

REUSE



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RESEARCH ON THE SCALE APPLICATION OF REUSABLE EXPRESS PACKAGING







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Plastic Free China

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INTRODUCTION

Underpinned by the robust domestic growth of e-commerce, express delivery services in China have witnessed a year-on-year surge in terms of volume, exceeding a hundred billion parcels in 2021. It has been proposed in the "14th Five-Year Plan for the Development of the Express Delivery Industry" that, by 2025, the volume of express delivery in China is expected to reach 150 billion parcels. Presently, single-use packaging predominates in express delivery, and after parcels are delivered to consumers, the packaging materials would typically be discarded. In large and medium-sized cities, the growth of

express delivery packaging waste has become a primary source in the increase in municipal solid waste. Confronted with the continuously rising volume of e-commerce express delivery services, the current linear model of packaging production, usage, and disposal is unsustainable, necessitating an urgent shift of express delivery packaging in China towards a more sustainable green transformation.

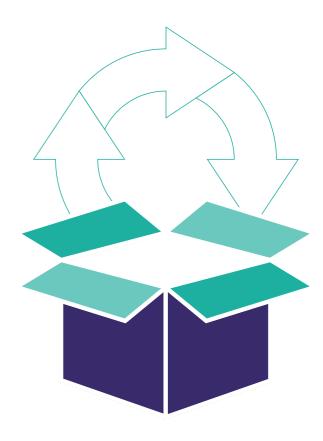
The Chinese government has taken the lead in setting forth policy objectives for the green transformation of express delivery packaging, with reusable packaging being



proposed as an alternative product and model to single-use packaging. In late 2020, the National Development and Reform Commission, together with seven other departments issued the *Notice on Accelerating the Green Transformation of Express Delivery Packaging*, which, for the first time, outlined the target application scale for reusable express packaging, aiming to reach 7 million units by 2022 and 10 million units by 2025. At the beginning of 2023, The State Post Bureau set a target to use reusable express packaging for 1 billion parcels within the year. The promulgation of a range of policy objectives and supporting measures concerning reusable express packaging by the Chinese government has positioned it as a global leader in this field.

In May 2023, shortly before the Second Session of the Intergovernmental Negotiating Committee on Plastic Pollution (INC-2) held in Paris, although reuse had been widely advocated by international organizations as a key solution to plastic pollution, and references to Reuse were frequently made in the documents submitted by various countries, few nations had proposed specific targets for the application of reusable packaging, particularly in the e-commerce express delivery sector. Only the European Union, in its proposal for the revision of the Packaging and Packaging Waste Regulations (PPWR) announced in November 2022, explicitly stated that the proportion of reusable packaging used for "non-food e-commerce packaging" should reach 10% by 2030 and 50% by 2040. In comparison, China's targets for the application of reusable express packaging were proposed earlier, with detailed guidance on usage scenarios, model cultivation, and support quarantees.

However, the application of reusable express packaging in China is still exposed to numerous challenges in practice. It is almost impossible for average consumers to access reusable packaging, and the promotion thereof remains considerably difficult. Apart from leading e-commerce and express delivery companies such as JD.com and SF Express that have achieved a certain scale and continuity in their investments in reusable packaging, application of reusable packaging by other enterprises is extremely limited. As an innovative business model, reusable express packaging involves significantly higher initial investment and ongoing operational costs compared to those of single-use packaging. Furthermore, reusable express



packaging should undergo a certain number of cycles to realize its environmental and economic benefits, thereby requiring effective reverse logistics systems to collect the packaging materials and return them to the logistics system for subsequent cycles. However, the current collection of reusable packaging is primarily performed by delivery couriers, resulting in low efficiency, and consumers often lack opportunities to participate in returning the packaging materials. Currently, reusable express packaging materials are only circulated within the logistics chains of individual enterprises without being shared among companies, thereby limiting its scalability potential.

To explore the paths for promoting the application of recyclable express packaging on a large-scale, this Report examines business cases and policy instruments for reusable express packaging in the global context, while analyzing the practices in this domain in China. This Report aims to propose suggestions for scaling up reusable express packaging in China, serving as a reference for policymakers, enterprises, and other stakeholders in society.

EXECUTIVE SUMMARY

Underpinned by the robust domestic growth of e-commerce, express delivery services in China have witnessed a year-onyear surge in terms of volume, exceeding a hundred billion parcels in 2021. It has been proposed in the "14th Five-Year Plan for the Development of the Express Delivery Industry" that, by 2025, the volume of express delivery in China is expected to reach 150 billion parcels. Such a massive volume brings about significant challenges in handling packaging waste, with its rapid growth constituting a primary source of the increase in the municipal waste in large and medium-sized cities. Due to the current reliance on single-use packaging materials such as corrugated cardboard boxes, plastic bags, adhesive tapes, waybills and fillers, the use and disposal of such packaging materials have not only result in substantial resource wastage and environmental pollution but also generated substantial carbon emissions. It has been reported that in 2020, the total carbon emissions from the entire process of express delivery packaging in China, including production and waste disposal stages, amounted to 23.95 million tons of CO₂ equivalent. In light of the objectives of "Carbon Peak and Carbon Neutrality" of China, e-commerce and express delivery companies are proactively setting up their own emission reduction targets and roadmaps, making the management of carbon emissions associated with their express packaging particularly pressing.

Replacing single-use packaging with reusable express packaging aligns with the principles of the circular economy, making it possible to reduce plastic pollution, mitigate climate change, and stimulate new economic growth. Compared to the environmental impact of single-use packaging, reusable express packaging generally shows superior performance across its lifecycle, provided that it reaches a certain number of reuse cycles. In terms of economic benefits, reusable packaging, as a model and system for Reuse, will generate numerous new opportunities for value creation. The adoption of reusable packaging fosters a "manufacturing as a service" model, which involves the development and leasing of reusable packaging, provision of collection and cleaning services, as well as facilitation of product recycling at the end of the life cycle. This transition can not only generate significant economic value but also create employment opportunities.

This Report analyzes the economic and environmental benefits of reusable express packaging, focusing on the scenario of

intra-city express delivery where reusable express packaging is mostly commonly applied. The results indicate that using reusable packaging for express delivery boxes becomes economically beneficial after reaching 28 reuse cycles. Furthermore, with the number of reuse cycles for reusable express packaging reaching 6, it can yield carbon emission reduction benefits. Based on the intra-city express delivery volume in China in 2021, if the penetration rate (substitution rate) of the increase in the reusable express boxes reaches 10%, and the average number of cycles per package exceeds 30, the cost of using reusable packaging boxes will be approximately RMB 160 million lower than that of single-use cardboard boxes. With the continuous increase of the number of reuse cycles, the environmental benefits, such as waste reduction and carbon emission reduction, are also expected to increase rapidly. With the average number of cycles per package reaching approximately 70, the cost savings are estimated to be around RMB 1.2 billion, realizing a reduction of approximately 670,000 tons of CO₂ equivalent.

In 2020, the Chinese government explicitly proposed a quantitative target for the application scale of reusable express packaging to reach 10 million units by 2025 in the *Notice on Accelerating the Green Transformation of Express Delivery Packaging*. Data released by the State Post Bureau in 2023 have revealed that, by virtue of the implementation of initiatives such as the "9917" Green Development Project for postal and express delivery services, China has deployed nearly 15 million reusable express boxes. Based on this, the State Post Bureau introduced the "9218" Project, aiming to achieve a volume of 1 billion postal parcels in reusable express packaging by 2023.

As guided by government policies aimed at addressing singleuse plastic pollution and promoting the transformation to green express packaging, China has made preliminary progress in its efforts towards the application of reusable express packaging. However, due to multiple constraints, its large-scale application still faces significant challenges, and consumers continue to encounter difficulties accessing reusable express packaging. This Report performs a comparative analysis on domestic and international business cases of reusable express packaging, summarizes the key challenges exposed to the upscaling of reusable express packaging in China, and, based on global policy trends, academic research, and commercial



Source: Official website of Huidu Environmental

practices, proposes recommendations for accelerating the large-scale application of reusable express packaging.

The research indicates that startup enterprises in the reusable express packaging market, mainly in North America and Europe, commonly employ a "manufacturing as a service" model, which not only provide innovative packaging products for e-commerce companies and brands but also establish an entire reverse logistics and customer service systems. Furthermore, through apps and other service platforms of reusable packaging merchants, consumers are guided to return the packaging to designated collection points. In overseas markets, the "last mile" return of reusable express packaging often utilizes postal mailboxes or collection points established by packaging suppliers, as well as options for in-store pickup. In contrast, the model employed in China mainly relies on selfoperated logistics networks of enterprises, with collection primarily performed by delivery couriers. Currently, reusable express packaging can only circulate within the logistics chain of individual enterprises, thereby reducing efficiency and increasing operational costs.

This Report presents recommendations for the large-scale application of reusable express packaging in China.

1) Offer fiscal and taxation support policies at both national and local levels for reusable packaging, so as to assist enterprises in alleviating initial investment cost and rectifying the distorted price situation between single-use and reusable packaging. Explore the implementation of extended producer

responsibility, single-use packaging fees/taxation systems, deposit systems, etc. in the field of reusable express packaging, and, stimulate enterprise research and innovation, and alleviate cost pressures by utilizing incentives such as central budget investments, green financing, tax incentives, and government procurement preferences.

2) In terms of "last mile" collection of packaging, government departments should take the initiative in coordinating the construction of shared collection logistic systems. Based on the formulation of related industry standards to enhance the standardization of reusable express packaging, the government should play a central role in coordinating related departments, institutions, and enterprises to establish shared collection logistic systems. This is made possible in conjunction with the construction of urban waste classification and recycling systems, and the utilization of both new and existing infrastructure for sorting and recycling to promote the collection of reusable packaging.

3) As an innovative business model, the development of the reusable express packaging system requires the collective participation of various sectors of society at the early stages. It is necessary to promote communication among societal stakeholders to unleash the potential for collaboration and co-create value. Simultaneously, in conjunction with the promotion of low-carbon and green consumption concepts, it is essential to raise consumer awareness and promote consumer acceptance and cooperation with reusable express packaging through corresponding incentive mechanisms.

INTRODUCTION TO REUSABLE EXPRESS PACKAGING

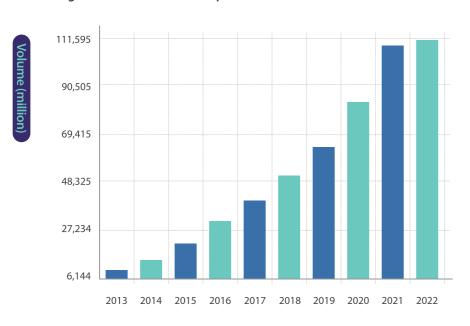
1.1 Reusable Express Packaging in the Context of Circular Economy

In 2021, the volume of express deliveries in China exceeded one hundred billion for the first time, accounting for over a half of the global total¹. The rapid growth in express delivery volume is largely attributed to the thriving online retail sector. Globally, the proportion of online retail sales to total retail sales increased from 15% in 2019 to 21% in 2021. After the pandemic, the online retail market continues to exhibit significant growth potential, with a projected compound annual growth rate (CAGR) up to 11.5% from 2023 to 2027.

Furthermore, the penetration rate of e-commerce in overall retail is expected to further increase^{2 3}. China's e-commerce sector achieved a compound annual growth rate of 24.6% during the "Thirteenth Five-Year Plan" period⁴. Concurrently, China's e-commerce penetration rate rose from 23% in 2019 to 31% in 2022, surpassing global averages⁵. In this context, the "Fourteenth Five-Year Plan for the Development of the Express Delivery Industry" proposes that by 2025, the volume of express deliveries in China will reach 150 billion.

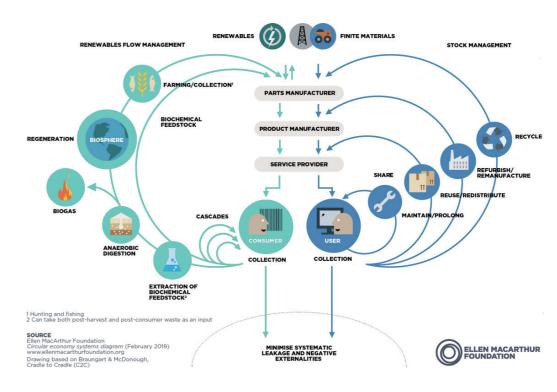
Figure 1: Volume of Postal Express Deliveries in China from 2013 to 2022





Source: National Statistics

Figure 2: The Butterfly Diagram: Visualising the Circular Economy



Source: the Ellen MacArthur Foundation

Such a massive volume of business has brought about significant challenges in the disposal of packaging waste, with its rapid growth becoming a primary source of garbage growth in large- and medium-sized cities. According to the Research Report on the Characteristics and Management Status of Express Packaging Waste Generation in China, based on the current development trends in the express delivery industry, by 2025, the consumption of express packaging materials in China will reach 41.27 million tons⁶. Due to the current reliance of express packaging on single-use materials such as corrugated cardboard boxes, plastic bags, adhesive tapes, waybills and fillers, their extensive use and disposal result in not only related carbon emissions and climate change impacts but also significant resource wastage and environmental pollution. There is an urgent demand for the transformation of single-use express packaging into a greener model by systematically transitioning to reusable packaging systems, replacing the linear packaging use and consumption model (in which products follow a linear life trajectory, from production to use, and then directly to landfill⁷), thereby reducing the generation of packaging waste at the source.

The revised "Circular Economy Promotion Law of the People's Republic of China" enacted in 2018 established principles on

waste management such as reduction and reuse. "Circular economy" has been listed as one of the Ten Key Actions for achieving carbon peak in the Action Plan for Reaching Peak Carbon Emissions by 2030" issued by the State Council. The amended Law of the People's Republic of China on Prevention and Control of Environmental Pollution by Solid Waste in 2020 proposed waste reduction requirements for industries such as e-commerce, express delivery and online food delivery in terms of product packaging design, manufacturing, use and disposal. It prioritizes the use of reusable and recyclable packaging materials and also legally prohibits or restricts the production, sales and use of non-degradable plastic bags as well as other single-use plastic products. Both laws reflect the fundamental elements of waste management priority order, i.e., Reduce, Reuse and Recycle. The rise of online shopping has resulted in the extensive use and disposal of e-commerce express packaging, and its governance also requires to follow the priority order of waste management. Management of packaging waste should not be limited to end-of-life treatment; in fact, there are opportunities for intervention at every stage of the packaging lifecycle. Rethinking the demands for packaging, redesigning packaging, and adjusting the usage and lifespan of packaging can save resources and reduce the likelihood of packaging becoming waste.

ENVIRONMENTAL AND ECONOMIC BENE-FITS OF REUSABLE EXPRESS PACKAGING

2.1 Costs of Single-Use Express Packaging



Currently, express packaging mainly consists of single-use materials such as cardboard boxes, plastic bags, paper-wrapped boxes, woven bags, foam boxes, document envelopes, packing fillers, etc. Research indicates that the consumption of express packaging materials in China has increased from 20,600 tons in 2000 to 9.41 million tons in 2018, and is projected to reach 41.27 million tons by 2025¹².

In terms of material types, express packaging materials can be categorized into paper-based and plastic-based types. In 2018, China consumed a total of 8.56 million tons of paper-based express

materials, while plastic-based packaging materials amounted to 851,800 tons, representing 9.05% of the total. Paper-based materials are primarily composed of corrugated cardboard boxes, though they can be reused, according to surveys, only less than 5% of cardboard boxes used for express packaging are reused¹³. Plastic-based packaging includes plastic bags, woven bags, pearlized bags, foam boxes, and adhesive tapes. Due to difficulties in recycling and high regeneration costs, approximately 99% (by mass) of plastic-based express packaging ends up mixed with household waste, either incinerated or landfilled¹⁴.

packaging materials, accounting for 90.95% of all express packaging

1.2 Renting the Packaging: Rethinking the Role of Packaging

Reusable packaging refers to the multiple reuses of packaging for its original intended purpose (defined by the European Union⁸/ISO 2013). In the report *Making Reuse a Reality commissioned* by the Break Free from Plastic (BFFP) and authored by the Global Plastic Policy Center at the University of Portsmouth, a reusable system is defined as "a comprehensive system designed for multiple circulations of reusable packaging which remains in the ownership of the reuse system and loaned to the consumer." This definition emphasizes the ownership of packaging compared to other definitions. In public discourse or business promotion, the terms "reuse" or "repurposing" of packaging are frequently used interchangeably. However, it's important to note that while repurposing involves using packaging for different purposes, such as using courier bags to hold other items, this doesn't meet the criteria for reusable packaging in this context.

Packaging can generally be categorized into the following three types, with reusable scenarios further divided into on-the-go and at-home return/refill modes¹⁰:

Refill Return Single-use packaging (including single-use packaging repurposed for other uses)

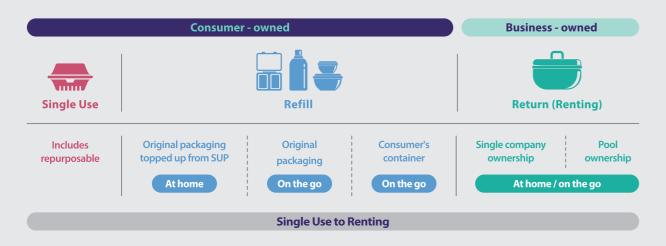
For a stricter definition of reusable packaging, such as the one provided by BFFP and the Global Plastic Policy Center, the category does not include at-home/on-the-go refill scenarios. As shown in the diagram below, in such mode, consumers own the packaging and may not deliberately complete a predetermined number of

cycles. In such cases, it is difficult to track packaging reuse data accurately and to monitor and enforce it effectively.

Reusable express packaging¹¹ falls into the category of "At home/ On the go Return" in this classification system, where consumers do not own the packaging but engage in a borrowing/renting relationship. In terms of single-use packaging, consumers actually purchase and own the packaging, disposing of it or using them for other purposes after use. However, the use of reusable packaging changes this ownership model, where consumers only purchase the product and borrow/rent the packaging for protecting the product. In fact, the emerging business model of reusable express packaging seen in many countries and regions such as Europe and the United States reflects this ownership relationship. In this model, consumers pay a deposit to rent packaging provided by thirdparty packaging companies, which should then be returned to the logistics system after use, so that the deposit is refunded.

Currently, the express packaging system is still dominated by single-use packaging, whether it's single-use cardboard boxes or plastic packaging and fillers. Plastics themselves are not single-use, and packaging doesn't have to be either. Plastics are durable, but in single-use scenarios, they are given a brief lifespan, only to become waste, with their resource value not fully utilized. Similarly, the production of paper-based packaging requires a significant amount of forest and water resources, leading to resource and energy waste when used once. Even for some cardboard boxes reused by logistics centers such as courier stations after consumer use, they fall under repurposing in the aforementioned definition, thereby making it difficult to scale up and ensure their reuse cycles and environmental benefits.

Figure 3: Different packaging categories and ownership forms



Source: Greenwood, S., et al. "Buy the product, but rent the packaging — Making reusable plastic packaging mainstream."

Climate Change Impacts

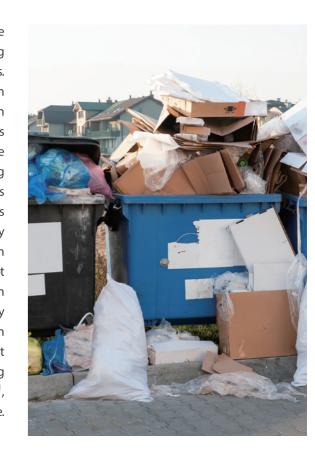
Single-use express packaging generates carbon emissions at various stages throughout its lifecycle, including raw material extraction, production, processing, and disposal. According to a research report from Sinopec and the Institute of Ecological Conservation and Circular Economy at Tongji University, the total carbon emissions from the entire process of express packaging in China, including production and waste disposal, amounted to 23.95 million tons of CO₂ equivalent in 2020. The study further predicts that, without effective green packaging interventions (BAU scenario), the carbon emissions from single-use plastic packaging in express delivery will increase. It is estimated that the cumulative carbon emissions from single-use plastic bags within express delivery industry in China will reach 59.61 million tons from 2021 to 2030, with emissions reaching 6.06 million tons of CO₂ equivalent in 2025 and 7.61 million tons of CO₂ equivalent in 2030¹⁵.

Raw materials for plastic production are primarily derived from fossil fuels. With the decreasing demands for petrochemical fuels from sectors such as transportation,

plastics will become one of the major drivers for future growth in petroleum demand 16. Plastics, especially singleuse plastics, have been of particular concern in the global efforts to reduce emissions. The plastic packaging industry, predominantly composed of single-use plastics, accounts for approximately 44% of total plastic production ¹⁷. In the business-as-usual (BAU) scenario, global plastic production is projected to consume 20% of the oil supply by 2050¹⁸. By 2050, it is forecasted that carbon emissions from plastics could comprise 10-13% of the total carbon budget required to achieve the global temperature control target of 1.5°C¹⁹, thereby significantly occupying on the remaining emission space of other industries. The Climate Change and Energy Transition Project at Peking University's Institute of Energy has analyzed the roadmap for carbon peaking and neutrality in the plastics industry of China, highlighting the key emission reduction path of source reduction, particularly in the realm of single-use plastics. Within the trajectory to phase out single-use plastics, source reduction (including reuse) represents a crucial strategy²⁰.

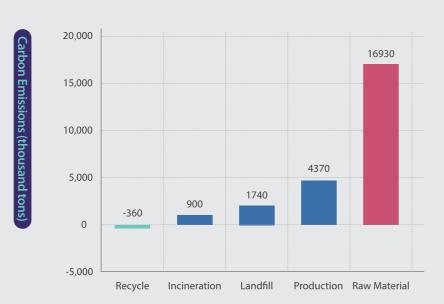
Waste Disposal Costs

The increase in waste generated by express packaging has become the primary source of waste growth in major cities in China, adding environmental pressure and generating associated waste disposal costs. The costs of waste disposal include not only costs for waste collection and transportation, operational and infrastructure, and land occupation but also costs for environmental pollution. Pollution caused by express packaging, including single-use plastic packaging, includes leachate from landfills and dioxin emissions from waste incineration. According to the Research Report on the Characteristics and Management Status of Express Packaging Waste in China, based on the volume of express delivery in 2018, the costs for waste disposal for express delivery amounted to RMB 1.24 billion, including landfill costs of RMB 974 million and net incineration costs of RMB 269 million. Incineration of plastics not only results in pollution such as dioxin emissions but also high carbon emissions. According to estimates from the Climate Change and Energy Transition Program at Peking University's Institute of Energy, the carbon emission intensity during plastic production is 2.5 tons of CO₂ equivalent per ton of plastic, while the carbon emission intensity from incinerating waste plastic reaches 2.7 tons of CO₂ equivalent per ton of plastic²¹, exceeding the carbon emission intensity at the plastic production stage.



In 2020 CO2 equivalent 23.95 MILLION TONS

Figure 4: Total Carbon Emissions from Express Delivery Packaging in China in 2020 (in thousand tons)



Source: Sinopec. Research Report on the Carbon Emission Reduction Potential of Green Packaging in China's Express Delivery Industry from 2021 to 2030.



In addition to the impact on climate change, the external effects of single-use plastics have also posed threats to human health. Single-use plastic packaging may introduce two health risk factors: the release of microplastics, and the migration of toxic and harmful chemicals from plastic processing. Microplastics have already been widely distributed in the environment and detected in table salt, tap water, and bottled water²². With the accumulating understanding of the impact of microplastics on human health, existing scientific research indicates that exposure to microplastics would result in particle toxicity, accompanied by oxidative stress and inflammatory lesions. The immune system may have to struggle to clear the synthetic particles, thereby resulting in chronic inflammations and increased risks of tumor formation. Additionally, microplastics may release adsorbed pollutants and pathogens, thereby posing harm to human health²³.

Furthermore, plastic packaging may contain toxic and harmful chemicals added during the production and processing process. These chemicals may eventually enter the human body through diet and gradually accumulate in human body, bringing about various toxic effects. Single-use plastic bags used in express delivery may also contain toxic and harmful substances such as heavy metals, chemical oxygen demand (COD) emissions generated during printing, adhesive powders, or dioxins, posing health hazards to individuals in contact with express packaging²⁴.

Analysis of Environmental and Economic Benefits of Reusable Express Packaging

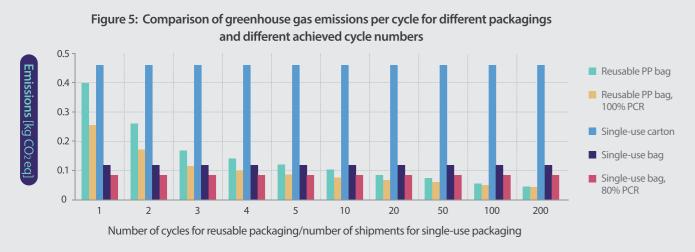
A number of studies have demonstrated that reusable express packaging features significant environmental and economic benefits compared to single-use express packaging. Environmental benefits are not only evident in reducing waste generation and pollution but also in the fact that, from a lifecycle perspective, the overall environmental benefits and carbon reduction benefits of reusable packaging are superior to those of single-use packaging (provided that reusable packaging undergoes a certain number of reuse cycles). In terms of economic benefits, reusable packaging will generate a large number of new value creation opportunities. Since reuse generally requires the "manufacturing as a service" model, which involves developing and renting reusable packaging, establishing operational and reverse logistics systems, providing collecting and cleaning services, as well as recycling at the end of the product lifecycle, this process is expected to generate significant economic values and employment opportunities.



Environmental Benefits

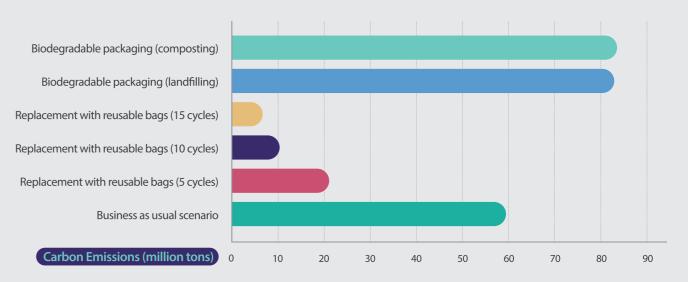
From the results of Life Cycle Assessment (LCA) analysis, many studies have confirmed that, after achieving the minimum number of reuse cycles, reusable packaging systems including reusable express packaging demonstrate better environmental benefits compared to single-use packaging. Specifically regarding reusable express packaging, LCA studies on European reusable courier bags have shown that, with a scenario where consumers return the reusable plastic bags through postal services, which have achieved 30 reuse cycles with a loss rate of approximately 10%, the environmental impact of reusable courier bags is reduced nearly threefold compared to single-use courier packaging²⁵.

Another study comparing the carbon emissions with environmental impact of two operational e-commerce express reusable packaging systems has demonstrated that, compared to single-use LDPE plastic bags, reusable PP courier bags have environmental advantages after achieving 8 cycles of reuse; however, if the reusable courier bags are 100% made from recycled plastics, their environmental benefits exceed those of single-use LDPE plastic bags just after 3 reuse cycles. Reusable PP plastic boxes exhibit environmental benefits superior to those of single-use cardboard boxes after 81 reuse cycles; however, if they're made from recycled plastics, the number of cycles needed for their environmental benefits to exceed those of single-use cardboard boxes decreases to 32²⁶.



Source: Zimmermann, T., & Bliklen, R. (2020). Single-use vs. reusable packaging in e-commerce: comparing carbon footprints and identifying break-even points.

Figure 6: Comparison of cumulative carbon emissions from single-use express plastic bags, biodegradable plastic bags, and reusable bags from 2021 to 2030



Source: Produced based on the Research Report on the Carbon Emission Reduction Potential of Green Packaging in China's Express Delivery Industry from 2021 to 2030

According to the report "Realising Reuse: The potential for scaling up reusable packaging, and policy recommendations" by Break Free From Plastic (BFFP), if 20% of the express packaging in Europe adopts reusable packaging by 2027, it could reduce resource usage by 60,000 tons, water consumption by 238 million cubic meters, and emissions by 102,000 tons CO_2 eq. If by 2030 half of the courier packaging switches to reusable packaging, it could reduce resource usage by 250,000 tons, water consumption by 1 billion cubic meters, and emissions by 429,000 tons CO_2 eq.²⁷.

Domestic research has also revealed the potential of using reusable express packaging to save resources and reduce waste and plastic. According to the "Green Express Packaging Saving Potential Research Report 2020 (Yangtze River Delta)" report, if all express packaging in the Yangtze River Delta could be replaced with reusable woven bags instead of single-use ones, reusable plastic bags instead of single-use plastic bags, and reusable cold chain boxes instead of single-use foam plastic boxes, it could reduce plastic consumption by 103,500 tons, approximately 39% of the plastic packaging consumption in the Yangtze River Delta in 2019.

The Research Report on the Carbon Emission Reduction Potential of Green Packaging in China's Express Delivery Industry from 2021 to 2030 jointly released by Sinopec and the Institute of Ecological Conservation and Circular Economy at Tongji University has calculated scenarios of carbon emissions for single-use plastic packaging, reusable packaging, and biodegradable plastic packaging substitution. According to the report, the total carbon emissions of express packaging in China in 2020, including

production and waste disposal stages, amounted to 23.95 million tons of CO_2 equivalent. If no reuse or substitution of single-use plastic bags in the express delivery industry occurs (Business-As-Usual scenario), the cumulative carbon emissions from single-use plastic bags in China's express delivery industry from 2021 to 2030 would reach 59.61 million tons. However, if single-use plastic bags are completely replaced by reusable bags, in a scenario of 5 reuse cycles, the carbon emissions from plastic packaging in the express delivery industry from 2021 to 2030 would decrease by 64.5%. If the number of reuse cycles increases to 10, the reduction would reach 82.3%. Further, if the number of reuse cycles reaches 15, the reduction would be as high as 88.2%.

Interestingly, as a comparison, the report suggests that if biodegradable plastic packaging is used as a substitute, with end-of-life treatment through 60% biodegradability in landfills, compared to the carbon emissions from single-use plastic bags, the express delivery industry would increase emissions by 23.24 million tons of CO_2 equivalent from 2021 to 2030, equivalent to a 57.4% increase in emissions. Even if composting treatment is performed in 60% biodegradable composting facilities, there would still be a 40% increase in emissions. According to this study, from the perspectives of carbon reduction, biodegradable plastics are considered false solutions. They fail to bring about emission reduction benefits and instead contribute to increased emissions. On the contrary, reusable packaging brings about significant emission reduction effects, with entirely positive environmental impact compared to single-use packaging.

12

Economic Benefits

Single-use express packaging fails to maximize the value of resources, as they are discarded shortly after use, leading to increased costs for waste disposal and pollution. Reuse not only represents a circular economy model that can achieve the greatest reduction in plastic pollution, but also holds significant economic potential through innovation in packaging and delivery models. According to the United Nations Environment Programme report "Turning off the tap: How the world can end plastic pollution and create a circular economy," reuse schemes are estimated to generate net savings of USD 1,289 per ton of plastic, while new delivery models bring a net saving of USD 516 per ton²⁸. The Ellen MacArthur Foundation has estimated that shifting 20% of global plastic packaging to reuse could create USD 10 billion in business opportunities²⁹. The key to this transition lies in making reusable models competitive with the current singleuse packaging models. Governments should internalize the externalities of single-use packaging through financial and tax incentives, thereby easing the upfront investment pressure on businesses during the transition and enabling the upscaling of reusable models.



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The cost of externalities for plastic packaging, plus the cost associated with greenhouse gas emissions from its production, has been estimated at USD 40 billion – exceeding the plastic packaging industry's profit pool.

---- The Ellen MacArthur Foundation
The New Plastics Economy: Rethinking the future of plastics

Using reusable courier boxes/bags may involve higher initial investment costs, particularly given the higher unit price of reusable packaging, setting up and operating reusable packaging systems also incurs additional expenses. However, if reusable courier systems can achieve a certain number of cycles, they can prove to be cost-effective in the long run. Researches have indicated that e-commerce companies can recover packaging costs after multiple cycles of reusable boxes, thereby saving on packaging expenses eventually. In addition, reusable boxes generally offer features such as heat resistance and waterproofing performance, making them superior to single-use cardboard boxes for protecting the goods. Furthermore, due to their relatively standardized size and low material density, reusable boxes can improve efficiency in packaging, loading, unloading, and transportation. They are also easier to be handled by machines, thereby enabling the potential to reduce costs and enhance efficiency³⁰.

2.3

Scenario Analysis of Environmental and Economic Benefits of Reusable Boxes for Domestic Express Delivery in China

As China embarks on the green transformation of express packaging and proposes national policy objectives for the application scale of reusable packaging, e-commerce and courier companies across the country have initiated investment in and utilized reusable express boxes and bags. The research

team of this report utilized existing practical data, particularly relevant data from same-city express services where reusable packaging is more prevalent. In conjunction with academic research findings, statistical data, etc., the preliminary analysis has been performed to explore the economic and environmental benefits of promoting the use of reusable express packaging boxes. However, this study only calculates the cardboard portion of single-use packaging, while the use of reusable

boxes may also reduce packaging materials such as fillers and tapes in single-use packaging. Therefore, the actual benefits would be higher than the results obtained in this study.

This study compares the environmental and economic benefits of single-use cardboard boxes and reusable polypropylene (PP) plastic boxes, and calculates the number of reuse cycles required for the reusable boxes to achieve higher environmental and economic benefits. The research covers the environmental impacts of the production, use (logistics distribution), and reverse recovery stages of reusable packaging, as well as comparison with traditional single-use express packaging, so as to assess the environmental benefits of promoting the reusable express packaging. For the purpose of economic benefits, the study primarily utilized the life cycle cost analysis method. Since the large-scale application of reusable express boxes for consumers is still in the early stages of pilot implementation, the economic benefits were mainly estimated from a macroscopic perspective. For detailed research methods, please refer to Appendix 1 (in Chinese).

The study suggests that when the number of reuse cycles for reusable express packaging exceeds 28, it becomes economically beneficial. Additionally, when the number of reuse cycles is 6, there are carbon emission reduction benefits from using reusable courier packaging. When the number of reuse cycles being 20, using a reusable express box costs approximately over RMB 0.44 more; however, with the number being 30, using a reusable

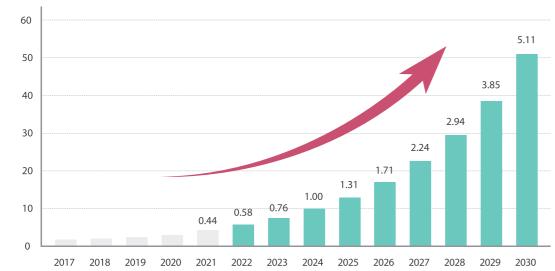
express box can save around RMB 0.18. With 20 reuse cycles, the carbon emissions of a reusable packaging box are approximately 0.17 kg of CO₂ equivalent, whereas single-use packaging emits around 0.53 kg of CO₂ equivalent. At this point, the emission reduction benefit is approximately 0.36 kg of CO₂ equivalent.



Based on the domestic intra-city express service volume of China in 2021, if the penetration rate (substitution rate) of reusable express boxes reaches 10% and the number of reuse cycles exceeds 20, the cost for using reusable packaging boxes will be approximately RMB 750 million higher than that of single-use cardboard boxes. However, if the number of reuse cycles reaches 30, the cost for using reusable packaging boxes will be approximately RMB 160 million lower than that of single-use cardboard boxes. With the continuous increase of the number of reuse cycles, the environmental benefits such as waste reduction and carbon reduction will also increase rapidly. When the number of reuse cycles reaches approximately 70, cost savings of about RMB 1.2 billion can be achieved, resulting in a reduction of approximately 670,000 tons of CO₂ equivalent.

The study further examines cost-benefit and carbon emission reduction estimations for the promotion of reusable packaging through 2030. If the substitution rate of reusable boxes in intracity express services reaches 30%, and the reuse rate can be maintained at 60 cycles per box, the cumulative economic benefits generated would increase from approximately RMB 580 million in 2022 to about RMB 5.1 billion in 2030. From 2023 to 2030, the cumulative economic benefits from replacing singleuse packaging materials are estimated to be around RMB 18.9 billion. The cumulative carbon emission reduction from 2023 to 2030 will reach approximately 11.76 million tons of $\rm CO_2$ equivalent.



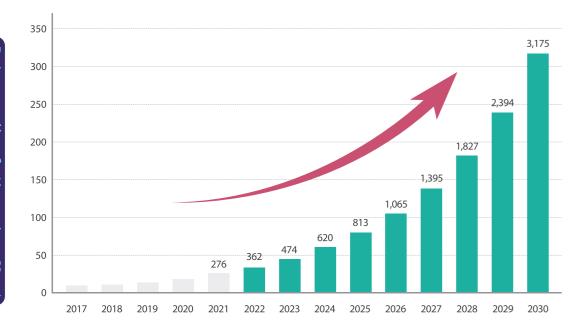


Note:

By 2030, replacing 30% of the single-use packaging in same-city express services with reusable packaging, with a reuse cycle of 60 times.

Year		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Subsitut rate	ion	4.16%	5.22%	6.65%	8.35%	10.82%	13.71%	16.48%	19.92%	24.23%	30.00%

Figure 7-2: The environmental benefits of reusable express packaging 2017-2023



Note:

By 2030, replacing 30% of the single-use packaging in same-city express services with reusable packaging, with a reuse cycle of 60 times.

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Subsitution rate	4.16%	5.22%	6.65%	8.35%	10.82%	13.71%	16.48%	19.92%	24.23%	30.00%

03

POLICIES OF REUSABLE EXPRESS PACKAGING

3.1 UN Global "Plastic Pact" and Regional Policies

In March 2022, the United Nations Environment Assembly passed a historic resolution addressing plastic pollution, with 175 countries worldwide agreeing to complete a legally binding international agreement by 2024. In May 2023, just before the second round of negotiations (INC-2) for the agreement held in Paris, the United Nations Environment Programme (UNEP) released a new report titled "Turning off the tap: How the world can end plastic pollution and create a circular economy." The report sets a goal to reduce global plastic pollution by 80% by 2040 and outlines three key transitions needed to achieve this goal. The primary transition highlighted is "Reuse," which includes initiatives such as refillable bottles, bulk containers, deposit-refund schemes, and packaging collection, aiming to reduce plastic pollution by 30% by 2040. The other two transitions after reuse are recycling and redesigning and diversifying, which can respectively bring about a reduction of 20% and 17% in plastic pollution.

It can be observed by analysing documents submitted by various countries before the INC-2 negotiations that, generally, reuse and recycling are frequently mentioned together without particular emphasis on their priority order. This aligns with the current policies, regulations and market status of plastic packaging in different countries. Most targets are overall goals without explicitly distinguishing between reuse and recycling. However, the High Ambition Coalition, including countries and regions such as the European Union and Japan, has proposed the establishment of separate reuse (reuse, refill system) targets³¹.

The most common policy objectives adopted by countries to address plastic and waste pollution include setting targets to reduce single-use plastics, implementing bans on certain single-use plastic products, and proposing waste recycling targets. Reuse-related policy objectives are relatively less common, and apart from the EU and China, few specific reuse targets are available in the field of e-commerce express packaging.

REUSE-RELATED POLICIES IN SOME COUNTRIES



Set targets for reusable packaging, aiming for a 5% reuse rate by 2023 and 10% by 2027. Reusable packaging must be recyclable. Non-disposable tableware can be used for dine-in meals at fast-food restaurants³².



Industries are required to establish reuse packaging targets by the end of 2022. In the absence of self-set goals, the following targets apply: by January 2025, at least 20% of beverage production volume must be delivered in reusable packaging, and by January 2030, at least 50%³³.



In November 2021, Austria established legally binding reuse targets in its Waste Management Act, stipulating that by 2025, the reuse rate for beverage packaging should reach 25%, increasing to 30% by 2030^{34} .



Chile has adopted a bill restricting the use of certain disposable products such as tableware, straws, trays, and small packaging bags in restaurants, hotels, bars, as well as similar establishments, with the use of reusable products being mandatory for on-site consumption³⁵.

3.2 EU Policies on Reusable Express Packaging

The European Union introduced the *Waste Framework Directive* (Directive 2008/98/EC) in 2008, emphasizing that reuse is an important means of waste management, second only to the principle of prevention. This directive serves as the fundamental legal framework for waste management in the EU, requiring member states to take measures to promote product reuse, including encouraging the establishment of reuse networks, implementing extended producer responsibility, and setting reuse targets, thereby laying the foundation for subsequent EU legislation on packaging and waste, and promoting reuse initiatives.

In 2015, the European Union adopted the *Circular Economy Action Plan*, which included 54 actions and 4 legislative proposals on waste, thereby constituting a comprehensive policy framework for the circular economy. In 2018, the *EU Plastic Strategy for a Circular Economy* set a target for 100% of plastic packaging on the EU market to be reusable or recyclable by 2030. At this stage, the reuse target remained a relatively general vision, which was in conjunction with the target for recyclability, and lacked specific targets for individual product categories.

In November 2022, the European Commission announced a proposal to revise the *Packaging and Packaging Waste Directive* (PPWR). For the first time, this proposal provided detailed

provisions on reduction targets for various types of plastic packaging in different categories and usage scenarios, including restrictions on unnecessary packaging, proportions of recyclable packaging, proportions of recycled materials, as well as targets for reuse. In terms of reuse targets, in addition to various types of beverage containers, transport packaging and accessories, household appliances, etc., specific reuse targets were also proposed for "non-food e-commerce packaging." By 2030, the proportion of reusable packaging for (non-food) e-commerce express services should reach 10%, and by 2040, it should reach 50%³⁶.

Although this proposal still needs approval from the European Parliament and governments of EU member states to become law, the proposed targets for replacing e-commerce express packaging with reusable alternatives are significant. The ambition of achieving a 10% usage rate of reusable packaging in e-commerce during the initial phase is noteworthy. This demonstrates the ambition of EU for the transformation of the plastic packaging industry to achieve its overall goals of a circular economy, waste reduction, and netzero emissions by 2050. Meanwhile, the European Commission believes that the circular economy of plastic packaging will also create more green, high-quality job opportunities, which in turn will bear a positive impact on employment and the economy.

Table 1: Targets for Reusable Packaging in the Proposed Revision of the EU PPWR Directive (Article 26)

Packaging type	Reuse target 2030	Reuse target 2040
large household appliances	90%	
cold or hot beverages filled into a container at the point of sale for take-away	20%	80%
take-away ready-prepared food	10%	40%
alcoholic beverages	10%	25%
wine (with the exception of sparkling wine)	5%	15%
non-alcoholic beverages	10%	25%
pallets, plastic crates, foldable plastic boxes, pails and drums	30%	90%
non-food items via e-commerce	10%	50%
pallet wrappings and straps	10%	30%
grouped packaging in the form of boxes	10%	25%

Source: European Commission. Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC

3.3 China Policies on Reusable Express Packaging

As for the policies addressing plastic pollution in China, in addition to banning and restricting the use of certain single-use plastic products and promoting alternatives such as biodegradable plastics, reuse has also been identified as one of the key pathways to tackle plastic pollution, especially in the express delivery and logistics sector. In the *Opinions on Further Strengthening the Governance of Plastic Pollution* issued in January 2020, reusable packaging was proposed as one of the alternatives to single-use plastics. The document suggests that, to promote reusable packaging, it is necessary to establish a cross-platform operational system for reusable packaging and reverse logistics system. At this stage, reusable express packaging is only conceptually mentioned in the document without specific elaboration or target guidance.

The "Notice on Accelerating the Green Transformation of Express Packaging" issued at the end of 2020 for the first time proposed the application scale targets of reusable express packaging, with an aim to reach 7 million units by 2022 and 10 million by 2025. This document also provides detailed guidelines for promoting reusable express packaging as a new packaging model, specifically including:

· Categories of Packaging Products and Scenarios

For example, promoting the application of reusable and foldable express packaging, reusable delivery boxes, as well as reusable cold-chain express boxes in urban fresh food delivery and bulk logistics of chain supermarkets.

· Model Cultivation

It is pointed out that municipal governments should combine the construction of smart cities and smart communities to plan and construct shared express distribution return facilities in communities, universities, business centers, and other places. During urban renewal and the renovation of existing housing, support should be provided for the construction of shared express distribution and return facilities. Entry barriers of such facilities into communities and public spaces should be eliminated, and supportive policies such as guaranteeing facility land use and reducing site occupation fees should be implemented. A batch of cities should be selected to carry out pilot demonstrations of large-scale applications of reusable express packaging.

Government Support Policies

Appropriate support from the central budget will be allocated for the construction of green express logistics and distribution systems, and the construction of specialized and intelligent return facilities. Research will be conducted to include companies engaged in the production and large-scale application of green and reusable express packaging to be eligible to the green credit support and provide supports in areas such as bond issuance. Government procurement requirements should be implemented for green express packaging standards to guide government procurement.



Implement existing tax incentive policies. The central finance will support the establishment of data monitoring and analysis platforms, law enforcement, and supervision capacity building for the production, use, and collection of express packaging by leveraging existing departmental budget funds.

In the "Notice on Accelerating the Green Transformation of Express Packaging," it was proposed to select a batch of cities to carry out pilot demonstrations of large-scale applications of reusable express packaging. One year after the issuance of the notice, at the end of 2021, the National Development and Reform Commission, the Ministry of Commerce, and the State Post Bureau issued the Notice on Organizing Pilot Demonstrations of Large-Scale Applications of Reusable Express Packaging. mainly targeting express delivery enterprises. Express delivery enterprises, either independently or jointly with e-commerce companies, packaging service providers, etc., are encouraged to apply for the pilot program. The pilot program lasts for two years, and major e-commerce and express delivery companies in China, as well as reusable packaging service providers, have participated in the pilot program.

The State Post Bureau has actively implemented the green transformation of packaging. After the successful implementation of the "9917" project for green packaging management in 2022, it proposed the "9218" project for green development in 2023. The "9218" project continues to promote the increase in the proportion of reusable packaging applications. One of the project's goals is to reach "1 billion express deliveries using reusable express packaging." This is an updated policy goal for reusable express packaging, following the targets set in 2020. This target uses express unit volume as a statistical indicator, which better reflects the number of reuse cycles and substitution rates, so as to facilitate the measurement of the performance of reusable express packaging when implemented.

GLOBAL REUSABLE EXPRESS PACKAGING MARKET

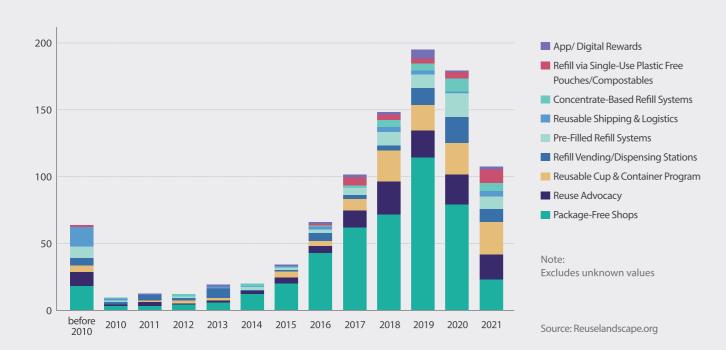
4.1 Current Trends in the Reusable Express Packaging Market

The report from the World Economic Forum suggests that the reuse model began to emerge globally from 2015. Driven by consumer demand for sustainability and regulations in some countries and regions, various startups have emerged. Such new models primarily manifest in North American and European markets, focusing mainly on zero-waste retail business. From 2015 to 2021, fundraising for the reuse model in the US, Canada, and European markets exceeded USD 1 billion³⁷. However, the reuse model remains significantly smaller compared to the single-use packaging model. For example, among the packaging of signatory

companies of the Ellen MacArthur Foundation's "New Plastics Economy Global Commitment," only 1.2% is reusable, and 42% of signatories have yet to introduce any reuse models into their packaging strategies³⁸.

In the realm of reusable shipping packaging, Reuselandscape.org's database has compiled 13 B2C reusable shipping projects and 33 B2B projects globally (excluding the Chinese market). Together, B2C and B2B reusable shipping projects account for 3.4% of all reusable packaging projects³⁹.

Figure 8: Reuse solution type by launch year



4.2 Business Cases of Reusable Express Packaging

Table 2: Business Cases of Overseas B2C Reusable Express Packaging

Company	Country	Specification	Applicable Products	Features	Return Methods
Repack	Finland	Box, Bag	Regular		Return to mailboxes available in Europe, California, Brazil, and Russia markets ⁴⁰
ReZip	Denmank	Box, Bag	Regular		Find drop points on Re-Zip APP (Denmark, UK) ⁴¹
Packoorang	Norway	Box, Bag	Regular		Returning points ⁴²
R-Creat	Romania	Box, Bag	Regular		Return to post office ⁴³
Livingpackets	France	Box, Tablet	High Value	Smart, 24/7 tracking, e-ink.	Use it for future delivery, or return to an applicable store 44 45
Opopop Colis	France	Bag	Regular		Return to mailboxes, or use it for returns ⁴⁶
Kickbag	Switzerland	Bag	Regular		Return to mailboxes ⁴⁷
Воох	USA	Вох	Regular		Over 40,000 returning points available for consumers to locate returning points by scanning codes on packaging
Returnity	USA	Box, Bag	Regular		Return Bar network (i.e. 700 existing Happy Returns bars in the US, with 15,000 Returnity reusable boxes in use ⁴⁸
Limeloop	USA	Box, Bag	Regular		Mailboxes
Liviri	USA	Cold Chain Box	Fresh Produce	Cold chain	Instore pick-up or delivery ^{49 50}





Introduction	Established in Finland, a reusable e-commerce packaging service provider, with foldable reusable bags as the main product.
Scale	Packaging Returnable in mailboxes in Europe, California, Brazil, and Russia, serving 50,000 global end-users
Operating Model	Serving e-commerce, rental, return, second hand goods recycling, pickup, etc. Consumers can scan the QR code on the packaging to obtain return point information and corresponding return rewards.
Features	Average reuse cycle of 20-40 times; 75% return rate. The longest-used reusable bag has been in use since 2015.
Impact Data	According to Repack's LCA study, the environmental impact of Repack reusable bags is better than that of reusable packaging starting from the second use. After 20 reuse cycles, Repack reusable bags reduce 80% of CO_2 emissions compared to single-use cardboard packaging and effectively reduce waste generation.
Economic Viability	If a single-use packaging costs 0.7 euros and a Repack reusable packaging costs 3 euros, for a brand with an annual parcel volume of 30,000 orders and a 30% return rate, the brand can save 4,100 euros in packaging costs per year by using Repack.

Boox ₭

Introduction	A reusable e-commerce packaging service startup launched in California in 2019.
Scale	Available in the United States, Canada, and the United Kingdom, with an expected deployment of 5 million reusable boxes by 2023.
Operating Model	There are over 40,000 return points available in the United States, Canada, and the United Kingdom. In the Canadian market, return is facilitated through ReturnBear, the first packaging reverse logistics service provider in Canada ⁵¹ .
Features	
Impact Data	Average reuse cycle is 12 times, with an 85% return rate. According to Boox's LCA study, the scale application of Boox reusable packaging reduces environmental impact by 70% compared to single-use packaging ⁵² .
Economic Viability	

Liviri

Introduction	A service provider in the United States specializing in fresh produce cold chain reusable boxes.
Scale	
Operating Model	Customers pick up fresh products in-store; or after delivery, consumers use the pre-equipped shipping label inside the box to return it via FedEx or other couriers to Liviri for sorting and cleaning.
Features	Insulation performance
Impact Data	
Economic Viability	

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Introduction	A French company specializing in high-end, intelligent reusable courier boxes.
Scale	
Operating Model	Operate under a Packaging-as-a-Service model: Users purchase the reusable box, and each time the box is used, the usage fee goes into that user's account.
Features	Employ a comprehensive monitoring system for the reusable boxes, which monitors internal temperature, pressure, impact, weight, etc., in real-time. Utilizing e-ink technology, it is mainly used for high-value and fragile products such as electronics, luxury goods, pharmaceuticals, etc., to prevent damage or theft.
Impact Data	
Economic Viability	Users purchase the Livingpackets reusable box for 399 euros, and with each use of the box, they earn income. After 8 years, the cumulative income ranges from 800 to 1,920 euros.



From an operational perspective, many countries employ the practice of returning reusable bags through postal mailboxes, considered one of the most scalable and well-established models in use today. The returning of reusable boxes mainly relies on returning points established by reusable packaging service providers or relies on retail stores for packaging return in scenarios where consumers pick up instore.

Currently, most overseas reusable express

packaging businesses are relatively young

startups, primarily concentrated in Europe

and North America. Apart from a few companies that have achieved relatively stable business scales and generated

initial operational and impact data, most startups are still in the stage of research

and development, experimenting with

new models, and seeking new users. These

companies have not yet disclosed detailed

business, economic, and environmental

data.

From the perspective of usage scenarios and user clients, many businesses users of reusable courier packaging are in vertical e-commerce sectors with a stronger environmental brand identity, such as some maternity and baby products, outdoor products, and sports brands. The types of business users and scenarios of use can be divided into:



Subscription-based e-commerce, such as subscription-based clothing and flower e-commerce platforms



Rental and sharing service platforms, such as clothing rental and toy rental



Returns (old goods recycling)



Pickup

Returns

E-commerce return rates, especially in the fashion industry, are very high, prompting the emergence of specialized service providers that focus on offering return management services tailored for e-commerce platforms, such as Happy Returns (a US company acquired by PayPal), Amazon's Return Provider (RP) Program, and ReturnBear (Canada), among others. These service providers have developed a robust reverse logistics system, which aligns closely with the requirements of reusable courier packaging. Consequently, it's logical for reusable express packaging companies to actively seek partnerships and collaborations with these service providers.

Click and Collect

Another application model for reusable express packaging in e-commerce is "buy online, pick up in store" (Click and Collect), such as the collaboration between Repack and Canadian Decathlon. The Click and Collect model, or BOPIS (Buy online, pick up in store) model, refers to the mode where consumers order online and pick up the goods at the store or other pickup points. In 2020, this model experienced explosive growth in the United States, accounting for 9% of total e-commerce sales, with a slight increase forecasted to 11% by 2024⁵³. With this model, retailers replace single-use packaging, which was originally provided to consumers either for a fee or free of charge, with reusable packaging. Consumers bring their own packaging to pick up goods ordered online without any additional burden. Meanwhile, they can save the cost of disposable packaging and enjoy a more environmentally friendly and sustainable experience. In this scenario, after consumers pick up the goods at the store, the reusable packaging can either be reused directly by the store for the next use, or the packaging only needs to be returned from the pickup point to the store through reverse logistics, thereby eliminating the step of consumers to return the packaging.

REUSABLE EXPRESS PACKAGING APPLICATION IN CHINA

5.1 Current Development Status of Reusable Express Packaging

Under a series of policy guidelines on plastic reduction and green transformation of express packaging in the country, China has witnessed numerous business innovations. Major e-commerce and express delivery companies in China have also been actively exploring reusable packaging. In 2020, the "Notice on Accelerating the Green Transformation of Courier Packaging" proposed that the scale of application of reusable express packaging should reach 10 million by 2025. According to data released by the State Post Bureau in 2023, China has already deployed nearly 15 million reusable express delivery boxes.

Based on the data published by major e-commerce and express delivery companies, there is still a significant gap between the application scale and the target of 1 billion parcels set by the State Post Bureau. There is a considerable difference in the level of investment in reusable express packaging among different companies in the e-commerce and express delivery sectors. JD Logistics and SF Express, in particular, have made substantial investments in reusable express packaging, demonstrating prolonged operational commitment and consistent exploration of large-scale applications. JD Logistics, notably within the cold chain sector, has attained considerable scale and is among the most prominent providers of reusable boxes that consumers are likely to encounter. SF Express, leveraging its independently

developed reusable boxes, has also achieved a relatively stable and sustained level of application scale. Apart from JD Logistics and SF Express, other notable players in the realm of reusable packaging include China Post, Suning, and others. However, companies like Cainiao have made comparatively fewer investments in reusable packaging initiatives.

From the perspective of the operational model of reusable packaging services, the self-operated model stands out as the primary operational framework, exemplified by companies like JD Logistics and SF Express. This model leverages the company's internal logistics network, ensuring complete control over the delivery and return process. Upon reaching the customer, the courier either collects the reusable packaging face-to-face or temporarily stores it at the customer's location for subsequent retrieval. Subsequently, the courier returns the packaging to the delivery station, from where it is transported to designated collection points managed by the logistics company. At this stage, reusable packaging is sorted and handled accordingly. Packaging deemed suitable for reuse is redirected to storage centers to initiate the next cycle, while items unfit for reuse are returned to the packaging service provider for recycling, transforming them into raw materials for further manufacturing and processing.



Table 3-1: Application of Reusable Express Packaging in China

Company	Application	Impact
SF Express	SF Express Group has independently developed reusable packaging boxes, evolving from the initial Feng-BOX to the current π -box. The reusable boxes are made of recyclable single-material PP honeycomb panels, featuring magic stickers and eliminating the need for disposable consumables like tapes. By the end of 2022, the cumulative deployment of the " π -Box" has reached 1.25 million, covering over 170 cities nationwide, with a total of 17.98 million cycles of reuse achieved.	In 2022, the reusable boxes were reused over 32 million times, reducing carbon emissions by approximately 13,000 tons.
JD Logistics	By the end of 2022, JD Logitstics' reusable courier packaging had been deployed cumulatively over 220 million times. JD Logistics primarily deploys two types of B2C reusable packaging: reusable insulated boxes for fresh produce and regular reusable Green Boxes. The reusable boxes are collected, sorted, and reused through JD's own logistics network until they are returned to JD's warehouses for reuse. It is projected that by the end of 2023, JD Logistics will have deployed a total of 2 million units of reusable packaging nationwide on a regular basis.	JD's reusable thermal insulation boxes have been regularly deployed in 18 cities with a total of 700,000 units, accumulating over 200 million cycles and reducing the use of single-use foam boxes by 200 million units. The reusable Green Boxes have been regularly deployed in 30 cities with 200,000 units, accumulating 20 million cycles.
China Post	As of September 2022, China Post has deployed over 1 million reusable boxes nationwide.	No public information available
Suning.com	The cumulative deployment of reusable boxes has reached 400,000 units, with a total use cycles exceeding 150 million.	The saved tape could circle the Earth 9.35 times, saving over 6,000 tons of carbon emissions.
NetEase	As of December 31, 2022, the reusable boxes have been reused approximately 193,000 times.	No public information available
Vipshop	Deployed 12,800 reusable boxes, each of which can be reused at least 50 times, resulted in saving 640,000 cardboard boxes in 2021.	No public information available
J&T Express	As of September 2022, over 27,000 reusable RedBoxes have been deployed in Beijing, Shanghai, Hainan, Fujian, Henan, Hunan, Shanxi, Qinghai, Gansu, and Heilongjiang.	No public information available
YTO Express	In 2021, over 10,000 new reusable boxes were deployed.	No public information available

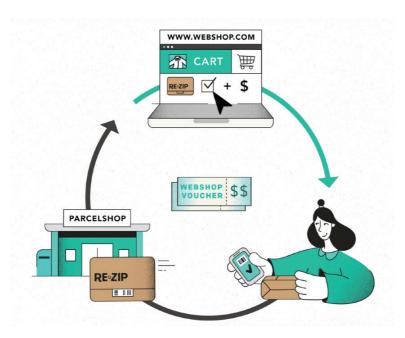
Source: 2022 SF Holding Sustainable Development Report; JD Logistics 2022 Environmental, Social, and Governance Report; China Post website ⁵⁴; Suning Logistics ⁵⁵; NetEase 2022 Environmental, Social, and Governance Report; Caixun website ⁵⁶; YTO Express 2021 Annual Report

Table 3-2: Business Cases of Reusable Express Packaging in China

Company	Specification	Applicable Products	Features	Return Methods
Huidu Environmental Technology	Box, Bag, Cold Chain	Regular, Fresh Produce		Corperate self-operated logistics
Zhilu Technology	Вох	Regular		Corperate self-operated logistics
Fuhai Box	Вох	High end products	Smart, digitalized, visualized, authorized opening	Corperate self-operated logistics
КР Вох	Вох	Regular, Cold Chain	Sharing and leasing income for users	Corperate self-operated logistics
SF Express	Вох	Regular		Corperate self-operated logistics

The typical operational process of overseas reusable express packaging business models, using Denmark's Re-Zip as an example.

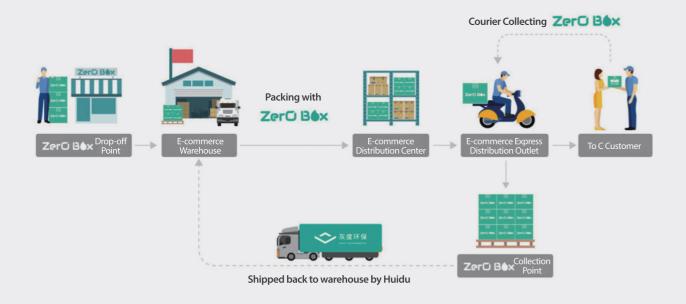
Users select reusable packaging when checking out on the e-commerce platform. After receiving the goods, they return the packaging to the returning point. The packaging is sorted and cleaned before returning to the logistics system for the next cycle of use. The packaging service provider is responsible for the operation of the entire system, including guiding and incentivizing consumers to return the packaging.



Source: Re-Zip.com

Reverse Logistics System

From face-to-face collection to a socialized reverse logistic collection system for reusable boxes



Source: Official website of Huidu Environmental

Presently, the return process for reusable packaging hinges on couriers for collection, with logistics firms primarily tasked with cleaning and reintegrating them into the next cycle. In parallel, Huidu Environmental Technology is actively exploring the creation of a "socialized reverse logistics system," intending to establish a network of return points where consumers can conveniently return reusable boxes.

Challenges and Opportunities in Reusable Express Packaging



Under the guidance of the China Post's Green Packaging Project and the investment from a few leading companies, a number of startups in reusable express packaging have emerged in China. These startups have formed commercial partnerships with large e-commerce and express delivery companies to jointly promote the application of reusable express packaging. However, the proportion of the reusable packaging in the overall express packaging application is still very small, and it is difficult for consumers to access reusable packaging. Its scalability still faces many challenges, including:

1 Cost Disadvantage

The most fundamental challenge in scaling reusable express packaging is the cost, as single-use packaging's price advantage significantly outweighs reusable options due to unaccounted external environmental and health costs. Apart from the initial investments on the durable, reusable packaging, there are also ongoing costs associated with the cleaning, maintenance and management of the logistic and reverse systems. Therefore, when countries introduce legislation against single-use plastics, in addition to direct bans, they also introduce systems such as Extended Producer Responsibility (EPR) and taxation on single-use plastics, so as to provide funding for the startup and development of reusable packaging models.

2 Challenges in Collection

For reusable packaging to realize its promised environmental and economic advantages, it must undergo a sufficient number of reuse cycles. Achieving this goal requires enhancing the rate of reuse, minimizing losses, and boosting the efficiency of circulation. At present, the collection of reusable packaging relies on express courier services which proves inefficient. On the other hand, consumers seldom return the packaging due to the lack of convenient collection points and the absence of clear instructions or incentives for doing so. Low return rates along with a high loss rate, drive up the overall costs and reduce the operational efficiency of the system, making it difficult to achieve commercial viability.

3 Consumer Participation is Low

On the one hand, the existing returning methods primarily involving courier collection significantly limit the opportunities to participate for the consumers. Even those consumers who are willing to participate lack channels and means to do so. On the other hand, shifting from single-use packaging to participating in a reusable packaging system requires a transformation in consumer attitude and behavior, which needs systematic support. Looking at cases from abroad, reusable packaging suppliers provide system plugins for e-commerce businesses, enabling the quick addition of reusable packaging options on

Renewable Energy Development Path

The cost of renewable energy has now reached competitiveness with that of fossil fuels. However, in its early stages when renewable energy was economically disadvantaged compared to traditional sources, government intervention played a crucial role. This intervention included investment in research and development, implementation of price reforms, and offering investment incentives such as tax reductions for clean energy while imposing taxes on high-carbon energy sources. These measures were pivotal in steering the energy structure towards cleaner and more sustainable directions.

Similarly, the development of reusable express packaging requires substantial initial investments from companies, covering expenses like packaging production, logistics, and operations. To facilitate this transition, governments must provide clear policy guidance to direct corporate investments and ensure regulatory certainty. Additionally, offering incentive measures such as tax incentives, special support funds, and preferential loans is essential to enable companies to sustain their investments in reusable packaging initiatives.

the checkout page. Consumers can then return the reusable packaging through the packaging supplier's system and receive incentives. However, domestic e-commerce platforms need to adapt their systems to offer reusable packaging options. When consumers opt for reusable packaging, thereby ensuring that the packaging inventory can meet the demand of consumers poses a significant challenge to inventory management too.

4 Low Standardization and Compatibility

Currently, companies piloting reusable express packaging are using their own standards, resulting in low packaging standardization and compatibility. This not only hinders the scalability of production to reduce costs but also poses a significant burden of sorting and stocking in the logistic process, thereby driving up operational costs and increasing the difficulty of sharing and utilizing reusable packaging among different enterprises.

5 Data Sharing and Security

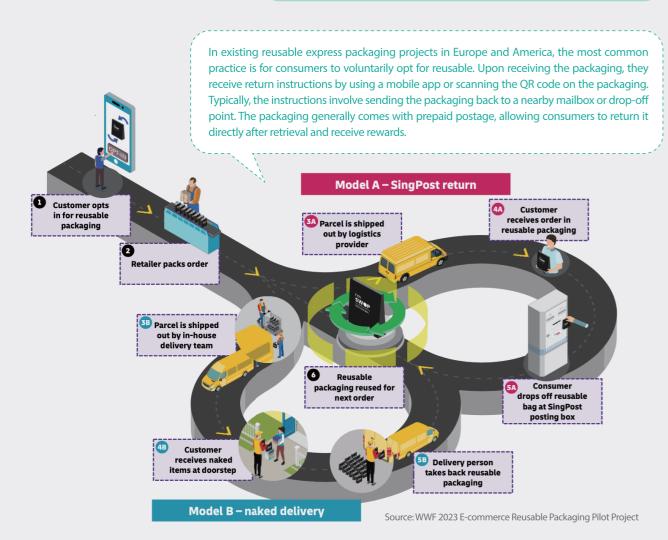
Efficiently tracking reusable packages throughout their lifecycle is essential to prevent loss, theft, or hoarding. The use of reusable packaging involves multiple different corporate entities, including merchants, e-commerce platforms, express delivery companies, and packaging service providers. However, data sharing between these different corporate entities is very challenging, leading to disruptions in the data chain.



Consumer Participation

A survey in Europe has revealed that about 75% of the consumers surveyed expressed support for replacing the current single-use cardboard boxes and plastic bags with reusable express packaging, and 70% of the respondents said they would be willing to pay a deposit of 2.5 euros for reusable packaging⁵⁷. In DHL's consumer survey, the use of circular packaging ranked second among consumer packaging concerns⁵⁸.

The World Wildlife Fund (WWF) has launched a pilot project for reusable express packaging in Singapore, where one-third of the consumers in 15,000 e-commerce orders chose reusable packaging. Most of the consumers who chose reusable packaging were driven by their own values towards sustainable consumption, and these consumers were not limited to those who purchase eco-friendly brands. Although incentive measures played a role in increasing the selection rate, they were not the key factor for consumers in selection of reusable packaging. In this project, the return rate of reusable packaging was approximately 50%. Among those who returned the packaging, 90% did so within a month, with an average of 16 days for return. Convenient return points (in this project, the mailboxes of the Singapore postal system) were more important than economic incentives, and the merchants' guidance and reminders to consumers for returns were also important in increasing the return rate and shortening the return time. In the survey for this project, three out of four interviewed consumers were willing to pay a deposit of 2 dollars or cover the cost of 5 cents for reusable express packaging⁵⁹.





Model Innovation

Currently, the applications of large-scale reusable express packaging in China mainly rely on the logistics systems operated by leading enterprises, with the reusable packaging circulating only within the internal logistic chains of these companies. At the same time, faceto-face collection by couriers is the primary method of returning the packaging. With the acceleration of life paces, the difficulty and time cost of face-to-face collection are also increasing. These factors restrict the efficiency and scale of reusable packaging. Academic research and studies by related institutions generally believe that a costeffective, sustainable model for reusable express packaging should be operated by a third-party platform (responsible for the collection, sorting, cleaning, storage, and reuse) and shared among companies. It is also observed that large-scale e-commerce reusable packaging in other countries and regions adopts this model, managed by reusable packaging startups responsible for the entire process from product development to collection and operation, with e-commerce or brands merely renting the products and services. In contrast, China's reusable packaging startups have yet to engage in the system service aspects after the rental or sale of their packaging products.

Creating a shared reverse logistics system necessitates overcoming corporate barriers and promoting cooperation and joint development. Achieving this goal requires more than the efforts of individual enterprises; it demands active support from government departments. This entails establishing a new platform system to facilitate the creation of an operational pool for reusable packaging. As stated in the Notice on Accelerating the Green Transformation of Express Delivery Packaging, city governments, in their promotion of policy goals in areas such as smart cities, low-carbon cities, and zero-waste cities, can also "plan and build a batch of express delivery co-distribution centers and reusable express packaging collection facilities." Furthermore, establishing a reusable system infrastructure requires multi-party participation in addition to government coordination and leadership in the initial phase. Some of the early explorations and experimental projects in other countries and regions are often initiated by non-profit organizations and the venture capital community, with the support and participation of e-commerce and courier companies. After gaining related experience and data and successfully operating for a period, such initiatives can evolve into economically viable commercial projects operated by enterprises.



Meituan Packaging Recycling

At its early stages, Meituan initiated pilot projects by setting up takeaway food container recycling points in some office buildings to collect meal boxes, which were then recycled into products such as mudguards for Mobike bicycles. Such early attempts were relatively experimental, small in scale, and lacked systematic and sustainable approaches. In recent years, Meituan has initiated recycling chain by bringing in third-party partners, with an aim to make the recycling of meal boxes more systematic and industrialized. By cooperating with local recycling facilities and recyclers (such as Aihuishou), meal boxes are collected as a new category of recyclable materials, making the process economically viable and sustainable. In collaboration with Aihuishou, Meituan has launched a meal box recycling project in Yangpu District, Shanghai, replacing and deploying smart recycling machines that include plastic meal box recycling categories. By the end of 2021, the daily average volume of meal box recycling had reached 3 tons per day 60 .

Although the recycling of takeaway food containers and reusable express packaging differ, both face a key constraint: the establishment of urban collection infrastructure, such as the allocation of land for collection facilities, transfer stations, and sorting centers. Therefore, from the perspective of building a reverse logistic system, practitioners from both industries can learn from each other. Whether it's takeaway plastic meal boxes or reusable express boxes/bags, a significant number of specialized collection facilities and sorting centers are needed. On one hand, governments should increase land planning for these purposes; on the other hand, they can make full use of existing recycling and sorting facilities, facilitate cooperation between different entities (such as sanitation and recycling companies), and provide financial support to businesses to help reduce collection and operational costs.

SUGGESTIONS FOR LARGE-SCALE APPLICATION OF REUSABLE EXPRESS PACKAGING



Implement national and local government incentive support policies for reusable express packaging

Given the fact that the Chinese government has already set clear goals and timelines for the application of reusable express packaging, it is crucial at this stage to implement corresponding support measures to assist enterprises in achieving such goals. National and local governments should accelerate the implementation of the many support and safeguard measures outlined in the *Notice on Accelerating the Green Transformation of Express Delivery Packaging*, assist businesses in reducing initial investment costs and correct the current price distortion between single-use packaging and reusable packaging.

- Explore the extended producer responsibility (EPR) system for express packaging. Use the funds collected from the EPR system for single-use express packaging to support the research, development and application of reusable packaging.
- Explore charging/levying taxes on single-use packaging and a deposit system for reusable packaging to make reusable packaging more economically attractive to consumers. By internalizing the external costs of single-use packaging, further improve the competitive advantage of reusable packaging over disposable packaging from a business perspective.
- By means of incentive policies such as the central budgetary investment, green credits, tax incentives, and government
 procurement, assist enterprises in purchasing and adopting reusable courier packaging and establishing corresponding
 collection infrastructure and logistic systems.

2 Government departments facilitate the construction of a shared reverse logistic infrastructure

Based on enhanced standardization and compatibility of reusable express packaging, the government should play a central role in coordinating related departments, institutions, and enterprises to establish a shared logistic infrastructure for reusable express packaging.

- Promptly introduce mandatory national standards for reusable express packaging, pushing for the standardization of reusable packaging, ensuring the compatibility while taking into consideration the needs of corporate brands.
- Remove barriers among different entities, so as to promote cooperation among waste management departments, professional recycling companies, and express delivery companies, and build a shared collection facility system among enterprises.
- Lead the coordination of data transmission between different corporate entities throughout the entire chain of
 reusable express packaging system, adopting technological means to facilitate data sharing between corporate entities
 while protecting data privacy.
- Increase land planning for recycling infrastructure, allocating land for recycling and collection facilities, transfer stations, and sorting centers. Develop special policies to fully mobilize resources of existing terminal outlets such as postal outlets, express delivery lockers, and distribution centers, and establish shared collection facilities.
- Incorporate the reuse packaging collection into the urban waste sorting and recycled resources recovery system construction initiatives of local governments.

Promote communication and joint construction among social stakeholders, enhance consumer awareness and participation

As an innovative and sustainable business model, reusable express packaging requires the participation and joint construction of multiple sectors of society in its early development, such as the government, enterprises, NGOs, the investment community, and consumers. It is necessary for government departments, associations, and other organizations to promote the communications between different stakeholders, to stimulate cooperation potential and bring about co-creation of value.

- Promote information sharing among enterprises and learn from leading practice cases both domestically and internationally. Enhance the communication and cooperation among enterprises throughout the industry chain, including e-commerce platforms, express delivery companies, reusable express packaging suppliers, brand owners, property service companies, etc.
- Encourage the participation of NGOs, enterprises, as well as the venture capital community in joint creation projects, to explore new models, and share experiences and outcomes.
- Integrate concepts of low-carbon and green consumption to promote awareness of reusable express packaging among consumers. Through consumer incentives, such as the exchange of carbon credit rights, increase consumers' acceptance and participation of reusable express packaging.

REFERENCE

- [1] People's Daily. (2022). In 2021, China's parcel volume accounted for over half of the global total: The economic vitality behind 108.3 billion express deliveries (in Chinese). https://www.gov.cn/xinwen/2022-01/18/content_5669008.htm
- [2] Morgan Stanley. (2022). Here's Why E-Commerce Growth Can Stay Stronger for Longer. https://www.morganstanley.com/ideas/global-ecommerce-growth-forecast-2022
- [3] Statista.https://www.statista.com/outlook/dmo/ecommerce/worldwide
- [4] China News Network. (2020). *Annual growth rate is 11.6%! "Thirteenth Five-Year Plan" period sees e-commerce emerge as a new engine for economic growth (in Chinese)*. https://finance.sina.com.cn/tech/2020-12-26/doc-iiznezxs9079498.shtml
- [5] Euromonitor International. (2023). *Outlook on Consumer Goods Retail Trends in China for 2023*. https://www.euromonitor.com/article/202 3%E4%B8%AD%E5%9B%BD%E6%B6%88%E8%B4%B9%E5%93%81%E9%9B%B6%E5%94%AE%E4%B8%9A%E8%B6%8B%E5%8A%BF%E5%B1%95%E6%9C%9B
- [6] Greenpeace. Plastic Free China. All-China Environment Federation. (2019) Research Report on the Characteristics and Management Status of Express Packaging Waste Generation in China (in Chinese). https://www.greenpeace.org.cn/chinas-express-delivery-sector-leaves-giant-waste-trail/
- [7] World Economic Forum. (2021). Platform Insight Report on the Future of Reusable Consumption Patterns: 'Shaping the Future of Consumption'.
- [8] European Commission. Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC
- [9] Global Plastics Policy Centre. (2023). *Making reuse a reality: A systems approach to tackling single-use plastic pollution*. Revolution Plastics, University of Portsmouth, UK.
- [10] Greenwood, S., Baird, H., Parsons, R., Walker, S., Neil, T., Slark, A., ... & Rothman, R. (2020, June). *Buy the product, but rent the packaging—Making reusable plastic packaging mainstream*. In Proceedings of the Plastics Research and Innovation Fund (PRIF) Conference, Sheffield, UK (pp. 8-9).; Ellen MacArthur Foundation.(2019). *Reuse rethinking packaging*.
- [11] Note: The reusable express packaging discussed in this report refers to reusable packaging in the business-to-consumer (B2C) model of e-commerce consumption. Reusable packaging at the enterprise end (B2B), including from suppliers to e-commerce company distribution centers, sorting centers, and business outlets, is not within the scope of this report.
- [12] Greenpeace. Plastic Free China. All-China Environment Federation. (2019) Research Report on the Characteristics and Management Status of Express Packaging Waste Generation in China (in Chinese). https://www.greenpeace.org.cn/chinas-express-delivery-sector-leaves-giant-waste-trail/
- [13] Ibid.
- [14] Ibid.
- [15] Sinopec. (2022). Research Report on the Carbon Emission Reduction Potential of Green Packaging in China's Express Delivery Industry from 2021 to 2030.
- [16] Peking University Institute of Energy. (2022). *Green and Low Carbon Development of The Plastic Industry in China (in Chinese)*. https://www.ccetp.cn/newsinfo/4697881.html
- [17] Plastic Europe. (2022). *Plastics the Facts 2022*. https://plasticseurope.org/wp-content/uploads/2023/03/PE-PLASTICS-THE-FACTS_FINAL_DIGITAL-1.pdf

- [18] UNEP. (2018). SINGLE-USE PLASTICS: A Roadmap for Sustainability. (Rev. ed., pp. vi; 6) https://www.unep.org/resources/report/single-use-plastics-roadmap-sustainability.
- [19] CIEL (Center for International Environmental Law). (2019). *Plastic & Climate: The Hidden Costs of a Plastic Planet (R/OL)*. https://www.ciel.org/plasticandclimate
- [20] Peking University Institute of Energy. (2022). *Green and Low Carbon Development of The Plastic Industry in China (in Chinese).* https://www.ccetp.cn/newsinfo/4697881.html
- [21] Ibid.
- [22] UNEP.(2018). SINGLE-USE PLASTICS: A Roadmap for Sustainability (Rev. ed., pp. vi; 6).
- [23] Prata, J. C., da Costa, J. P., Lopes, I., Duarte, A. C., & Rocha-Santos, T. (2020). *Environmental exposure to microplastics: An overview on possible human health effects*. Science of the total environment, 702, 134455.
- [24] People's Daily Online. (2018). *People's New Observation: How to Govern "Packaging Pollution" in Online Shopping (in Chinese)*. http://news. haiwainet.cn/n/2018/0123/c3541083-31242707.html
- [25] Rethink Plastic Alliance & Break Free from Plastic. (2021). *Realising Reuse The potential for scaling up reusable packaging, and policy recommendations.*
- [26] Zimmermann, T., & Bliklen, R. (2020). Single-use vs. reusable packaging in e-commerce: comparing carbon footprints and identifying breakeven points. GAIA-Ecological Perspectives for Science and Society, 29(3), 176-183.
- [27] Rethink Plastic Alliance & Break Free from Plastic.(2021). Realising Reuse The potential for scaling up reusable packaging, and policy recommendations.
- [28] United Nations Environment Programme. (2023). *Turning off the Tap. How the world can end plastic pollution and create a circular economy.* Nairobi
- [29] Ellen MacArthur Foundation. (2019). Reuse rethinking packaging.
- [30] Xu, Juan. (2020). Research on the Planning of Reverse Logistics System for Reusable Courier Boxes in E-commerce Self-operated Logistics Models (in Chinese). https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD202301&filename=1022721563.nh
- [31] High Ambition Coalition To End Plastic Pollution. *High Ambition Coalition Joint Ministerial Statement INC-2*. https://hactoendplasticpollution.org/high-ambition-coalition-joint-ministerial-statement-inc-2/
- [32] Legifrance. (2020). Law # 2020-105 of February 10 relating to the fight against waste and circular economy. https://www.legifrance. gouv.fr/jorf/id/JORFTEXT000041553759
- [33] Ellen MacArthur Foundation. UNEP. (2022). Government Insights. Published as part of Global Commitment Progress Report 2022.
- [34] RIS. (2023). Bundesrecht konsolidiert: Gesamte Rechtsvorschrift für Abfallwirtschaftsgesetz 2002, Fassung vom 23.08.2023. https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20002086
- [35] Ellen MacArthur Foundation. UNEP. (2022). Government Insights. Published as part of Global Commitment Progress Report 2022.
- [36] European Commission. (2022). Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC. COM/2022/677 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022PC0677
- [37] World Economic Forum.(2022). Unlocking the Plastics Circular Economy: Case Studies on Investment.
- [38] Ellen MacArthur Foundation. The Global Commitment 2022. https://ellenmacarthurfoundation.org/global-commitment-2022/overview
- [39] Living Landscape of Reusable Solutions. https://www.reuselandscape.org/charts
- [40] Repack website. https://www.repack.com/myrepack/
- [41] ReZip website. https://re-zip.com/

- [42] Packoorang website. https://www.packoorang.com/
- [43] R-Create website. https://r-create.ro/
- [44] Nick Summers.(2021). LivingPackets will trial its next-gen smart delivery parcels in France. https://www.engadget.com/livingpackets-the-box-replacement-cardboard-trial-boulanger-france-122237753.html
- [45] Björn Weber. (2020). *Casino's Cdiscount plans new trial with LivingPackets*. https://retail-optimiser.de/en/casinos-cdiscount-plans-new-trial-with-livingpackets/
- [46] Opopop Colis website. https://opopop.co/notre-offre/
- [47] Kickbag website. https://www.kickbag.ch/
- [48] Happy Returns website. https://happyreturns.com/press/return-bars-from-returnity-and-happy-returns-drop-off-points-using-reusable-packaging
- [49] Fort Collins. (2019). *Liviri Introduces Reusable Home Shipping Solution for Meal Kits, Perishables*. https://www.prnewswire.com/news-releases/liviri-introduces-reusable-home-shipping-solution-for-meal-kits-perishables-300824617.html#:~:text=After%20a%20 shipment%20is%20received,readied%20for%20its%20next%20journey.
- [50] Liviri website. https://liviri.com/2021/12/13/bell-and-howell-liviri-empowering-the-future-of-e-grocery-pickup/
- [51] Business Wire.(2023). Boox and ReturnBear Partner to Enable More Sustainable eCommerce Packaging in Canada. https://www.businesswire.com/news/home/20230620714680/en
- [52] Boox. (2020). Carbon Footpringting Methodology Disclosure. https://cdn.shopify.com/s/files/1/0485/9949/8919/files/Boox_LCA_Methodology.pdf?v=1636430706
- [53] Insider Intelligence. (2021). Click-and--Collect 2021: Buy Online, Pick-up In Store (BOPIS) Industry Trends. https://www.businessinsider.com/click-and-collect-industry-trends
- [54] China Post Website. (2022). *I am Green Action π China Post's Green Action Continues to Take New Steps (in Chinese).* http://www.chinapost.com.cn/html1/report/2211/3608-1.htm
- [55] Suning Logistics. (2021). Suning Easy Buy Logistics 'Green City Plan' Completes Its Assignment! Carbon Reduction of 56g per Single Package in 3 Years (in Chinese). https://mp.weixin.qq.com/s/Viwed3llmNKhhwNFVs8baQ
- [56] Caixun Online. (2022). *The Development of Green Express Delivery is Timely, and J&T Express Accelerates Across the Entire Chain (in Chinese)*. https://m.tech.china.com/tech/article/20221205/122022_1190563.html
- [57] Bovensiepen, G.; Fink, H.; Schnück, P.; Rumpff, S.; Raimund, S.(2018). Verpackungen im Fokus–Die Rolle von ircular Economy auf dem Weg zu mehr Nachhaltigkeit.
- [58] DHL. Rethinking Packaging. A DHL perspective on the future of packaging in the logistics industry.
- [59] WWF.(2023). Reusable E-commerce Packaging Pilot | Pilot Report.
- [60] People's Political Consultative Conference Newspaper. (2022). *How can plastic meal boxes be "turned from waste to treasure"*? http://dzb.rmzxb.com/rmzxbPaper/pc/con/202205/12/content_24472.html