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KEY POINTS

- The People's Republic of China (PRC) is the world's largest producer and consumer of plastics and the biggest generator of plastic waste, accounting for one-fifth of global single-use plastic waste.
- In its efforts to control plastic waste pollution, the PRC Government launched its National Sword initiative in 2017, banning the import of recyclable wastes, including most plastics. A 5-year action plan for 2021–2025 was also issued to improve the management of the entire chain of plastic pollution, including the elimination of single-use plastics.
- Policy recommendations for strengthening the PRC's plastic waste management involve the upscaling of recycling efforts; effective promotion and behavior change; implementation of integrated, circular waste management; and the use of bio-based alternative materials.

Managing Plastic Waste in the People's Republic of China

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INTRODUCTION

Plastic waste pollution has grown exponentially around the world, driven by growth in emerging markets and affecting the global community and the environment. According to the first Global Plastics Outlook report of the Organisation for Economic Co-operation and Development (OECD), global production of plastics doubled between 2000 and 2019 to 460 million tons. In the same period, the world generated over twice as much plastic waste, at 353 million tons.[1] Only 9% of the plastic waste was successfully recycled; the majority ended up in landfills (50%), was incinerated (19%), or eluded waste management systems (22%) (footnote 1). The OECD report also noted that plastics accounted for 3.4% of global greenhouse gas (GHG) emissions.

During the 18th National Congress of the Communist Party of China in November 2012, the Party Central Committee and the State Council accorded high importance to addressing the issue of solid waste pollution, especially "white pollution" caused by plastic waste. In its efforts to control pollution and achieve its carbon neutrality targets in the People's Republic of China (PRC), the government issued a 5-year action plan for 2021–2025 to "further improve the management of the entire chain of plastic pollution by eliminating single-use plastics, encouraging recycling, and promoting alternatives to plastic."[2] Although the country's plastic waste pollution problem has been reduced to a certain extent, much remains to be done to alleviate its impact on society and the environment.

The Asian Development Bank (ADB) supported a comprehensive study on the PRC's plastic waste pollution control and management to raise awareness on its impacts in the country's environment—particularly in river and marine ecosystems—and its national and global ramifications.[3] This brief summarizes the study's findings and

Note: ADB recognizes "China" as the People's Republic of China.

1 OECD. 2022. *Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options.* Paris: OECD Publishing.
2 Yujie Xue. 2021. China Ramps Up Efforts to Tackle Plastic Pollution with Five-Year Action Plan. 16 September.
3 ADB. 2019. *Technical Assistance to the People's Republic of China for Capacity Building on River and Ocean Eco-Environmental Management and Plastic Waste Pollution Control.* Manila.

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provides a road map of policy recommendations to strengthen the regulatory and administrative system's capacity for ecological and environmental management with a focus on plastic waste pollution control.

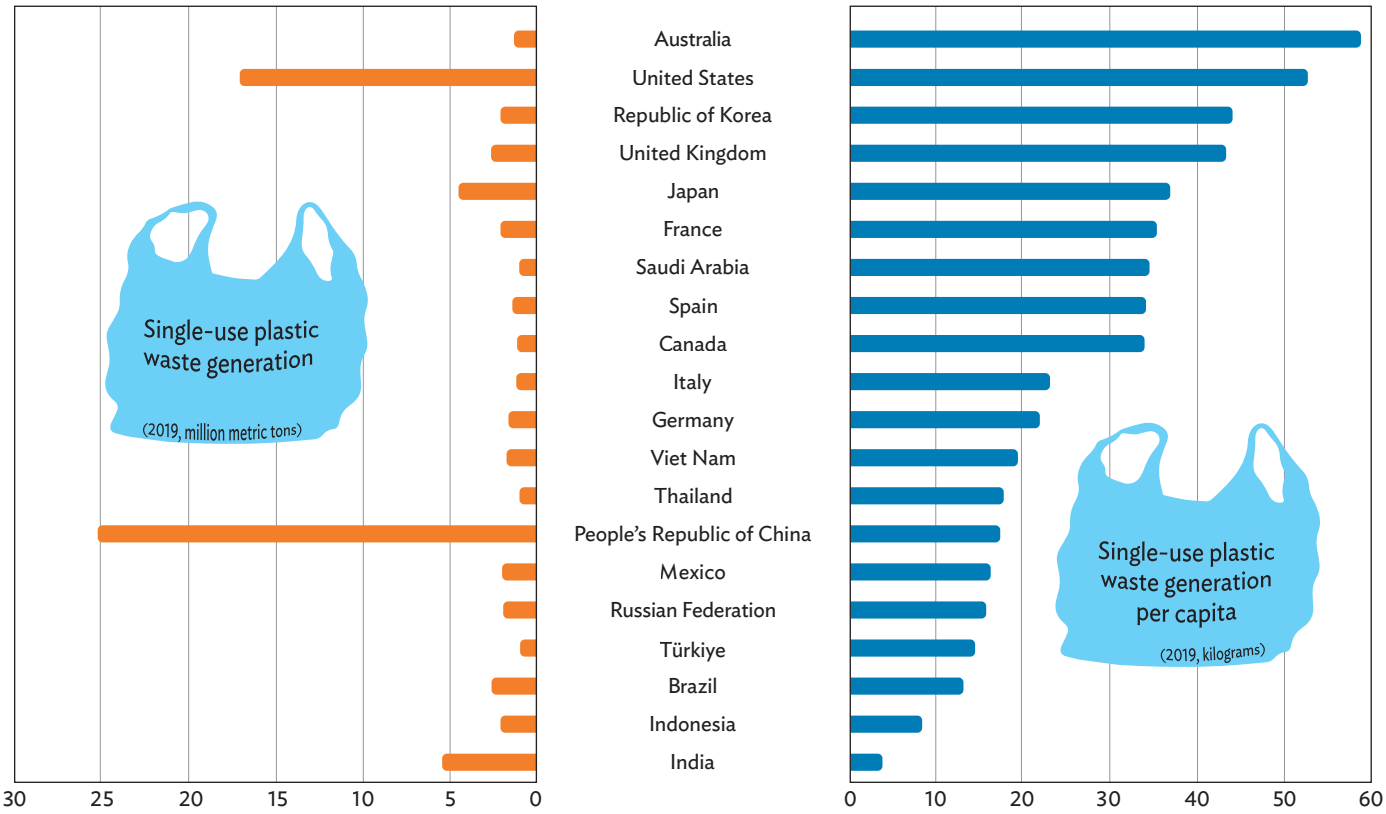
STATUS AND TRENDS OF PLASTIC PRODUCTION AND CONSUMPTION

The development of and trends in the PRC's production, consumption, and trade of plastics and plastic products parallel the country's industrialization process. In 1949, the PRC's plastic production was only 200 tons; 30 years later, its output had risen to 948,000 tons (equivalent to less than 1% globally), and it further climbed to 10.36 million tons in 2000 (about 5% globally). In recent years, its production of plastic materials has increased steadily, going from 26% in 2014 to 32% of global production in 2020.[4] With 80 million metric tons in 2021, the PRC is now the world's largest plastic producer, accounting for nearly one-third of global plastic production.

As the PRC is one of the world's most populous countries, it is not surprising that it is also the largest consumer of plastics. Plastic product consumption increased from less than 40 million tons in 2008 to over 75 million tons in 2017. In 2019, the PRC was responsible for one-fifth of the world's single-use plastic waste, and it has been named as the biggest generator of plastic waste, with production exceeding consumption by 5 million metric tons.[5] By 2021, the PRC accounted for around 20% of plastics demand worldwide.[6] However, in terms of plastic waste generation per capita, the PRC is far down the list, generating about 18 kilograms (kg) of plastic waste per person, as compared with Australia's 59 kg, the United States' 53 kg, and the Republic of Korea's 44 kg (Figure 1). It is worth noting that many other higher-income countries with higher per capita usage have better waste management practices to reduce the impact of plastics on the environment.

According to the United Nations commodity trade statistics database, from 1992 to 2018 the PRC imported 110 million tons of plastic waste, accounting for more than 60% of global plastic waste

Figure 1: Top Countries Generating Single-Use Plastic Waste, Total and Per Capita, 2019



Source: Adapted from Minderoo Foundation. 2021. *The Plastic Waste Makers Index: Revealing the Source of the Single-Use Plastics Crisis*. Perth. p. 43.

[4] Statista. Plastics Production Volume in China 2012–2022 (accessed 14 September 2022).
[5] Minderoo Foundation. 2021. *The Plastic Waste Makers Index: Revealing the Source of the Single-Use Plastics Crisis*. Perth.
[6] Footnote 1, pp. 34–35.

imports.[7] In 2017, the government announced its National Sword initiative, which banned the import of recyclable wastes, including most plastics. The ban officially commenced in January 2018. The excess waste was largely absorbed by Southeast Asian countries such as Indonesia, Malaysia, and Viet Nam.[8] As a result of the PRC's ban, other countries absorbed large amounts of waste in the short term, with temporary negative environmental impacts. Altogether, the change in trade flows saved €2.35 billion in annual environmental costs worldwide, shifting plastic waste from exports to domestic plastic waste management, and from landfills to recycling.[9]

GENERATION, DISPOSAL, AND LEAKAGE OF PLASTIC WASTE

Generation

From 2000 to 2019, the PRC consumed around 981.4 million tons of the five commodity plastics—polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polystyrene (PS), and acrylonitrile-butadiene-styrene (ABS)—generating 590.4 million tons of plastic waste.[10] While there exists large and economically valuable plastic waste that is easily recyclable and reused, there is also low-value plastic waste, such as plastic packaging and single-use plastic, that is not easy to recycle.

Single-use plastics (also known as disposable plastics) comprise plastic bags, food packaging, bottles (including polyethylene terephthalate, or PET, bottles), straws, containers, cups, tableware, plastic packaging films, agricultural films, and woven bags. These are utilized for packaging, usually only once, before being thrown away or recycled. Even when discarded properly, single-use plastic shopping bags, especially the ultra-thin ones, can be windblown from waste bins, transport vehicles, or landfill locations, and left hanging on trees and wires, resulting in so-called "white pollution."

Prior to the 1990s, people used sustainable packaging such as traditional "vegetable baskets" but they have since increasingly replaced them with more convenient and cheaper plastic shopping bags. Similarly, disposable foam plastic lunch boxes have become popular and widely used, especially on trains, resulting in littering of these lunch boxes along railways and highways. Despite increasing legislation to reduce plastic use, the use of plastic bags and foam lunch boxes remains widespread.

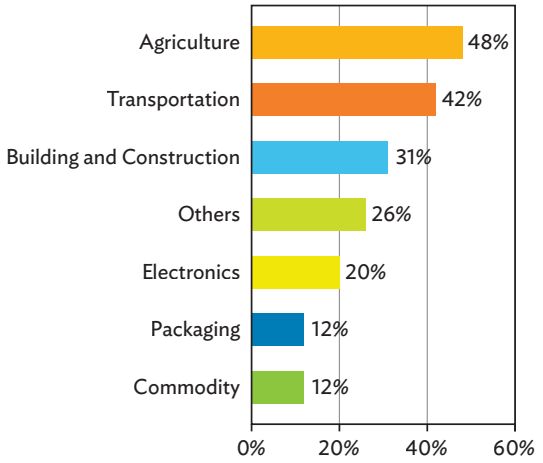
In 2019, the PRC used about 3 billion plastic bags every day, of which 1 billion were used exclusively for vegetables. The proliferation of eating places, particularly fast-food outlets, caused the wide dispersion of plastic waste. In megacities such as Beijing and Shanghai, kitchen waste is the largest source of mixed waste, accounting for more than 50%, while plastic waste accounts for 13%–22%. Recycling plastic food packaging is difficult because it is often mixed with kitchen waste and made of varied materials in varying colors.

To understand the generation and disposal of takeaway waste in urban areas, a case analysis was carried out in the cities of Chengdu, Suzhou, and Wuhan. This found that various packaging materials were used depending on the types of takeaway food, ranging from PP for Chinese food and PS for other cuisines to paper bowls for Western food and aluminum or tinfoil for hot pot and barbecue. Waste production peaks in office and residential areas during lunch and dinner times. It is, therefore, recommended to improve collection capacity and recycling facilities around these key areas, and to target the collection and transportation of waste to improve waste pollution control.[11]

Recycling

The average recycling rate for the 5 standard plastics is an estimated 27%, while recycling rates for each plastic are as follows: PE 28%; PP 30%; PVC 27%; PS 26%; and ABS 26% (footnote 8). As the plastic types with the greatest production and consumption, most PE and PP have been recycled. In addition, with bulky waste that is easy to collect and dispose of, transportation and agriculture have relatively high recycling rates, exceeding 40%, while recycling rates in the packaging and merchandise sectors are relatively low (Figure 2).

Figure 2: Overall Recycling Rates of the Five Commodity Plastics in Different Applications



Source: Xiaomei Jian et al. 2022. Material Flow Analysis of China's Five Commodity Plastics Urges Radical Waste Infrastructure Improvement. *Environmental Research: Infrastructure and Sustainability*. 2 (025002).

[7] United Nations Statistics Division. Commodity Trade Statistics Database (accessed 15 September 2022).
[8] *European Environment Agency*. 2019. The Plastic Waste Trade in the Circular Economy. 28 October.
[9] Zongguo Wen et al. 2021. China's Plastic Import Ban Increases Prospects of Environmental Impact Mitigation of Plastic Waste Trade Flow Worldwide. *Nature Communications*. 12 (425).
[10] Xiaomei Jian et al. 2022. Material Flow Analysis of China's Five Commodity Plastics Urges Radical Waste Infrastructure Improvement. *Environmental Research: Infrastructure and Sustainability*. 2 (025002).
[11] Zongguo Wen. 2022. Case Analysis of Urban Takeaway Packaging Management. (Draft) Special Report prepared for ADB.

Box 1: Life Cycle Analysis Modeling of Plastic Waste Management—A Case Study of Suzhou City

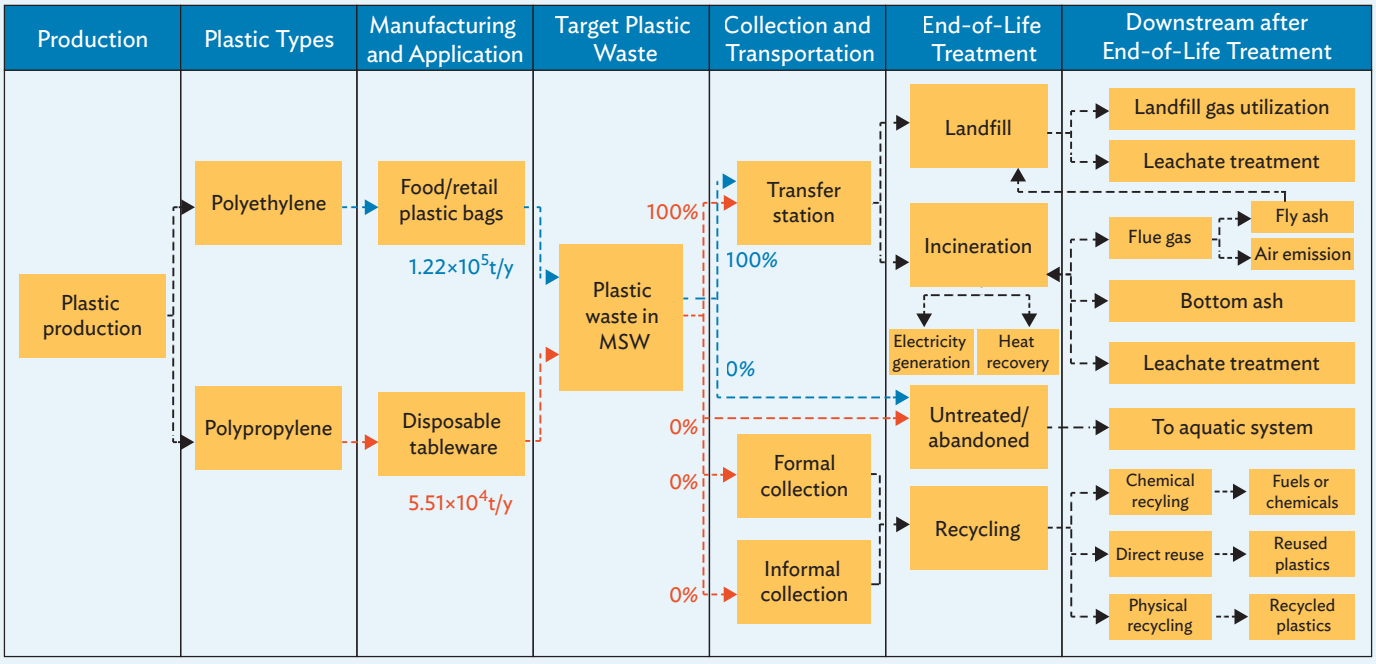
The case study quantified the potential life cycle environmental impacts of recent plastic waste management systems in the city and assessed potential future use in other cities. Conducted in 2015 to 2020, the study (i) mapped the flows of plastic waste, (ii) quantified potential environmental impacts of plastic waste management in Suzhou, and (iii) identified the technological and management issues within a future waste management system.

The life cycle analysis model included (i) waste PE shopping bags from supermarkets or the retail industry and (ii) waste PP meal boxes from the takeaway industry. It covered approximately 5.2 million inhabitants, and the respective waste of 1.47×10^5 tons of PE shopping bags and 8.87×10^4 tons of PP meal boxes per year.

The results indicate that the rapid increase in carbon emissions from managing two typical plastic waste types (PE and PP) owes mainly to increased plastic use and waste generation. Also, incinerating this plastic waste does not reduce carbon emissions but instead increases this by 2.3×10^5 tons CO_2-eq per year (from replacing landfill with incineration).

In the future, a 20% recycling rate for plastic waste can reduce carbon emissions by 1.0×10^5 tons CO_2-eq per year. However, the anticipated reduction still will not fully counteract the carbon emission increase (1.7×10^5 tons CO_2-eq per year) from increased consumption and production. Thus, achieving carbon minimization requires reducing the use of plastic (and replacing this with alternatives, such as degradable plastics bags and meal boxes) and maximizing plastic recycling.

However, the environmental benefits of degradable materials depend on how these are disposed of. Bioplastics can be incompatible with fossil-based plastic recycling systems. Cross-contamination and even higher carbon emissions can result from unsuitable recycling technologies. For example, given the lack of available waste treatment technologies, degradable shopping bags made with polybutylene adipate terephthalate (fossil-based content) should be treated in landfills rather than incinerated as the latter will cause more harm to the environment. Degradable meal boxes made with polylactic acid (corn starch-based content), however, can be incinerated and substitute for current PP boxes. Thus, the selection and application of substituted materials need to consider technological availability and development within the waste management system of the city.



Source: Zhao Yan. 2022. Case Study Report on LCA of Typical Plastic Waste. (Draft) Special Report prepared for ADB.

From 2000 to 2019, about 174.8 million tons of the 5 standard plastic types were recycled, of which 32% was imported waste plastic and 68% domestically recycled plastic. Recycled waste can be used to manufacture films, injection products, containers, tubing, wire drawing, coatings, cables, and others (footnote 9).

Greenhouse Gas Reduction

The results of life cycle analysis (LCA) of plastic products show that every ton of waste PE shopping bags or waste PP meal boxes burned generates about 1,000–1,100 kg of carbon dioxide equivalent (CO_2-eq) of GHG emissions.[12] In contrast, the corresponding physical recovery of 1 ton of the same plastic waste can curb about 1,600–1,900 kg CO_2-eq of GHG emissions, which is a significant reduction in carbon emissions and fossil resource consumption.

To better understand the environmental impacts of plastic waste management, Suzhou City in Jiangsu Province of the PRC was selected as a case study (Box 1).

THE CURRENT SITUATION OF PLASTIC WASTE MANAGEMENT

Laws and Policies on Plastic Waste Management

In 1995, the PRC adopted the Law on the Prevention and Control of Environmental Pollution by Solid Wastes. This has since guided regulations and systems related to plastic waste management in the country.[13] It also stipulates the circular design, manufacturing processes, and recycling of products and packaging materials, while clearly prohibiting and restricting the general production, sale, and use of disposable plastic products such as nondegradable plastic bags. However, for some sectors, the law permits the use but mandates active recycling of disposable plastic products. Sectors include commodity retail establishments, e-commerce platform enterprises, express delivery businesses, takeaway services, tourism, accommodation, and agricultural film, among others. The corresponding consequences of noncompliance are clearly outlined.

Several policy documents have been issued to prohibit and restrict the production and use of different plastic products, encourage the use of substitutes, and make provisions for pollution prevention and control of the production and processing of plastics and recycled plastics, and for waste plastics disposal. In response:

- Plastic product manufacturers are strengthening ecological design and using materials that are not prohibited or restricted.
- Degradable plastics and other new materials manufacturers are breaking through the cost dilemma in the research and development of new materials.
- Recycling enterprises are promoting technology localization.

The current national regulations, standards, and policies mark the entry of the PRC's plastic pollution prevention and control program into a new development phase—one that has a multisubject approach that covers subfields and considers the whole value chain within a circular economy.

To this end, in 2008, the PRC passed the Circular Economy Promotion Law, which stipulates that any new industrial policies created by the government must meet the criteria for promoting a circular economy.[14] Industries are required to implement management systems that reduce resource usage and waste generation while improving resource recovery and recycling. Research, development, and international cooperation in the field of circular economies are encouraged. The government also supports education, publicity, and the popularization of scientific knowledge with the aim of giving citizens a better understanding of resource-saving and environmental protection practices. To operationalize the development of circular economy approaches, the Circular Economy Development Strategies Action Plan was introduced in in 2013. This sets out tangible goals for indicators such as energy efficiency, waste reduction, and the recovery of essential resources.

Importantly, many local governments have responded well to the central government's initiatives to reduce plastic pollution. Many cities, including Beijing, Shanghai, Tianjin, and Chongqing, and all provinces and autonomous regions have announced local implementation plans. Some provincial capitals, such as Hangzhou and Changsha, have already issued municipal implementation plans.

Authorized Agencies and Key Responsibilities

National. Plastic waste pollution prevention and control are the responsibility of various government agencies.[15] These agencies divide their work according to their core responsibilities to manage the planning and regulation of the plastic industry, covering production, transportation, sale, use, abandonment and disposal, recycling, and reuse of plastic products. The central government's work involves the supervision and coordination of over 10 departments, which entails clarifying responsibilities to facilitate the effective division of tasks. This poses a massive social governance hurdle. Additionally, because of the rigid demand for plastics consumption, prohibition measures face challenges in enforcement and supervision.

[12] LCA is an objective process of assessing the environmental burdens related to certain products, processes, or activities. It has been used as an effective tool to assess the environmental impacts of whole waste management systems, including during the recycling of plastic waste, such as PET bottles. The LCA approach can help (i) promote awareness of existing plastic waste management systems; (ii) compare alternative technologies or strategies for plastic waste management; and (iii) identify optimization potential in future systems, thus supporting policy and strategic development of plastic waste management.

[13] Government of the People's Republic of China. 1996. Law on the Prevention and Control of Environmental Pollution by Solid Wastes. Amended in 2004, 2013, 2015, and 2016; revised in 2020.

[14] Government of the People's Republic of China. 2008. Circular Economy Promotion Law.

[15] These are the National Development and Reform Commission, Ministry of Ecology and Environment, Ministry of Industry and Information Technology, Ministry of Housing and Urban–Rural Development, Ministry of Agriculture and Rural Affairs, Ministry of Commerce, Ministry of Culture and Tourism, Ministry of Transport, State Administration for Market Regulation, State Post Bureau, and General Supply and Marketing Cooperation Agency.

Local. Each region's development and reform commission is responsible for coordinating the implementation of the plastic waste pollution control plan locally. For specific action plans, relevant departments in each region must cooperate with the commission to implement and promote pollution control work. For example, for the prohibition and restriction of plastic products, regional ecological environment bureaus and market supervision bureaus carry out market supervision and special cleaning and restoration work; for environmental law enforcement, regional ecological environment bureaus largely carry out on-site inspections of enterprises; and for the plastic reduction and recycling requirements of logistics outlets, the post office in each region is responsible for sampling inspection and law enforcement.

Plastic Waste Cleanup Initiatives

- The Ministry of Housing and Urban–Rural Development organized its bureaus and the municipal councils (e.g., municipal management committees) to investigate, clean up, and rectify the informal stacking and dumping sites of domestic waste. This initiative included cleaning up domestic garbage—particularly that dumped randomly on urban–rural fringes; in environmentally sensitive areas; along railways and roads; and by rivers, pits, ponds, and ditches—and burning plastic waste or sending it to a sanitary landfill.
- The Ministry of Agriculture and Rural Affairs organized its local bureaus to clean up—that is, recycle and/or incinerate—the residual film and plastic packaging of pesticides and chemical fertilizers on farmlands. However, there are still deficiencies in the classification, recycling, treatment, and disposal of plastic waste in rural areas, and recycling of agricultural film is still in its nascent stage. Mechanized recycling has just started, and the cost charged for manual picking is quite high.
- The Ministry of Ecology and Environment organized local bureaus to clean up plastic waste floating in rivers, lakes, harbors, reservoirs, and offshore areas, and plastic waste found on beaches.

Use of Alternative Products

Like other countries, the PRC has introduced policies to disincentivize the use of disposable products that pollute easily or are not easily recyclable and to incentivize the adoption of biodegradable materials.[16] In supermarkets, shopping malls, pharmacies, bookstores, markets, and other places, the country promotes the use of non-plastic products such as cloth bags, paper bags, and recyclable bags, with the installation of self-service and intelligent delivery devices. The application of other alternative products is encouraged—for example, the use of degradable packaging films (bags) for fresh products and use of bio-based products, such as straw-coated meal boxes and degradable plastic bags, that meet the performance and food safety requirements of the takeaway catering industry.

LESSONS FROM INTERNATIONAL BEST PRACTICES

There is growing international awareness on the issue of ocean waste and the sources of mismanaged waste that ultimately pollutes seas and oceans, particularly following the PRC's waste import ban announced in 2017. Increasingly, the focus among governments and the private sector has been on global plastic management practices and demand drivers in e-retail food and beverages packaging (e.g., plastics, single-use plastics, single-use packaging). This trend is supported by a recent study that found that 40% of marine plastic litter originated from food and beverage containers primarily used in the food takeaway industry.[17]

Plastic waste management strategies range from prevention to cleanup. There is a broader shift to circular economy approaches because of environmental concerns regarding landfill-based waste management systems, resource scarcity, and regulation aimed at reducing linear supply chains. Circular economy approaches (Box 2) can also have significant economic benefits by reducing waste and maximizing the use of resources, thereby saving on disposal fees and the need to purchase new raw materials. Strengthening a circular economy approach entails closing (zero leakage), slowing (longer product life cycle), narrowing (resource efficiency), intensifying (asset-sharing), and dematerializing (virtualization of products and services) the resource loops to increase the length and value of product life cycles.

ROAD MAP FOR STRENGTHENING PLASTIC WASTE MANAGEMENT

The PRC's goal for plastic waste management is to minimize its environmental impact through reduced plastic product use and improved recycling. To achieve this, the PRC is implementing two main approaches: (i) improved recycling capacity through a circular economy approach and (ii) reduced plastic waste through recovery and capture measures. The PRC's 14th Five-Year Plan for Plastic Pollution Control includes policy recommendations for reduction, reuse, and recycling; use of bio-based alternative materials; and carbon capture and/or storage. The circular economy strategy focuses first on reducing and simplifying inputs and closing material flow, then prioritizing repair and maintenance, reuse, remanufacturing, and, finally, recycling. For the food and beverage industry, adopting innovative approaches, such as durable, material-based packaging reuse models like TerraCycle's Loop system, can further accelerate the transition to a circular plastic economy that minimizes waste and prioritizes resource recovery. Several key areas stand out for policy formulation and regulation.

[16] Biodegradable plastics are a type of polymer that eventually and completely degrades into carbon dioxide (in aerobic conditions) or methane (in anaerobic conditions), mineralized inorganic salts, and biomass (e.g., microbial remnants) under the natural action of microorganisms in soil burial, sand burial, seawater environment, freshwater environment, and processes such as composting or anaerobic digestion.

[17] Carmen Morales-Caselles et al. 2021. An Inshore-Offshore Sorting System Revealed from Global Classification of Ocean Litter. *Nature Sustainability*. 4 (6). pp. 484–493.

Box 2: International Examples of Best Practices in Recycling

Loop (United States)–circular shopping system. One of the most innovative systems for managing consumer product packaging in food delivery service is the TerraCycle's Loop™ system. This is a circular shopping system with reusable and returnable product packaging. The Loop system aims to offer a zero-waste option for consumer products while maintaining affordability, improving convenience, and establishing a circular life cycle through either reuse or recycling. Despite cleaning and using heavier packaging and more transportation, the Loop system has a lower carbon footprint than single-use packaging—more importantly, it reduces waste. The system initially delivered directly to customers, then collected and recycled the packaging. Now, the company offers brick-and-mortar return points and e-commerce solutions through its retail partner network. Loop is like many beverage schemes in Germany and the Netherlands, where customers can return empty containers in any supermarket. Loop operates in Australia, Canada, France, Japan, the United Kingdom, and the United States.

The following are other examples of best practices in packaging in the food and beverage sector, including those distributed via e-commerce:

Deliveroo (Australia)–replacing disposable plastic takeaway containers with compostable and recyclable alternatives. Partnering with sustainable packaging providers, Deliveroo offers compostable and recyclable takeaway packaging to partner restaurants in Australia; Hong Kong, China; Singapore; and the United Kingdom. Deliveroo has also invested in an incentive scheme that seeks to encourage restaurants to use plastic-free packaging for their delivery orders.

Pieter Pot (Netherlands)–reuse model for home delivery service. The start-up Pieter Pot is a supermarket that aims to make zero-waste shopping as competitive and convenient as regular grocery-buying. The company has expanded in Europe, including in the United Kingdom.

Zero Impack (Italy)–reuse model replacing plastics materials. Zero Impack seeks to reduce the consumption of single-use plastic packaging in the takeaway industry by offering aluminum containers with leak-proof silicone lids to customers and restaurants. The containers can be brought back to the restaurant or drop-off sites or picked up at a predetermined time by riders. Washing and sanitization are done by Zero Impack.

Initial Approach

Modified Approach

Sources: Adapted from The LOOP™ Initiative; and GreenBiz. 2019. Loop's Launch Brings Reusable Packaging to the World's Biggest Brands.

Upscale recycling of plastic products. After use, plastic products are typically incinerated or enter landfill facilities. The PRC's recycling infrastructure for renewable resources is currently insufficient and underdeveloped. A sound plastic waste recycling system must be established and accompanied by effective regulation to increase the resource utilization efficiency of plastic waste and ensure compliance with environmental standards. One example of a country that has established a successful plastic waste recycling system is Germany, which recycles over 50% of its plastic waste.

Strengthen green approaches at design, production, and consumption stages. Such a measure can be either prescriptive through stricter regulation and standards or encouraged through a focus on providing incentives for innovations in sustainable packaging, treatment technologies, and smart management systems. Reusability and recyclability of plastic products must be treated as an essential consideration in product design and production.

Achieve positive guidance by changing behaviors through education and community engagement. The prevention and control of plastic pollution is needed to establish an enabling environment for the wider participation of society. This is key to developing green consumption habits and reducing consumption of disposable plastic products. Education and awareness-raising must be supported at all levels, including youth engagement in schools. Changing behavior is critical to achieving long-term shifts in consumption and demand habits.

Establish plastic recycling centers, control scale of plastic incineration, and incentivize the plastic recycling industry. Administrations should prioritize regional sorting centers for low-value recyclables and combine the construction of park-based plastic recycling centers. Strictly control the scale of plastic incineration, reduce investment in plastic incineration facilities, and transfer the corresponding investment to incentivize and support the plastic recycling industry. Particularly in busy areas or those that suffer from high environmental pollution, the necessary infrastructure should be set up and the use of alternatives should be actively encouraged.

Prioritize environmental recovery and establish a normalized operational mechanism. A normalized operational mechanism should be established for the commercialization of recent technologies in plastic recycling, such as high-level physical recycling and chemical recycling technology. Integrating the different recycling technologies of plastic waste can facilitate the establishment of competitive advantages and complementary benefits.

Carry out environmental recovery and capture work and establish a normalized operational mechanism. A normalized operational mechanism and sanitation system should be established to help areas reduce their environmental leakage. Environmental recovery and capture work should be carried out for a small amount of plastic environmental leakage. Leveraging the river and lake chief system to implement special cleanup activities for plastic waste is also recommended.

Establish a responsibility-sharing mechanism across the whole value chain, from producers to retailers and consumers. It is necessary to establish extended responsibility-sharing mechanisms by rewarding nondisposability and efficiency. Consumers could be rewarded for efficiency and material segregation through financial incentives and deposit return schemes.

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ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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