sorting line



WEEE Waste Plastics Recycling Industry Chain with High Value

Recycling and scientific and rational utilization of WEEE waste plastics can not only save resources but also protect the environment and realize sustainable development, which has strategic significance. GER's high-value full-lifecycle utilization model of "electronic products-plastic waste-modified recycled plastic pellets-recycled plastic products" has achieved intelligent treatment as well as green and complete resource utilization, which not only improved the utilization rate of environmental resources and reduced environmental pollution, but also helped to build and improve the application market of recycled materials, promote the green development of recycled plastics industry, and lead the industry to develop towards higher quality.

Case 5

Dow Chemical Company - "Recyclable All-Polyethylene Packaging"

[Overview]

Dow's INNATE™TF-BOPE resin is characterized by stronger toughness, higher stiffness and better optical and printing performance, which is more adaptive to the shelf display effect of flexible packaging and better meets strict requirements of e-commerce logistics transportation requirements. Meanwhile, the inner PE film also uses Dow's high-performance heat-sealing resin to reduce the heat-sealing temperature, helping the all-PE prefabricated packaging bag to be able to be produced normally in the packaging manufacturer Kaida and used normally by Liby.

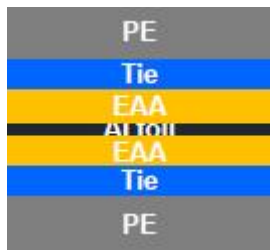
[Practice Results]

In September 2020, the first batch of Liby laundry beads in all-PE packaging (TF-BOPE//PE) were sold in Liby's Jingdong and Tmall flagship stores. Dow, Liby and LOVERE (a waste management technology company) signed a Memorandum of Understanding on Strategic Cooperation (MoU) in January 2021, to jointly solve the plastic packaging waste through a strategic alliance among the three parties and realize a closed loop starting from recyclable packaging design, thus promoting the development of China's circular plastics economy. This all-PE packaging not only obtained "Double E" certification (easy to recycle, easy to renew) of excellent level at the beginning of 2021, but also was officially certified in China in June 2022 to reduce carbon emissions by 35% as compared to traditional non-recyclable packaging materials, helping brands achieve their targets of carbon emissions reduction. As of September 2022, a total of 14 Liby products have changed from adopting the traditional non-recyclable structure to single all-PE material.



Case 6

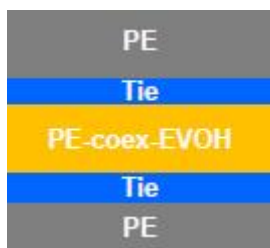
Dow's Recyclable Toothpaste Tubes



Traditional structure

[Overview]

Dow's unique high-density metallocene polyethylene, such as ELITE AT™ 6900, can provide excellent water blocking performance to the structure; high-density polyethylene ELITE™ 5960G1/ELITE™ 5538G and linear polyethylene Dowlex™ can provide good display effect for toothpaste tubes, such as straightness, high brightness, low crystal point, etc. Dow's adhesive, BYNEL™, acts as a bonding layer between polyethylene and EVOH, which can replace aluminum foil and enables the entire tube to be recycled from non-recyclable.



New structure

[Practice Results]

According to TUV Rheinland's full-lifecycle measurement and evaluation, Dow's recyclable toothpaste tube solution can reduce carbon emissions by up to 37% as compared to conventional aluminum-plastic tubes.

Case 7

Borouge - "Circular Agricultural Film Economy Program"

[Overview]

Considering that agricultural film is generally easy to break and has a low recycling rate after crop harvest season, four common types of plastic film with different material ratios and different thickness gradients were designed and used in the planting experiment in Wusu cotton fields of Xinjiang, during which the tensile strength of plastic film, the soil temperature and humidity after mulching, the yield and recovery performance of residual plastic film were comprehensively evaluated to provide theoretical guidance and data support for further application and promotion of recyclable plastic film.



From 2021 to 2022, Borouge has developed industry chain partnerships with China Agricultural University, Sino-agri General Chemical co.,Ltd., Shandong Tianda Plastic Co., Ltd., and Wusu Fumin Agricultural Materials Co., Ltd. According to the application and recycling demand in the Xinjiang market, a high-standard experimental field for plastic film recycling was established in Wusu, Xinjiang, and the local agricultural departments were coordinated to ensure the continuity of plastic film use and the traceability of experimental results. At the front end, the service life and strength of agricultural film were improved from the selection of optimal film thickness, materials, and additives; in the middle stage of the project, local agricultural scientific research institutions were cooperated to collect field agronomic data and take staged samples from the plastic film; at the rear end, research was carried out on field agronomy and residual film recycling with China Agricultural University and the manufacturers of plastic film recycling machines, to screen out the overall plan design that is suitable for local crop increment and easy mechanical recycling of residual film.

[Practice Results]

A model that deepens cooperation throughout the industry chain was advocated, in which raw material suppliers and film blowing factories participate in the product design, scientific research institutions initiate the testing, and end users give reverse feedback, to explore and try to create an innovative model of an agricultural circular economy. It is urgently believed that the pioneering combination of institutional innovation and industry chain, as well as the promotion of successful experiences and demonstration projects, will help China's agriculture achieve long-term sustainable development.

Case 8

Shenzhen Luhuan - "Remanufacturing of Blended High-value Alloy Sheet with Waste PET Doped Material"

[Overview]

This project used twin-screw blending equipment and technology with a special structure, in which the self-made compatibilizer was added to the crushed PET dopants and blended with them to extrude the sheet. The twin-screw extruder with a special structure can fully mix the doped materials, and minimize the degradation of material properties caused by PET molecular fracture as a result of blending; the self-made compatibilizer improves the compatibility between PET and doped materials so that higher performance indicators can be achieved to replace other plastic sheets with higher prices. This extruded alloy sheet can be used as luggage lining, thus realizing the purpose of recycling and processing waste PET plastics with high added value.

[Technology Description]

- The twin-screw blending equipment with a special structure is used to alleviate PET pyrolysis by adopting the screw arrangement with low shear strength.
- Good compatibility of PET with dopants
- PET non-drying process



[Practice Results]

- **Completion of technical indicators**

No.	Item	Technical Indicator
1	PET sheet	Impact strength: $\geq 12 \text{ KJ/m}^2$;
2		Tensile strength: $\geq 42.0 \text{ Mpa}$;
3		Elongation at break: $\geq 200\%$
4		The sheet should be not be broken after folded 3 times.

- **Completion of academic indicators**

During the implementation of this project, 6 invention patents and 4 utility model patents have been applied for, 4 utility model patents have been authorized, and 6 invention patents have entered the substantial review stage.

- **Completion of economic indicators**

During the implementation period of this project, the sales revenue exceeded 6.4813 million yuan, which outperformed the expected target.

- **Social benefits achieved**

Employment and training of talents: Due to the implementation of this project, more than 20 new employees was employed. During the implementation of this project, 5 skilled workers were trained, including talents in technical R&D and the production process of waste plastics recycling to enrich the Company's R&D team and enhance the Company's technological innovation ability.

Industry driving effect: The implementation of this project promoted the technological development of the waste plastics recycling industry, addressed the current situation that China's engineering plastics production capacity is insufficient and the engineering plastics market demand cannot be met, realized the high value of waste PET doped materials, and met the huge market demand. At the same time, the implementation of the project fostered the technological development of relevant industries and promoted the development of the industry to the high end.

Case 9

Anhui Zhongke Photoelectric - "Sorting for Regeneration of A Circular Economy"

[Overview]

Good sorting technology and a good sorting process can not only improve the production efficiency and the production quality of a recycling plant, but also raise the intelligent and automatic level of the plant, significantly reduce labor, and lower the production cost. Zhongke Photoelectric has developed the most complete series of waste plastics sorting equipment in the industry, covering from the whole bottle sorting at the front end of recycling to the sorting of broken, washed, and dried pieces, and finally to the particle sorting after granulation (including the sorting of raw materials and composite materials as well), which can be widely applied with different functions in each link (sorting by visible light color, infrared light material, and ultraviolet fluorescence aging), accelerating the industry development.



Zhongke Photoelectric's waste plastics sorting equipment is an intelligent sorting equipment based on high-techs such as artificial intelligence, the Internet of Things, and machine vision, which is widely used in waste plastics recycling. It can quickly and efficiently classify, sort, decontaminate, and remove foreign matter from waste plastics, effectively improving the recycling rate and the resource utilization rate of waste plastics, greatly reducing the pollution of waste plastics to the environment, and playing an irreplaceable role in promoting the circular plastics economy.

Case 10

Danone - "Mizone Investment in Smart Carbon Packaging"

[Overview]

LanzaTech's advanced "carbon capture" technology can directly transform carbon monoxide and carbon dioxide in carbon-rich gas sources to key raw materials required for the production of PET bottles through microorganisms, thereby reducing the use of oil and the carbon emissions on the environment.

Lanzatech estimates that using this technology as a key raw material for the production of Mizone PET bottles can reduce carbon emissions by 1.3 kilograms per kilogram of PET produced as compared to traditional processes.

In fact, Danone (China) Food and Beverage has deeply incorporated the concept of environmental protection into its research and development process. With material and process improvement, Danone (China) Food and Beverage fully implemented the recyclability design on the premise of maintaining high packaging quality, and the weight of Mizone bottles decreased by about 30% as compared with that in 2004, which

greatly reduced the use of plastics. By 2021, all Mizone bottled products were made of 100% recyclable packaging materials, to fully support the development of a circular economy.

IV. Overview of Business Cases

Case 1

Hangzhou Wuhuan - "Circular Plastics Economy - Solution Based on Reverse Supply Chain Construction"

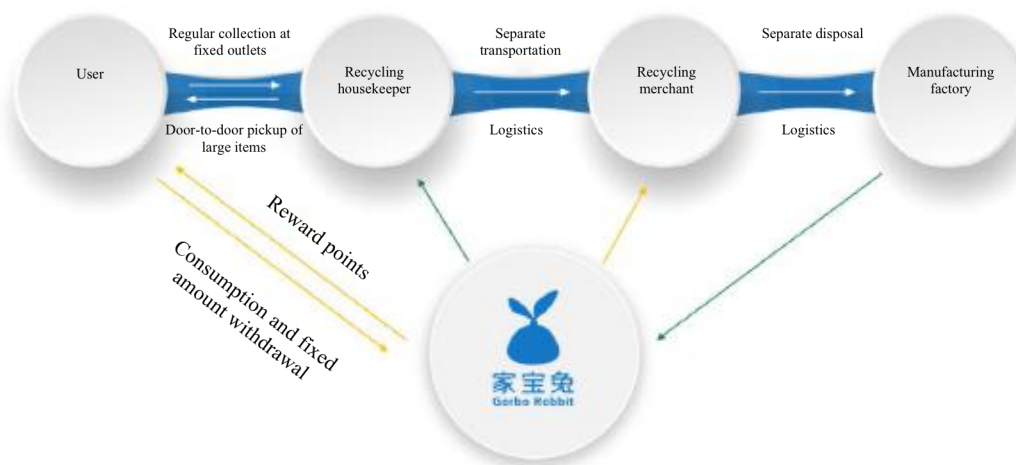
[Overview]

Relying on the traditional recycling market form, the Garbo Rabbit Renewable Resources Industry Internet Platform (hereinafter referred to as the "Garbo Rabbit Platform") gives full play to its enabling advantages, connects recycling industry entities, creates a reverse supply chain of renewable resources through front-end reorganization of mobile recycling personnel as industrial workers, middle-end enabling of recycling merchants and back-end linkage to manufacturing factories, and establishes an industrial value chain and a value feedback mechanism consisting of "users \longleftrightarrow recycling workers \longleftrightarrow recycling merchants \longleftrightarrow manufacturing factories". At the same time, it independently develops intelligent hardware and software systems based on the whole industry chain and establishes a whole-process information chain of "recycling + utilization" to promote the digital upgrade of the industry.

[Specific Measures]

In November 2020, Hangzhou Wuhuan Technology Co., Ltd. won the bid for Hangzhou Tonglu Renewable Resources Sorting and Recycling Project, synchronously relying on the Garbo Rabbit platform to promote the setup of a reverse supply chain for waste plastics recycling as follows:

- Reorganization of recycling personnel
- Enabling of recycling merchants
- Linkage to manufacturing factories
- Implementation of digital enabling





[Practice Results]

In Tonglu County, a reverse supply chain of renewable resources was built upon the Garbo Rabbit Platform. For the sub-categories of plastic waste, a service path from standard recycling at the source of waste production to subdivision processing in the sorting center and then to high-value utilization in factories was formed, with modern logistics, payment, and credit information systems established simultaneously to promote the upgrade of the plastics recycling industry.

(1) Industry chain enabling effect

With the promotion and use of Internet of Things equipment and software systems, the residents were motivated to participate in the recycling of plastic waste (especially flexible plastics). At the same time, the efficiency of recycling housekeeping service and plastic waste removal was improved by 30%, the plastic waste recycling merchants were helped to improve their operating efficiency by 40% and reduce operating costs by 20%, which consequently achieved cost reduction and efficiency increase.

(2) Project implementation benefits

- Economic benefits
- Social benefits
- Environmental benefits

(3) Demonstration project implementation

Based on the data, technology, and operational serviceability of the Garbo Rabbit Platform, two waste plastics recycling projects have been launched: the "Plastic Pollution Prevention and Control Through the Entire Value Chain Modality" Project and the "Flexible Plastics Reborn" Project funded by the UNDP GEF Small Grants Programme. The partners of the demonstration projects included industry organizations such as All-China Environment Federation, the Plastics Branch of China National Resources Recycling Association, and Green Recycled Plastics Supply Chain Joint Working Group (GRPG), as well as brands such as P&G

China, Mars Inc. China, Dow, PepsiCo, and Amcor PLC.

Case 2

Xiamen Luhai - "Innovation and Practice of Closed-loop Recycling Management of Low-value Plastic Waste"

[Overview]

The low-value plastic waste includes disposable tableware, express packaging bags, flexible food packaging, and other daily miscellaneous waste plastics. According to the statistics, China generates about 25 million tons of low-value plastic waste every year. Considering that there is a large amount of dispersed low-value plastic waste and it has low economic value without accurate sorting and large-scale recycling, it is difficult to be recycled through the traditional recycling channels driven by market interests, which is still a gap to fill in the industry. At present, it is regarded as other waste for incineration and landfill. Collecting and recycling low-value plastic waste not only saves resources but also minimizes the environmental impact. In this way, plastic pollution can be mitigated, the economic value will be generated, which enables the recycling of the low-value plastic waste to be a model for the "integration of two networks".

Since 2018, Xiamen Luhai Pro-environment Inc. has begun to innovate and practice the recycling management model of low-value plastic waste, seize the historical opportunity of garbage sorting, cooperate with the government and sanitation enterprises, give full play to the advantages of many invention patents and software copyrights obtained in the field of waste plastics recycling management, actively carry out pilot projects for recycling, sorting and recycling of low-value plastic waste, and provide experience in developing and practicing the recycling modes and key techniques of intelligent sorting for the governance of low-value plastic waste.

[Specific Measures]

Front end: Assist the government in promoting the formulation of plastic waste sorting policies and inclusion criteria for the low-value plastic waste catalog, publicity, and training, and enhance residents' awareness of source sorting.

Middle-end: Cooperate with sanitation enterprises to accomplish sorted collection and sorted transfer.

Rear end: Relying on the sorting center and the resource utilization base, implement professional sorting, processing, and high-quality and high-value application, to form a beneficial circle.



[Practice Results]

Through the practical exploration of recycling management of low-value plastic waste, Liu Hai Pro-environment has opened up a recycling value chain, increased the recycling capacity (daily treatment of 50 to 100 tons of mixed low-value recyclables, of which the plastic waste accounts for about 60%), and created environmental, social and economic benefits.

Case 3

Kingfa - "Whole-chain Governance of Waste Plastic Packaging Pollution: From Packaging Waste to High-performance Recycled Packaging Materials"

[Overview]

As a global leader in new chemical materials, Kingfa Science and Technology provides sustainable plastic packaging solutions from packaging waste to high-performance recycled packaging materials.

Kingfa has opened up the three key links of "recycling-pretreatment-reuse", established a recycling network system for plastic packaging waste, and harmlessly recycled and resource-utilized waste packaging plastics. The recycled plastic pellets developed are characterized by easy processing, low odor, and few black spots, and have the same physical properties as the original materials. With the advanced recycling technology, plastic packaging waste will be re-converted into recycled plastic pellets, which will be provided to brand packaging factories or other downstream plastic product manufacturers to manufacture new plastic packaging, and then returned to consumers through the market, thus contributing to a closed-loop model of plastic packaging. Therefore, it helps the leading enterprises of daily used chemicals and fast-moving consumer goods to achieve their commitment targets for recycled plastics by 2025.

[Specific Measures]

Kingfa's innovation and breakthrough of high-quality recycling technology have enabled the high-value

utilization of packaging waste at the same level, thus reversely promoting the front-end recycling of packaging waste.



Packaging industry

- Taking the application of washing solution bottles as an example

Material category: rHDPE

Recycled component ratio: 100%

Carbon dioxide footprint: $\geq 65\%$ reduction compared to virgin HDPE

At present, Kingfa has cooperated with more than 500 high-quality suppliers at home and abroad, built more than 60 resource recycling outlets, set up a plastic waste recycling system covering life, marine, and other scenarios and various waste categories, developed sufficient and stable large-scale resource supply capacity, and achieved traceability of raw materials.

Kingfa has opened up the three key links of "recycling-pretreatment-reuse" and transformed plastic waste into high-performance materials. Its sustainable plastic packaging solution significantly innovates the production technology, the production process, and the recycling scheme, and its "recycling, pretreatment, and modification" links and technologies are operational for promotion. For now, Kingfa has developed cooperative partnerships with the waste plastics recycling networks in Malaysia, India, and other countries, and plans to establish environmentally friendly recycled plastic production bases in Europe. For local sorting of all kinds of plastic waste as required, Kingfa also provides technical support to promote this plastic recycling model to the world.

[Practice Results]

From 2020 to 2022, Kingfa utilized approximately 70,000 tons of plastic packaging waste and produced and sold approximately 60,000 tons of high-performance recycled packaging materials, which were mainly applied to products with high-performance requirements such as cosmetics, daily used chemicals, and household products, generating high economic value.

On the one hand, Kingfa's recycling application of technologically innovative high-performance plastics directly reduced the production and use of new plastics, saving the consumption of natural resources such as coal, water, and electricity. In the past three years, a total of about 70,000 tons of plastic packaging waste has been recycled, equivalent to a cumulative reduction of 210,000 tons of crude oil consumption, 36,900 tons of solid waste emissions, and 25,200 tons of carbon dioxide emissions. On the other hand, reducing plastic landfills can avoid the pollution of forests, grasslands, wetlands, and other ecological environments and

protect biodiversity in the environment.

Case 4

Guangxi Guolong - "Project with An Annual Output of 30,000 Tons of High-end PET Blister Sheet Products"

[Overview]

The initial raw materials required for the production of this project are mainly various kinds of discarded beverage bottles. Guangxi Wuzhou Guolong Recyclable Resource Development Co., Ltd. has established a perfect waste material recycling system in Guangxi Autonomous Region and set up recycling centers in various prefecture-level cities to purchase waste materials for sorting, cleaning, and processing, to realize resource recycling. At present, it can process more than 60,000 tons of waste PET bottles and more than 50,000 tons of high-quality bottle flakes per year, which fully meets the needs of the project and can provide sufficient raw materials for the project.



[Specific Measures]

The project adopts advanced equipment imported from Europe and the U.S., introduces production lines from EREMA Group and SML in Austria, and the quality of the sheets produced is in the leading position in the world. Moreover, ABA three-layer co-extrusion technology is adopted, which has a competitive price advantage. The blister equipment comes from Kiefel's production line, which consists of a thermoforming system, a cutting system, and a stacking system.



[Practice Results]

Guolong pays an annual tax of 38.55 million yuan, including 9.14 million yuan for value-added tax, 1.83 million yuan for taxes and surcharges, and 27.58 million yuan for enterprise income tax, which will bring certain financial revenue to the Wuzhou Government and can promote social and economic construction as well as spiritual civilization construction in all aspects in Wuzhou.

The project drives the growth of upstream and downstream industries and indirectly provides more than 1,000 jobs. It will give priority to the employment of the local labor force, especially the rural labor force and precise poverty alleviation households with employment intention, implement the national industrial poverty alleviation policies, and then realize common prosperity.

Case 5

Ningbo Topcentral - "Post-consumption Commercialization of Zero-carbon High-quality Recycled Plastics"

[Overview]

The lifecycle management and high-value utilization of recycled plastics are the best solutions at this stage. The implementation technologies of zero-carbon recycled plastics include: 1. Digital enabling industry chain. Strengthen the integration and coupling of low-carbon technologies in the whole industry chain, realize the traceability of the whole process, clarify the low-carbon path, make the carbon footprint measurable, and implement carbon neutralization; 2. Optimization of the equipment process and energy consumption structure to reduce pollution and carbon emissions. Use efficient equipment and technology to reduce energy consumption, adopt the circulating water treatment system to reduce wastewater discharge, and lay solar photovoltaic panels to use green electricity; 3. Innovation of recycling technology at the same level to create

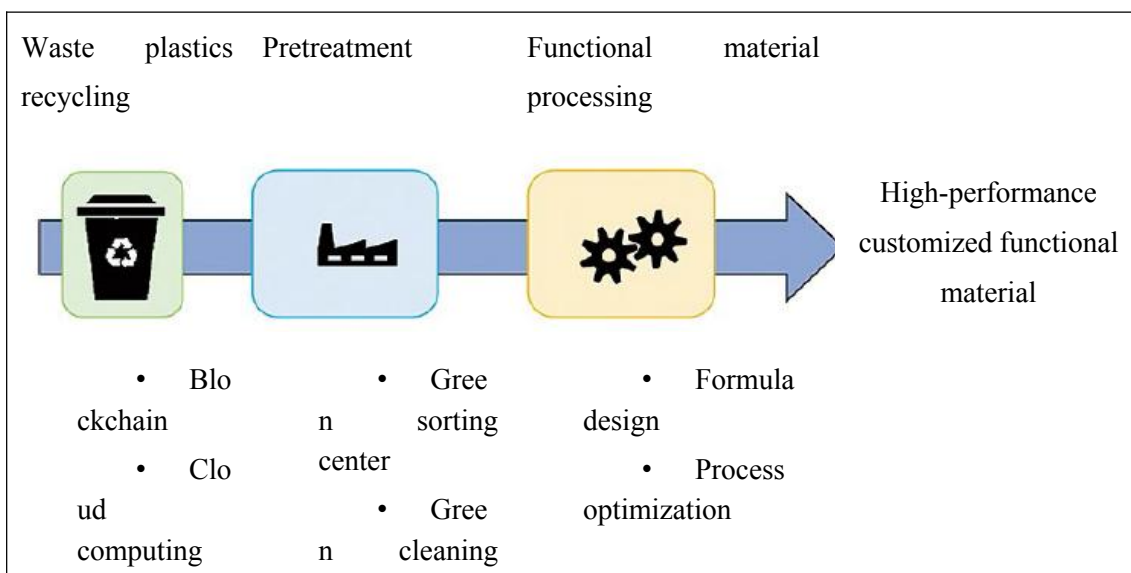
high-quality circulation. Optimize the formula design and functional repair of additives to realize recycling at the same level. The key to high-value utilization is to apply matching and repair technology to match recycled plastics of different sources and different quality grades to suitable application scenarios.

[Specific Measures]

Construct and promote the innovation scheme of a full recycling system for a closed-loop industry chain that is easy to collect, easy to renew, easy to use, easy to recycle and easy to trace in the whole industry.

Combine digital enabling of recycling industry chain + energy optimization + technological innovation + product certification system solutions + branding for public welfare cooperation together.

- Enable the industrial chain with digital technology;
- Adhere to the local supply chain strategy;
- Continue to develop efficient equipment and technology and green energy structure;
- Be committed to the innovation of functional additives to facilitate the innovation of recycling technology at the same level;
- Build a traceability system and carbon neutralization system solutions;
- Adhere to the concepts of circular economy and sustainable development by combining business drivers with public welfare publicity.



• Big center data

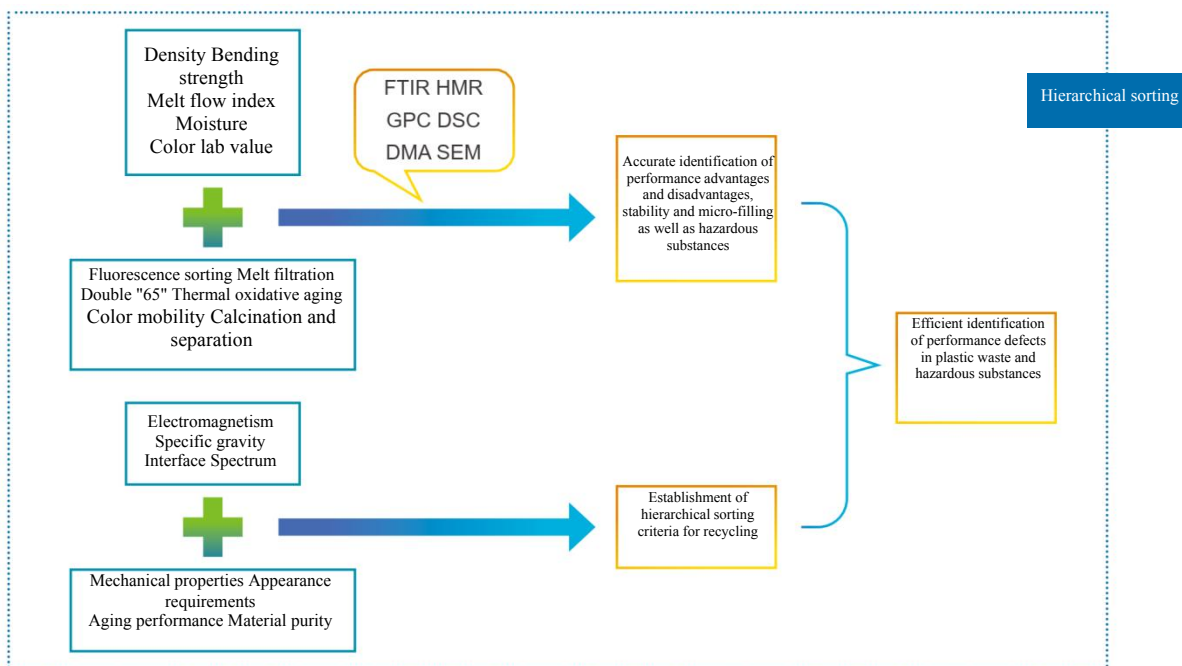
[Practice Results]

A total of 15,000 tons of waste plastics have been recycled. In 2021, 1,414 tons of greenhouse gas emissions have been completed for carbon neutralization; 2,489 tons of carbon offset was completed in 2022. After intelligent transformation, CO₂ emissions can be reduced by 43 kg per ton of products as compared to 2020.

The revenue from low-carbon and zero-carbon products reached 102 million yuan in 2021 and 115 million yuan in 2022; the automation level has been improved by 300%, the manual labor force was reduced by 80%, and the system efficiency was improved by 4 times or more.

Users are provided with systematic solutions for green low-carbon post-consumption recycled materials, saving a lot of resources for society.

<p>Difficulty: It is impossible to efficiently and quickly identify the advantages and disadvantages of plastic properties and harmful substances</p>	<p>Idea: Combination of general and special detection technologies</p>
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A variety of characterization methods are used to accurately identify the performance advantages and disadvantages as well as hazardous substances and to establish the sorting criteria.

Case 6

Zhejiang InResST - "Application of Waste Plastic Fishing Nets to Feasibility Research and Development, Production and Manufacturing in the Textile Industry"

[Overview]

The main purpose of the InResST project is to protect the marine ecology and environment, protect marine biodiversity, and reduce carbon emissions. At present, the project mainly recycles waste fishing nets for high-value recycling and application in the textile industry. At the same time, a sound recycling system is established to promote the replacement of waste fishing gear with new ones in the community and hence create a closed-loop circular economy. The recycling industrial park project under construction by InResST integrates recycling, high-performance processing, spinning and manufacturing together in one park, setting up a closed-loop industry chain and creating a circular economy of the recycling industry. InResST now has a sales network spreading all over the world and a professional R&D team of domestic polymers. The recycling industrial park can be replicated globally to better solve the pollution of global marine fishing nets, and protect the global marine ecology and environment as well as the global marine biodiversity.



[Practice Results]

The InResST project was launched in 2015 and started small-batch trial production in 2019. From the ocean to the recycling plant, and then to the spinning plant, every link was very complex. The equipment of the recycling plant has been independently researched and developed, which breaks through the traditional recycling methods. The new equipment saves water resources, consumes low energy, and yields high efficiency, and it has been authorized and is to be authorized with more than 20 patents.

InResST's business scope includes the upstream and the downstream of the entire industry. It plans to set up an exclusive foundation for marine environmental protection to protect the marine ecology and environment as well as marine biodiversity. Each ton of consumed nylon applied to textiles can save 95% of water resources by about 7.3 tons, save 96% of electricity by about 33,630 kWh, and reduce 95% of carbon dioxide emissions by about 8.8 tons. The recycling plant is still expanding, and it must be green, low-carbon, environmentally friendly, and beautiful in the future.

Case 7

Shenzhen Kplocker -

"Technology and Application of Shuangti Recycling Lunch Box Model"

[Overview]

The operation system of Shuangti recycling lunch box model consists of a distribution system (lunch box model management, warehousing management, delivery management, and order binding), a recycling system (supporting recycling box, multiple rounds of regular recycling, and recycling scanning and inventory), a cleaning system (canteen cleaning lines, up to 30-minute cleaning, infrared + ozone compound disinfection and sterilization, and 60-70°C medium temperature drying), a monitoring system (destination monitoring, return monitoring, and inventory monitoring) and a risk control system (a reminder mechanism, and a blacklist mechanism).

① Ordering by students on their mobile phones → ② Order receiving by merchants → ③ Automatic printing → ④ RFID scanning to correlate with handover → ⑤ Sorting and distribution → ⑥ Delivery into lockers → ⑦ Automatic reminder on WeChat → ⑧ Automatic food pick-up by student on their mobile phones → ⑨ Lunch box return to recycling cabinet → ⑩ Cleaning and warehousing

[Practice Results]

Recycling lunch boxes are made of more durable materials of high quality, and their lifecycle is longer than disposable lunch boxes. They can serve the takeaway delivery multiple times and realize zero output of takeaway packaging waste from the source and the collection of kitchen waste, and they can be scrapped for recycling, thus preventing the degradation and the toxic hazards from incineration of disposable tableware in the tail-end treatment. The ownership belongs to the supplier of these recycling lunch boxes, and these recycling lunch boxes both obtain economic benefits and bear environmental costs, which is conducive to tracing responsibility and supervising the implementation of sustainable emission reduction in the whole processes of production, distribution, recycling, and scrapping of the lunch boxes. To sum up, the whole lifecycle of the recycling lunch boxes forms a closed loop of material flow, which can greatly reduce the negative externality impact of human takeaway activities on the environment.



Recycling the lunch boxes extends the service life of lunch boxes, which can optimize operations and save packaging costs, and repeatedly create an inflow of economic benefits. The repetitive recycling model can also expand the development space of multiple industries, such as the logistics industry, cleaning and disinfection industry, etc.

The emergence of recycling lunch boxes provides a brand-new takeaway packaging solution for the catering takeaway industry and presents a new model for the reduction of urban takeaway packaging waste, plastic pollution control, and the construction of "Zero Waste Cities" in China. If the recycling lunch box model is widely promoted, it is expected to gradually replace the use of disposable plastic lunch boxes, reduce the generation of packaging waste, and lower the impact on the ecology and environment.

Case 8

McDonald's - "Reinvention of MM Green Plate"

[Overview]

At present, McDonald's China mainly recycles waste plastic products in restaurants, supply chains, and industries, and innovates and transforms them to implement recycling solutions for plastic waste. Since 2021, McDonald's China has launched the "Reinventing Good Things" platform to redesign and reshape waste plastic products into items that are needed by restaurants and consumers.

So far, a series of recycled products have been launched, including baby chairs, "Confused Elephants", happy flower pots, dining tables and chairs, and eco-friendly rechargeable bicycles.

As the plate is a carrier of food in restaurants, it is of great significance and mission to recycle waste plastics.

At the same time, the plate is also the object that consumers use in their daily lives. McDonald's China hopes to let people from all walks of life participate in the creation and design of the popular reinvented plate.

[Specific Measures]

In 2021, McDonald's China teamed up with IDEO, a world-renowned innovative design company, to host an open innovation challenge, inviting creative communities to participate in designing new green plates and exploring the boundaries of recycled material innovation and product design. The winning team of this innovation challenge worked with IDEO designers to remold the plastic waste into the raw materials for the production of plates and finally create a unique aesthetic design of the new plate named "MM Green Plate".

The "MM Green Plate" uses bright green to represent nature and vitality, with "ripples" as the core design element to symbolize the interconnection among "green nature, the community, and plates" in McDonald's restaurants just like the convergence of water droplets into waves. Its appearance and function design stem from the insight into customer dining scenarios and habits, in which the grips are enlarged to improve stability and comfort, and the plate size and edge design are optimized to expand the dining space. After testing and continuous improvement, the plate was manufactured on a large scale and put on the market.

The "MM Green Plate" was first launched in Changsha, Hunan Province in September 2022. In November of the same year, it appeared at the China International Import Expo and was put into use in 10 popular McDonald's green restaurants in Shanghai, including those in the Expo venue, Shanghai Square, and Pudong Shanghai Center. The green plates have been gradually promoted to McDonald's restaurants nationwide. By April 2023, the total number of green plates ordered reached 38,720, covering 600+ McDonald's restaurants in 27 provinces, municipalities, and autonomous regions. It is expected that by 2025, green plates will be launched and used in more than 5,000 McDonald's restaurants nationwide, allowing more consumers to experience the significance of plastic recycling for environmental protection, carbon emissions reduction, and green development.

[Practice Results]

The MM Green Plate contains 51% recycled materials (recycled PP materials) from McDonald's supply chain production waste, 49% virgin PP materials, and other fillers. According to the Life Cycle Assessment (LCA) method, the carbon footprints of the new plates and the old plates were calculated separately, and the results showed that the carbon footprint of the new plates was reduced by about 40% as compared with the old plates. As of April 2023, the total number of green plates ordered reached 38,720, covering 600+ McDonald's restaurants distributed in 27 provinces, municipalities, and autonomous regions, and 8.1 tons of recycled waste was effectively used. It is expected that by the end of 2023, the total order number will reach 97,000, and 20.3 tons of recycled waste will be used.

So far, the "Reinventing Good Things" platform has used a total of 32.8 tons of recycled plastics and 0.6 tons of recycled coffee grounds. These "reinvented goods" are made of recycled materials, which can minimize

the consumption of natural resources and the generation of waste, thus reducing the burden on the environment.

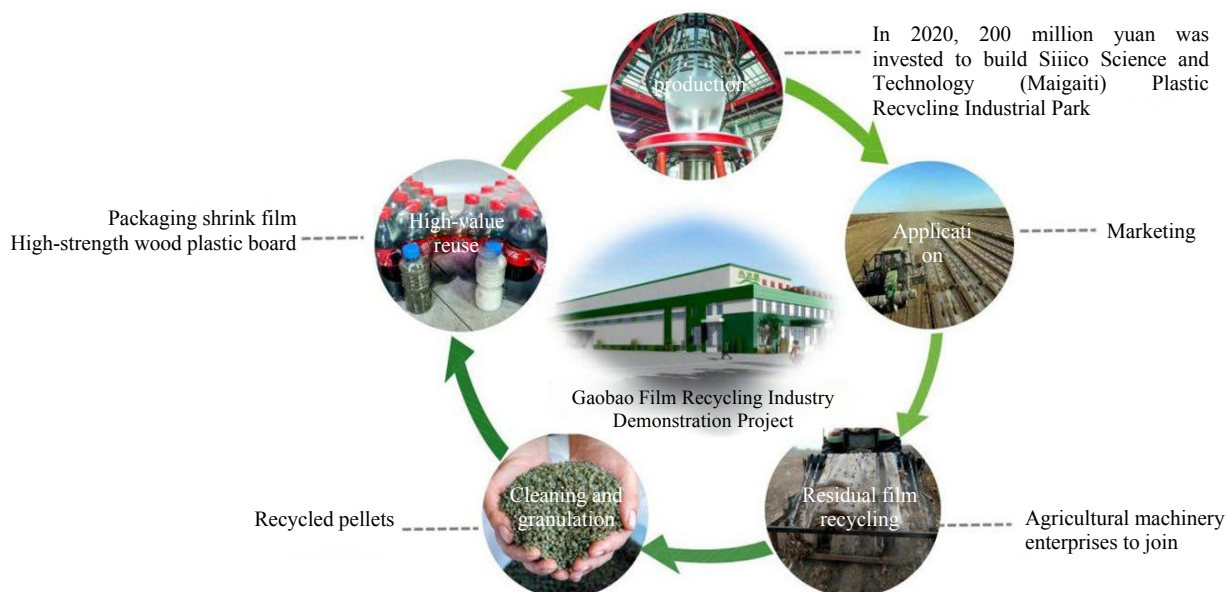
Case 9

Siiico Technology - "Integrated Rational Application and Efficient Recycling of Gaobao Film in Maigaiti, Xinjiang"

[Overview]

To solve the "white pollution" caused by agricultural plastic film, Siiico Technology's R&D team focused on the scientific research of "improving the strength of plastic film with no need to thicken it", to increase the recycling rate of residual film, improve the reuse value of the residual film, and finally achieve the goal of a low-carbon cycle".

Siiico Technology's core product "Gaobao Film" is an innovation achieved by "the tensile rheology-based methodology and equipment for polymer material plasticization and transportation" (ERE technology) combined with new molding equipment and material formulation technology, which is characterized by remarkable production results, high recyclability (one-time mechanical recycling rate > 90%), and high-value reuse of recycled plastic film, such as recycling plastic film for producing the packaging shrink film after recycling, cleaning, and granulation. Taking advantage of the outstanding performance of "easy recycling and high-value reuse", Siiico Technology has built a recycling industry chain that consists of production, application, recycling, cleaning and granulation, and high-value reuse of Gaobao film in Xinjiang. Starting from solving the existing white pollution increment of plastic film, Siiico Technology finally transformed the "white pollution" into "green renewable resources", providing new products and new solutions for ending the residual pollution of plastic film in China in a wide range of application scenarios.





[Practice Results]

In 2020, Siiico Technology Agricultural Film Co., Ltd. invested 200 million yuan to establish an "Integrated Plastics Recycling Industrial Park for Gaobao Film" with a floor area of 80,000 square meters in Maigaiti County, Kashgar Prefecture, Xinjiang, with an annual design output of 100 million tons of "Gaobao Film" and 2,000 tons of packaging shrink film. In 2021 and 2022, the industrial park produced 5,000 tons of Gaobao film, 1,000 tons of shrink film, and 3,000 tons of recycled agricultural film, generating direct economic benefits of 20 million yuan for the Company; meanwhile, the industrial park employed 100 migrant workers locally; the crop area covered by Gaobao film reached about 466,666,666 square meters, bringing direct economic benefits of 120 million yuan to local farmers.

Core Product: High-strength, weather resistant, and easily recyclable plastic film product - "Gaobao Film"(10-micron standard plastic film, technically enhanced without thickening). By enhancing the strength of the agricultural film, the film recycling rate and the reuse value of residual film will be finally improved, the mechanical properties of the agricultural film outperform the relevant requirements for agricultural film and Class I weather-resistant film specified in GB 13735-2017. Due to its high strength and good weather resistance, the agricultural film was not easy to crack in use, and its performance in terms of moisture retention, moisture preservation, and grass pressing was better than any ordinary film under the same planting conditions, which reduced manual input for weeding and the comprehensive cost by 50 yuan per 666.6667 square meters, and increased the cotton yield by 6.5% to 10.4% and the economic income by 14.8% to 22.8%. As a kind of high-tech product, the Gaobao film saves agricultural cost and increase efficiency, bringing about remarkable economic benefits.

Recycling: Because the mechanical properties of the residual Gaobao film outperform the national standard requirements for new ordinary films, the high strength still maintaining after use determines a higher recycling rate. After being used for 6 months, the residual Gaobao film can keep a one-time mechanical recycling rate of more than 90% and a manual recycling rate of more than 98%, which are 30% higher than that of the traditional plastic film. At the same time, Siiico Technology has set up an operation team specially for recycling high-strength agricultural film by using roll-type film recycling machines which have a higher recycling efficiency than traditional rake-type recycling machines. The Gaobao film solves the pollution caused by ordinary plastic film because it is easy to break and difficult to recycle and therefore brings about remarkable ecological benefits.

High-value reuse: Considering the excellent mechanical properties of the residual film and the low impurity rate for recycling, the used high-strength thin film is cleaned, granulated, recycled, and transformed into high-quality heavy-duty packaging film that contains recycled materials from waste film, which has now obtained the technical approval of Coca-Cola Company. This packaging film produced by using recycled materials from residual Gaobao film can be fully applied to the outer packaging film for Coca-Cola products. High-performance recycled materials can also satisfy more high-value application scenarios in the future. High-value recycling broadens the recycling industry chain, improves the added value, increases employment opportunities, improve economic benefits, increases tax revenue for the local government, and brings about significant social benefits.

Case 10

Shanghai Tianqiang - "A Closed-loop Model of Renewable Resources to Facilitate Waste Plastics Recycling"

[Overview]

In the context of carbon peaking and carbon neutrality goals, resource recycling can effectively reduce carbon emissions and is also an important means of energy saving and emission reduction. At present, One of the hot topics in solving plastic pollution control is how to achieve the orderly management and resource utilization of plastic waste. Given this difficult problem, Shanghai Tianqiang Environmental Protection Technology Co., Ltd. proposed to boost the recycling of plastic waste by using a closed-loop recycling model of renewable resources. By self-developing a system that integrates two networks for garbage sorting, Tianqiang has established a national waste plastics recycling network, which reduces the recycling and transportation cost of plastic waste under the support of a collection and transportation system consisting of outlets, stations, and sites integrated with two networks, continuously recycles the plastic waste in large quantities, and achieves the high-value recycling of plastic waste by adopting advanced plastic modification and recycling technologies and a whole-process digital management and control system, thus forming a closed-loop recycling model for the operation in the whole industry chain and providing reference as a business case for the development of the industry.

[Specific Measures]

(1) Further implement the "integration of two networks" to collect all the plastic waste

At present, Tianqiang undertakes the main task of "integration of two networks" in Fengxian District of Shanghai City. Among the 12 streets and towns counted by the Fengxian District Administrative Bureau of City Appearance and Environmental Sanitation, Tianqiang has served 6 streets and towns and has

successfully operated 6 transfer stations and 286 recycling outlets. Through the integration of two networks, about 200 tons of renewable resources were recycled every day, accounting for more than 70% of the recyclable materials in the whole district. Tianqiang has obtained the land operation right for recycling plastic waste resources of 13,333.334 square meters in Zhuangxing Town and 26,666.668 square meters in Jinhui Town in Plot 104 of Fengxian District. In 2019, Tianqiang has recycled nearly 260,000 tons of renewable resources (including 80,000 tons of plastic waste) annually through the integration of two networks, making a profit and tax of nearly 20 million yuan, saving 30% of solid waste disposal cost for the local government, directly or indirectly driving employment of more than 5,000 people, and producing recycled industrial raw materials annually valued about 400 million yuan.

(2) Open up the whole process from waste plastics recycling, and sorting to tail-end disposal

By setting up recycling outlets in rural areas, resident communities, and enterprises and adopting self-developed professional PDA equipment, supporting Bluetooth scales and a self-service weighing system to quickly record relevant information on sorted recycling of low-value waste from sources (rural areas, resident communities, parks, and enterprises and institutions), the platform automatically give reasonable bonus points and cash to participants base on the recycling situation from sources and encourage active participation at the sources. The Lvqiao Sorting Center in Zhuangxing Town, Fengxian District under enterprise operation recycles more than 1,000 tons of waste plastic film every month and has realized the tracking management of data collection, packaging transfer, and tail-end disposal in the recycling link of low-value plastic waste.

Tianqiang has also established a comprehensive resource utilization base in Zhuangxing Town, Fengxian District, which covers the whole lifecycle of recycled plastics from recycling, sorting, packaging, and granulation to injection-molded products and also organizes the publicity and exhibition activities about green products made of recycled plastics (such as green recycling tour of waste express packaging bags). The base covers an area of about 13,333.334 square meters and has a building area of about 6,000 square meters. The total investment of the project is expected to be 22 million yuan. After all the buildings are completed and put into operation, the annual capacity of recycling, sorting, processing, and comprehensive utilization of various domestic waste, industrial waste, and plastic waste will reach 65,000 tons.

(3) Enable a digital service platform for whole industry chain of plastic waste

A service platform for the whole industry chain of renewable resources is built to resolve the pain points in the recycled plastics industry, with the aim of tax compliance by adopting high-techs such as Internet, IoT equipment, big data, SaaS, and AI, to link the whole process of the recycled plastics industry chain and thus improve the operation efficiency of each link. Through the new infrastructure construction such as online trading, site qualification sharing, intelligent warehousing, logistics optimization and supply chain finance, etc., the upstream and downstream of the industry are enabled to form a platform that integrates goods flow, capital flow and information flow together, which supervises these capital, goods and ticket flows to realize uniform tax payment and tax compliance in the industry, promote the innovation of industry taxation mechanism, and foster the healthy development of the industry.

(4) Develop a green, low-carbon and high-value utilization path for plastic waste

With the plastic waste from domestic sources, industrial sources and marine sources recycled, the annual recycling volume has exceeded 100,000 tons. These waste plastics are modified into high-performance environmentally-friendly recycled plastic pellets and are provided as more pure, more stably supplied, and traceable environmentally-friendly high-performance recycled plastic pellets to the middle and high-end market, mainly including r-PP, r-PE, r-PA, etc.

[Practice Results]

Tianqiang has received social attention and recognition for the innovative achievements of the nationwide pilot project of applying a closed-loop model for recycling renewable resources. From 2016 to 2018, Tianqiang was consecutively awarded as a national Internet + comprehensive resource recycling case company; in 2017, it won the honor of an innovation case for "integration of two networks" through Internet + comprehensive resource recycling; in 2018, the integrated management system of outlets, stations, and sites integrated with two networks for garbage sorting in Fengxian District under Tianqiang's operation was included in the national action guide; in 2019, the "Tianqiang Model" won many honors, such as the innovation case in renewable resource recycling field as awarded by the Ministry of Commerce.

Tianqiang actively promotes the construction of a closed-loop recycling system for renewable resources and has explored a replicable and widely applicable market-oriented business model that is suitable to China's actual conditions for the recycling of plastic waste. The optimization and promotion of this model can contribute to winning the battle against plastic pollution and accelerating the construction of the ecology and environment in China.