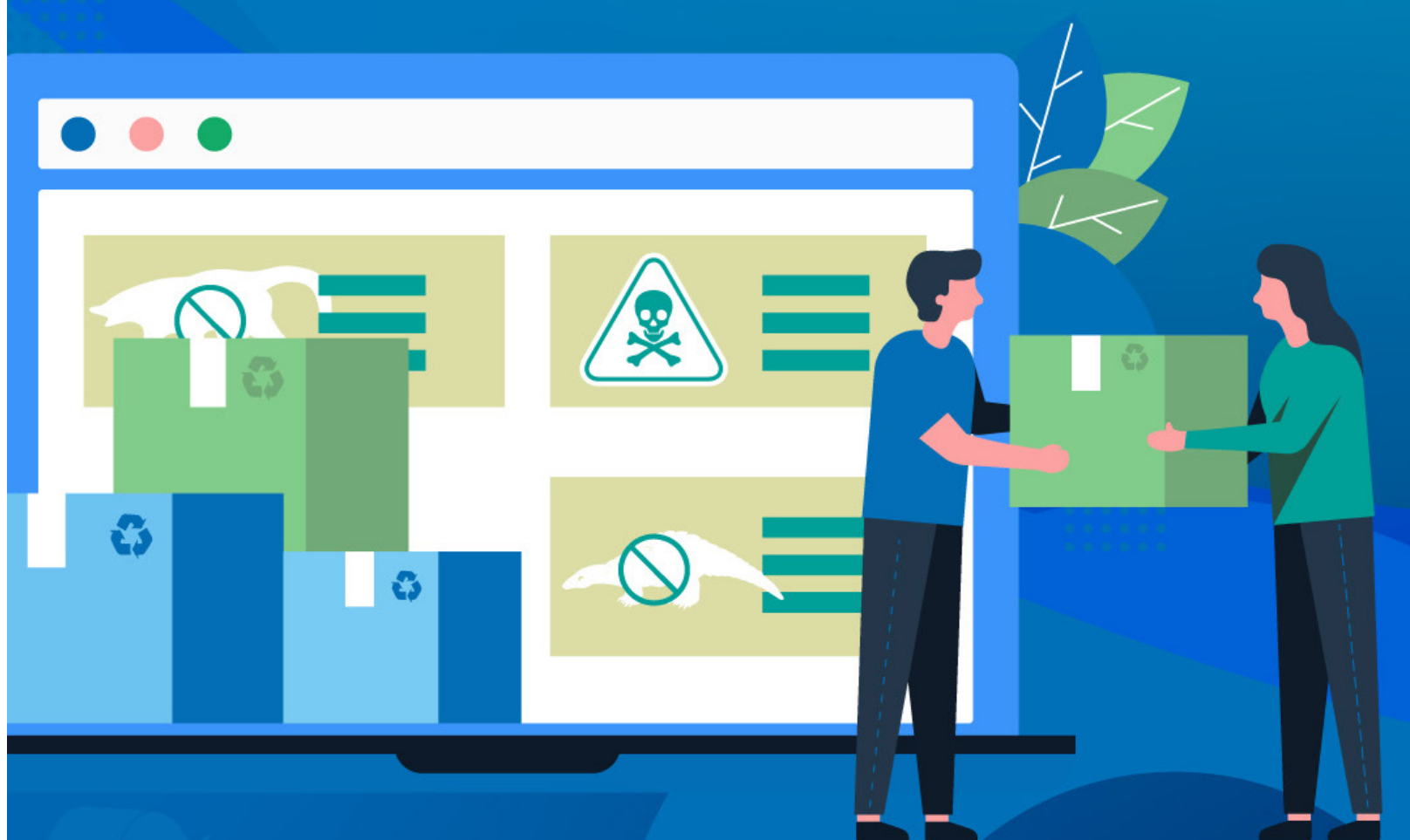


GREEN E-COMMERCE ACTION GUIDE

Addressing the Environmental Impacts of Retail E-commerce in China



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Green E-commerce Action Guide Addressing the Environmental Impacts of Retail E-commerce in China

Author

Yi Lan

Layout designer

DANCY BBM

Reviewers

Zhang Yue

Associate Professor, the College of Economics and Management, China Agricultural University

Guo Yi

Party Secretary and Professor, the School of International Economics and Management, Beijing Technology and Business University

Du Huanzheng, Director of the Ecological Conservation and Circular Economy Research Institute, Tongji University; Head of the Zhejiang Yangtze River Delta Circular Economy Technology Research Institute

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EXECUTIVE SUMMARY

The year 2022 is full of challenges, with the COVID-19 pandemic still profoundly affecting every aspect of production and life. The pandemic has inspired the public, policy makers and business leaders around the world to re-examine the relationship between economic development and environmental sustainability, and they have become more aware of the importance of building a community shared by humans and the other living beings of Nature. While the Chinese government is participating in international climate change and biodiversity governance, the business sector should also play a more active role in promoting the green transformation, helping China achieve its carbon peaking and neutrality goals, managing solid waste and new pollutants^[1], protecting biodiversity, among others.

As an important part of the national economy, the retail industry not just relates closely to consumption in daily life but plays an important role in stimulating consumption and promoting the execution of China's dual circulation strategy. As an emerging business model, online retail has accounted for a quarter of the total consumer spending in China and continues to grow amid COVID-19 outbreaks. China has been the world's largest online retail market for eight consecutive years, and is home to a number of highly influential e-commerce retailers. As one of the new drivers for economic growth, China's e-commerce retailers should also fulfil their primary responsibility for environmental

[1] New pollutants are chemicals or pollutant of emerging concern, which are not covered by existing management regimes and regulations. Major new pollutants identified include persistent organic pollutants; endocrine-disrupting chemical; antibiotics and microplastics.

governance, and have a positive influence on promoting environmental protection and sustainable development.

While retail e-commerce and food delivery companies are creating huge economic value, the environmental impacts of their business have gradually become prominent. These environmental impacts range from climate change, solid waste and plastic pollution, biodiversity destruction, to toxic pollution, and more. In the areas that have received the most attention at present, such as climate change and plastic pollution, e-commerce retailers have taken some green actions to varying degrees, such as energy conservation and emissions reduction from data centers, procurement of renewable energy, packaging reduction and recycling. However, these actions are basically scattered actions taken by individual companies on various issues, and generally lack target guidance, which makes it impossible to form an industrial scale **green transformation**.

For the e-commerce industry, the Notice on Promoting the Green Development of E-commerce Enterprises released by the Ministry of Commerce (MOFCOM) in January 2021 has put forward the requirements for its green transformation. Compared with other e-commerce fields such as life, trade, education and health, retail as the largest field by total value^[01], should play a leading role in the green transformation of the e-commerce industry. The green transformation of e-commerce retailers not only respond to policy requirements and reduce compliance risks, but gain better investment opportunities in the capital market. In fact, the COVID-19 has greatly stimulated the shift to ESG investing, or strategies that consider a company's environmental, social and governance performance. E-commerce retailers should improve their understanding of the scope of their environmental impacts, and develop corresponding goals and implementation plans, to mitigate physical and transition risks caused by external environmental risks such as climate change, and respond to the sustainable development requirements of investors and regulators.

The Report presents analysis of the environmental impacts of retail e-commerce in China, as well as recommendations on actions for each type of impacts incorporating relevant policy guidelines and industry best practices at home and abroad. The types of environmental impacts identified in the Report include climate change, solid waste and circular economy, chemicals management, biodiversity protection and sustainable food.

The Environmental Impacts of E-Commerce Retailers and Action Guide

Climate Change

Climate change is one of the biggest challenges of our time, and the physical risks of climate change have already affected industries such as e-commerce. Although the e-commerce industry is different from energy and pollution intensive industries, its carbon emissions and impact on climate change cannot be ignored given its rapid growth and continuous expansion. If calculated according to the current growth rate of the e-commerce industry, the emission increment of e-commerce during the "14th Five-Year Plan" period will account for 1/4 of the national increment. So far, e-commerce retailers have taken emission reduction measures such as introducing green data centers, electric logistics vehicles, packaging emission reduction programs, but their efforts are generally insufficient when it comes to carbon emission data accounting and disclosure, emission reduction target setting and action pathways.

The Report suggests that e-commerce retailers set carbon emission reduction and neutrality goals which extends from scope 1 to 3, starting from data centers, office buildings, logistics and transport, packaging and warehouse; and work out the pathways and timetables for emissions reduction. Scope 3 emissions represent the largest part of the overall carbon emission of the retail e-commerce sector, Chinese e-commerce retailers should undertake Scope 3 emissions calculation as soon as possible, which include carbon emissions from purchased goods and services, and engage suppliers to reduce emissions through the development of a supplier environmental and sustainability policies.

Solid Waste and Circular Economy Packaging Waste

The retail e-commerce model has brought about big challenges of packaging waste disposal, and the increase in waste generated by express packaging has become the primary source of the increase in domestic waste in medium and large cities. The packaging waste from e-commerce not only causes high carbon footprint, but brings high costs for domestic waste removal and treatment. Although corporates have made some efforts in packaging reduction and substitution in recent years, the overall achievement is limited in terms of scale and effectiveness. The Opinions on Further Strengthening the Treatment of Plastic Pollution released by the National Development and Reform Commission (NDRC) and the Ministry of Ecology and Environment (MEE) requires e-commerce, takeaway and other platform

companies to strengthen merchants management, formulate implementation plans to reduce and replace disposable plastic products, and disclose implementation progress. That said, most e-commerce retailers have yet to set environmental targets on packaging. According to a survey, none of the seven largest local e-commerce retailers have revealed any packaging reduction targets, and only JD Logistics, a subsidiary of JD Group, has proposed packaging reduction target.

The Report recommends that e-commerce retailers follow waste management priorities in packaging waste reduction actions. First minimize the generation of packaging waste, then explore and shift to business models and operations based on reusable packaging, and finally ensure that single-use packaging can be recovered where its use is inevitable. E-commerce retailers, including online delivery companies should set measurable packaging and emissions reduction targets as soon as possible. Develop a statistical evaluation system, and disclose packaging reduction and substitution plan. The e-commerce platforms should fulfil their responsibility for green development, make platform rules for green express packaging, and guide platform merchants and express delivery service providers to practice and transition to green packaging. Strengthen effective communication with consumers on green express packaging, actively guide consumers to choose green packaging and enhance consumer awareness and participation.

Chemicals Management

Chemicals are widely found in daily consumer goods. While consumers are increasingly shifting to online shopping, e-commerce platforms have unfortunately become haven for products containing toxic and harmful substances. Consumers and environmental groups have repeatedly found that platforms sell products containing toxic and harmful substance, among which are toys, stationery and other products sold to groups like children and students. At the same time, fresh food e-commerce retailers have also been involved in selling products containing pollutants that exceed national standards, such as pesticides, veterinary drugs, heavy metals, microorganisms and additives. Leading fresh food e-commerce platforms have repeatedly received fines from local market supervision departments. The residual toxic and harmful substances in foods pose health risks to consumers, while causing environmental pollution on the production side. E-commerce platforms that fail to fulfil the obligations of monitoring relevant merchants and of ensuring consumer safety and thus cause damage and harm to consumers shall be accordingly held responsible, according to the E-commerce Law of the People's Republic of China. Selling products containing toxic and harmful chemicals brings business risks to e-commerce companies and reduces corporate reputation and consumer confidence. Given the variety of chemicals, retail e-commerce platforms should develop a comprehensive chemicals management system for own-brand products and supplier products in a timely manner, and play the gatekeeper's role in urging upstream producers to ensure product safety.

The Report suggests that e-commerce retailers take a two-stage approach to chemicals management. In the first stage, make sure that the products sold on the platform meet relevant national standards. In the second stage, move beyond regulatory compliance by managing the chemicals that have not yet been covered by national standards but whose use needs to be banned or restricted, so as to better control corporate risks and protect consumers' rights and interests. In both stages, they can start from key/priority products and chemicals, develop corporate chemicals management policies and priority products and chemicals lists.

Biodiversity Protection

The rise of e-commerce has made illegal wildlife trade online more hidden and more difficult to track. Massive products and services that threaten biodiversity are found on e-commerce sites. In 2020, environmental protection organizations have reported hundreds of cases of wild animals, plants, products, and hunting tools sold on e-commerce platforms. As a result, relevant e-commerce or internet platforms blocked or removed over 10 million posts and listings of illegal wildlife and products. Platforms that tacitly allows merchants to sell illegal products that damage ecosystems and the environment may violate the E-commerce Law of the People's Republic of China, the Wildlife Protection Law of the People's Republic of China and/or other laws and regulations, and thus face risks of non-compliance and counters to China's ambition on biodiversity protection.

The Report recommends that e-commerce retailers develop internal governance mechanism in a timely manner to remove all wild animals/plants protected by national laws and regulations and their products, as well as medicines, tools, alien species and other products that damage biodiversity. Establish relevant reporting channels and a dynamic monitoring mechanism, and cooperate with law enforcement agencies to maintain an eco-friendly online environment.

Sustainable Food

The current global food system is unsustainable. Unhealthy diet poses health risks that include the coexistence of obesity and malnutrition, while the corresponding mode of production also exacerbates environmental problems such as climate change and biodiversity loss. Transitioning to a sustainable food system is crucial for promoting population health and alleviating climate change. As the Chinese government has committed to climate goals and to the low-carbon and green economic development, the sustainable food system transitioning will bring immense potential for emissions reduction and thus

provide opportunities for companies to achieve carbon goals. The transition involves many areas, of which direct emissions reductions from agriculture and livestock production, sustainable and healthy diet, and reduction of food loss and waste are key areas with potential to reduce emission.

As China has adopted law against food waste in 2021, e-commerce retailers, including takeaway platforms should fulfil their primary responsibility for environmental governance, taking initiatives to remind consumers to prevent food waste and providing means to assist them in so doing. The Implementation Plan for Promoting Green Consumption issued by the National Development and Reform Commission in 2022 also proposed to improve the green level of food consumption and guide consumers to towards a civilized and healthy food consumption habit. E-commerce retailers, including takeaway platforms can play an active role in the transformation of sustainable food systems by formulating sustainable food procurement policies, actively conducting consumer guidance and education, etc., so as to promote consumer health while contributing to the achievement of China' s climate goals.

Summary

The green development of retail e-commerce has become an urgent need at a time when China is actively participating international environmental governance, investors are paying growing attention to non-financial performance indicators such as corporate ESG, and consumers are more inclined to green consumption. Only by comprehensively examining the environmental impacts of companies and the industry, and setting environmental and sustainable development goals and implementation plans, can challenges be turned into opportunities for sustainable business growth.

The Report suggests that e-commerce retailers comprehensively identify their major environmental impacts as soon as possible, set environmental and sustainable development goals, set up teams/ departments to be responsible for the implementation and track and communicate progress. Retail e-commerce platform companies should actively assume the primary responsibility for environmental governance in the platform ecosystem, leverage their influence and resource aggregation capabilities, and trigger the green transformation of the value chain.

INTRODUCTION

China's e-commerce has experienced rapid development in the past two decades. By 2020, the online retail sales of physical goods accounted for about 1/4 of the total retail sales of consumer goods. Consumers have switched heavily to online shopping. The number of online shopping users in China reached 782 million, accounting for 79.1 percent of the total netizens^[02]. E-commerce has been fully integrated into all aspects of production and life in China, and has become an important driver of socioeconomic development. China's e-commerce industry is concentrated with large and influential companies, occupying four of the top five e-commerce companies by market capitalization in 2020^[03].

With the development of the online retail industry, its environmental externalities have gradually become prominent. From the pollution of logistics and transportation; waste of express delivery packaging, energy consumption of data centers, to toxic and harmful chemicals, food waste and biodiversity destruction, the environmental impacts of retail e-commerce have increased along with the expansion of the industry. These environmental impacts are not unique to Chinese retail e-commerce industry. In fact, many foreign e-commerce retailers have already mapped out their environmental impacts, and have established corporate sustainability strategies to address the impacts. Chinese e-commerce retailers is lagging behind in this regard, and urgently need to review their environmental impacts and set goals and targets for improvement.

The Chinese central government pledged in September 2020 to peak carbon emissions by 2030 and achieve carbon neutrality by 2060. China's participation in global climate governance reflects its responsibility as a major country, and the realization of the carbon peaking and neutrality goals requires a comprehensive low-carbon and green transformation of the national economy and society. Such a transformation requires the leadership of the government and efforts of multiple social entities including enterprises.

Regarding e-commerce sector, the E-commerce Development Program for the 14th Five-Year Plan Period points out that e-commerce companies should actively adapt to the requirements of green and low-carbon development, fulfil their corporate social responsibility for environmental protection, and

enhance green innovation. The Notice on Promoting the Green Development of E-commerce Companies issued by the Ministry of Commerce in 2021 specifies the requirements for the green development of e-commerce companies. This notice requires e-commerce platforms to have a strong sense of “primary responsibility” for environmental protection in areas like energy conservation and energy efficiency enhancement, green data centers, green express packaging, reducing and replacing single-use plastic products, expanding sales of green products, promoting consumer green consumption awareness, etc.

It is undeniable that Chinese e-commerce retailers have launched some actions on carbon emissions reduction or green transformation addressing different environmental issues in the past few years. Such actions include the advocacy on reducing single-use utensils by online delivery companies, e-commerce packaging reduction and the trial of reusable boxes; data center energy conservation and emissions reduction; the procurement of renewable energy, etc. However, these actions are basically scattered actions taken by individual companies on various issues, and generally lack target guidance, which makes it impossible to form an industrial scale green transformation. When facing climate change, resource extraction and biodiversity loss of our time, the lack of strategies and actions from e-commerce retailers is inadequate to the sustainable requirements and demands from national regulations, capital market and consumers.

The Report aims to provide a comprehensive assessment of the environmental impacts of e-commerce retailers, and offer action recommendations. Compared with other e-commerce fields such as life, trade, education and health, retail is the largest field by total value. Online food delivery companies have also attracted much attention due to the environmental impact of solid waste and disposable plastic packaging brought about by their business models. Therefore, the report also includes the environmental impacts of online food delivery into the study. As the fields with the strongest ties to everybody's daily life, retail and takeaway e-commerce business involves the production, distribution, consumption and disposal of countless goods, adding the complexities of their overall environmental impacts. With regard to the sustainable development of the retail e-commerce industry, in addition to government policies, laws and regulations, there are also ranking of the environmental action performance of leading e-commerce retailers by environmental groups^[04]. In the meantime, relevant industry associations, such as China Chain Store & Franchise Association (CCFA) have also released guidelines to guide companies including online shopping platforms to improve CSR management and enhance corporate environmental, social and governance capacities.

The Report presents analysis on the environmental impact of e-commerce retailers^[ii], offers corporate action recommendations for multiple environmental impact dimensions, by incorporating domestic and foreign policy trends and best practices. The report aims to help e-commerce retailers better respond to regulatory and investor requirements, enhance corporate environmental responsibility, and play a more active role in the country's low-carbon green transformation.

^[ii] The report focuses on the retail e-commerce sector, but also include online food delivery business sector. According to the classification of e-commerce business in the "2021 China Top 100 E-commerce List" released by the E-commerce Research Center of Netease.com, there are various types of e-commerce business in China including digital retail, digital life, digital trade, digital education, digital industry and digital health. Taking into account the scale and scope of environmental impacts of different sectors, the report also includes the takeaway business sector which falls into the digital life category when discussing environmental impacts of e-commerce retailers.

THE CASE FOR A GREEN RETAIL E-COMMERCE INDUSTRY

2.1 Meeting emerging Policy and Regulatory Requirements

The 18th National Congress of the Communist Party of China (CPC) incorporated ecological conservation into the country's overall development plan, sustainable development has become a national strategy. China has since not just actively participated in global climate change governance and pledged carbon peaking by 2030 and carbon neutrality by 2060, but introduced multiple national policies and regulations involving low carbon, biodiversity, solid waste pollution, new pollutants and circular economy, which strengthened compliance requirements for corporates.

Regarding the e-commerce industry, in addition to the legal constraints such as the E-commerce Law of the People's Republic of China, there are also policy guidelines for greening of the e-commerce sector. The Notice on Promoting the Green Development of E-commerce Enterprises requires e-commerce platforms to have a strong sense of responsibility for environmental protection. The notice involves energy conservation and low-carbon development; green packaging and green consumption, and requires e-commerce platforms to report the progress of relevant work.

At the core of the platform ecosystem, retail e-commerce platform companies have strong data and resources aggregation capabilities and technological innovation capacities. They have a unique ecological position in the value chain,

enjoy “platform power” and assume pivotal functions. Accordingly, they should also play a leading role in the multi-stakeholder environment governance and drive wider and synergized environmental actions.

Various national policies and regulations emphasized the unique role of e-commerce companies in the environment multilevel co-governance system. The E-commerce Development Program for the 14th Five-Year Plan Period, for example, requires e-commerce platforms to fulfil their “primary responsibility for green management”. The retail e-commerce platforms link the supply side and the consumer side. In the process of fulfilling green management responsibilities, the platforms can, on the one hand, convey environmental compliance and green/low-carbon development requirements to the supply side by formulating platform rules; on the other hand, they can stimulate and guide the consumer side to choose green products and sustainable lifestyles. Leveraging their extensive influence on stakeholders along the value chain, the retail e-commerce platforms have immense potential to contribute to the synergy of environmental governance actions.

2.2 Improving Corporate Governance and Increasing Investors' Confidence

As environmental challenges such as global climate change, biodiversity loss and resource extraction intensify, policymakers, regulators, investors, and other stakeholders are increasingly concerned about corporate non-financial performance and sustainability strategies. Environmental risks, such as climate change, have begun to pose physical risks to businesses. The frequency of disruptions in the production and transportation of products and services due to environmental disasters has increased by 29 percent since 2012, according to the Global Risks Report 2019 published by the World Economic Forum (WEF)^[05]. In recent years, ESG investing that takes into account environmental, social and governance factors alongside financial factors, has rapidly grown into mainstream among the international investment community, and the COVID-19 pandemic has made the importance of ESG even more prominent. According to the 2021 Global Institutional Investor Survey released by MSCI, in response to the pandemic, 90 percent of investors in large institutions with assets of more than \$200 billion said they would increase their ESG investing, and 55 percent of investors said it would "substantially" increase investing in ESG. This survey covered 200 asset owners owning assets of around US\$18 trillion. Many investors recognized that companies with good ESG practices performed better during the pandemic^[06].

At present, governments and stock exchanges around the world are actively promoting ESG information disclosure. China Securities Regulatory Commission (CSRC) has also established the basic framework of ESG information disclosure in the revision of the Code of Corporate Governance for Listed Companies. In China, mandatory and voluntary ESG reporting coexist. According to a report jointly compiled by the World Economic Forum and PricewaterhouseCoopers, as of mid-2020, a total of 1,021 Chinese listed companies have released ESG reports, of which about 130 companies are listed in Hong Kong, as it is mandatory to publish ESG reports for listed companies in Hong Kong^[07].

Environmental risks such as climate change are priority ESG issues facing investors. It is essential for companies to fully identify the types of environmental impacts of their business and establish effective corporate strategies and implementation plan to address them.

2.3 Responding to Consumer Demand for Green Products and Services

Consumers are important participants in the construction of ecological civilization. Consumers' expectations for corporate social responsibility and environmental performance are constantly rising^[08]. Not only do consumers show higher awareness and willingness to buy sustainable goods, but consumers' willingness to pay a premium is also on the rise. Consumer consumption of sustainable products has continued to grow rapidly since the COVID-19 pandemic. According to a 2021 report by New York University Stern Center for Sustainable Business, sustainability-marketed products delivered 54.7 percent of the consumer packaged goods market growth from 2015 to 2019, and they grew seven times faster than products not marketed as sustainable^[09]. In China, SynTao and Jiemian have co-released the China Sustainable Consumption Report for six consecutive years. The report shows that Chinese consumers' attention to corporate social responsibility has increased rapidly, from 21 percent in 2017 to 52 percent in 2019. At the same time, the significance of price factors on consumers' sustainable consumption is also decreasing^[10].

However, there are pervasive gaps between consumer attitude and behaviour. The Chinese public have generally recognized the importance of personal behavior to environmental protection, but they have yet to take sufficient actions in many areas such as green consumption despite

high awareness, according to the Citizens' Environmental Behavior Survey (2019) published by the Ministry of Ecology and Environment and the Policy Research Center for Environment and Economy (PRCEE). The barrier to consumers' green consumption choices includes the limited availability of sustainable products, the lack of suitable purchasing channels, and the lack of sufficient sales support^[11]. E-commerce retailers can play a more active role in facilitating green consumption. The National Development and Reform Commission has made clear in the Implementation Plan for Promoting Green Consumption that it is necessary to urge e-commerce platforms to set up green and low-carbon product sections and offer consumers incentives for green consumption.

In fact, studies have proven that if e-commerce platforms provide more effective consumer communication and incentives, consumers' green choices and behaviour can be facilitated and improved. Zalando Group, for example, introduced sustainability filters and flag system, products are highlighted when they fulfill one or more sustainability criteria. This move alone has effectively increased the proportion of consumers choosing (at least one) sustainable product from 18 percent at the beginning of 2020 to 50 percent by the end of the year. With regard to packaging and shipping, a study based in Europe researched the possibilities of influencing decisions that

online consumers make, with respect to the time and place of the delivery. The research shows that if consumers are provided information on the CO₂ impact of different delivery options such as same-day, next-day or delivery at collection point; doubled with the pre-selection of the most sustainable option, the observed behavioural effect is substantial. The most sustainable delivery method was chosen almost four times more often than in the case of no intervention ^[12].

E-commerce platforms can leverage their technological advantages to take active interventions to facilitate green consumption, such as increasing the supply of sustainable products, offering environmental impact information for products and packaging, and providing incentives to promote green consumption. These measures not only respond to consumers' expectations and enhance consumer loyalty, but also fuel the production of green products and packaging from the supply side.



THE ENVIRONMENTAL IMPACTS OF THE RETAIL E-COMMERCE INDUSTRY AND ACTION GUIDE

With the rapid growth of the platform economy, as well as a growing number of retailers accelerating their digitalization process, online retail is making up an increasing share of the overall retail sector, and has shown strong resilience and competitiveness amid the impact of the COVID-19 pandemic. In 2020, global online retail accounted for 19 percent of the overall retail sales^[13]. In 2021, China's online retail sales of physical goods reached 10.8042 trillion, an increase of 12 percent over 2020, accounting for 24.5 percent of the total retail sales of social consumer goods^[14]. Household consumption is the primary cause of environmental impacts such as carbon emissions, land use change, natural resources extraction and biodiversity loss^[15]. As a prominent functional hub of the retail sector, online retailers' efforts in reducing the industry's overall environmental impacts would be of great significance to combating climate change and protecting the environment.

Although the e-commerce industry has only shown strong growth momentum in the past ten years, research on its environmental impacts dates back to a few decades ago. Because of the characteristics of “dematerialization” of e-commerce, there were high expectations for its positive environmental impact in reducing the operational and

warehousing energy and resource consumption, reducing shopping travels and promoting reuse and sharing, etc.^{[16][17]} The comparison of the environmental impact of online and offline shopping also tends to draw the conclusion that the environmental impact of the e-commerce model is smaller^[18]. A 2020 study based on eight European countries, for example, also showed that offline shopping generated 1.5 to 2.9 times more GHG emissions than online shopping^[19]. But a growing number of studies also start to show the other side of the story. In addition to waste disposal and single-use plastic pollution caused by online food delivery and e-commerce express packaging, issues like the energy consumption

and carbon emissions from data centers are also becoming increasingly prominent. Due to the complexity of retail e-commerce business and supply chain, its environmental impact does not stop there. It is not uncommon for products containing toxic and harmful substances and illegal wildlife products to be sold on the platforms. A green retail e-commerce industry must confront all the environmental issues associated with its business.

Currently there is no fixed classification framework for the multiple environmental impacts of e-commerce retailers. This report will combine the mainstream corporate social responsibility information disclosure guidelines, ESG environmental information disclosure guidelines, relevant media reports and institutional reports, and sustainability reports published by e-commerce companies, etc., in order to map out the environmental impacts of retail e-commerce industry (including online food delivery platforms), and propose recommendations on strategies and actions specific to each issue.

GRI Sustainability Reporting Standards -- the Environmental Aspect

- Materials
- Energy
- Water and Effluents
- Biodiversity
- Emissions
- Waste
- Supplier environmental assessment

Sustainability Accounting Standards Board (SASB) Standards -- the Environmental Aspect of the E-commerce Industry

- Hardware, infrastructure, energy & water management
- Product packaging & distribution

HKEX ESG Reporting Guide -- the Environmental Aspect

- Emissions
- Use of resources
- The environment and natural resources (biodiversity)
- Climate change

Guidance on Corporate Social Responsibility Management for Chain Stores & E-Commerce Platforms -- the Environmental Aspect of the List of Substantive CSR Issues

- Energy & carbon emissions management
- Resources management
- Waste management
- Environmental compliance

According to a report released by Greenpeace in 2021, the retail e-commerce business has brought or magnified the following environmental problems: climate change and carbon emissions, solid waste pollution, destruction of biodiversity, sale of toxic and hazardous substances, food safety and food waste^[20]. The rapid development of retail e-commerce and food delivery in China has brought substantial environmental burdens. Similarly, foreign e-commerce retailers are also under scrutiny for the negative environmental impacts. Therefore, key e-commerce companies have identified their environmental impacts in their ESG or sustainability reports, which includes climate and energy, solid waste and circular economy, food waste, chemicals, sustainable products (responsible sourcing), etc^[iii].

Combining the environment aspects of mainstream corporate social responsibility classification, the already reported environmental impacts of the e-commerce sector, and the environmental issues that have been identified by foreign e-commerce retailers, this report categorizes the environmental issues involved in the greening of the e-commerce industry as follows:



Climate
change



Solid waste and
circular economy



Chemicals
management



Biodiversity
protection



Sustainable
food

[iii] Amazon Sustainability 2020 Report; eBay Impact 2020 Report; Rukuten Sustainability Environment; Walmart Environmental, Social and Governance FY 2021 Summary; OTTO Annual Report 2020/21; 2021 Target Corporate Responsibility Report; ASOS Fashion With Integrity. Our 2030 Strategy.

3.1 Climate Change

Climate change is one of the most pressing environmental problems facing mankind, and its physical risks have already affected industries such as e-commerce. Regulators, investors and consumers are taking initiatives towards a low-carbon transition. In September 2020, China announced the goals of carbon peaking by 2030 and carbon neutrality by 2060. In 2021, China released the Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy. The successive launch of this top-level design document and policies and guiding opinions in various fields reflect China's commitment and responsibility as a major country in global climate governance. As the world's largest retail e-commerce (B2C) market, China's e-commerce retailers should also assume the corresponding responsibility and leadership in the global actions to combat climate change. However, China's retail e-commerce industry started relatively late in climate actions, with insufficient accounting and disclosure of carbon emission data plus a lack of corresponding emission reduction goals/targets and action pathways.

According to ESG data from MIOTECH, China's mainstream retail e-commerce companies, including Alibaba and Pinduoduo, have taken various actions to manage greenhouse gas emissions, but generally lack corporate strategic focus on climate risks and opportunities.

ESG Scores of Some Listed E-commerce Platform Companies

	2022Q1 Overall ESG Performance	Environment (E)	Energy Consumption (Level II Topic-)	GHG Emissions (Level II Topic-E)	Environmental Management (Level II Topic-)	Climate Change (Level II Topic-E)	Waste (Level II Topic-E)	Social (S)	Product Responsibility (Level II Topic-)	Governance (G)
Alibaba	42	30	5	79	32	0	50	38	51	49
JD.com	51	33	35	38	36	8	39	55	51	51
Pinduoduo	29	5	0	0	52	0	22	32	35	36
Xiaomi	62	60	76	53	56	8	80	64	69	62
Suning.Com	49	46	51	39	73	0	43	54	57	42
Vipshop	64	52	47	56	82	0	48	78	58	48
NetEase	65	64	67	83	60	0	100	62	83	69
Meituan	51	40	32	61	54	0	50	49	74	56
Kuashou	56	47	55	27	53	0	100	61	68	54
GOME Retail	60	43	55	76	29	0	52	74	89	60
China Youzan	72	68	72	67	67	0	100	78	92	69
Weimob	68	67	70	86	85	0	50	64	81	73

Although e-commerce companies are different from energy intensive and polluting industries, their carbon emissions and climate impacts cannot be ignored given the its rapid growth and continuous expansion. The total carbon emissions of Chinese e-commerce enterprises in 2019 were 53.26 million tons, or 2.5 percent of the total emissions of the tertiary sector that year, according to the Research Report on Total Greenhouse Gas Emissions of Chinese E-commerce Companies published by the local carbon emissions management platform Carbonstop. Moreover, the total carbon emissions of

e-commerce will continue to grow rapidly in the next five years, as it is expected to reach 116 million tons in 2025, with a growth rate of 73 percent. Given that other industries are stepping up efforts in low-carbon transformation, the emission increment from the e-commerce industry during the 14th Five-Year Plan period will account for a fourth of the national increment, if the industry continues its current path^[21]. E-commerce is a new economic model driven by technological innovation, its lagging behind in decarbonization is apparently inconsistent with its industrial characteristics.

At the corporate level, it is necessary to pay attention to the **value chain (Scope 3)** emissions in addition to scopes 1 and 2 carbon emissions owned or controlled by e-commerce retailers. At the core of the platform ecosystem, e-commerce platforms should also fulfil its environmental responsibility for this ecosystem, and should exert its influence and innovative ability to trigger emission reduction actions and positive changes across the value chain (Scope 3). The Notice on Promoting the Green Development of E-commerce Enterprises also proposes to leverage e-commerce platforms' advantages to create a green development-oriented ecosystem, and to make sure that they are fulfilling their responsibility for green management. Their responsibility should be expanded to cover merchants within their respective ecosystems, according to this notice.

So far, local e-commerce companies such as Alibaba and JD Logistics have already set their Scope 3 carbon emissions reduction targets, while leading e-commerce companies outside China, including Amazon, Target, Zalando, ASOS and others, have disclosed data on their Scope3 carbon emissions, and to some extent, included the scope 3 carbon emission into the overall carbon emissions reduction goals.

3.1.1 Data Centers' Energy Consumption and Greenhouse Gas Emissions

The energy consumption of China-based data centers in 2020 was about 150.7 billion kWh, equivalent to about 94.85 million tons of CO₂ emissions, according to Greenpeace and CEPREI. It is expected that by 2035 China data centers' energy consumption will be about 450.5 - 485.5 billion kWh, equivalent to about 150.47 - 192.74 million tons of CO₂ emissions^[22]. The Notice on Promoting the Green Development of E-commerce Enterprises also requires e-commerce companies to reduce the carbon emissions of their data centers, build green data centers and improve energy efficiency.

Currently, the carbon emissions of e-commerce companies are distributed in logistics, offices, data centers, packaging and warehouses, according to assessment by Carbonstop. Logistics, in particular, now holds the largest share, or 29 percent, of the total carbon emissions; data centers, 23 percent. Data centers are the "brain" of retail e-commerce business, and e-commerce platforms' demand for them will keep growing as consumers increasingly rely on online shopping. Data centers' energy consumption and GHG emissions will continue to rise as long as fossil fuel is the primary energy supply. Without intervention, the proportion of emissions from e-commerce data centers will increase from 23 percent in

2019 to 30 percent in 2025, surpassing logistics as the largest source of GHG emissions in the e-commerce industry^[23]. Reducing emissions from data centers is therefore crucial to cutting the overall emissions of e-commerce companies.

Construction of green datacenters rely on changing the energy mix by adopting renewable energy, and increasing energy efficiency for energy conservation. Globally, information and communication technology (ICT) companies account for about half of the renewable energy purchased by all companies. By contrast, China's data center industry has yet to purchase significant amount of renewable electricity. In 2018, for example, the proportion of renewable energy in the energy consumption of data centers was 23 percent, which was even lower than its proportion in municipal electricity consumption (26.5 percent)^[24]. The status of renewable energy procurement by data centers of China's e-commerce retailers remains unclear. But according to a survey on China's leading e-commerce retailers, their renewable energy consumption is limited. According to incomplete statistics, in 2020, the electricity consumption of renewable energy disclosed by Alibaba and Vipshop exceeded 30 million kWh^[25]. By contrast, Alibaba Cloud servers alone consumed over 400 million kWh of electricity that year^[26]. There is still much room for data centers of e-commerce retailers to significantly increase renewable energy purchases.

- Ebay joined RE100 initiative and committed to 100% renewable energy for its data centers and office buildings by 2025.
- Alibaba pledged in its 2021 Carbon Neutrality Action Report to become 100% carbon neutral for the electricity needed for its production and operations globally by 2030. From 2030, 100% of cloud computing power supply will come from clean energy.

3.1.2 GHG Emissions from Transport, Packaging, Offices and Warehouses

Transport

At present, logistics holds the largest share, or 29 percent, of all emissions from Chinese e-commerce companies. In 2018, e-commerce accounted for 78 percent of all express parcels in China^[27], and the continuous growth of express delivery services will also push up the traffic and corresponding carbon emissions.

Air transport contributes 22 percent of all transport-related emissions despite that it only makes up eight percent of all parcels delivered. On average, each parcel transported by air generates 3.5 times more emissions than by road. In order to attract more consumers to switch from offline to online, e-commerce retailers are also constantly introducing more ultra-fast delivery options^[28], which makes the task of reducing emissions from transport even harder.

For emissions reduction in the area of logistics, e-commerce retailers are also actively taking actions, including using big data and other technologies tools to increase logistics efficiency, reducing air transport and long-distance transport, adopting diversified and low-carbon “last mile” transport, using new-energy logistics vehicles, etc.

The Ministry of Transport proposed in the 14th Five-Year Development Plan for Comprehensive Transportation Services that the proportion of new energy vehicles for urban logistics and distribution services should increase from 8% in 2020 to 20% in 2025. It puts forward clear requirements for the e-commerce sector to increase its use of new energy vehicles for logistic services.

Packaging

In 2021, the total volume of express service reached 108.3 billion pieces, a year-on-year increase of 29.9%, according to data from the State Post Bureau (SPB)^[29]. The volume of e-commerce delivery has been growing in China, with carbon emissions from packaging materials such as boxes, plastic bags, tapes, waybills and woven bags in all stages of their lifecycles ranging from raw materials through manufacturing to waste disposal. In 2019, the carbon emissions from e-commerce packaging reached 9.6 million tons of CO₂ equivalent. According to a research report on the characteristics and management of express delivery packaging waste in China co-published by Greenpeace, Break Free from Plastic and All-China Environmental Federation. The consumption of express packaging materials in China increased from 20,600 tons in 2000 to 9.41 million tons in 2018. Without effective measures, the consumption of express packaging materials will reach 41.27 million tons in China by 2025, and carbon emissions throughout the lifecycle will reach 57.06 million tons.

The market size of China's food delivery industry has grown from over 20 billion yuan in 2011 to 664.6 billion yuan in 2020^[30]. Besides continuous market expansion, there are increasingly diverse product categories. At the same time, however, packaging waste such as meal boxes, utensils and bags has also become a major contributor to the increase in municipal waste. The consumption of plastic containers nationwide was about 1.07 million tons in 2020, according to the Report on the Recovery and Recycling of Plastic Containers co-published by China National Resources Recycling Association (CRRRA) and Meituan^[31]. Conclusions on carbon emissions relevant to food delivery sector differ from study to study, but they all focus on carbon emissions relevant to food packaging. A team led by Professor Wen Zongguo of the School of Environment, Tsinghua University has quantified the environmental impact of the whole process of takeaway orders. The research shows that the environmental impact of the takeaway industry mostly comes from the production and disposal of takeaway packaging, accounting for 95 percent of the total emissions, as opposed to five percent from transportation. Taking Beijing as an example, each takeaway order emits about 0.68kg of CO₂ equivalent^[32]. Another study estimated the overall emissions of takeaway packaging, which showed that carbon emissions from takeaway packaging reached 709,000 tons of CO₂ in 2018^[33].

For e-commerce retailers including food delivery companies, the key to reducing emissions from packaging is to source reduction, packaging slimming, as well as avoiding secondary packaging. At the same time, develop re-use, increase the adoption of reusable packaging, and enhance end-of-life recovering and recycling. At present, leading e-commerce retailers are all working on packaging emissions reduction, and have launched some emissions-reducing measures with upstream brands and downstream express delivery service providers. But there is a general lack of comprehensive, measurable packaging waste and emission reduction goals/targets of the industry.

Offices and Warehouses

The energy use and carbon emissions of office buildings are also the bulk of current e-commerce companies' emissions. E-commerce retailers should improve energy efficiency while realizing 100% renewable energy in data centers. The emissions from warehousing facilities mainly come from the use of electricity in lighting, ventilation, and air conditioning during the storage of goods. At present, e-commerce retailers are building storage facilities powered by rooftop photovoltaics to reduce emissions.

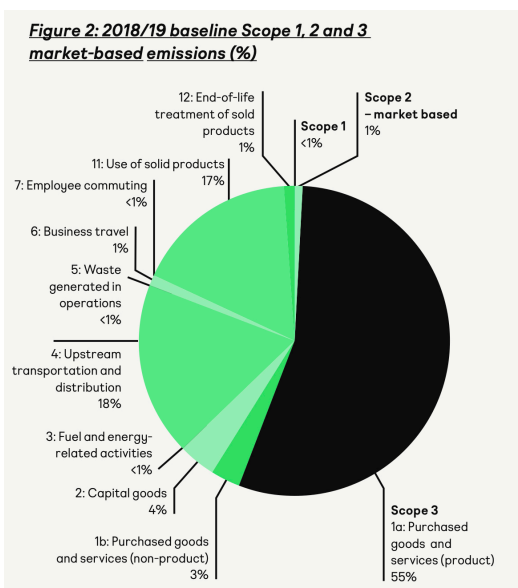
- As of June 2021, more than 90 of Amazon's fulfillment facilities are powered by on-site rooftop solar installations, which generate as much as 80% of a single facility's annual energy needs.
- By the end of 2021, JD.com had completed the installation of the first batch of photovoltaic power generation systems in 12 smart industrial parks. JD expects to build 1,000 megawatts of photovoltaic power generation capacity in 3 years, which can provide green energy for 85% of JD's smart industrial parks.

3.1.3 GHG Emissions from Suppliers

Compared with Scopes 1 and 2, Scope 3 carbon emissions are the bulk of the overall emissions from e-commerce companies. Amazon's Scope 3 emissions accounted for about 75 percent of its total emissions in 2020, while Ebay, ASOS, and Target's Scope 3 emissions accounted for 96%, 98%, and 96% of overall emissions, respectively. As for Scope 3 emissions, purchased products and services, and the transport and use of physical goods are generally the largest sources of Scope 3 emissions. E-commerce retailers have taken some emission reduction actions in logistics, transport and packaging, but carbon emissions management over their suppliers remains missing. Take Alibaba Group for example. As a forerunner in terms of setting Scope 3 emissions reduction targets in the e-commerce sector in China, Alibaba has announced that it will reduce Scope 3 carbon intensity to half of the 2020 level by 2030. Nonetheless, its Scope 3 emission measurements do not include emissions relevant to goods and their use and disposal due to the "unavailability of information on upstream and downstream activities across the value chain" [34]. By comparison, some foreign e-commerce retailers have identified and disclosed the carbon emissions of purchased products and services, and require suppliers to set up their own emissions reduction pathways so as to achieve the Scope 3 emissions reduction targets of e-commerce platforms.

Target Group commits to achieving net-zero GHG emissions across the enterprise by 2040, which includes requirements for its suppliers. Target requires its suppliers to set science-based Scope 1 and Scope 2 targets by 2023. Target aims to achieve 30% reduction in supply chain emissions by 2030, and to achieve net zero emissions in supply chain by 2040.

Zalando commits to reduce scope 3 GHG emissions from private label products by 40 percent by 2025 from a 2018 base year. Zalando also commits that 90 percent of its suppliers (by emissions covering purchased goods and services sold on its platform, packaging and last-mile-delivery partners) will have science-based targets by 2025.



ASOS, Scope 1, 2 and 3 market-based emissions (%) 2018 - 2019
Source: ASOS Fashion With Integrity - Our 2030 Strategy

Carbon Footprint

	2018	2019	2020	YOY%
Carbon Intensity (grams of CO₂e per \$ of GMS)	128.9	122.8	102.7	-16%
Emissions Category (mmt CO₂e)	2018	2019	2020	YOY%
Emissions from Direct Operations (Scope 1)	4.98	5.76	9.62	+67%
Fossil fuels	4.70	5.57	9.37	+69%
Refrigerants	0.28	0.19	0.25	+32%
Emissions from Purchased Electricity (Scope 2)	4.71	5.50	5.27	-4%
Emissions from Indirect Sources (Scope 3)	34.71	39.91	45.75	+15%
Corporate purchases and Amazon-branded product emissions (e.g. operating expenses, business travel, and Amazon-branded product manufacturing, use phase, and end-of-life)	11.95	15.41	16.70	+8%
Capital Goods (e.g., building construction, servers and other hardware, equipment, vehicles)	4.64	8.01	10.52	+31%
Other indirect emissions (e.g., third-party transportation, packaging, upstream energy related)	13.89	12.44	15.77	+27%
Lifecycle emissions from customer trips to Amazon's physical stores	4.23	4.05	2.77	-32%
Amazon's Total Footprint	44.40	51.17	60.64	+19%

Amazon, Carbon Footprint, 2018 - 2020
Source: Amazon Sustainability Report 2020

3.1.4 Recommendations

The growth of the online retail industry is accompanied by the urgency of the impact of global climate change globally and the determination of China's low-carbon transformation at the national level. As a key part of the green development of the e-commerce industry, climate action has been increasingly risen to the strategic level of corporates. E-commerce retailers should start from reducing emissions from data centers, office buildings, logistics and transport, packaging, warehouses and suppliers, set full range (Scope 1,2 and 3) carbon emissions reduction and neutrality goals, and develop pathways and timetables for climate actions.

- *Massively scale up the use of renewable energy to power office buildings, data centers and warehouses, and reduce carbon emissions through energy-saving and emission-reduction technologies.*
- *Logistics and transport: Respond to the Ministry of Transport's goal of 20 percent of new-energy logistics vehicles by 2025 by rapidly raising the proportion of NEVs for logistics vehicles and putting charging piles in place. At the same time, optimize the logistics and transport systems by increasing efficiency while reducing losses. Actively guide consumers towards slower logistics options, and optimize the trunk transportation routes so as to reduce relevant carbon emissions.*
- *Packaging: set measurable packaging and emissions reduction goals. Develop statistical evaluation system, and disclose packaging reduction and substitution plan.*
- *Suppliers: Identify and disclose corporate Scope 3 carbon emission footprints, including carbon emissions of purchased products and services. Establish supplier environmental management system as well as the access and exit mechanisms; provide technical, guidance, financial and other means to assist suppliers in emissions reduction actions.*

3.2 Solid Waste and Circular Economy

The rise of the retail e-commerce industry has brought innovative business models such as the sharing economy. A large number of idle goods trading platforms have emerged. The network effect of the platforms has greatly promoted the exchange of idle items, extending the service life of the traded products. The second-hand economy has shown immense growth potential with the empowerment of digitalization. With the younger consumer groups, China's idle economy, including second-hand e-commerce, has ushered in rapid growth. In 2019, the scale of China's second-hand e-commerce market reached 259.69 billion yuan, an increase of 53% from 169.5 billion yuan in 2018^[35]. Although second-hand e-commerce is in line with the concept of circular economy and has the potential to reduce resource consumption and carbon emissions, it is still difficult to quantitatively evaluate its impacts. The overall environmental benefit is more difficult to assess when considering potential rebound effects in the secondary market, such as whether the savings in purchasing power lead to the purchase of other products and services with a greater environmental impact^[36]. In contrast, the huge increase in solid waste in the packaging process brought about by the retail e-commerce model, as well as food waste occurring in the online food delivery business, have brought real challenges to the promotion of circular economy and low-carbon transformation.

Solid Waste Pollution Caused by Packaging

The express delivery service industry has been growing rapidly thanks to the rise of the retail e-commerce, with an average growth rate of the express delivery service volume reaching 30 percent over the past five years^[37]. The express delivery service industry generates more than 9 million tons of paper waste and about 1.8 million tons of plastic waste every year^[38]. Around 80 percent of express parcels are from e-commerce business^{[39][40]}. The increase in waste generated by express packaging has become the primary source of domestic waste increases in large and medium-sized cities.

The extensive use of packaging materials not only results in a high carbon footprint, but also leads to waste of resources and environmental pollution. Report shows that less than 5% of express carton packaging waste is reused, 80% is recycled, and 15% is mixed into household waste. The plastic packaging waste is even more difficult to recover and the cost of recycling is very high, resulting in about 99% of the current plastic express packaging mixed with municipal waste, destined for incineration or landfill.

As of the end of 2020, the total amount of takeaway orders reached 17.1 billion in China^[41]. On average, each order consumes 1.63 - 2.98 single-use plastic containers, according to a survey by

Meituan^[42]. If calculated by 2 plastic containers per order, the online food delivery sector consumes over 30 billion plastic containers every year. Plastic takeaway packaging including containers and utensil is mostly mixed with household waste for incineration and landfill due to the difficulty of recovery.

The environmental impact of retail e-commerce including online food delivery has become a bottleneck against the industry's green and sustainable development, and it is also a focus of policy attention by various national departments. In 2020, for example, eight departments including the National Development and Reform Commission jointly issued the Opinions on Accelerating the Green Transformation of Express Packaging, which clearly put forward the timetable and task list for the green transformation of e-commerce packaging. For example, by 2022, The proportion of e-commerce express items that no longer needed secondary packaging would reach 85%, and the scale of reusable express packaging applications would reach 7 million. This proportion will reach 100% and 10 million respectively by 2025. Internationally, the fifth United Nations Environment Assembly passed the Resolution on Ending Plastic Pollution in Nairobi, Kenya on March 2, 2022. This is the most important environmental multilateral agreement on the environment since the Paris Agreement, and is expected to become legally binding by the end of 2024. For enterprises, environmental compliance requirements such as resource recycling and plastic waste prevention are unavoidable.

Although e-commerce, express delivery and takeaway companies have made some efforts and attempts in packaging reduction and substitution in recent years, their impacts are rather limited. The Observation Report on the Greening of Express Packaging from Retail E-commerce Platforms published by Break Free From Plastic China in 2021 analyzed the green packaging actions of major e-commerce platforms, and found that the practices of slimming tape and reusable bags/boxes, as well as the recycling of paper cartons have had certain effects, while relevantly little efforts has been made in collaboration with upstream enterprises to improve packaging design, resource reduction, and reasonable use and promotion of degradable packaging materials^[43]. The Opinions on Further Strengthening the Treatment of Plastic Pollution co-released by the NDRC and the MEE in 2020 requires e-commerce, takeaway and other platform companies to strengthen merchants management, formulate implementation plans to reduce and replace disposable plastic products, and disclose implementation progress. That said, most e-commerce retailers have yet to set environmental targets on packaging. None of the seven largest local e-commerce retailers have revealed any packaging reduction targets, and only JD Logistics, a subsidiary of JD Group, has proposed packaging reduction target, according to a Greenpeace report published in 2022^[44].

Although packaging pollution control requires joint participation and efforts of government authorities, express delivery service providers, packaging producers, platform merchants as well as consumers, retail e-commerce and takeaway platforms as the creators of the online retail ecosystem, in particular, should fulfil their primary governance responsibilities, and leverage their influence and bridging abilities to drive collaborative actions across the value chain.

The Target Group committed to making owned-brand packaging with 20% post-consumer recycled plastic content and design 100% of owned-brand packaging to be recyclable, compostable or reusable by 2025. In 2021, Target also announced the goal to reduce the total volume of virgin plastic packaging by 20% in owned-brand Food, Beauty and Essentials businesses, measured against the baseline volume in 2020^[45].

Zalando used 68,000 metric tons of packaging materials in 2021, 89 percent stemmed from recycled input and 99% was recyclable. Zalando boxes are produced from 100 percent recycled cardboard. Moreover, Zalando commits to eliminating single-use plastic packaging by 2023^[46].

E-commerce retailers and online food delivery companies should develop a statistical evaluation system, disclose packaging reduction and substitution plan, formulate platform rules for green express packaging, and guide platform merchants and express delivery service providers to practice and transition to green packaging. Strengthen effective communication with consumers on green express packaging, actively guide consumers to choose green packaging and promote consumer awareness and participation.

Reduction, Reuse and Recycle

When taking green packaging actions, corporates should follow the priorities of waste management hierarchy by first minimizing waste generation. China's Circular Economy Promotion Law points out that the development of circular economy should be implemented in accordance with the principle of reduction prioritization. Express packaging and food delivery packaging are mostly single-use packaging. It is difficult to recover such packaging, especially plastic packaging, which will eventually become waste for incineration and landfill. Their use should be minimized at the source.

Secondly, explore and gradually shift to business models based on reusable packaging. According to a study by the Institute of Circular Economy of Tongji University, if single-use express plastic packaging in the "free shipping zone" of the Yangtze River Delta is replaced with reusable packaging, the resulting plastic reduction would reach 39 percent of the total consumption of single-use express plastic packaging in the region, alleviating plastic waste pollution^[47]. Many startups and solution innovators have emerged around the world to explore reusable packaging and reverse logistics. E-commerce platforms should leverage their innovation capacities, participating such technological R&D, promoting the collaboration of different players and scaling up the reusable express packaging adoption.

In the case of unavoidable use of single-use packaging, corporations should maximize the recovery of single-use packaging waste. When re-use is still not a common practice for express and takeaway packaging, corporations should ensure that the single-use packaging is recovered. Enhance consumer communication, create channels for higher packaging recovery rate.

Several German-based e-commerce platform companies including Tchibo, OTTO and Avocadostore have launched a three-year packaging reuse project praxPACK, with the aim to test how returnable packaging systems must be designed so that they are practical and economically viable, and which industry-specific and political framework conditions can support.

In Phase 1 of the project, the system developed by the company RePack was tested in 2020. The project used the Repack reusable delivery bag which is made of recycled plastic, and can be used 20 times and more. They can be folded by customers to letter size and returned by post free of charge. It turned out that 72 percent of the reusable packaging bags were returned, whereas in Tchibo's case, the return rate reached over 80 percent. Consumers generally appreciated the reusable packaging recovery and expressed their willingness to pay a surcharge or a deposit in the future ^[48].

Reduction

- Set reduction goals for single-use plastic packaging. Collect statistics and disclose information on the use and recovery of single-use plastic packaging in own operations, and guide the merchants on the platform to reduce and replace single-use plastic packaging by formulating platform rules, and regularly evaluate and publish the reduction effect;
- Strengthen upstream and downstream coordination, reduce the secondary packaging of e-commerce goods, and encourage direct shipment with the original packaging;
- Promote the use of slimming packaging for e-commerce goods, such as lightweight, high-strength packaging, glue-free carton, and less packaging filler;
- Improve packaging materials suitability, and avoid excessive and random packaging;
- Takeaway platforms: formulate effective platform incentive or punishment rules to supervise merchants' implementation of "utensils free" orders.

Reuse

- Engage in the development of reusable packaging technology;
- Gradually expand the use of reusable express packaging by product and business category, such as the local fresh food delivery services; prioritize the rollout of reusable packaging platform' s own brand products or self-distribution goods;
- Explore cross-platform reusable express packaging recovery channels and operation systems.

Recycle

- Collaborate with the existing public waste sorting and recycling systems to increase the recycling rate of carton packaging;
- Collaborate with sanitation departments and third-party recycling operators, setting up collection facilities in key areas, to enhance recycling of the single-use express and food packaging.

Consumer Communication

- Provide consumers with packaging options through visible prompts and active intervention. Provide incentives to encourage consumers to choose green packaging and participate in packaging recycling; takeaway platforms encourage consumers to choose "utensils free" orders, and provide an effective consumer feedback mechanism to urge merchants to enhance implementation;
- Incorporate the green packaging measures into the platform merchant evaluation system and establish channels for consumers' feedback on packaging.

3.3 Chemicals Management

Chemicals have long become necessities for modern production and life, and are found in all types of consumer products and the environment. The chemical industry is the world's second largest industry, with a total of 2.3 billion tons of chemicals produced globally in 2017, and the production and market of chemicals will continue to grow. Not all chemicals are toxic, but the hazards of some chemicals have adversely affected human health and the environment. Estimates by the European Environment Agency suggest that 62 per cent of the volume of chemicals consumed in Europe in 2016 were hazardous to health. The World Health Organization estimates the burden of disease from selected chemicals at 1.6 million lives in 2016, and the lives of many more are negatively impacted^[49].

Chemicals are widely used in daily consumer products. The health and environmental hazards of certain chemicals have received particular attention in recent years, such as heavy metals, persistent organic pollutants, endocrine disruptors, etc. Humans can be exposed through drinking water or eating food contaminated with chemicals from agricultural production, and can also be exposed through ingestion, inhalation, or skin contact with building materials, toys, textiles, food packaging, etc.^[50]

Common heavy metals in products include lead, cadmium, mercury, chromium, arsenic and nickel; persistent organic pollutants include perfluorinated compounds (PFCs), short chain chlorinated paraffins (SCCPs), polybrominated diphenyl ethers (PBDEs), etc.; endocrine disruptors include phthalates, bisphenol A (BPA), perfluorinated compounds, poly brominated diphenyl ethers (PBDEs) and others. These substances can have negative impacts on human health, and cause huge economic losses. The existing management measures for toxic and harmful chemicals in products in China include the Product Quality law of the People's Republic of China, the Pollution Control and Management Measures for Electronics and Information Products, national standards on Toy Safety, standards on limits of harmful substances in interior decoration materials. There are also product environmental certifications, as well as compulsory product certification systems in place^[51]. Although these measures help to reduce the use of and exposure to toxic and hazardous chemicals in products, the proliferation of chemicals is still prevalent. While consumers are increasingly shifting to online shopping, e-commerce platforms have unfortunately become haven for products containing toxic and harmful substances.

In recent years, e-commerce retailers have been repeatedly found to be selling products containing toxic and harmful substances. For example, from the inspections from the State Administration for Market Regulation in 2019 and 2020, and Guangdong Provincial Administration for Market Regulation in 2021, many e-commerce platforms were found selling products containing chemicals exceeding national standards. These chemicals in question include phthalates, formaldehyde, heavy metals, decomposable and carcinogenic aromatic amine dyes and others^{[52][53][54][55]}. In addition to the inspections conducted by the Market Supervision and Administration Bureau, social organizations have also found home decoration paints with substandard lead content^[56]; lipsticks with excessive lead and cadmium or containing the banned components of chromium and nickel on e-commerce platforms^[57]. The sale

of products containing toxic and hazardous substances is not a special case of domestic e-commerce platforms. For example, in 2019, the e-commerce giant Amazon was revealed to be selling stationery products with excessive lead and cadmium, and some school supplies with more 80 times legal limit of lead^[58]. In the same year, Amazon’s website was revealed to be selling more than 4,152 kinds of products not meeting the safety standards, false labelled or prohibited by the state^[59]. Amazon also realized that it might need to spend billions of dollars in the future to prevent the sale of expired food or dangerous products on its platforms to preserve the customer trust^[60].

Products with excessive chemicals sold on e-commerce platforms found in inspections by the State and Guangdong Administration for Market Regulation (SAMR and GDAMR) in 2019 and 2020 (Incomplete)

Year	Sampled by	Product Category	Non-compliant Chemicals
2020	SAMR	Bedding fabrics	Decomposable and carcinogenic aromatic amine dyes
2019	SAMR	Kids toys	Phthalates
2019	SAMR	Kids clothing	Formaldehyde
2019	SAMR	Kids shoes	Total heavy metals (arsenic, lead, cadmium)
2019	SAMR	Correction stationery	Benzene
2019	SAMR	Correction stationery	Benzene
2020	GDAMR	Kids shoes	Phthalates
2020	GDAMR	Kids shoes	Total heavy metals (arsenic, lead, cadmium)
2020	GDAMR	Kids shoes	Phthalates
2020	GDAMR	Kids shoes	Total heavy metals (arsenic, lead, cadmium)
2020	GDAMR	Kids hats/caps and accessories	Formaldehyde

For products that have not been covered by mandatory national standards, e-commerce retailers have also been found to sell products containing toxic and harmful chemicals exceeding EU standards, such as excessive phthalates in erasers^[61] and excessive boron element in slime^[62].

In the fresh food e-commerce sector, illegal levels of pollutants in food such as pesticides, veterinary drugs, heavy metals, microorganisms and additives are also very serious, and fresh food e-commerce retailers often receive fines from market supervision departments^{[63][64]}. An environmental organization purchased portunid crabs from four fresh food e-commerce retailers, and all of them were found to contain excessive cadmium^[65]. The environmental organization Nature Fields found that there were repeated cases of products exceeding national standards of major fresh food platforms including Hema, Dingdong Maicai, Missfresh and Meituan Maicai. The cases include excessive pesticides in vegetables and fruits which were on the national banned or restricted list, and excessive veterinary drugs in aquatic

products, including those banned by Chinese government^[66]. Toxic and harmful substances in food poses health risks to consumers on the one hand, and cause onsite environmental pollution on the other hand.

The E-commerce Law of the People's Republic of China promulgated in 2018 has clearly stipulated that "for goods or services that are related to the life and health of consumers, e-commerce platform operators failing to fulfill their obligations to review the qualifications of merchants on the platform, or failing to fulfill their security obligations and causing harm to consumers shall bear corresponding responsibilities in accordance with the law." As the state has been constantly raising the requirements e-commerce platforms to fulfill their responsibilities through legislation and other means, their repeated selling of products containing toxic and harmful chemicals bring huge challenges to corporate compliance, increase business risks, undermine corporate reputation and consumer confidence.

Progress in Management of Toxic and Hazardous Chemicals in Products

In November 2020, the Standardization Administration of the People's Republic of China (SAC) released the Notice No. 26 of the year, officially introducing the Guidelines for Controlling the Use of Key Chemicals in Consumer Goods (GB/T 39498-2020)^[67]. Effective since June 1, 2021, the guideline restricted the use of 117 chemicals, covering major harmful chemicals in consumer goods in China. In May 2022, the General Office of the State Council released New Pollutant Control Action Plan, introducing schemes for managing new pollutants including persistent organic pollutants, endocrine disruptors, and antibiotics.

Many international organizations are advocating for chemical safety of goods sold on retail/e-commerce platforms, and many foreign e-commerce retailers also cover the issue of chemicals management in their CSR and sustainability work. An initiative called the Retailer Report Card ranked the largest retailers in the U.S. and Canada on their corporate actions to eliminate toxic chemicals^[68]. The scoring involves 13 indicators, and the retailers are ranked for their performance in chemicals management on criteria like policy setting, accountability, disclosure, safer alternatives, transparency, chemical footprint and so on.

Take the Target Group, the top-scoring retailer on this score, as an example to examine its chemical management progress. Target Group developed a chemical management framework in 2017 that covers the Group's operations and products. A list of restricted chemicals has been developed and implemented first in the private label textile category. At the same time, Target has formulated and announced a series of chemical-related goals and implementation plans, such as progress on the availability and disclosure of chemical composition information in cosmetics, baby products, personal care and household products, and the removal of certain chemicals from these products^[69]. Although the information disclosed from Target shows that the company has not been able to achieve

its set chemical management goals, experiencing difficulties in obtaining chemical information from the supply chain, it is undoubtedly a good start that retailers leverage their advantages to engage supply chain on the “detox” journey.

IKEA, the Swedish home furnishing retailer with more than 400 retail outlets worldwide, has developed comprehensive chemicals management system. IKEA has a chemical strategy that applies to products sold globally. The Chemicals Strategy includes a list of restricted chemicals applicable



GRADES

Retailer	Grade	Points
Apple	A+	116.25
Target	A+	105
Whole Foods	A	98.25
Sephora	A	96.25
Walmart	A-	93
Sam's Club	A-	93
IKEA	A-	90

to all product types, a restricted list for specific product types, and a list of chemicals restricted for use in manufacturing. IKEA has also banned the use of several types of plastics that can cause environmental and health harm, including polyvinyl chloride (PVC) in all products (except some wires) and polycarbonate (PC) in all food-contacting materials and children's products, and has eliminated expanded polystyrene (EPS) from nearly all packaging. Also, it has banned plastic recycled from certain parts of electronics containing brominated flame retardants (BFRs). Since 1993, IKEA has banned or eliminated more than a dozen chemicals. To ensure compliance, IKEA tests materials and finished products on a regular and random basis. IKEA also requires suppliers to report chemical composition information in products, and the level of disclosure varies from product to product. In the case of toys, IKEA requires suppliers to report all chemical substances above 1%, as well as intentionally added harmful substances above 0.01 percent and all known harmful impurities.

In order to effectively control risks arising from chemical substances in consumer goods, business needs to understand what the common toxic and harmful chemicals are, what are their environment and health impacts, which products most likely to contain such chemicals, and the use requirements or limits stipulated by the state. However, such information can be difficult to obtain, especially in the

case of unfamiliar, risky substances and products. Managers may need to spend much time in searching for such information, while the result might not be complete and accurate. A non-profit organization has developed the “Toxics-Free Corps+” search tool based on the WeChat mini program to address the challenge:



E-commerce retailers can take stepwise approach to chemical management, according to whether there are mandatory national standards. The stage one is to ensure compliance: products on sold should meet national standards; the stage two is moving beyond compliance: take precautionary approach in chemicals currently not regulated, but need to be banned or restricted in use. For both stages, companies may start with key/priority products and chemicals.

For stage one, retailers can start with key product categories, giving priority to the products for groups such as infants, children and pregnant women, products that fail to pass market supervision and inspections, and products that are prohibited from production and sales. For stage two, retailers can start from chemicals and prioritize management over chemicals which are persistent, bio-accumulative and toxic (PBT), as well as those that have been identified by international organizations or domestic and foreign government agencies as being carcinogenic (Category 1A), mutagenic and reprotoxic (CMR).

Stage 1: Compliance

- Stay current with relevant national laws, regulations and standards, and dynamically update knowledge in this respect;
- Develop a list of priority products. Such products can include children's toys, school supplies, children's clothing, shoes, hats and accessories, cosmetics, clothing, textiles and fashion items, shoes, jewelry, ornaments, fabrics, bedding fabric, tableware, coatings, fertilizers, portunid crabs, lindane cream, plastic swabs, foam food containers, raw mercury, etc.;
- Take precautionary and preventive measures over products according to the list of priority products. Measures that can be taken include, but are not limited to, setting keywords to block products that are prohibited from production and sales; strict listing requirements for merchants; verification of the certification for CCC^[iv] products; regular sampling, and timely tackling of non-compliant products, food and merchants involved.
- Rapid response. Respond rapidly to reports on non-compliant products and food sold on the platform by market supervision departments, consumer associations and NGOs. Verify and remove problematic products, conduct inspections of similar products to eliminate the non-compliant products;
- Assist in recalls. For products that need to be recalled, offer assistance in reaching consumers by setting up recall area, messaging consumers and etc.

[iv] CCC is the abbreviation of “China Compulsory Certification” .

Stage 2: Beyond Compliance

Currently, China's product quality standards only cover a limited variety of chemicals, and a host of chemicals have yet to be covered by mandatory national standards. But as the regulation evolves, an increasing number of chemicals will be regulated in the future. E-commerce retailers can move ahead by going beyond compliance. Measures can be taken include:

- Develop a chemicals management policy, which involves setting goals and targets for priority chemicals, requirements for suppliers, commitment to reduce the use of priority chemicals, commitment to public disclosure of the policy and progress in ESG reports and annual reports;
- Develop restricted substances list and priority products list. It is recommended that e-commerce retailers prioritize control over chemicals which are persistent, bioaccumulative and toxic (PBT), as well as those that have been identified by international organizations or domestic and foreign government agencies as being carcinogenic (Category 1A), mutagenic and reprotoxic (CMR). E-commerce retailers can refer to Annex A/B/C of the Stockholm Convention ^[70], Annex to the Minamata Convention ^[71], List of New Pollutants for Key Control ^[v], GB/T 39498-2020 Guidelines for the Control of the Use of Key Chemicals in Consumer Products, EU REACH List of Substances of Very High Concern ^[72], the World Health Organization's International Agency for Research on Cancer (IARC)'s Category 1 Carcinogen List ^[72], and also refer to the list of banned and restricted chemicals from retailers such as Wal-Mart ^[74] and IKEA ^[75].
- Information disclosure. Make available to public the lists of priority chemicals and products, management progress and achievements.

[v] The lists of key new pollutants subject to control will be released in 2022. Before that, one can refer to the "List of key new pollutants subject to control (2021 Edition)" in the "Action Plan on New Pollutants Governance (Draft for Comments)".

3.4 Biodiversity Protection

Biodiversity is the basis of human survival and development. Fueled by the pandemic, there is a growing consensus and actions among international community to reverse current biodiversity loss, a number of policies and regulations have been put forward in countries including China. In February 2020, the Standing Committee of the National People's Congress permanently prohibited commercial breeding and trade in most terrestrial wild animal species for the purposes of consumption as food. In October 2021, the General Office of the CPC Central Committee and the State Council co-released the Opinions on Further Strengthening Biodiversity Protection. The intensive introduction of national policies and decrees highlights the urgency of biodiversity conservation and China's determination on enhancing biodiversity governance.

The openness and convenience of the Internet has increased the ease of illegal wildlife trade. Massive products and services that threaten biodiversity are found on e-commerce sites. In response, mechanisms and cross sectoral collaborations have been established, such as the Coalition to End Wildlife Trafficking Online, with the goal of significantly reducing illegal wildlife trade information on e-commerce platforms. Some Chinese e-commerce platforms such as Alibaba have also joined the coalition. Although the member companies of the alliance have deleted millions of illegal wildlife products information^[76], there are still a wide range of products and information that endanger biodiversity on e-commerce platforms.

According to the research of “Wildlife-Free E-Commerce Initiative” jointly initiated by a number of environmental protection groups and volunteers, a large amount of trade information and content related to wild animals and plants on retail e-commerce platforms and other internet communities still exists, even after the prohibition of commercial breeding and trade of wild animal species by the Standing Committee of the NPC. Such products include products made of National Key Protected Wildlife pangolins, cycads, as well as electric fishing equipment and electric earthworm motors.

Participants of the Wildlife-Free E-Commerce Initiative reported and advocated against the sale of wild animals and plants as well as relevant products and hunting tools for over 100 cases. Over 10 million posts and listings of illegal wildlife were blocked or removed. Products damaging biodiversity sold on e-commerce platforms include:

- 1. Wild animals protected by national regulations or their products**
- 2. Wild plants protected by national regulations or their products**
- 3. Wild animals significant to biodiversity protection and their products**
- 4. Wildlife hunting tools including various electric trapping equipment**
- 5. Alien species with potential biosecurity risks**
- 6. Chemicals poisoning wild animals**

Although e-commerce retailers and other internet community websites removed and deleted posts and listings of illegal wildlife in response to advocacy from volunteers and conservation groups, such products are still found on their websites. Besides, companies lack a long-term mechanism intended to solve this problem and maintain an eco-friendly online retail environment. According to the E-commerce Law of the People's Republic of China, all the goods or services available from e-commerce operators shall meet the requirements of protecting personal and property safety and environmental protection, and platform operators shall not sell or provide goods or services prohibited from trading by laws or administrative regulations. Platforms that tacitly allow merchants to sell illegal products that damage ecosystems and the environment may violate the E-commerce Law of the People's Republic of China, the Wildlife Protection Law of the People's Republic of China and/or other laws and regulations, and thus face risks of non-compliance. E-commerce platforms should establish an internal management system for biodiversity protection in a timely manner so as to cut off the illegal trading routes.

China opened the UN Biodiversity Conference (COP 15) in Kunming in October 2021. Biodiversity protection, as one of the important contents of China's national ecological civilization construction, has always been essential part of China's participation in international environment governance. Combating illegal wildlife trade and activities that damage biodiversity is at the heart of biodiversity conservation efforts, and Chinese e-commerce platforms should not allow platforms to become a breeding ground for such activities, running counter to national governance efforts. In January 2022, the administrative and criminal law enforcement departments, relevant internet companies and organizations held the first meeting on preventing and combating illegal online wildlife trade, and established a working group composed of the government, enterprises and social organizations. The social collaborative co-governance of wildlife online trade has entered a new stage.

From 2020 to 2022, after receiving reports from environmental groups, JD.com removed products such as electric earthworm motors, electric bird traps and snow lotus from the Tianshan Mountains.

- Retail e-commerce platforms and other internet platforms establish or strengthen internal control mechanisms related to illegal wildlife trade, and remove all wildlife and their products protected by national regulations, as well as other products, chemicals, hunting tools and exotic species that harm biodiversity; block relevant key search words, advertising, promotional texts, short videos, etc., and strengthen user communication on wildlife conservation;
- Establish dynamic monitoring mechanisms, strengthen the auditing for product listing from merchants and sellers; reinforce manual screening, constantly update related key words bank. Enhance monitoring and reviewing of key products, or products and advertisements receiving frequent reports, with particular focus on the relevant activities in live streaming.
- Develop relevant reporting and feedback channels; enhances the efficiency of handling reported issues, and feedback the progress in a timely manner;
- Cooperate with law enforcement agencies, report businesses that sell illegal goods that violate laws and regulations and regularly disclose relevant information;
- Establish and enhance communication and collaboration with NGOs or volunteers concerned with relevant issues; actively respond to and address the reported issues;
- Establish a corporate evaluation system on biodiversity and disclose relevant information in annual reports.

3.5 Sustainable Food

The current global food system is unsustainable. Unhealthy diet poses health problems that include the coexistence of obesity and malnutrition, while the corresponding mode of production also exacerbates environmental problems such as excessive water consumption and biodiversity loss. The Special Report on Climate Change and Land released by the Intergovernmental Panel on Climate Change (IPCC) in 2019 stressed the importance of changing the food system for mitigating climate change. Transformation to a sustainable food system through key measures like direct emissions reductions from agriculture and livestock production, sustainable and healthy diet, and reduction of food loss and waste, not only reduce emissions, but also improve the health of global population^[77].

The food system is an overlooked opportunity for climate change mitigation. The total GHG emissions from the food system accounts for more than one-third of the global anthropogenic total, according to a study released by the Food and Agriculture Organization (FAO) in 2021. Three quarters of these emissions are generated either within the farm gate or in pre- and post-production activities, such as manufacturing, transport, processing, and waste disposal^[78]. The remainder was generated through land use change. In a business-as-usual scenario emissions from food production alone could use up all of the 1.5°C carbon budget. Food system changes such as reducing food loss and waste and shifting towards sustainable and healthy diets could reduce emissions by 1.8 Gt CO₂ equivalent per year, according to a report co-released by the World Wildlife Fund for Nature (WWF), the United Nations Environment Programme (UNEP), EAT and Climate Focus^[79]. In the context of the Chinese government's proposed carbon peaking and carbon neutrality goals and the green and low-carbon development path, there is huge potential for emission reduction in promoting the transformation of a sustainable food system.

In recent years, the Chinese government has also introduced laws and policy guidelines in reducing waste and promoting sustainable and healthy diet. The rise of e-commerce has changed consumers' food purchasing habits in many regions, and the pandemic has further increased the number of users who purchase fresh food online. In 2019, China's fresh food e-commerce market reached 279.62 billion yuan, an increase of 36.7 percent over 2018. It is expected that by 2023, the fresh food e-commerce market will exceed 800 billion yuan^[80]. At the same time, food delivery has gradually become a high-frequency consumption behavior of Chinese consumers. In 2020, the number of online takeaway users in China has reached 456 million^[81]. E-commerce, including food delivery business, is an emerging retail segment that can lead the industry to play an active role in the transformation of sustainable food systems by formulating more sustainable food procurement policies and intervening in consumer purchasing behaviors.

3.5.1 Food Waste

One-third of the world's food produced for human consumption is lost or wasted each year, according to a study released by the UN Food and Agriculture Organization (FAO). Reducing food loss and waste not only saves food itself, but also reduces the natural resources used to produce, store, and transport food, reduces greenhouse gas emissions, and lightens the burden on waste treatment systems. Today, when climate action is still insufficient, 8 to 10 percent of global GHG emissions are related to unconsumed food, if the pre-consumption stage losses are taken into account.

Food waste mostly occurs at retail and household levels. In 2019, An estimated 931 million tonnes of food, or 17% of total food available to consumers went into the waste bins of households, retailers, restaurants and other food services^[82]. People are increasingly buying food online, and fresh food e-commerce and takeaway businesses are different from traditional stores and wet markets. Consumers can only make purchasing decisions based on pictures, text and data, so it is more likely that products do not meet expectations on quality and quantity, resulting in waste of food. Some studies conclude that due to psychological factors, online food consumption is more likely to cause food waste than offline food consumption^[83].

At the same time, the marketing strategy and retail model of fresh food e-commerce also increases the possibility of food waste. For example, in the "Daily Fresh" sales model, products that are not sold out within a day will be taken off the shelves and reported for damage and destruction on the same day. But the shelf life of such products normally can last a few days rather than just one day^[84]. Even food that is approaching or past its expiration date doesn't mean it can't be eaten, it may just not be in the best condition. Whether the food that has been stored for a period of time can still be eaten depends on the initial state of the food, the preservation method and the cooking method at the discretion of the consumers. In addition, the pre-packaged food sold online may leave consumers with no choice but to buy more than they need in some cases.

Amazon has set corporate goals to reduce food loss and waste. Amazon is committed to halving food loss and waste in its U. S. operations by 2030 and will disclose progress on its website.

Fresh Food E-commerce

- Storage: Smart control of light, temperature and humidity, and adopt different storage methods depending on the types of food to reduce food loss during storage;
- For the sale of primary agricultural products, it is recommended to remove pre-packaging so that consumers can buy them in bulk; remove uniform requirements for primary agricultural products in terms of size, shape and color;
- Provide consumers with the pictures of the real food, information on serving size and storage recommendations;
- Replace “use by” with “best before” dates for fresh fruit and vegetables to allow consumers to use their own judgement where safe to do so;
- Instead of discarding packaged foods approaching expiry date, donate or sell at lower price to those in need;
- The treatment of spoiled food: remove packaging and send them to municipal kitchen waste collection system;
- Take initiatives to remind consumers to prevent food waste and buy less, in a conspicuous manner.

Food Delivery Platforms

- Remind customers in a conspicuous manner to order moderately;
- Provide consumers with information such as pictures of the real food, food portions, specifications or the recommended number of diners;
- Provide half-serving, small serving and other forms for consumers to choose from;
- Remind consumers to remove the packaging after use, properly dispose and ensure the leftovers enter the municipal kitchen waste collection system.

Article 10 Catering takeaway platforms should remind customers in a noticeable way to order in moderation. Where a catering service operator provides services through a catering takeaway platform, it shall provide customers with information such as food portions, specifications or the recommended number of diners on the platform page.

-- Law of the People's Republic of China on Food Waste

3.5.2 Sustainable Diet

China is a big food producing and consuming country. The prevalence of diabetes and obesity in China is increasing. In 2016, the Chinese government released the Outline of the "Healthy China 2030" Plan, pointing out that the national strategy of comprehensively improving public health and realizing the coordinated development of public health and socioeconomic development is a major measure for the fulfillment of China's international commitment to the 2030 Agenda for Sustainable Development. China shall actively implement its national nutrition plan, guide the public toward scientific dietary habits, and address coexistence of under and over nutrition of its citizens.

With the continuous expansion of the sector, e-commerce retailers, including fresh food and takeaway platforms, can leverage their influence of their retail links to consumers to actively intervene in their food purchasing behavior and improve dietary health level. According to the Analysis Report on Nutrition Contribution of Takeaway Lunches carried out by Meituan, most consumers choose food with more energy and fat than the recommended intake and choose less vegetables. If this unbalanced dietary habit is maintained for a long time, it is likely to increase the risk of overweight and obesity^[85].

E-commerce retailers including Meituan and JD.com have been exploring ways to influence consumers' purchasing behavior by introducing healthy and sustainable product filters, awareness building and promotional activities for healthy diets. Foreign retailers are also launching sustainable food products that are healthy and good for the environment on their offline and online platforms. For retail and platform companies, the CCFA published the Healthy, Sustainable Diet Implementation Manual for Retail/Platform Enterprises in 2022, which presents strategies for Chinese companies to promote healthier and sustainable diet among consumers.

The Report adopts the measures for Online Platform Enterprises as identified in the CCFA manual as recommendations for e-commerce retailers to promote sustainable diets. These measures describe the actions that companies can take from the four dimensions of commodity, environment, personnel and platform.

Commodity: By improving the quality and quantity of food and raw commodity supplies required for healthy and sustainable diets, and using pricing, marketing, operations, and information delivery measures to influence consumer decisions.

- Adopt raw materials and processing methods required for healthy and sustainable diets for new product development;
- Source products meeting standards relevant to healthy and sustainable diets;
- Label products with higher nutritional value, none or reduced additives, and other products that benefit consumer health;
- Purchase and promote local and seasonal fruits and vegetables;
- Follow a more competitive pricing strategy for healthy and sustainable products;
- Implement marketing and promotional programs that encourage consumers to buy healthy and sustainable products.

Environment: Affect buyers' decisions by sharing knowledge about healthy and sustainable goods, creating an environment and atmosphere facilitating healthy and sustainable consumption, and providing more healthy, sustainable dietary solutions:

- Design and highlight separate entry points for healthy and sustainable goods;
- Push pictures, texts, videos and other information online to users to deliver information on health and sustainable diets;
- Provide healthy dietary solutions for consumers to choose from;
- Invite consumers to participate in offline educational and charitable events.

Personnel: Present the concept of health and sustainability to senior management, improve staff professional skills on creating healthy and sustainable dietary options for consumers.

- Share international experience in promoting health and sustainability initiatives;
- Research and exchange on China's health and sustainability policies and trends;
- Engage in the development of norms and standard for healthy and sustainable diets, and improve the industry' s awareness and understanding in this respect;
- Participate in the dissemination of innovations in healthy and sustainable consumption, and encourage enterprises to fulfill their social responsibilities;
- Develop training programs to enhance business expertise and competence on healthy and sustainable diets. Effectively communicate with consumers and mobilize consumers' initiative to participate in dietary transformation.

Platform: Leverage the influence of platforms on merchants to develop their sustainability corporate strategy.

- Provide training and capacity buildings to the merchants to improve their understanding of healthy and sustainable diets.

II. Comprehensively promoting the green transition of consumption in key areas

(IV) Accelerate green food consumption

Guide consumers to establish a civilized and healthy food consumption concept; purchase, store, prepare, order food and dine in a reasonable and appropriate manner.

Urge catering enterprises and takeaway platforms to implement regulations and requirements against food waste, and constantly drive dining services toward green, healthy, safe, scalable, standardized and compliant development.

-- The Implementation Plan for Green Consumption

CONCLUSIONS



In 2022, the world is still facing challenges from the COVID-19 pandemic. The pandemic has urged us to re-examine the relationship between human activities and the environment. More and more consumers start to prefer sustainable products and lifestyle, and more and more investors are increasing ESG investment. The Chinese government is also actively enhancing efforts for environmental protection and ecological conservation, responding to climate change, reducing plastic pollution, managing new pollutants and protecting biodiversity. Green production and consumption transformation are undergoing. As a forward-looking and innovative business sector, e-commerce retailers can turn various challenges into opportunities for corporate sustainability if they are able to respond quickly and actively fulfil their responsibility for environmental governance. Based on the environmental impacts of retail e-commerce business identified in the report, combined with the guidelines of national policies and regulations and the best practice cases of domestic and foreign companies, the report recommends that e-commerce retailers start from the following steps to achieve green transformation.

1. Identify corporate environmental impacts and collect data on environment footprint to establish a baseline against subsequent improvements;

2. Set comprehensive environmental and sustainable development goals/targets based on the identified environmental impact issues and baseline data. Put forward action plans with measurable indicators and requirements;

3. Incorporate the environment and sustainable development goals to the daily work of the Board of Directors, and set up departments/working groups for environmental and sustainability work, overseeing the implementation and be responsible for delivering of the environment and sustainability goals.;

4. Regularly disclose key environmental information, and communicate progress with the public, investors, policy makers and other stakeholders;

5. Leverage the influence of the retail e-commerce platforms to establish supply chain environmental performance review mechanisms, and drive supply chain merchants to fulfill their environmental responsibilities through supplier codes, incentives, funding and technological inputs;

6. Strengthen consumer communication, provide consumers with more sustainable goods, packaging, logistics and other options. Enhance the labeling and effective communication of environmental information to help consumers practice sustainable consumption.

5 REFERENCES

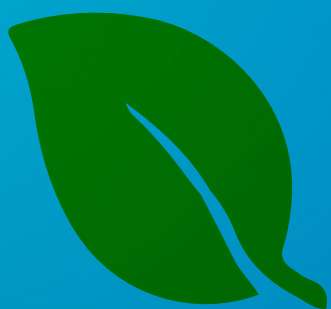
- [1] 产业信息网 . 2022.02.23. 2021 年中国电子商务百强排行榜：阿里巴巴位居榜首，数字生活领域企业最多。 <https://www.chyxx.com/top/202202/996363.html>
- [2] 中国网 . 2021.02.03 中国发布 报告：我国连续 8 年成为全球最大网络零售市场 . http://news.china.com.cn/txt/2021-02/03/content_77183331.htm
- [3] 商务部 中央网信办 发展改革委 . (2021) 《“十四五” 电子商务发展规划》
- [4] 绿色和平 . (2022) 《中国零售电商气候行动与环境表现 (2021)》
- [5] World Economic Forum. (2019) The Global Risks Report 2019. 14th Edition. <https://www.marshmcclennan.com/content/dam/mmc-web/insights/publications/2019/jan/global-risks-report-2019.pdf>
- [6] MSCI. (2021) MSCI Investment Insights 2021. Global institutional investor survey. <https://www.msci.com/documents/1296102/22910163/MSCI-Investment-Insights-2021-Report.pdf>
- [7] World Economic Forum. 普华永道 . (2021) 《ESG 报告：助力中国腾飞 聚势共赢》
- [8] Nielsen. (2014) Doing well by doing good. Increasingly, consumers care about corporate social responsibility, but does concern convert to consumption? <https://www.nielsen.com/wp-content/uploads/sites/3/2019/04/global-corporate-social-responsibility-report-june-2014.pdf>
- [9] NYU Stern Center for Sustainable Business. (2020) Sustainable Market Share Index. <https://www.stern.nyu.edu/experience-stern/about/departments-centers-initiatives/centers-of-research/center-sustainable-business/research/csb-sustainable-market-share-index>
- [10] 商道纵横 . 界面新闻 . (2019) 《中国可持续消费报告 公众可持续消费认知、态度、行为调研》 . <https://newwezhannoss.oss-cn-hangzhou.aliyuncs.com/contents/sitefiles2035/10175544/files/180278..pdf?Expires=1650336976&OSSAccessKeyId=LTAleKGM1705vEQp&Signature=GYS%2FLLtO4wVql6cYhwsp7WrVkr%3D&response-content-disposition=inline%3Bfilename%3D2019%25e4%25bc%258a%25e5%2588%25a9%25e4%25b8%25ad%25e5%259b%25bd%25e5%258f%25af%25e6%258c%2581%25e7%25bb%25ad%25e6%25b6%2588%25e8%25b4%25b9%25e6%258a%25a5%25e5%2591%258a.pdf&response-content-type=application%2Fpdf>
- [11] 商道纵横 . 界面新闻 . (2020) 《中国可持续消费报告 小康社会之下的可持续消费新趋势》 https://pdf.dfcfw.com/pdf/H3_AP202012251443823750_1.pdf
- [12] Ecommerce Europe. (2021) Collaborative Report on Sustainability and e-Commerce. 2nd edition
- [13] UNCTAD. (2021) ESTIMATES OF GLOBAL E-COMMERCE 2019 AND PRELIMINARY ASSESSMENT OF COVID-19 IMPACT ON ONLINE RETAIL 2020. https://unctad.org/system/files/official-document/tn_unctad_ict4d18_en.pdf
- [14] 2021 年社会消费品零售总额增长 12.5% . 国家统计局 . 2022.01.17. http://www.stats.gov.cn/tjsj/zxfb/202201/t20220117_1826591.html#:~:text=2021%E5%B9%B4%E5%85%A8%E5%9B%BD%E7%BD%91%E4%B8%8A%E9%9B%B6%E5%94%AE,%E3%80%818.3%25%E5%92%8C12.5%25%E3%80%82&text=%E6%B3%A8%E5%B9%A0%E7%B4%A0%E7%9A%84%E5%90%8D%E4%B9%89%E5%A2%9E%E9%80%9F%E3%80%82

- [15] Ivanova, Diana, et al. "Environmental impact assessment of household consumption." *Journal of Industrial Ecology* 20.3 (2016): 526-536.
- [16] Sui, Daniel Z., and David W. Rejeski. "Environmental impacts of the emerging digital economy: the e-for-environment e-commerce?." *Environmental Management* 29.2 (2002): 155-163.
- [17] Demailly, D., & Novel, A. S. (2014). The sharing economy: make it sustainable. *Studies*, 3(14.1).
- [18] Pålsson, H., Petterson, F., & Hiselius, L. W. (2017). Energy consumption in e-commerce versus conventional trade channels-Insights into packaging, the last mile, unsold products and product returns. *Journal of cleaner production*, 164, 765-778.
- [19] Wyman, O., Häberle, L., & Stölzle, W. (2021). Is e-commerce good for Europe? Economic and environmental impact study.
- [20] 绿色和平 . 2021.12.09 《平台上的权与责：平台企业环境治理责任履责现状分析与前景展望》
- [21] 碳足迹 . (2020) 《中国电子商务温室气体排放总量研究报告》
- [22] 绿色和平，赛宝计量检测中心 . 2021.5 《中国数字基建的脱碳之路，数据中心与 5G 减碳潜力与 挑战 (2020-2035)》
<https://www.greenpeace.org.cn/wp-content/uploads/2021/05/China-5G-and-Data-Center-Carbon-Emissions-Outlook-2035.pdf>
- [23] 碳足迹 . 2020.4.30. 《中国电子商务温室气体排放总量研究报告》
- [24] 绿色和平 . 华北电力大学 . (2019) 《点亮绿色云端：中国数据中心能耗与可再生能源使用潜力研究》
- [25] 绿色和平 . (2022) 《中国零售电商气候行动与环境表现 (2021)》
- [26] 界面新闻 . 2022.03.11. 阿里巴巴的碳中和生意 . <https://m.jiemian.com/article/7196590.html#:~:text=2021%E5%B9%B45%E4%B8%AA%E6%9C%88,%E7%9A%84%E8%A7%84%E6%A8%A1%E8%A6%81%E6%9B%B4%E5%A4%A7%E3%80%82>
- [27] 绿色和平 . 摆脱塑缚 . 中华环保联合会 . (2019) 《中国快递包装废弃物生产特征与管理现状研究报告》 <https://www.greenpeace.org.cn/chinas-express-delivery-sector-leaves-giant-waste-trail/>
- [28] Activate Consulting. (2022) Activate Technology & Media Outlook 2022. <https://activate.com/wp-content/uploads/2021/10/Activate-Technology-Media-Outlook-2022.pdf>
- [29] 国家邮政局 . 2022. 1.15. 国家邮政局公布 2021 年邮政行业运行情况 . http://www.gov.cn/xinwen/2022-01/15/content_5668333.htm
- [30] 智研咨询 . 2021.06.11 2020 年中国外卖行业发展现状及未来发展前景分析：在线外卖逆势增长 [图]. <https://www.chyxx.com/industry/202106/956697.html>
- [31] 人民政协报 . 2020.5.12. 塑料餐盒如何“变废为宝”？ http://dzb.rmzxb.com/rmzxbPaper/pc/con/202205/12/content_24472.html
- [32] 温宗国，张宇婷，& 傅岱石 . (2019). 基于行业全产业链评估一份外卖订单的环境影响 . *中国环境科学* , 39(9), 4017-4024.

- [33] Zhou, Y., Shan, Y., Guan, D., Liang, X., Cai, Y., Liu, J., ... & Yang, Z. (2020). Sharing tableware reduces waste generation, emissions and water consumption in China's takeaway packaging waste dilemma. *Nature Food*, 1(9), 552-561.
- [34] 阿里巴巴 . (2021) 《2021 阿里巴巴碳中和行动报告》
- [35] 电商智库网经社电子商务研究中心 . 2020.06.15. 14 张数据图看清零售电商市场格局 . <https://www.jiemian.com/article/4525347.html>
- [36] Demaily, D., & Novel, A. S. (2014). The sharing economy: make it sustainable. *Studies*, 3(14), 14-30.
- [37] 生态环境部 . 2021.4. 《快递包装废物分类回收污染控制技术规范（征求意见稿）》编制说明 . <http://www.mee.gov.cn/xxgk2018/xxgk/xxgk06/202104/W020210419587636350438.pdf>
- [38] 中央人民政府网 . 2020.08.12. 八部门联合推进快递绿色包装标准化 . http://www.gov.cn/xinwen/2020-08/12/content_5534274.htm
- [39] 满投财经 . 2022.01.11. 中国快递行业千亿时代正式开启，不配送上门、信息泄露等问题或将得到改善 . <https://m.jiemian.com/article/7001751.html>.
- [40] 东方网 . 2021.05.11. 《中国经营报》对话雷中南、段华波：快递 100 将推快递包装碳排放大数据 . <https://caijing.chinadaily.com.cn/a/202105/11/WS6099f7b4a3101e7ce974e832.html>
- [41] 艾媒网 . 2021.01.04. 全国外卖订单量达 171.2 亿单，2020 年你贡献了多少？ <https://www.iimedia.cn/c1020/76200.html#:~:text=%E6%91%98%E8%A6%81%20%E6%A0%B9%E6%8D%AE%E6%9C%80%E6%96%B0%E6%95%B0%E6%8D%AE%EF%BC%8C%E6%88%AA%E8%87%B3,%E8%80%85%E7%82%B9%E5%A4%96%E5%8D%96%E7%9A%84%E6%96%B0%E5%AE%A0%E3%80%82>
- [42] 美团外卖 美团研究院 . 2020. 《外卖行业环保洞察 暨青山计划三周年进展报告》 https://s3plus.meituan.net/v1/mss_e602b0ee72a245fd9997b7276211d882/waimai-pc/%E5%A4%96%E5%8D%96%E8%A1%8C%E4%B8%9A%E7%8E%AF%E4%BF%9D%E6%B4%9E%E5%AF%9F%E6%9A%A8%E9%9D%92%E5%B1%B1%E8%AE%A1%E5%88%92%E4%B8%89%E5%91%A8%E5%B9%B4%E8%BF%9B%E5%B1%95%E6%8A%A5%E5%91%8A.pdf
- [43] 摆脱塑缚 . 无毒先锋 . 2021. 《零售电商平台快递包装绿色化观察报告》 . <http://www.plasticfreechn.org.cn/upload/ueditor/20211110/202111101703215118.pdf>
- [44] 绿色和平 . 2022. 《中国零售电商气候行动与环境表现（2021）》 . <https://www.greenpeace.org.cn/wp-content/uploads/2022/01/ecommerce-climate-action-ranking-CN.pdf>
- [45] Target. 2021. 2021 Target Corporate Responsibility Report.
- [46] Zalando. 2022. Sustainability. Reimagining packaging, Minimizing Waste. Designing packaging with circularity principles in mind. <https://corporate.zalando.com/en/sustainability/reimagining-packaging-minimizing-waste>
- [47] 同济大学循环经济研究所 . 2021. 《2020 年绿色快递业包装节约潜力研究报告（长三角）》 .
- [48] Ecommerce Europe. 2021. Collaborative Report on Sustainability and e-Commerce. 2nd edition.
- [49] United Nations Environment Programme. (2019) Global Chemicals Outlook II.
- [50] 无毒先锋 . (2021) 《国际化学品管理概况与改革进展》 <http://www.toxicsfree.org.cn/html/6218971812.html>
- [51] 王滢 , & 丁琼 . (2016). 加强产品中化学品的风险管理应对我国履约新形势 . *科技管理研究* , 36(22), 237-242.

- [52] 市场监管总局 . 2020.2.8. 2020 年儿童及婴幼儿服装等 34 种产品质量国家监督抽查情况通报 . https://gkml.samr.gov.cn/nsjg/zljdj/202102/t20210209_326020.html
- [53] 市场监管总局 . 2020.3.20. 市场监管总局办公厅关于 2019 年第二批玩具等 16 种网售产品质量国家监督专项抽查情况的通报 . https://gkml.samr.gov.cn/nsjg/zljdj/202003/t20200320_313243.html
- [54] 市场监管总局 . 2019.4.16. 市场监管总局办公厅关于 2019 年第一批玩具等 4 种网售产品质量国家监督专项抽查情况的通报 . https://gkml.samr.gov.cn/nsjg/zljdj/201904/t20190416_292860.html
- [55] 广东省市场监督管理局 . 2021.6.5. 广东省市场监督管理局关于 2020 年度广东省儿童服装鞋帽及饰品产品质量监督抽查情况的通告 . http://amr.gd.gov.cn/zwgk/zdlyxxgk/cjcc/qtjc/content/post_3309480.html
- [56] 无毒先锋 . 2021.8.27. 无 3C 认证的涂料买回家, 铅暴露风险高! <https://mp.weixin.qq.com/s/yYIbpQRSRI3ThYaeGPDng>
- [57] 无毒先锋 . 2019.4.18. 10 款销量 10 万 + 的口红, 告诉你这 4 款绝对不能买 . https://mp.weixin.qq.com/s/SrKML81zi0Yr_zi0EXhPZg
- [58] Washington State Office of the Attorney General. 2018.05.09. AG Ferguson: Amazon must remove toxic school supplies, kid' s jewelry from marketplace nationwide. <https://www.atg.wa.gov/news/news-releases/ag-ferguson-amazon-must-remove-toxic-school-supplies-kid-s-jewelry-marketplace>
- [59] The Wall Street Journal . 2019.08.23. Amazon Has Ceded Control of Its Site. The Result: Thousands of Banned, Unsafe or Mislabeled Products. <https://www.wsj.com/articles/amazon-has-ceded-control-of-its-site-the-result-thousands-of-banned-unsafe-or-mislabeled-products-11566564990>
- [60] The Wall Street Journal. 2019.10.22. Amazon Ready to Pour Billions Into Policing Products on Its Site. <https://www.wsj.com/articles/amazon-ready-to-invest-billions-in-policing-products-on-its-site-11571787628>
- [61] 无毒先锋 . 2020.04.01. 市售 62 款橡皮擦 34% 检出增塑剂, 环保组织呼吁关注学习用品质量安全 . https://mp.weixin.qq.com/s/X-agzLExIIM_dbUX7dm1Rg
- [62] 无毒先锋 . 2021.8.17. 我们, 与水晶泥的故事 | 公众送检水晶泥结果中的 5 大发现 . <https://mp.weixin.qq.com/s/11lZqOwHMufzhKi5sc0Meg>
- [63] 中国质量新闻网 . 2022.01.19. 叮咚买菜因销售不合格产品被重罚 罚款金额为货值 10 倍 . <http://cn.315rx.com/index.php?m=content&c=index&a=show&catid=16&id=101002>
- [64] 中国质量新闻网 . 2022.01.18. 盒马旗下两家公司被查出食品安全问题 . https://m.cqn.com.cn/pp/content/2022-01/18/content_8776233.htm
- [65] 无毒先锋 . 2019.01.07 建议加强对电商平台梭子蟹等海产品的重金属检测 . <https://mp.weixin.qq.com/s/Blj3uOHHVv4M0azhfbdorw>
- [66] 自然田 . 2022.04.20. 你买菜常用的生鲜平台够安全吗? 这些事你应该知道 . <https://mp.weixin.qq.com/s/GDPR7c-RfuZ1r96fRCny5w>
- [67] 国家市场监督管理总局 国家标准化管理委员会 . 《消费品中重点化学品使用控制指南》 (GB/T 39498-2020) , 2020 年 11 月 19 日。
- [68] Retailer Report Card. https://retailerreportcard.com/grades/?fwp_sort=points_desc

- [69] Target Group. (2021) 2021 Target Corporate Responsibility Report. <https://corporate.target.com/sustainability-ESG/governance-and-reporting/reporting-progress>
- [70] 联合国环境规划署 (UNEP). 2019. 《关于持久性有机污染物的斯德哥尔摩公约 文本和附件》. <http://chm.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>
- [71] 联合国环境规划署 (UNEP). 2017 《关于汞的水俣公约 正文和附件》 <https://www.mercuryconvention.org/en/about>
- [72] European Chemicals Agency (ECHA). 2022. Candidate List of Substances of Very High Concern for Authorisation. <https://echa.europa.eu/candidate-list-table>
- [73] World Health Organization (WHO) International Agency for Research on Cancer (IARC). 2022. IARC Monographs on the Identification of Carcinogenic Hazards to Humans.
- [74] Walmart. 2022. Walmart Sustainable Chemistry Commitment. <https://www.walmartsustainabilityhub.com/sustainable-chemistry/walmart-sustainable-chemistry-commitment>
- [75] IKEA. 2016. IKEA Restricted Substance List. https://www.ikea.com/us/en/files/pdf/2a/0f/2a0f5e67/ikea_restricted_substance_list.pdf
- [76] Traffic. WWF. IFAW. (2020) 《在线下，在野外打击网络野生动植物非法贸易全球联盟》. <https://static1.squarespace.com/static/5b53e9789772ae59ffa267ee/t/5e5c5f91af79a531e0eeecfc/1583112087175/Offline+and+In+the+Wild+-+Coalition+2020+Progress+Report+-+CHINESE.pdf>
- [77] IPCC. (2019) Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems
- [78] Tubiello, F. N., Rosenzweig, C., Conchedda, G., Karl, K., Gütschow, J., Xueyao, P., ... & Sandalow, D. (2021). Greenhouse gas emissions from food systems: building the evidence base. *Environmental Research Letters*, 16(6), 065007.
- [79] WWF. (2020) Enhancing NDCS For Food Systems Recommendations for Decision-makers.
- [80] 艾瑞咨询. (2020) 中国生鲜电商行业研究报告. http://pg.jrj.com.cn/acc/Res/CN_RES/INDUS/2020/9/11/614059ce-621e-49d4-8cac-f3fff3c567cb.pdf
- [81] 艾媒网. 2021.03.26. 外卖行业数据分析: 2020 年中国在线外卖用户规模达 4.56 亿人. [https://www.iimedia.cn/c1061/77653.html#:~:text=iiMedia%20Research\(%E8%89%BE%E5%AA%92%E5%92%A8%E8%AF%A2,%E7%A8%B3%E6%AD%A5%E5%A2%9E%E9%95%BF%E4%B9%8B%E5%8A%BF%E5%89%8D%E8%BF%9B%E3%80%82](https://www.iimedia.cn/c1061/77653.html#:~:text=iiMedia%20Research(%E8%89%BE%E5%AA%92%E5%92%A8%E8%AF%A2,%E7%A8%B3%E6%AD%A5%E5%A2%9E%E9%95%BF%E4%B9%8B%E5%8A%BF%E5%89%8D%E8%BF%9B%E3%80%82)
- [82] United Nations Environment Programme. (2021) UNEP Food Waste Index Report 2021. <https://www.unep.org/resources/report/unep-food-waste-index-report-2021>
- [83] Ilyuk, V. (2018). Like throwing a piece of me away: How online and in-store grocery purchase channels affect consumers' food waste. *Journal of Retailing and Consumer Services*, 41, 20-30.
- [84] 北京日报客户端. 2020.09.24. 媒体调查“生鲜超市不卖隔夜菜”: 日日鲜成日日扔, 或致浪费. https://www.thepaper.cn/newsDetail_forward_9322105
- [85] 央广网. 2022.05.30. 5 亿外卖用户, 多数人营养搭配不均衡, 外卖点餐 4 点建议. https://www.sohu.com/a/552404347_362042



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