



# Rethinking Plastics – Circular Economy Solutions to Marine Litter

“塑料再思考”

循环经济应对海洋垃圾

## Project Results in China

Author/Review: Dr. Liu Xiao, Zhou Yanwen

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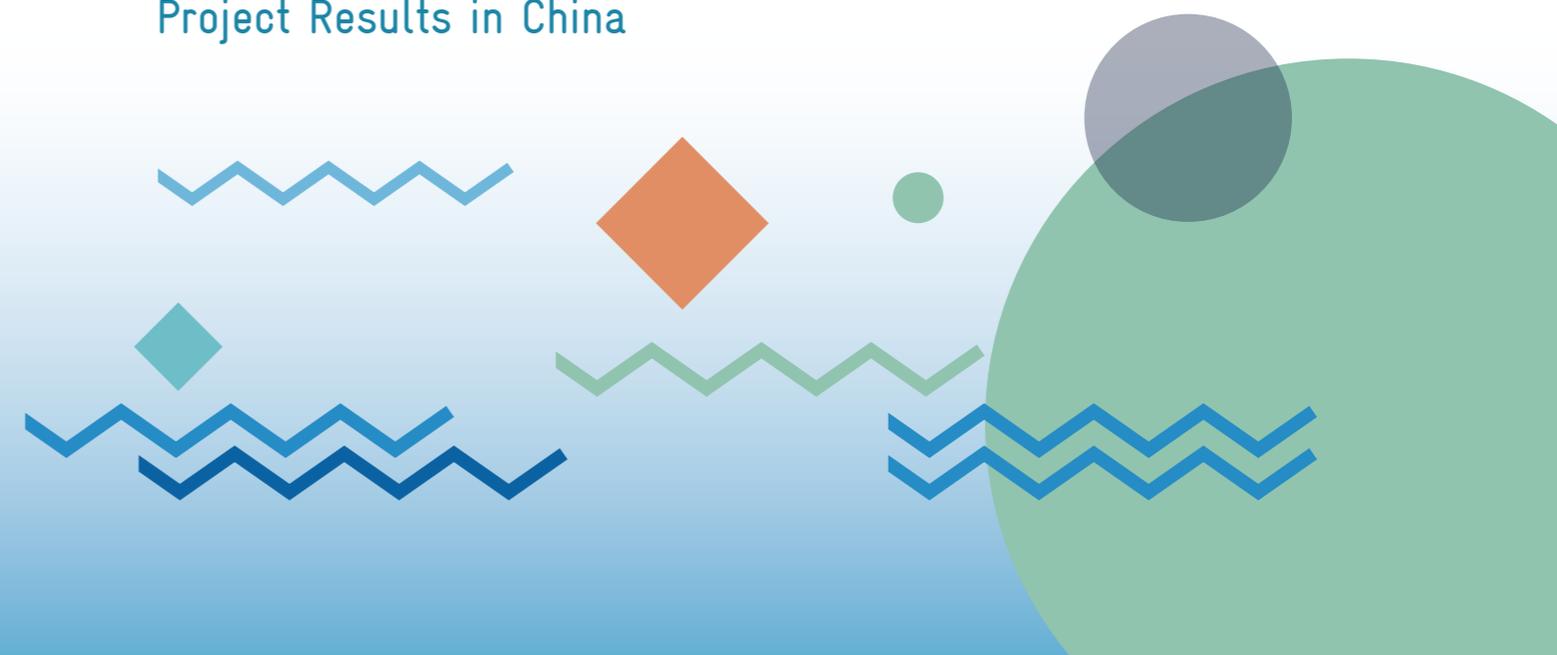
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Website



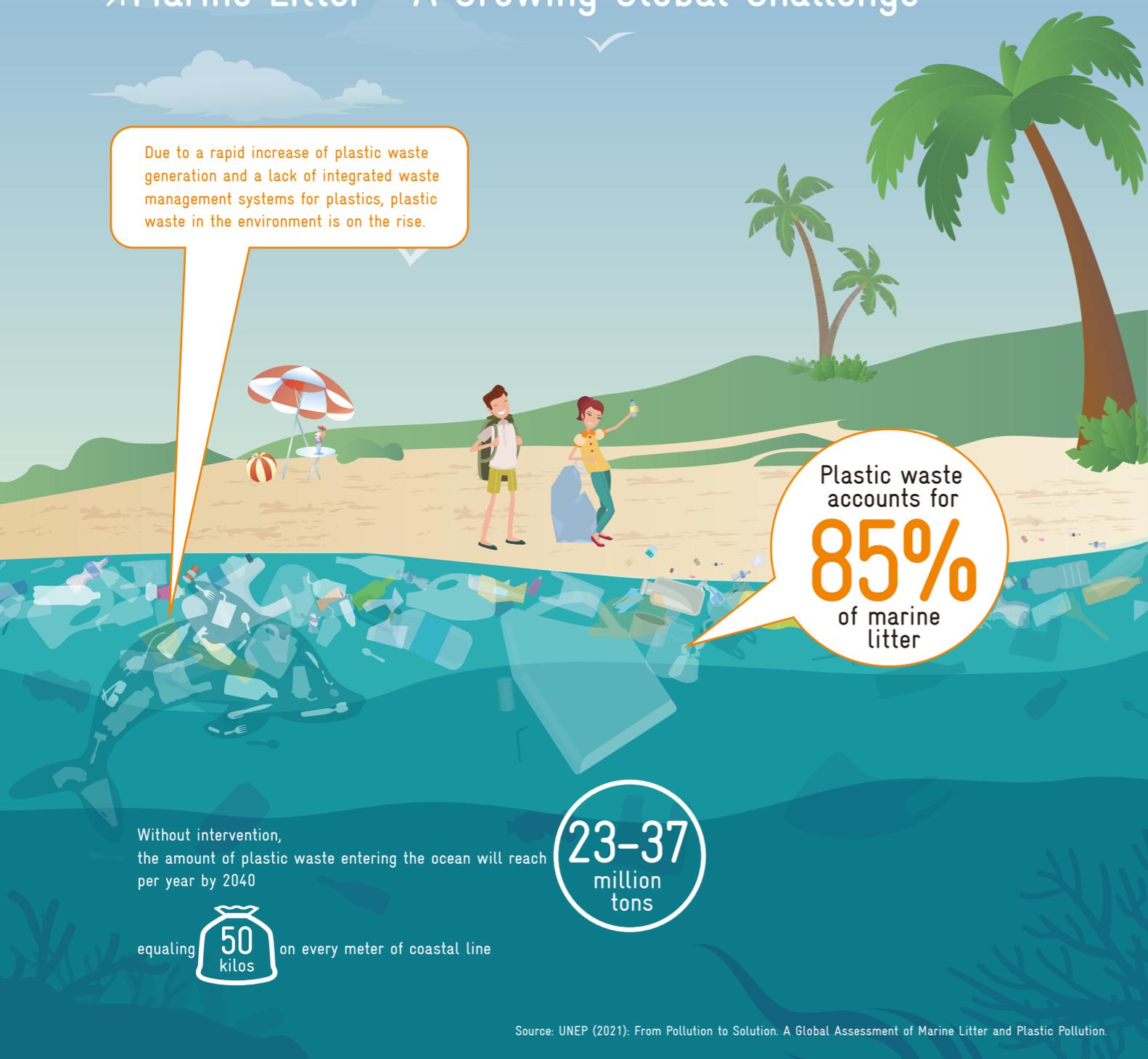


Reduce Plastic Waste  
and Protect the Ocean!



## ➤ Marine Litter – A Growing Global Challenge

Due to a rapid increase of plastic waste generation and a lack of integrated waste management systems for plastics, plastic waste in the environment is on the rise.



Plastic waste accounts for **85%** of marine litter

Without intervention, the amount of plastic waste entering the ocean will reach per year by 2040

**23-37** million tons

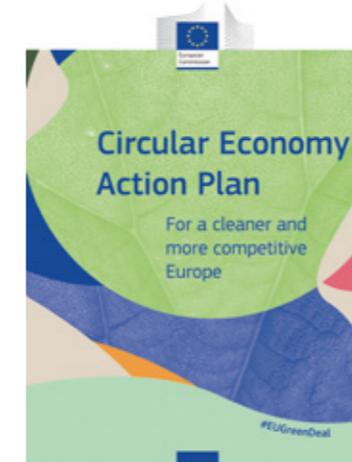
equaling **50 kilos** on every meter of coastal line

Source: UNEP (2021): From Pollution to Solution. A Global Assessment of Marine Litter and Plastic Pollution.

## ➤ Circular Economy Solutions

To tackle the global plastic waste challenge, joint efforts are needed for a circular economy. The European Union (EU) presented the Plastic Strategy and Circular Economy Action Plan, as well as issued the Single-use Plastic Directive, aiming to reduce marine

litter. In recent years, China has also released a series of policy documents to promote plastic management along the whole value chain and reduce the plastic leakage into the environment.



Circular Economy Action Plan



Single-use Plastic Directive

Source: European Commission



**Sébastien PAQUOT** | Counsellor for Climate Actions and Environment  
Delegation of the European Union to China

Circular Economy is what we want to achieve. We are working on concrete approaches in China through our Rethinking Plastics project. Several pilot activities in different regions contribute to finding new solutions to reduce plastic waste and marine litter.



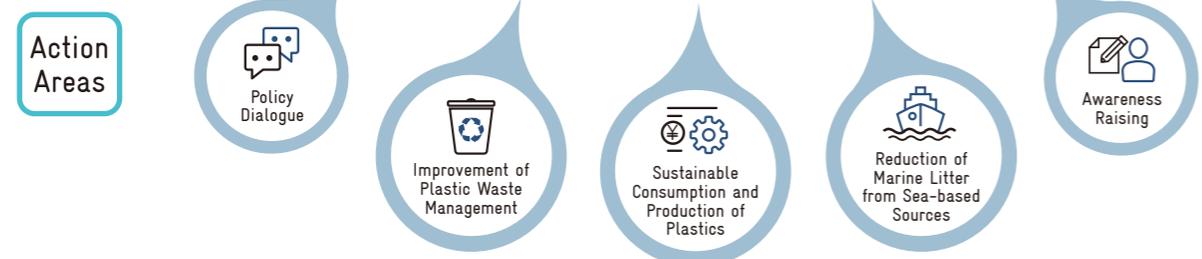


## Project Information

### Rethinking Plastics – Circular Economy Solutions to Marine Litter

<b>Contracting Authority</b>	European Union (EU), German Federal Ministry for Economic Cooperation and Development (BMZ)
<b>Implementation Organization</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Expertise France (EF)
<b>Partner Countries</b>	China, Indonesia, Philippines, Thailand, Vietnam, Singapore and Japan
<b>Implementation Period</b>	May 2019 to October 2022

**Objectives**  
The project supports the transition towards a circular economy for plastics in East and Southeast Asia to reduce plastic waste leakage into the sea and thus marine litter.



#### Rethinking Plastics in China:

Through dialogue and training activities, recommendations and one-year long pilot projects including agricultural mulch film management, packaging waste reduction, ship waste management and fishing-for-litter initiative in China, the project aims to improve the plastic management along the whole value chain, promote sustainable consumption and production of plastics, and reduce marine litter from sea-based sources.

**Pilots**

**Xiamen**



Pilot Study on Establishing a Waste Collection System Favouring Single-Use Plastic Drinking Bottles

**Haikou**



Reusable Packaging in the Online Express Delivery Industry

**Tianjin Port/Shanghai Port**



Ship Waste Management at Commercial Ports

**Kailu County, Inner Mongolia**



Innovative Plastic Mulch Film Collection

**Qingdao**



Application and Promotion of Reusable Standardized Containers

**Changhua/Sanya**



Reducing Marine Litter through Fishing-for-Litter



For more information: <https://rethinkingplastics.eu/>

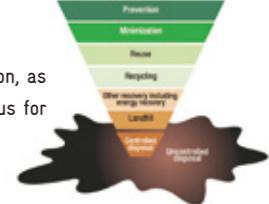
## Key Concepts



### 01 Waste Hierarchy

The hierarchy provides a generalised priority order for waste reduction and management: Prevention, as well as the 3R principle (Reduce, Reuse and Recycle) are on top and should be promoted. The focus for the remaining waste is to phase out uncontrolled disposal (e.g. open dumping and burning).

Source: UNEP (2015), Global Waste Management Outlook.





### 02 Circular Economy

In a circular economy, resources are used and managed in a more efficient and sustainable way through the principles of "Reduce, Reuse, Recycle".



### 03 Extended Producer Responsibility (EPR)

EPR is an environmental policy approach in which a producer's responsibility for a product is extended to the waste stage of that product's life cycle, including collection, sorting, recycling or final disposal.

Source: Basel Convention (2019): Practical Manual on EPR.



### 04 Deposit-Refund System (DRS)

In a Deposit-Refund System, the packaging is given an economic value by requiring consumers to pay a deposit at the point of sale. When the empty packaging is returned, the deposit is refunded. The DRS has proven to be an effective way to collect plastic bottles for high-quality recycling.



### 05 Sustainable Consumption and Production

Sustainable consumption and production encourages circular economy development, in which the reduction of single-use plastic products, reuse and recycling are promoted. Products can for example be designed in a way, that they use less packaging or that they can be reused and recycled. Consumers can choose more sustainable or reusable alternatives, refuse over-packaging, or bring their own bag, cup or cutlery.



### 06 Awareness Raising

Awareness raising is an important approach on environmental topics that aims to inform and engage people regarding more environment-friendly and sustainable attitudes and behaviors. The target groups cover decision makers on policy level and in businesses, youth and consumers etc.

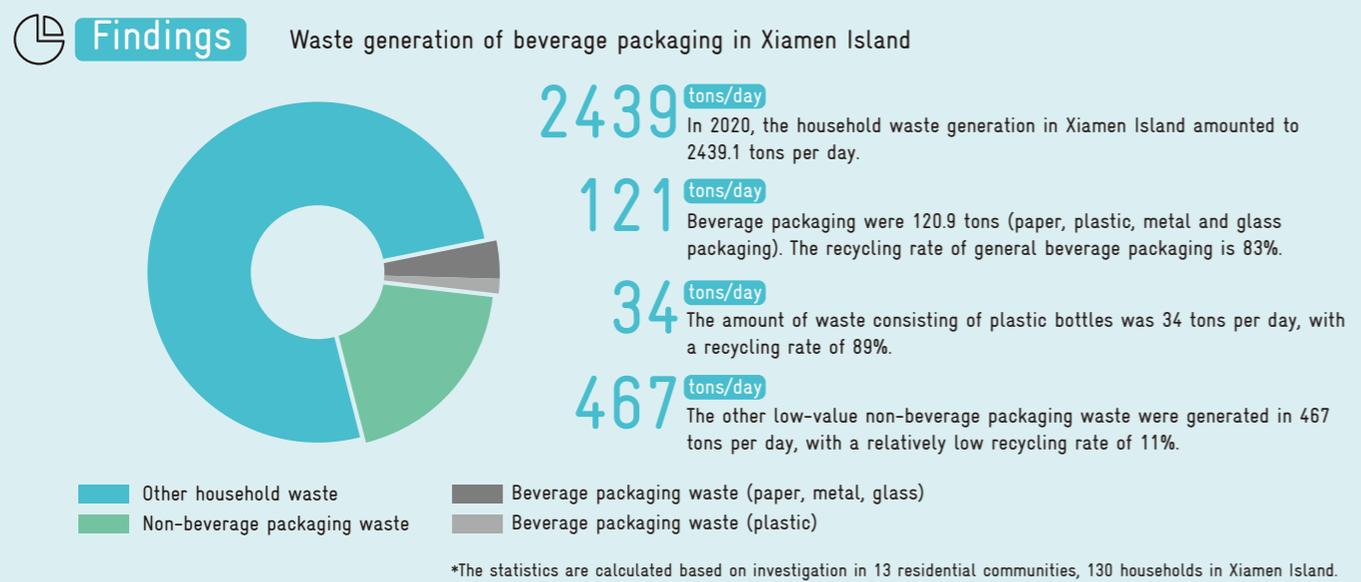
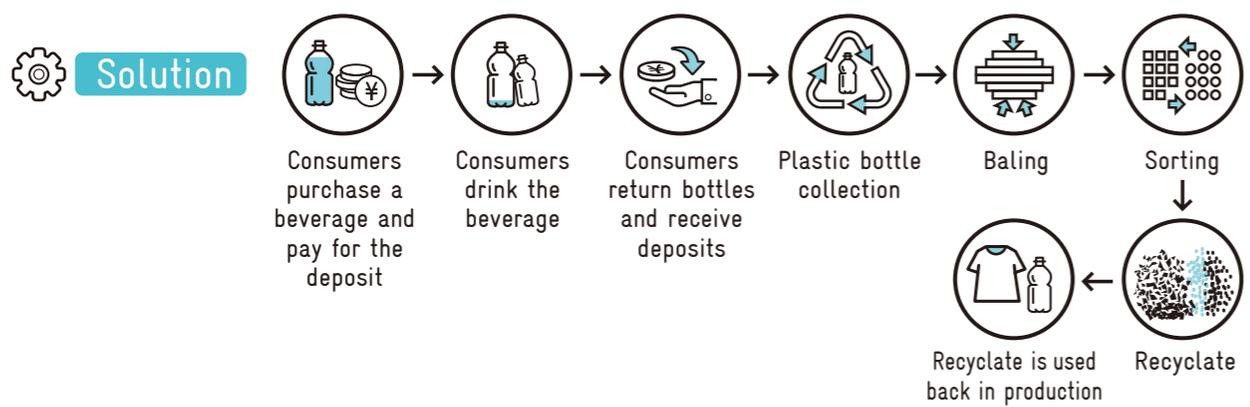


# Xiamen Pilot Study on Establishing a Waste Collection System Favouring Single-Use Plastic Drinking Bottles

**Partner** China Association of Circular Economy (CACE)

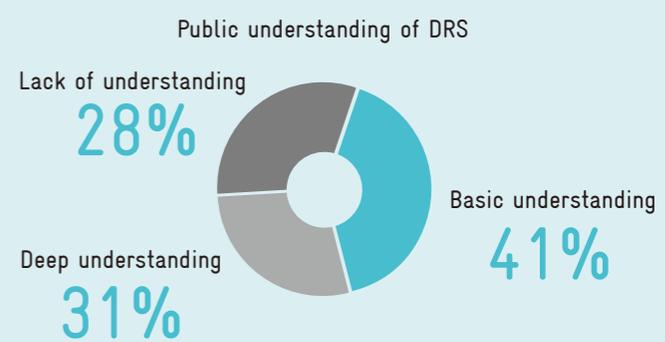
**Problem** Are the consumed drinking bottles collected and recycled? How can this process be improved to be more efficient and value-added?

**Contribution by Rethinking Plastics** Baseline study of plastic bottle collection in Xiamen + Public awareness towards a Deposit Refund System (DRS) + Cost analysis to establish DRS



## Public awareness towards DRS

The pilot conducted an online survey on knowledge and readiness of consumers with 243 replies. Most respondents stated that they have an interest in joining DRS but need more information about the new system. They voted for a deposit amount of up to 1 RMB and 78 per cent of participants hope to get refund through WeChat and Alipay.



## Cost analysis to establish DRS

	Collection of plastic bottles	Collection of all packaging types (paper, plastic, metal and glass)
Recycling rate target	90%	90%
Daily collection amount (ton)	34.3	120.9
Deposit (RMB/bottle)	0.3	0.3
Collection station	154	154
Construction cost (million RMB)	16.72	21.56
Operation cost (million RMB/year)	26.37	73.45
Cost (RMB/ton)	2340	1849
Cost (RMB/packaging)	0.06	0.05

## Suggestions

- According to the research result of Xiamen pilot, it is feasible to establish DRS through market operation.
- Relying on the existing internet-based collection mode, the financial calculation suggests that better economic benefits can be achieved by integrating collection of all kinds of beverage packaging, and establishing an intelligent management platform of the whole value chain.
- There is much room for improvement regarding the collection and recycling of low-value packaging waste in Xiamen. The next step can focus on low-value packaging collection and its performance evaluation.



Source: PREVENT Waste Alliance (2020): EPR Toolbox.



**ZHAO Kai** | Executive Vice President  
China Association of Circular Economy

Through the pilot experience of DRS research in Xiamen, we hope to explore a new mechanism for plastic bottle collection based on the local situation in China, which will contribute to the improvement of the overall recycling rate, plastic pollution control and the achievement of the national carbon neutrality strategy.



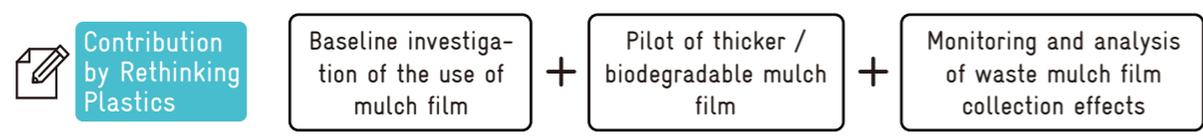
# Kailu County

Inner Mongolia Autonomous Region

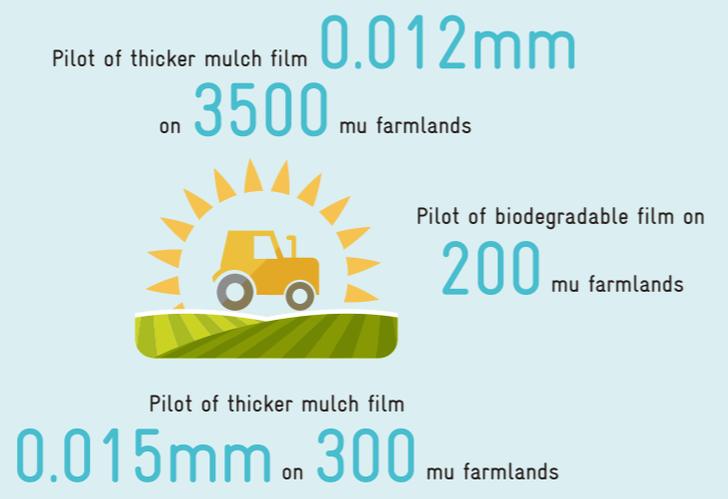
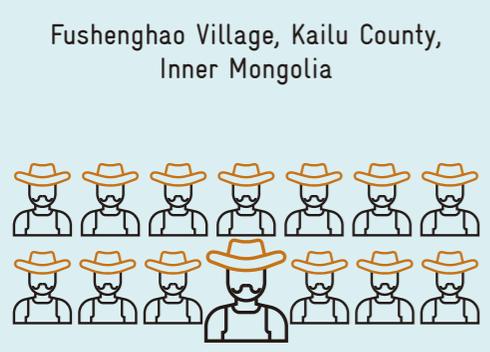
## Innovate Plastic Mulch Film Collection

**Partner** Research Center for Rural Economy (RCRE), Ministry of Agriculture and Rural Affairs (MoARA)

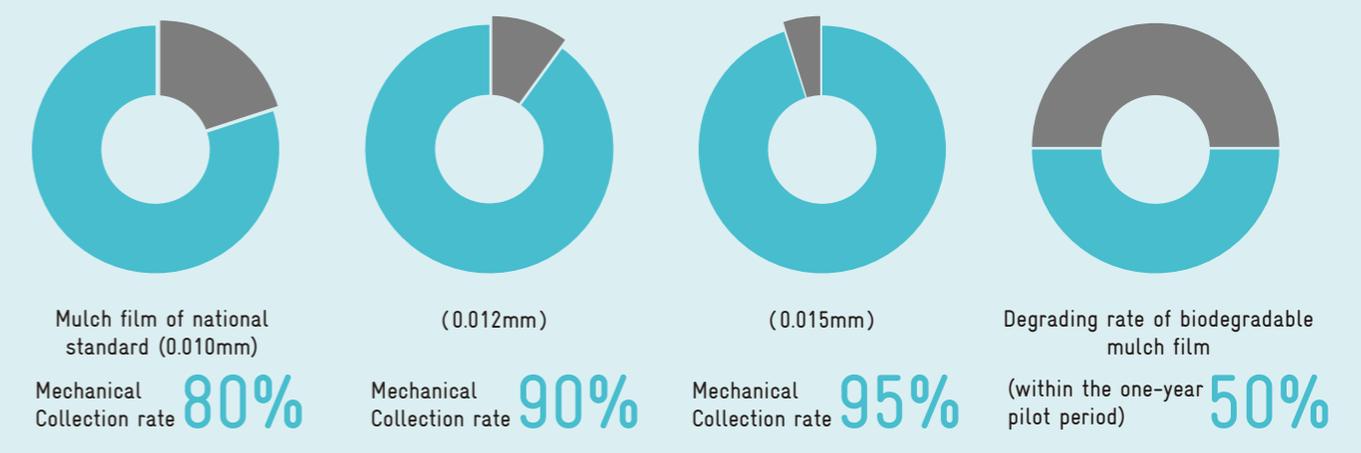
**Problem** China is the largest consumer of agricultural mulch film, with an annual consumption amount of 2.4 million tons. The collection rate of waste mulch film is around 80%. How to minimise the mulch film residue in the soil and promote recycling in a more effective and efficient way?



### Solution



### Findings



\*The collection of waste mulch film is completed by local common collection machines.

Thicker high-quality mulch films contribute to a high collection rate and bring a revenue of **500-1000** RMB/t for the recyclables.

In 2022, the national subsidy will support the use of 0.015 mm mulch film on **50 million** mu farmlands, and additional **5 million** mu farmlands for biodegradable mulch film. The Kailu County will continue the pilot on **0.1 million** mu farmlands of 0.015mm mulch film with the national subsidy.

Unified scientific monitoring methods and long-term monitoring mechanism should be established for monitoring mulch film residue in the soil, which can help to better summarize the mulch film pollution problem and implement solutions.

### Suggestions

- Using high-quality mulch film can reduce mulch film residue in the soil. The pilot shows it is effective to reduce mulch film pollution through the cooperation with producers. With this regard, EPR will be an effective instrument.
- Considering the vulnerable position of farmers in the society, and under the agricultural subsidy background in China, it is effective to adjust the subsidy policy and guide the promotion of using high-quality mulch films.
- It is suggested to further monitor and evaluate the effectiveness of the 0.1 million mu pilot in Kailu County, which can help promote the mulch film management policy.



**JIN Shuqin** | Director/Researcher  
Research Center for Rural Economy, Ministry of Agriculture and Rural Affairs

Dedicated to the research of agriculture and rural affairs, I feel the deep affection for farmlands, just like farmers. I hope our earth can be revitalized with bluer sky, cleaner waters and soil through joint efforts.



# Haikou Reusable Packaging in the Online Express Delivery Industry

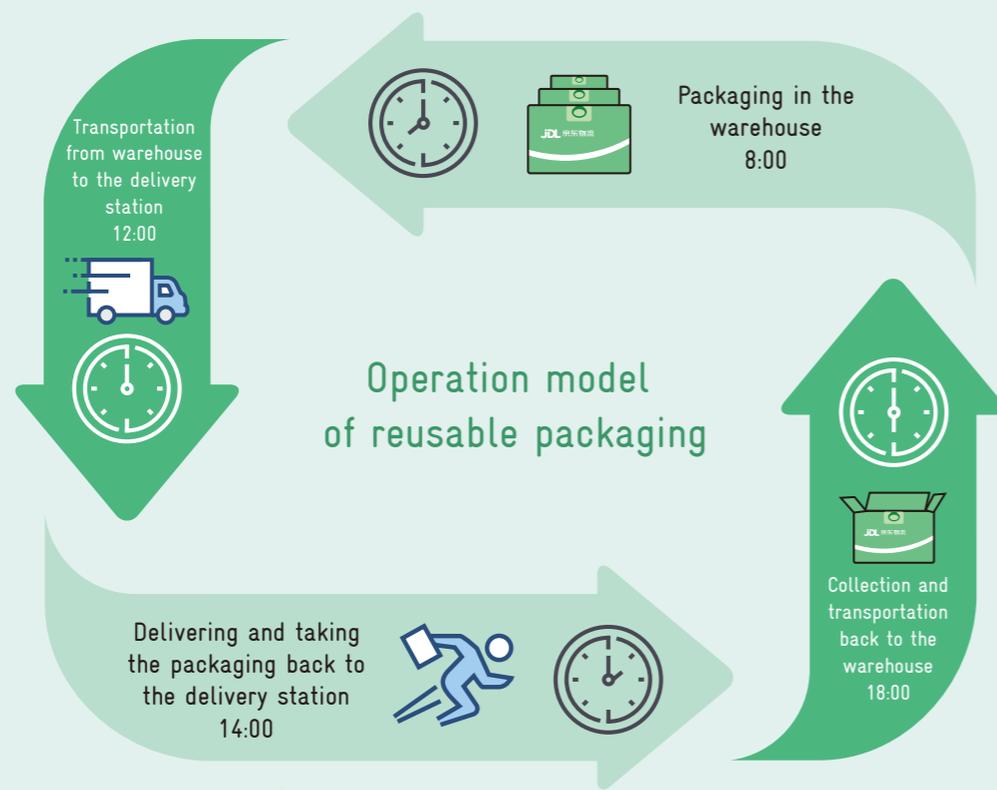
**Partner** China Federation of Logistics and Purchasing (CFLP), Shenzhen University

**Problem** In 2021, the total volume of express delivery was over 100 billion pieces. How to better reduce resource consumption and waste in the express delivery industry?

**Contribution by Rethinking Plastics**

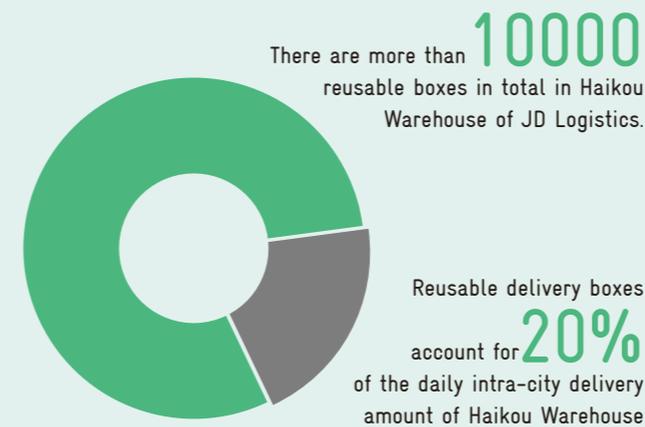


## Solution



\*The analysis is based on the existing model of reusable delivery packaging of JD Logistics in Haikou, which is one of the leading express delivery companies in China.

## Findings



Using Green Stream Box, **0.9** million single-use plastic packaging have been saved in one year

including over **0.3** million corrugated boxes, **0.5** million plastic bags, and **1.78** million meters of tape

The scenario of using reusable boxes is the intra-city express delivery package sent by JD Haikou Warehouse, covering a population of more than **200000**. The reusable box is circulated every **3** days. Based on the survey, more than **90%** of the customers provided positive feedbacks and acceptance of the reusable box.

## Suggestions

- The reverse logistics cost is the key part for reusing delivery packages. The successful case of JD Haikou relies on the self-run warehouse and delivery system. It is suggested that the current operation model can be promoted. It is still challenging to promote reusable packaging in intercity delivery or between different delivery systems.
- The delivery industry currently focuses mainly on the optimization of cost and benefit. The sustainable transition in this industry needs support and guidance from the national policy level.



**DUAN Yanjian** | Director of Green Stream Initiative  
JD Logistics

It is important to achieve the standardization of delivery packaging and build the infrastructure for packaging collection and reuse. In addition, the green consumption needs to be encouraged, so that the reusable packaging in delivery can be promoted.



**WAN Ying** | Secretary General of E-commerce and Express Service Committee  
China Federation of Logistics and Purchasing

I think it is promising to promote the business model of reusable packaging in the express delivery industry. I hope that we can choose reusable packaging, when using express services in our daily life. Together we can build an ecological society.

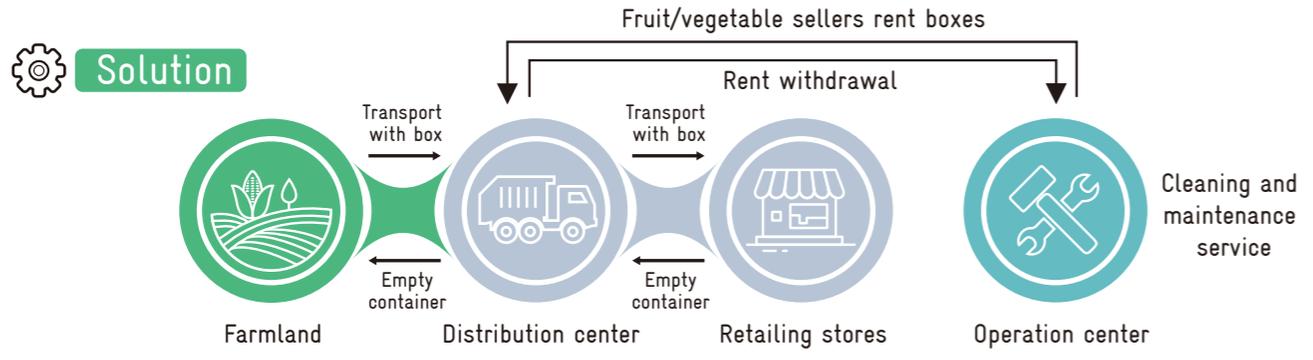


# Qingdao Application and Promotion of Reusable Standardized Containers

- Partner** Qingdao Junshengmingshi Logistics Packaging Institute
- Problem** The annual consumption of single-use containers amounts to 17 million pieces in Qingdao West Coast New District (QWCND). Is there any better solution?

**Contribution by Rethinking Plastics** Based on the existing pilot in QWCND

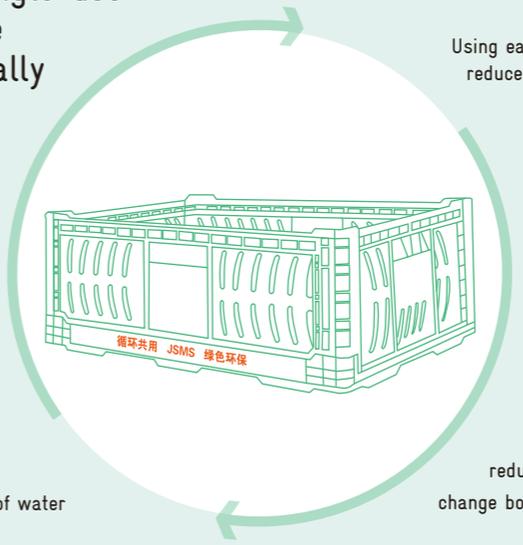
Business model analysis + Environmental benefit analysis + Policy recommendations



Compared to the single-use ones, each reusable container can annually

reduce the GHG emissions of **936kg CO<sub>2</sub>eq**

save **516L** of water

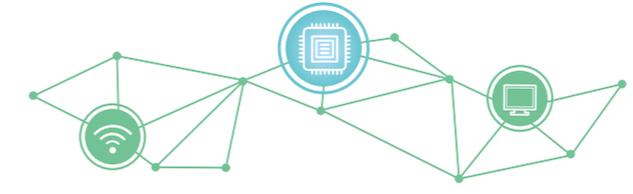


The daily cost of each container is **1 RMB**

Using each reusable logistic container helps reduce single-use material consumption in **120kg** and save the cost of buying new single-use containers for an amount of **600 RMB**

If the food loss during transportation through single-use packaging is **20%** according to research data, using a reusable container can contribute to food loss reduction in **300kg**/year as there is no need to change boxes during transportation and arrangement in retailers.

The reusable boxes are managed through chips and digital system, which can effectively achieve the tracking functions and improve the efficiency.



In comparison to single-use containers, the reusable containers have higher construction investment and operation cost. The Qingdao pilot received a green financial loan from China Construction Bank (Qingdao), which supports the establishment of a sustainable business model.

## Suggestions

- The reusable containers have remarkable environmental and economic benefits, and it can be promoted as a sustainable business model.
- The reusable frequency in the Qingdao pilot is stable and not affected by seasons. However, based on the experience in some European cases, the cost related to seasonal changes needs to be carefully considered.
- The deposit and property management are important for reusable containers. The digital system can improve the management effectiveness and efficiency.



**WANG Guixin** | Director  
Qingdao Junshengmingshi Logistics Packaging Institute

There is a great demand for packaging in the fruit and vegetable industry in China. If this packaging can be replaced by reusable options, the amount of single-use plastic can be significantly reduced at source.



# Tianjin Port Shanghai Port

## Ship Waste Management at Chinese Commercial Ports

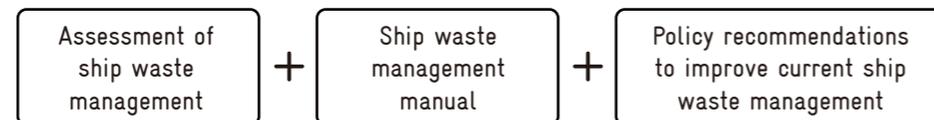
**Partner**

National Marine Data and Information Service (NMDIS)  
Transport Planning and Research Institute (TPRI), Ministry of Transport (MoT)

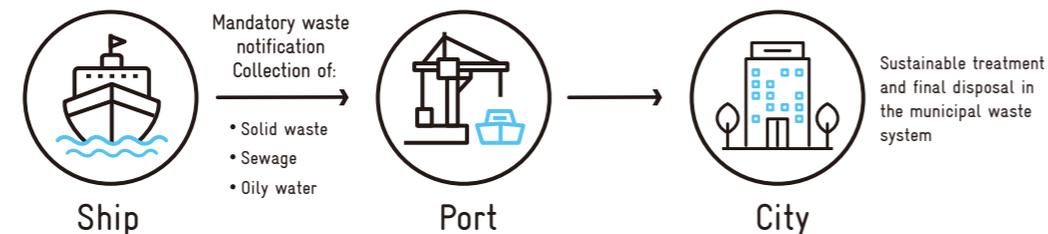
**Problem**

There are 20 million ships in total at Chinese ports every year. How can we encourage more ship waste to be delivered to ports?

**Contribution by Rethinking Plastics**



**Solution**



**Findings**

Average reception amount per ship in different ports in 2021



\*Considering the ship type and operation model, the waste reception amount has significant differences between inner river and seaport.

### Summary of charging systems for ship waste reception (cost-recovery)

Charging system	Operation mode
Direct fee	Ships are charged according to the waste delivered
Indirect fee	Ships are charged a certain amount no matter if waste is delivered
Free of charge	Port receives the ship waste for free
Contract	Ships are charged based on contracts with ports (e.g. annual fee)
Combined	Above modes combined

(Source: ANGEL CARPENTER, SALLY MACGILL. Charging for Port Reception Facilities in North Sea Ports: Putting Theory into Practice [J]. Marine Pollution Bulletin, 2001, 42 (4): 257-266.)

The reception capacity in Dazhi River is sufficient. The capacity of receiving sewage can be improved for Yangshan Port. At Beijiang Port, it is suggested that a treatment facility can be constructed for centralized treatment of sewage.

The key aspect is to guide the ships to deliver waste to ports, and have the proper capacity to receive the waste. International experience shows different charging schemes for ship waste reception, which can be discussed by ports based on local needs.

### Suggestions

- Policy recommendations based on pilot results have been submitted to related departments.
- Improve the ship waste facility and increase the reception capacity. Require the ship to deliver all waste, unless enough storage space can be proved on the ship.
- Introduce the cost recovery system based on the situation in China. Explore the indirect fee scheme to motivate the ship to deliver waste actively to Ports.
- Raise the awareness of stakeholders and encourage their participation in ship waste management.



**LIN Ning** | Professor/Director of Marine Archives  
National Marine Data & Information Service

Efficient and sustainable ship waste management requires a clear division of roles and responsibilities and a close cooperation between all stakeholders involved in ship waste management, among them ships, ports and cities. Together, they can create joint efforts to reduce marine litter.



**HAN Zhaoxing** | Section Chief of Planning and Assessment, Department of Environment & Resources  
Transport Planning and Research Institute, Ministry of Transport

It is recommended that waste generated on ships are encouraged to be delivered to ports, and then integrated to municipal waste treatment systems, so that the impacts on the marine environment can be minimized.



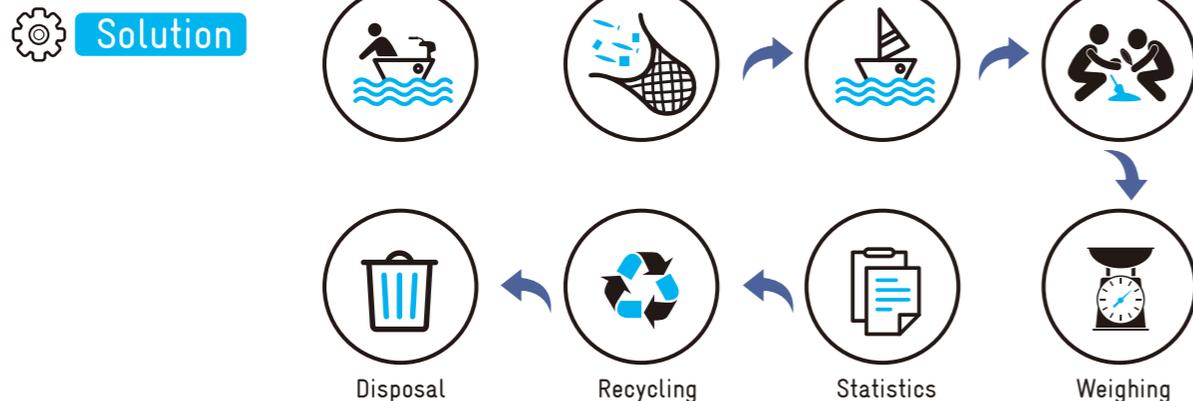
# Changhua Sanya

## Reducing Marine Litter through Fishing-for-Litter

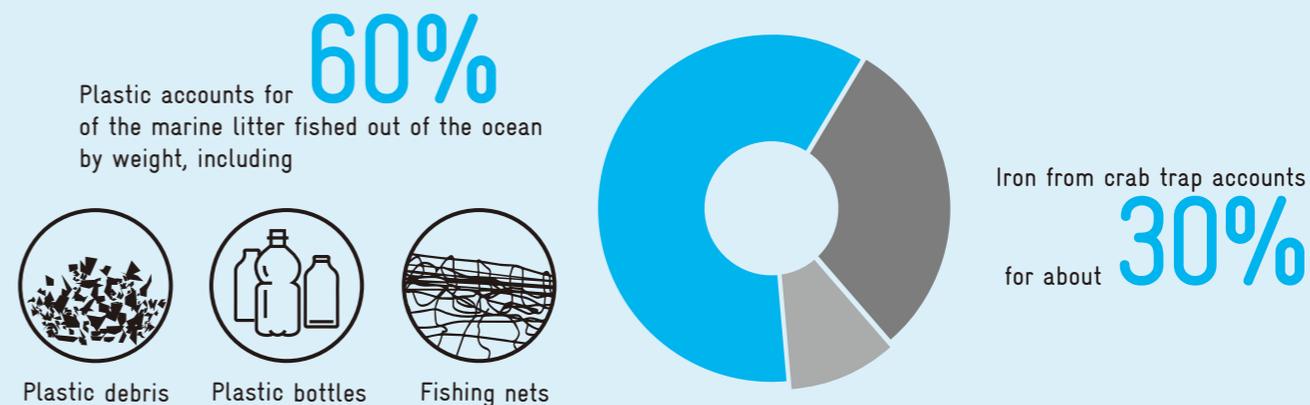
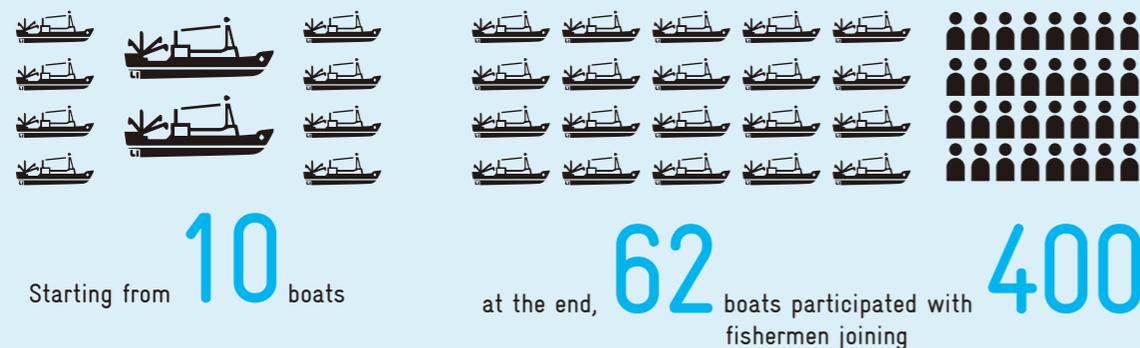
**Partner** Hainan Research Academy of Environmental Sciences (RAES)

**Problem** How can fishermen be encouraged to collect the waste from the ocean to reduce existing marine litter?

**Contribution by Rethinking Plastics** Exploring the fishing-for-litter scheme + Public awareness raising



### Findings



Under the pilot project, fishers were encouraged to bring back waste they fish on the sea for environmentally sound disposal on land. Around 30 organizations (e.g. communities, government departments and different social groups) directly joined the reduction of marine litter.

The pilot results are widely disseminated through different media channels. A total of 131 news releases were published so far.

The pilot established the mechanism of fishing-for-litter at sea, waste sorting on the land, transportation and treatment by environment sanitation bureau, and receives support from Department of Ecology and Environment of Hainan Province and People's Government of Changhua County. After the project, the fishing-for-litter activities in pilot areas will be supported in the long term through governmental funding.

### Suggestions

•The FfL pilot is a good case of social governance from multi-stakeholders in marine litter management, and worth promoting nationwide and even worldwide.

•The environment and social value of collecting marine litter needs to be further recognized by the society. The next step is to explore an incentive system for the fishermen and promote the sustainable business model of FfL in a wider range.



**LYU Shuguo** | Director of Ecology and Environment Institute South China Sea / Researcher Hainan Research Academy of Environmental Sciences

Marine litter has no national boundaries, and it is difficult to identify responsibilities, that is why it particularly needs global management and actions of everyone. Through our efforts, I hope to promote our Changhua-model to the whole country, and even to the world, so that the vision of a plastic free ocean can be realized.



**ZHONG Qiangbin** | Captain of Fishing Boat Qiongchangyu No. 30010 Changhua Port, Hainan Province

The power of one person to salvage marine litter is small. I want to involve more fishermen through my efforts and let's clean up the ocean together!



## ➤ Awareness Raising and Public Education

Currently, there are a lot of information about the amounts and negative impacts of marine litter, but still: people are often not aware that they contribute to the problem and that it affects them, too. The Rethinking Plastics Project has organised various aware-

ness raising activities targeting at different age groups. This helps to bridge the gap between the public and marine litter and motivates to change behaviour in the daily life.

### “No Plastic for Future” Art Paintings of Children



LI Xiangyu



JIA Dingyi



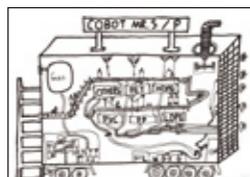
CHEN Xinyue



CHEN Xiangyi



ZHANG Kaiyi



HE Zi'ang



XU Simiao



WANG Shuoqi



CHEN Xiangyi

### Whale Fall Exhibition of Marine Litter



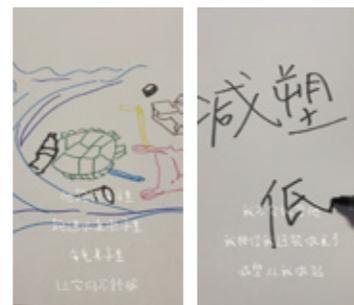
### Teenager Ambassadors



### Online Marine Litter Knowledge Quiz



### #No Plastic for Future# TikTok Short Video Competition



FAN Wenming



YANG Liuxin

### Photo Contest "Green Development & Circular Economy"

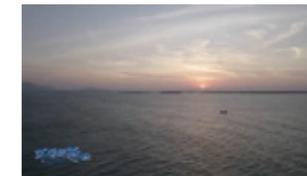


Greatwall Guardian (YING Liming)



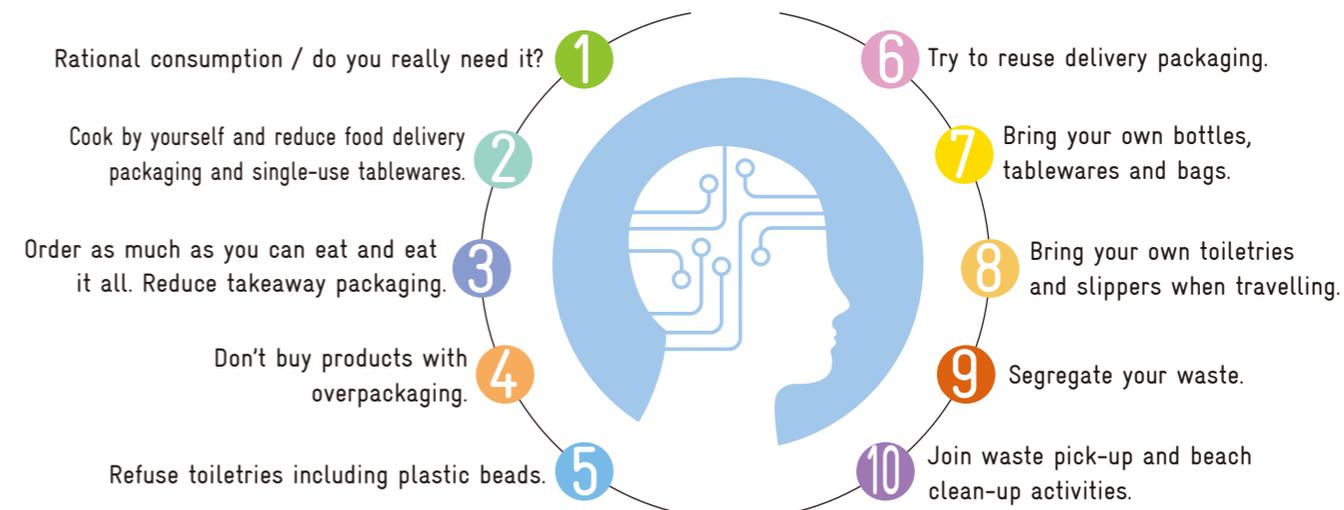
Waste and City (ZHANG Yuping)

### EU Sustainability Tour



### Plastic Reduction Action List

The action list was summarized from the ideas and opinions brainstormed by participants of campaign activities.

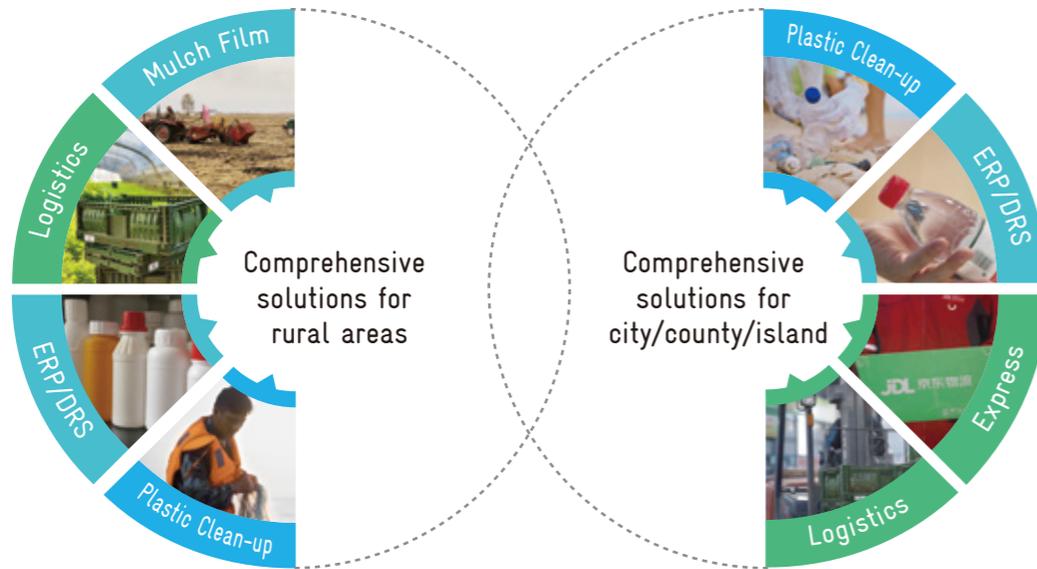




## ➤ What is the Future?

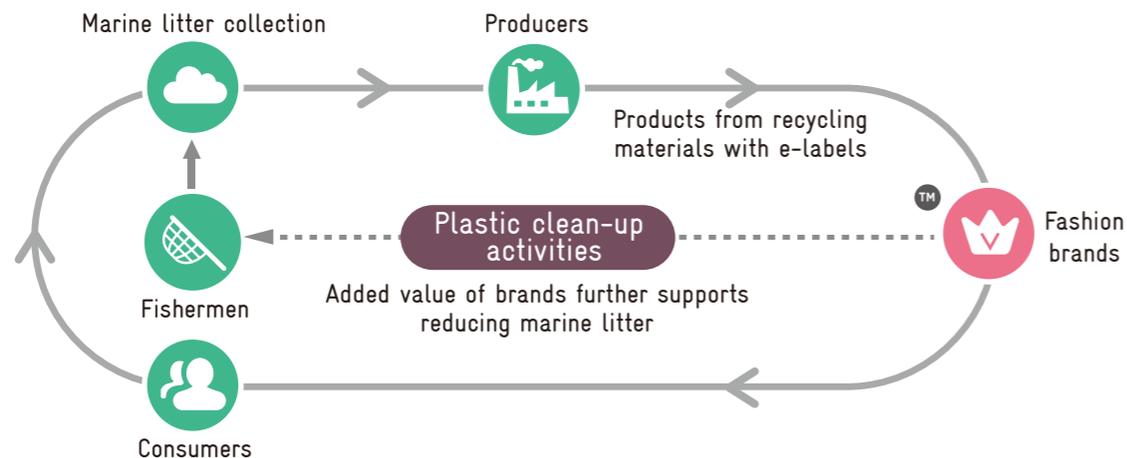
### Rethinking Plastics – Comprehensive Solutions for City/County

The sustainable business models and solutions summarized from results of the Rethinking Plastics Project can be continuously promoted in other cities and regions.



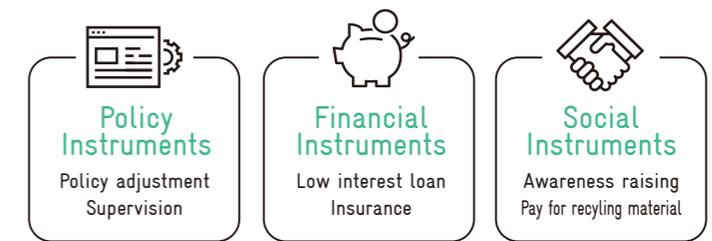
### Digitalization Empower Waste to Fashion

A replicable mechanism can be established to use recycled plastic material from sea-based waste for fashion production to give an added value to marine litter. This can for example be linked to Fishing for Litter activities. By using a digital system, a link can be set between fashion brands and reducing marine litter.



### Add More Value to Waste

An important lesson learnt based on practical situation in China: Added value to waste is needed to promote plastic pollution control and circular economy development. It can be realized by various instruments such as national subsidy policies, green financing or awareness raising. Especially for marine litter topics, innovative financing instruments are worth development, for example a plastic credit system as the foundation for EPR.



#### Alvaro ZURITA

Team Leader  
Rethinking Plastics Project, GIZ

The EU Rethinking Plastics Project supports 24 pilot projects implemented in China, Indonesia, the Philippines, Thailand and Vietnam. We hope these innovative initiatives can inspire some changes and provide lessons learnt to public policy makers and other stakeholders, fostering the reduction of plastic waste and marine litter.



#### LIU Xiao

Project Manager  
Rethinking Plastics Project, GIZ

We hope to encourage the public to rethink the value of plastics. Let's enjoy the convenience of plastics on one hand, and support plastic pollution control on the other hand. Joint efforts are needed by all of us to be in harmony with nature and the ocean. Please believe in the power of small. Little drops of water make the mighty ocean.



#### ZHOU Yanwen

Specialist  
Rethinking Plastics Project, GIZ

Motivated by our pilot projects, people involved in the project, including fishermen, farmers, deliverymen and me myself, are gradually changing our behaviors. We start to use less plastics, prefer reusable options, and segregate waste. In this way we contribute to the reduction of plastic pollution and marine litter.



#### WANG Chufan

Intern  
School of Environment, Tsinghua University

Marine litter and other new environmental problems have presented serious challenges to human beings and other creatures. As a student majoring in Environment Engineering, I'm inspired by the Rethinking Plastics Project and I'm trying to explore more about the relation between theory, technology, business and actions. We do need to think more towards a better future.



#### CHEN Xiaoting

Program Manager, Ellen MacArthur Foundation (UK) Representative Office

The Rethinking Plastics Project discusses solutions to end plastic pollution from different perspectives such as EPR, sustainable consumption and production. In order to meet this global challenge, we need to accelerate the transition towards a circular economy in the plastic industry, tackle the plastic pollution from the source, phase out unnecessary plastic products and promote circularity and innovation.



#### WANG Yanhui

Director of Climate and Energy Research Center  
Institute of Finance and Sustainability (IFS)

We are deeply touched by the enthusiasm of teenagers to improve the environment, and we will keep being devoted in this area and make environment friendly actions more easier for the public!



#### DING Yu

Expert of Green Finance

The participation in the EPR training organized by Rethinking Plastics Project gives me a new and detailed orientation regarding financial issues. The training also inspired me in the design in the design of financial products, risk and process management.



#### CHEN Weilin

Head of Video Shooting and Production Team  
Rethinking Plastics Project

The whole process of shooting and production of the project impressed me deeply and inspired our team to rethink the problem of plastic pollution from multiple perspectives. We hope that through our works, we can influence and drive more people around us to reduce the use of plastic products, actively use recyclable and degradable substitutes, and actively practice a simple, moderate, green and low-carbon lifestyle.

