

# **Circular Economy: An Essential Step Towards a Green Future**

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## **Executive Summary**

Plastic pollution has become an increasingly pressing environmental issue that calls for a collaborative effort from governments, corporations, and citizens. Despite accounting for only a small portion of plastic consumption, the beverage sector has great potential to mobilize change in society given how widely its products are used and consumed in our daily lives. Swire group has long been an active supporter of green development. As one of the world's largest bottlers, Swire Coca-Cola Ltd., a subsidiary of Swire Group, has been fully committed to improving the recycling rate of plastic beverage packaging. The Company has set up a recycling plant in Hong Kong S.A.R. to process post-consumer polyethylene terephthalate (PET) and high-density polyethylene (HDPE) every day, and convert it into ultra-clean recycled PET flakes (quasi-food grade) and recycled HDPE grains.

In China, although over 90% of post-consumer bottles are recycled, 84% of them are utilized to make artificial fibre other than being reused for beverage packaging. The major obstacle is the ambiguity of the relevant laws. Food grade applications of recycled PET bottles are neither explicitly prohibited nor permitted. In light of successful practice in most developed countries and regions to allow the use of certified recycled PET for food packaging, and in order to avoid major policy adjustments, this study suggests making a clear distinction between "reclaimed materials" and "recycled materials" in the current regulations, and setting up standards of qualified recycled materials for food-grade applications.

As one of the world leaders in terms of PET bottle recycling rate, China is already in a strong position to enter the next stage of increasing its utilization rate, in order to counter petroleum shortages, environmental pollution and raising unemployment in the country.

Following the global trend of restricting the use of plastic, China is ready to seize the opportunity to develop its PET recycling industry to alleviate shortages in raw materials for domestic businesses in the long run, and enable the country to reap the rewards from owning advanced technology and products in the international market.

We further suggest leveraging the advantages of the Guangdong-Hong Kong-Macao Greater Bay Area in its high mobility of funds, technology and talent, to make it a forerunner in the circular economy and an industry leader. We suggest introducing world's latest technologies and building the first modern large-scale waste beverage bottle processing production line in the Greater Bay Area, under the guidance and policy support of the government. The next step will be to further extend upstream and downstream to build a green supply chain system with complete functions, comprehensive support, matching components, and stable structure in the region.

The concept of the new plastic economy requires all plastic packaging to be 100% reusable, recyclable, or compostable. Landfill sites, incineration, and energy recovery are therefore not among the options for handling plastic waste. En route towards the new plastic economy, China must stay at the forefront of technological innovation, improve the collection mechanism of recyclable materials, and strengthen publicity to form green production and living. Only by taking these steps can we create a better "green" era and pass it on to our future generations.

## **Main Paper**

Plastic is one of the greatest 100 inventions in human history. It has become an indispensable raw material in modern society, and is widely used in various sectors such as aviation, aerospace, agriculture, and the food industry. As plastic is so commonly used in our daily activities, it has become a major pollutant that poses a serious threat to our living environment due to its inability to decompose naturally. Human beings are by far the biggest consumers of resources on the planet, and we therefore have a responsibility to work together to tackle the pressing issue of plastic pollution. Since plastic cannot simply be banned overnight, recycling seems to be the only realistic solution. In the face of increasingly pressing environmental issues, we can no longer ignore this problem and leave it to the next generation. It is therefore the responsibility of governments, corporations and citizens to ensure that immediate action is taken.

Despite accounting for only a small portion of plastic consumption, the beverage sector has great potential to mobilize change in society given how widely its products are used and consumed in our daily lives. The Swire Group commits to promote sustainable development in the industries in which we operate. As one of the world's largest bottlers, Swire Coca-Cola Ltd., a subsidiary of Swire Group, has been fully committed to improving the recycling rate of plastic beverage packaging. Swire Coca-Cola Ltd. has invested a great deal in technical research and development, and has set up a pilot recycling plant in Hong Kong Special Administrative Region of China (Hong Kong S.A.R.). Our experience indicates that China has enormous potential in utilizing recycled materials from plastic bottles, and that it is entirely possible for the country to become a global leader in this field, benefiting the economy, the environment, as well as our future generations.

### **I. Status of plastic beverage bottle recycling in China**

1. High recycling rate, yet low utilization rate

In 2018, global plastic production amounted to approximately 360 million tons<sup>(1)</sup>. The United Nations Environment Programme reported that only 9% of all plastic produced in the world was recycled, about 12% was incinerated, and the remaining 79% was eventually disposed of in landfill sites or in nature. If this recycling rate remains the same, it is expected that a total of 12 billion tons of plastic waste will be disposed of in landfill sites, incinerated or dumped by 2050. The amount of plastic in our oceans will exceed that of fish, leading to serious ocean, atmospheric, and soil contamination.

At present, China is the world's largest plastic consumer and producer. In 2018, 60.42 million tons of plastic products were produced<sup>(2)</sup>, representing 16.8% of the world's total, whereas the overall recycling rate was 27%<sup>(3)</sup>. A major use of plastic is packaging, representing a quarter of all plastic consumption. This translates to 15.1 million tons a year, of which 5 million tons are polyethylene terephthalate (PET). Given that beverages are fast-moving consumer goods, this infers that approximately the same number of post-consumer PET beverage bottles is generated each year. Driven by downstream demand, the market has spontaneously formed an open-loop recycling system: 44% of PET beverage bottles enter the recycling stream directly (sold by end-users), while 56% are discarded after use. 95% of discarded bottles are then later picked up by scavengers and eventually sold to recycling companies. The remaining 5% go to food waste treatment plants, landfill sites and incinerators. In other words, over 90% of post-consumer PET beverage bottles are recycled in China.

However, a high recycling rate does not necessarily mean a high utilization rate. Closed loop recycling is currently not feasible in the PET downstream industry chain due to regulatory constraints. Recycled materials can only be used in non-food applications, of which 84%<sup>(4)</sup> are recycled into artificial fibres. Artificial fibres made from PET cannot be recycled upon end-of-life disposal and will end up in landfill sites or incinerators, all

of which simply add to the other significant environmental issues emanating from the textile industry.

## 2. Circular economy still in its infancy

The "Circular economy" requires materials to be reused multiple times in the system, so as to achieve "dematerialization" of production and consumption, and to minimize material use, particularly natural resources. Waste has to be carefully designed to ensure it can be assimilated within nature's absorption capacity. Food-grade application of recycled materials is a prime example of this new closed-loop recycling model. Compared with using new petroleum-derived materials, it consumes 79%<sup>(6)</sup> less energy and emits 67%<sup>(5)</sup> fewer greenhouse gases, contributing significantly towards mitigating global warming and protecting the environment. For beverage packaging, recycling is the only feasible choice. Compared with other packaging materials, plastic is economic and practical, with good stability, moldability and impermeability. It is also lightweight for safe long-distance transportation, while reducing energy consumption and carbon emissions during transportation. Therefore, plastic is seen as an irreplaceable material for beverage packaging. "Old bottle to new bottle" technology enables post-consumer plastic beverage bottles to be reused in food applications, and is typically adopted in the circular economy of plastic bottles.

China has conducted trials in this area. In 2006, Incom Recycle Co., Ltd. in Beijing introduced production technology from Europe and set up China's first "bottle-to-bottle" production line. In 2010, it was approved by the government to use certified recycled PET materials for food packaging. However, downstream companies were unable to adopt its products due to regulatory conflicts, and its production line was suspended as a result. China currently has no food-grade application of recycled materials.

## 3. Strategic significance of food-grade application of recycled PET bottles

PET has the largest output and widest range of applications among saturated thermoplastic resins, and is commonly used in various food, beverage, edible oil and other packaging. After more than 50 years of development, China's PET industry has grown stronger and become the world's most important PET producer and consumer. Over the past decade, China's expansion of its PET production capacity has been relatively rapid, with an average annual growth rate of 8.5%. Since PET is a derivative of petroleum, the increased utilization rate of recycled PET has led to a reduction in the reliance on fossil fuels. It is estimated that 6 tons of petroleum is used for every ton of PET produced. Based on current figures of PET bottle consumption in China, 30 million tons of petroleum can be saved every year if all post-consumer plastic bottles are recycled in a closed-loop.

On the other hand, China's waste plastic processing industry has large and solid foundations. Large-scale waste plastic trading centres and processing clusters have recently been formed around Guangdong, Shandong, Zhejiang and Hebei. The market for waste plastic recycling, reprocessing and operation has been expanding, with an annual transaction volume reaching 10 billion RMB. With regards to the large number of waste PET bottles, China has promising potential to develop its recycling industry with high value-added utilization. Such a move will also play a strategic role in countering petroleum shortages, environmental pollution and rising unemployment in the country.

#### 4. Laws and regulations need to be enhanced

The development of this mature technology spans 25 years. The United States' Food and Drug Administration (FDA) and European Food Safety Authority (EFSA) have issued specifications and guidelines on the food-grade application of recycled PET. While most developed countries and regions have allowed the use of certified recycled

PET for food packaging, it is not yet the case in other countries and regions, such as China, India, Thailand (under research), the Middle East, and Africa.

In Chinese Mainland, food-grade application of recycled PET has experienced major changes. Once legally prohibited, it is now permitted by the state on a case-by-case basis, however a general development process is yet to be stipulated. Article 7 of the "Administrative Measures on the Hygienic Management of Plastic Products and Raw Materials for Food" promulgated by the former Ministry of Health in 1990 stipulates: "When processing plastic tableware, containers and food packaging materials, recycled plastics shall not be used." The regulation was declared invalid in 2010. To this day, although there is no legal provision that explicitly prohibits the food-grade application of recycled PET, the lack of supporting policies has hindered its development.

On January 16, 2020, China's National Development and Reform Commission and the Ministry of Ecology and Environment jointly issued the "Opinions on Further Strengthening the Control of Plastic Pollution". Based on the concept of "prohibition, substitution, and standardization", it promotes recycling with ease, recyclable materials, degradable alternatives, and cultivates the new model of plastic reduction, green logistics and reuse. It is clearly stipulated that green design and new environmentally friendly materials should be actively adopted and the safety and recycling performance of plastic products should be enhanced. The use of recycled plastics that meet quality control standards and application restrictions should be encouraged. Lastly, the development of relevant materials and products must be reinforced, with the aim of reducing application costs and increasing supply. The industry has high expectations on how supporting policies will be introduced, so that these opinions can be put into action.

## **II. Choosing the right path for the development of China's recycled plastics industry**

### **1. Sharing China's experience with the world**

In the development of the environmental protection field around the world, pioneers are often seen coming from the private sector, but planning and promotion actions still require foresight from public policy makers. Plastic recycling has become an undisputed trend in our world. China represents a huge market and its policy choices will most certainly have a global impact. In the field of plastic bottle recycling, China can undoubtedly become a model for the world.

With a PET bottle recycling rate of over 90%, China is one of world leaders in this regard. Japan far surpasses Europe and the United States, with a rate of 92%. The recycling rates in Europe and the United States are 59.8% and 29.9% respectively. While many countries in Europe and the United States are still at the stage of adopting various methods including deposit systems to improve recycling rates, China already has the framework firmly in place to enter the next stage of increasing its utilization rate, setting the standard for global plastic recycling projects.

The promulgation of environmental policies often involves negotiation with various parties. The reform and adaptation of industries can be costly and involve complex laws and long-term public education. On the contrary, plastic bottle recycling has a comparatively strong foundation. With favourable policies in place, the market can quickly adjust to a new economic model and develop a mature industrial chain. The Basel Convention's restriction on the import and export of plastic waste will take effect in 2021. Following the global trend of restricting and banning the use of plastic, China is ready to seize the opportunity to develop its PET recycling industry. This will alleviate shortages in raw materials for domestic businesses in the long run, and enable the country to reap the rewards of owning advanced technology and products in the international market.

## 2. Encouraging corporations to develop the circular economy



Since 2010, only one company has been licensed to apply recycled PET in food packaging, despite the beverage industry being very keen to move forward in this area. It is an internationally accepted practice for manufacturers to be involved in recycling and utilization processes. Since manufacturers are held directly accountable for their end consumers, they tend to strictly adopt safety standards to the best of their abilities. The arrangement itself also facilitates government supervision. The Coca-Cola Company has committed to recycling one beverage bottle for each one it sells worldwide by 2030. To this end, participation in the Chinese market is essential. Swire Group has been cooperating with the Coca-Cola Company in the beverage sector for over 55 years. Swire Coca-Cola Ltd. is currently the fifth largest Coca-Cola bottler in the world which owns the franchise to produce, promote and distribute Coca-Cola products in Chinese Mainland, Hong Kong S.A.R., Taiwan and western United States. The company owns 18 bottling plants in Chinese Mainland, employs 20,000 people, and offers 21 brands of beverages to its customers. Not only are we a beverage supplier, but also an active supporter of the sustainable management of post-consumer beverage bottles. Swire Coca-Cola Ltd. joined the Allen MacArthur Foundation in 2017 to promote the new plastic economy based on the concept of the circular economy. The Company has brought together key stakeholders to rethink and redesign the future of plastic packaging. For instance, we redesigned the main packaging to minimize consumption of packaging materials and natural resources, without compromising its function. Since 2010, we have been applying lightweight technology to plastic bottles of certain brands in Chinese Mainland, Hong Kong S.A.R., Taiwan and western United States. This includes reducing the length of bottlenecks as well as materials used for bottle caps and bodies.

### 3. Lifting restrictions and setting standards

Food-grade application of recycled PET bottles are neither explicitly prohibited nor permitted according to the current policy status. Considering that food safety is a livelihood issue involving the well-being of thousands of households, the government has to strike a balance between encouraging recycling and market supervision. In light of international practice and in order to avoid major policy adjustments, we suggest making a clear distinction between "reclaimed materials" and "recycled materials" in the current regulations, and clarifying that recycled materials meeting certain standards will be qualified for food-grade applications.

- a) Reclaimed materials are post-consumer PET beverage bottles that have undergone the complete or partial process of collection, cleaning, shredding and removal of impurities;
- b) Recycled materials are post-consumer PET beverage bottles that have been subject to cleaning and purification processes, and thus meet the testing requirements;
- c) It is necessary to clarify the concepts and scope of "reclaimed materials" and "recycled materials" in the "Implementation Rules of Production Licenses for Food-related Products", and that only recycled materials are allowed to be used in food packaging.

The technology used for producing recycled PET can be categorized into physical and chemical methods. Technically speaking, both can assure product safety for multiple primary recycling. Scientific safety evaluation criteria can be adopted to evaluate the residual pollutants in the processed materials. Since waste is used as a raw material, it is subject to all kinds of contamination. To ensure product safety, the production process must pass a series of extreme raw material contamination tests. If the contaminant level can be lowered to the safety threshold recognized by the World Health Organization, i.e. an estimated daily intake (EDI) of 1.5 micrograms / person / day (0.5 ppb dietary

concentration (DC) <sup>(8)</sup>, it can be concluded that the recycled materials produced using this process are safe to use as food packaging. Establishing a safety assessment method for food-grade recycled PET materials will promote the recycling of material multiple times, and conserve primary resources. It will also make it easier for the government to regulate the recycling industry as a whole.

### **III. Leveraging the advantages of the Guangdong-Hong Kong-Macao Greater Bay Area**

On February 18, 2019, the Central Committee of the Communist Party of China and the State Council issued the "Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area", which strongly promotes the construction of eco-living areas and the concept of green development. We believe that the high mobility of funds, technology and talent in the Greater Bay Area will make it a forerunner in the circular economy and an industry leader.

1. Making full use of international technology and funds to develop the circular economy in Hong Kong S.A.R.

Application of approved recycled materials in food packaging is allowed in Hong Kong S.A.R.. With green recycling development as one of its strategic goals, Swire Group has taken advantage of the interconnection between Hong Kong S.A.R. and Chinese Mainland in the Greater Bay Area to vigorously develop the recycling industry. In 2018, certain carbonated beverage brands in Hong Kong S.A.R. replaced their bottles made from 100% virgin material with ones made from 25% recycled material. Significant technological progress in the sustainable use of plastic bottles was also made.

We have formed partnerships with German company ALBA and Hong Kong S.A.R. company Baguio, both long-term players in this field, to introduce advanced recycling technology and have invested 257 million HKD to set up a recycling plant in Hong

Kong S.A.R.'s Tuen Mun area. It is expected to be running in the third quarter of 2020 and handle local post-consumer beverage and personal care product containers. The plant will also be equipped with the most advanced wastewater treatment technology. Its solar water and photovoltaic power installations will enable renewable energy to be generated on site. The plant will process approximately 100 tons of post-consumer PET and high density polyethylene (HDPE) every day, and convert it into ultra-clean recycled PET flakes (quasi-food-grade) and recycled HDPE grains.

2. Learning from Hong Kong S.A.R.'s experience and establishing a complete industrial chain in the Greater Bay Area

The Hong Kong S.A.R. government attaches great importance to the environmental protection industry and has given it great support. However, the incomplete local industrial chain, coupled with the shortage of land resources and labour, has hindered the development of in-depth product processing in Hong Kong S.A.R.. The products from our recycling plant in Hong Kong S.A.R. will be mainly exported to the world in the form of recycled plastic flakes and grains. On the contrary, the Greater Bay Area has the conditions to establish a complete industrial chain. By combining our commitment to global sustainable development with Hong Kong S.A.R.'s operating experience, we suggest using "closed-loop recycling of waste polyester beverage bottles" as an entry point to introduce the world's latest technologies, and investing in the construction of the first modern large-scale waste beverage bottle processing production line in the Greater Bay Area, under the guidance and policy support of the government. In combination with the existing preform and beverage can manufacturing processes, the synergy of the modern recycling industry and beverage industry will single-handedly bring about economic, environmental and social benefits. This can be further extended upstream to organically and effectively coordinate the collection, sorting, packing,

distribution, and information of waste beverage bottles. Ultimately, a green supply chain system with complete functions, comprehensive support, matching components and a stable structure can then be formed in the region.

#### **IV. Working together to create a new plastic economy**

The concept of the new plastic economy requires all plastic packaging to be 100% reusable, recyclable, or compostable. Landfill sites, incineration, and energy recovery are therefore not among the options for handling plastic waste. There will be no plastic waste in natural environments and all future use of plastics should be completely disassociated from non-renewable resource consumption. This is both our beautiful vision and our responsibility for future generations. Creating a new plastic economy is bound to be a process in which the whole of society is involved. It requires policy makers to make top-level plans and mobilize participants from all sides.

##### **1. Staying at the forefront of technological innovation**

In order to make the new plastic economy a reality, new technologies and solutions have been emerging in recent years. In 2019, the Coca-Cola Company introduced the world's first recycled beverage bottle made from recycled marine plastic waste, and petroleum giant BASF opened up a whole new concept of recycling plastic waste through its "Chemical Cycle" project. Scientific research teams from various countries have been gathering professional knowledge to seize new opportunities in the emerging field of the circular economy. A new revolution with technology at its core has become an important force in reshaping regional economic development. The new plastic economy is driven by innovation, and the use of virgin plastic is reduced through reduction, reuse and recycling. Where permitted by law and technology, the use of recycled plastics is strongly encouraged. On the premise of ensuring environmental friendliness and reliable sources, virgin materials should be replaced by renewable raw materials. These

guidelines will require us to re-conceive, innovate and explore new business models, materials, packaging design, and re-processing technology.

## 2. Improving the collection mechanism of recyclable materials

Waste collection is where recycling begins and is the starting point of the reverse supply chain. A scientific and adequate collection system is a prerequisite for effective recycling. The reverse supply chain in Chinese Mainland is dominated by small companies and individuals scattered around the country, resulting in high management costs, and difficult and ineffective policy implementation. Deployment of a market adjustment mechanism is recommended in order to encourage wider use of recycled materials. A traceability system for recycled materials should also be developed to enable the introduction of tax incentives for end-product businesses using recycled materials, in order to form a feedback loop that contributes to the healthy development of the reverse supply chain.

Swire Coca-Cola Hong Kong Ltd. is a founder of the "Drink Without Waste" initiative in Hong Kong S.A.R. Downstream in our value chain, we have been working with stakeholders to promote recycling through public education, innovative business solutions and package-free alternatives. We also hope to cooperate with the government on aspects such as recycling infrastructure and system planning to jointly reduce process contamination, enhance product value, formulate product service information systems, and ultimately achieve full control of the recycling process.

## 3. Strengthening publicity to form green production and living

The recycling of plastic beverage bottles is closely related to the economy and our daily lives. Green production and living cannot be formed overnight. Continuous efforts on strengthening publicity and guidance, raising awareness among businesses and the

public on plastic recycling at all levels, and getting them involved are absolutely necessary. More can be done to encourage beverage companies to commit to sustainable development goals, and promote best practices for green design, supply chain, green ideas and choices among consumers. These steps will eventually form a social consensus and become positive driving forces.

## **Conclusion**

In today's plastic conscious era, we need to think rationally as to whether we let the plastic industry subsidize, or embrace it and foster its scientific development, based on the concept of the circular economy. Plastic production and packaging is a 700 billion US Dollar industry. Putting an end to plastic would have a significant industrial impact, and also greatly affect the convenience of modern life. The lifting of restrictions on food-grade application of recycled PET material could help turn plastic into an established “green” resource.

Only by raising public awareness, preventing littering, optimizing waste separation initiatives, encouraging primary recycling, and implementing the relevant regulations, can we truly protect our planet Earth.

Over the past century, the arrival of the plastic era brought gasps of surprise, but perhaps that was just a prelude of what was to come. And now, thanks to exciting new recycling technologies, the real plastic era is only just beginning. Only through the circular economy can we create a better "green" era and pass it on to our future generations.



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