

# Enhancing Sustainable Development Through Regulatory Means and Market-Oriented Incentives for Waste Management in the GBA



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**Abstract** Garbage sorting is conducive to the development of a quality living circle in the Guangdong, Hong Kong and Macau for creating a world-class bay area composed of sustainable cities. This paper focuses on the status quo of the “garbage siege” problems in the Greater Bay Area (GBA) mainly comprising Guangdong, Hong Kong and Macau and highlights the seriousness of the problems associated with waste management. It analyses the market-oriented operation mechanism for urban domestic waste sorting and processing. Under the assumption of a market-based economy, the information asymmetry between “agent” and “principal” is established and different incentive systems are designed to construct a market-oriented model for the classification of urban domestic wastes. Finally, this paper provides some suggestions based on the experience in Guangdong for improving the operations of the waste industry, including two main mechanisms: long-term incentive through regulatory supervision mechanisms as well as market-oriented green finance and investment mechanism, which can jointly be complemented by an integrated waste management policy for enhancing sustainable development of the GBA.

**Keywords** “Garbage siege” · Waste management · Garbage sorting · Market-oriented operations

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# 1 Reasons for the Market-Oriented Operation Mode of Garbage Disposal

## 1.1 *Criticalness of Managing Wastes*

According to the World Bank report, as early as in 2004, China became the country with the most waste generated in the world. According to the National Bureau of Statistics of China, from 2005 to 2015, the total amount of urban domestic garbage generated in China increased from 156 million tons to 273 million tons per year, and the growth rate reached 75% in only 10 years. Currently, the national municipal solid waste rate is flat annually. Nearly 10% of the growth rate is increasing. Of the more than 660 large- and medium-sized cities across the country, approximately two-thirds of the cities face the problem of “garbage siege”. In 2016, the daily output of municipal solid waste in China exceeded 1.4 million tons; it is estimated that by 2020, the total amount of municipal solid waste in China will reach 324 million tons. According to the “2018 Annual Report on Environmental Pollution Prevention and Control of Solid Wastes in Large and Medium Cities in China” issued by the Ministry of Environmental Protection, the total amount of domestic waste generated in 202 large- and medium-sized cities in China reached nearly 202 million tons in 2017, an increase of more than 13 million over 2016. The average output per ton is nearly 1 million tons, which is 13.52% higher than the 890,900 tons in 2016.

## 1.2 *Introducing Market-Based Incentives for Waste Management*

With the continuous increase of urban domestic garbage production, the investment and construction of waste sorting and treatment infrastructure has become the key to solving the current urban waste problem in China. At present, China is in a period of rapid economic development, and the multi-faceted capital demand makes the government’s fiscal revenue increasingly less likely to meet the needs of urban domestic waste disposal. According to the 2017 China Green Finance Development Report, in recent years, the government had to invest large amounts of financial resources to dispose of urban domestic garbage. In 2016, the national new investment in urban domestic waste treatment was 12 billion yuan, an increase of 253% compared with 2015. In 2017, the national urban domestic waste treatment volume is expected to be 436 million tons, or 1.195 million tons per day, an increase of 87,000 tons compared per day with 2016. The new waste level needs to be increased by 7 billion yuan, which greatly increases the government’s financial pressure. In the case of unbalanced capital supply, the introduction of social capital under the guidance of the government and the comprehensive promotion of market-oriented reform of the urban domestic waste industry are the best solutions at present.

### ***1.3 Promoting a Green and Low-Carbon Lifestyle as an Important Component in Developing the Guangdong, Hong Kong and Macau***

#### **1.3.1 Development of Guangdong, Hong Kong and Macau into a Quality Living Circle**

Under the background of the construction of the Guangdong, Hong Kong and Macau Bay Area, the government has put forward a new era of development and construction requirements for the environment of Guangdong, Hong Kong and Macau. With the promulgation of the “earl River Delta Reform and Development Plan (2008–2020)” and the “Guangdong-Australia Cooperation Framework Agreement” and other policy agreements, the development of economy, environment and other aspects of Guangdong, Hong Kong and Macau is more closely related. In the “Guangdong, Hong Kong and Macau Bay Area Development Plan” issued in February 2019, it is emphasized that the Guangdong, Hong Kong and Macau should be built into a world-class bay area with green low-carbon production, lifestyle, urban development and operations. The “Special Plan for Building a Quality Living Circle”, released in June 2012, proposes a regional development vision and cooperation direction for the construction of a quality living circle in Guangdong, Hong Kong and Macau. The long-standing “garbage siege” phenomenon in Guangdong, Hong Kong and Macau is a major “blocking tiger” in the construction of a quality living circle in Guangdong, Hong Kong and Macau, which has seriously hindered the construction and development of a well-developed and sustainable development of Guangdong, Hong Kong and Macau.

## **2 Problem of “Garbage Siege” in the Context of the Emerging Greater Bay Area**

At present, the phenomenon of a “garbage siege” in Guangzhou, the capital city of Guangdong Province, is becoming increasingly prominent. The unbalanced development of the environment and economy will constrain the steady growth of Guangzhou’s economy. The need for garbage disposal will promote the market-oriented reform of the domestic waste industry in Guangzhou. As the capital city of Guangdong Province and the central city of the country, Guangzhou is the main city of the Bay Area of Guangdong, Hong Kong and Macau. With the rapid development of its economy, the amount of domestic garbage generated is also increasing year by year. It is a typical “garbage siege”. This finding runs counter to the development planning goals of Guangdong, Hong Kong and Macau. In 2016, the total amount of municipal solid waste generated in China was approximately 204 million tons, of which the amount of domestic garbage produced in Guangdong Province was 23.91 million tons, while the domestic garbage produced in Guangzhou reached 5,352,100

tons, accounting for the national municipal solid waste. The total amount produced was 2.62%, accounting for 22.38% of the total amount of domestic garbage produced in Guangdong Province. As of December 2017, Guangzhou has a resident population of 14.408 million, of which the urban population is 12.48 million and the urbanization rate is 86.14%. Its population size and urbanization process are China's leading representative cities. According to the "Guangzhou City Master Plan (2017–2035)", the permanent population of the city will reach 20 million by 2035. It is foreseeable that a large amount of urban domestic waste will have a serious impact on the current domestic garbage disposal system in Guangzhou. The continuous growth of Guangzhou's population and the increased consumption levels have led to a growing trend in the production of domestic waste. The demand for development funds for the waste industry has been far greater than supply, and the government's fiscal revenue is increasingly difficult to meet the development of the domestic waste industry in Guangzhou. Reality needs. Therefore, the economic vitality of Guangzhou's domestic waste industry can be improved through market-oriented reforms. Waste sorting is a low-efficiency traditional industry with great potential for reform and is an indispensable part of Guangzhou's search for new economic growth points.

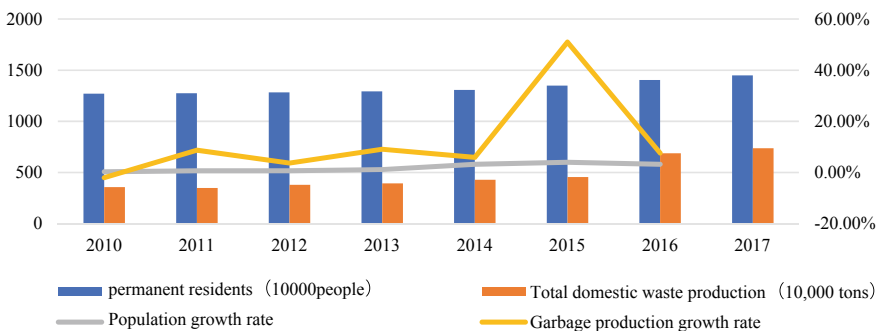
Hong Kong and Macau have also faced the problem of "garbage siege" in recent years. According to the Hong Kong Solid Waste Monitoring Report 2017 and the Macau Environmental Status Report 2017, the amount of municipal solid waste and per capita urban solid waste disposed of in Hong Kong and Macau has continued to rise in recent years. The per capita daily solid waste and disposal volume in 2017 were 1.45 kg and 2.16 kg, respectively, which were higher than 0.98 kg in Guangzhou. This finding reflects that the garbage problem in Hong Kong and Macau is also very prominent, which seriously restricts the ecological construction development of Guangdong, Hong Kong and Macau. As the leading soldier in the reform and opening up of the country, and an important bridge connecting Hong Kong and Macau, Guangzhou City should undoubtedly shoulder the heavy responsibility of "pre-testing" in the market-oriented reform of the garbage industry, paying attention to and drawing on the waste treatment dynamics and experience of the two major cities of Hong Kong and Macau. Based on this, we will promote the construction of the Pearl River Delta living circle with a high-quality garbage sorting environment.

With economic development, population growth and the improvement of people's living standards, the phenomenon of "garbage siege" in Guangzhou has increasingly constrained the sustainable development of cities. As the third largest city in China and the capital city of Guangdong Province, Guangzhou is China's southern gateway to the world. It is the main city of the Bay Area of Guangdong, Hong Kong and Macau, the Pan-Pearl River Delta Economic Zone and the political, economic and cultural centre of South China. Since the reform and opening up, Guangzhou has made outstanding achievements in economic and cultural construction and has strong international influence. Generally, the most important factor in all economic development is population resources. Because the more abundant the population resources are, the more participants in the urban economic construction, and the greater the city scale is expanded. However, the economic development and population expansion of large cities, environmental pollution and other issues are more

prominent. If they are not effectively resolved, they will inevitably lower the living standards of residents and pose a serious threat to the sustainable development of the urban economy. As an economically developed city in South China, Guangzhou is a rapidly changing city, attracting many migrants to live in this agglomeration. The number of permanent residents in the city is increasing year by year. As of December 2017, the resident population of Guangzhou was 144.884 million, of which the urban population was 12.488 million and the urbanization rate was 86.14%. It is a veritable megacity in China. The various garbage problems brought about by this population growth have become an urgent problem to be solved in the modernization and economic development of Guangzhou.

In terms of absolute quantity, the output of urban domestic garbage in Guangzhou has increased year by year. Figure 1 shows the permanent population and urban domestic waste production in Guangzhou from 2010 to 2017. It can be seen or calculated from the following. First, during the period of 2010–2017, the resident population of Guangzhou increased continuously, while the total amount of municipal solid waste generated by the city grew at an average annual growth rate of more than 10%, far exceeding the growth rate of the resident population in Guangzhou. In 2015, the output growth rate was as high as 51%. Second, the total amount of domestic garbage produced in Guangzhou has shown an overall upward trend. In 2017, the total amount of production of domestic garbage reached 7,737,600 tons, and the daily output reached 20,200 tons. The per capita daily output was as high as 14 tons. If the capacity of an ordinary garbage truck is 10 tons, then the daily garbage produced in Guangzhou is as high as 2000 cars, and the average person produces nearly 1.4 cars of garbage per day. As the living standards and per capita consumption levels of urban residents in Guangzhou are still in the advancement stage, it is expected that future urban domestic garbage production in Guangzhou will continue to rise.

In terms of relative quantity, the output of urban domestic garbage in Guangzhou has always been among the highest in the country. Figure 2 shows the top ten cities in China in 2013–2017. The following findings can be seen or calculated. First, the



**Fig. 1** Permanent population and urban domestic waste production in Guangzhou from 2010 to 2017. *Source* <http://www.gzcgw.gov.cn>



**Fig. 2** Top ten cities in China for urban domestic garbage generation in 2013–2017. Source <http://www.mee.gov.cn>

amount of municipal solid waste generated in Guangzhou has been among in the top six in the country in recent years. The amount of domestic garbage generated by large- and medium-sized cities was 202 million tons, of which Guangzhou's output was 737,660 tons; Guangzhou was ranked third, second only to Beijing and Shanghai, accounting for 3.65% of the 202 large- and medium-sized cities nationwide. The phenomenon of garbage siege is prominent.

In general, for a long time, the amount and growth rate of domestic garbage in Guangzhou has far exceeded its limited waste disposal capacity. The contradiction between urban sustainable development and garbage disposal has become increasingly prominent. The phenomenon of “garbage siege” has existed for a long time. The unilateral dependence on government governance and financial supply has long been unable to meet the requirements of social development in terms of capital guarantee and operational efficiency. Further promoting the market-oriented operation of urban domestic waste sorting has become an inevitable requirement for Guangzhou.

### 3 Literature Review

#### 3.1 Necessity of Market-Oriented Operations of the Waste Industry

Research by Western scholars on the market-oriented operation of the waste industry is mainly carried out from the perspectives of the theory, the comparison before and after the market-oriented reform, and the efficiency; this research is combined with field investigations and interviews for analysis and has accumulated detailed research results. On a theoretical level, Joseph [1], based on the theory of competitive market, and Arena [2], based on the theory of effective competition, noted the necessity of introducing market forces in the process of waste sorting and provided a new connotation for the treatment of urban domestic waste. On a practical level, Sabbas et al. [3] conducted a field survey of 48 small towns in Canada and found that the cost

of relying solely on government-sponsored garbage collection was higher than that of contracted garbage collection. The necessity of market-oriented operation of the waste industry. Oteng-Ababio et al. [4] conducted a survey of 101 cities in Africa and found that the average cost of directly operating the garbage industry in the public sector is higher than that of private enterprises. Themelis and Mussche [5] found that the government's garbage collection costs were 124% higher than public-private partnerships by comparing 198 government agencies in the US, Japan and China. Finstein and Morris [6] conducted field surveys and interviews in 33 cities in 1970 and found no significant efficiency differences between government departments and the private sector.

### ***3.2 Realization Path of the Market Operation of the Garbage Industry***

Western countries have begun to study government public utilities early. Therefore, most of the research on market-oriented operation of the urban domestic waste sorting and processing industry is based on the reform model of government public utilities, which has formed a series of theoretical results. Ferreira et al. [7] analysed in detail the economic factors affecting the production of domestic waste and compared the benefits before and after the implementation of the waste volume charging system. It was proposed that the specific charging system can promote the reduction and market operation of garbage to a certain extent. Okuda and Thomson [8] proposed that the recycling space of urban domestic garbage is large and that space is large. Public participation, the introduction of third-party funds, the construction of classification and treatment facilities are important factors affecting the market operation of domestic waste.

### ***3.3 Performance on the Market Operations of the Waste Management Industry***

Research by Western scholars on the market-based performance of the government's public sector focuses on the three dimensions: market structure, ownership structure and regulatory reform; the scholars use relevant performance variables to assess market-based reform performance, while government public utilities reform performance. The research has important guiding significance for the market-oriented reform of the waste industry. In empirical research, Igarashi et al. [9] conducted an empirical analysis of garbage collection enterprises, pointing out that private enterprises have an advantage in improving the internal operation efficiency of the waste sorting industry. The empirical findings of Beigl et al. [10] reflect that the cost of the waste industry mainly depends on the competitive external environment and that the

public–private property rights after market reforms have merged. Eriksson et al. [11] analysed the impact of both state-owned and private ownership systems and noted that privatization of public goods should be addressed. In terms of market structure, Khetriwal et al. [12] believes that market competition not only optimizes the allocation of resources but also effectively motivates related companies to improve the efficiency of waste sorting. Kikuchi and Gerardo [13] noted that regulatory reform not only promotes market-oriented reforms by improving the efficiency of business operations but also improves the pricing mechanism of public services.

This paper examines Guangzhou as the target city, systematically analyses the development status of all aspects of the market-oriented operation of Guangzhou municipal waste separation and the problems of the three major participants of government, enterprises and residents, and combines the case of enterprise green investment to support waste classification projects. The paper tries to build a market-oriented operation model for the “three-in-one” classification of domestic wastes for Guangzhou, which is tailored to local conditions, and clarify the roles and responsibilities of relevant participants.

#### **4 Analysis of the Market-Based Mechanism of Urban Domestic Garbage Classification and Processing**

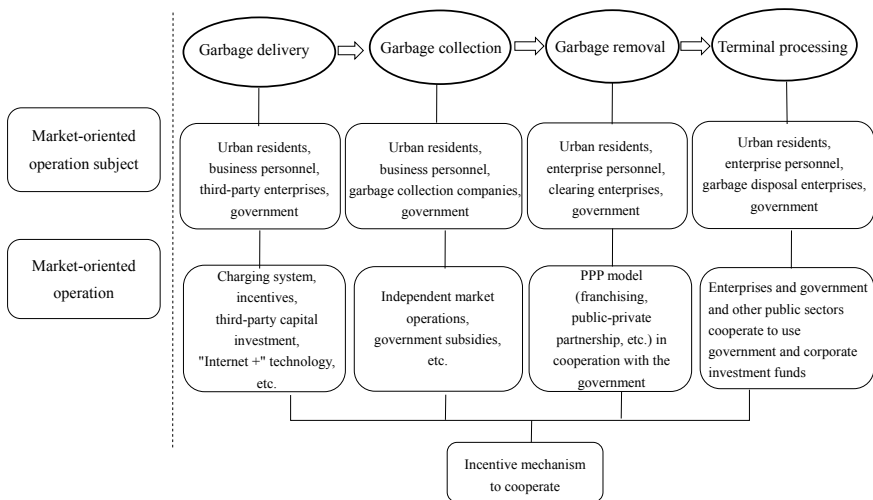
In the market economy, most of the subjects present a situation where the information is not symmetrical, and this will lead to a principal–agent relationship. If the parties in the market are assumed to be rational economic agents, they pursue the maximization of utility, in which entrepreneurs pursue profit maximization. Under the premise of this assumption, the principal and the agent will perform multiple rounds of game to maximize the expected utility and finally reach a relative equilibrium state. In this process, because the information is not symmetrical for a long time, the principal often uses incentives to effectively stimulate the agent’s behaviour, stimulate demand and enhance its internal behavioural motivation to achieve organizational goals. In this paper, the government and other relevant departments do not fully understand the efforts of enterprises and residents to participate in the classification and disposal of municipal solid waste. Therefore, enterprises and residents can be considered “agents” and the government “clients”; enterprises have information asymmetry, which requires that in the process of deepening the garbage revolution, the government needs to formulate an effective incentive system to encourage and control the behaviour of enterprises and residents and to fully stimulate the garbage separation and recycling behaviour of multiple entities.

This paper argues that the incentive mechanism for the classification and treatment of urban domestic waste refers to government or government joint ventures adopting legal means, administrative means, economic means, etc., through incentives, punishments, fees, investment, publicity, pilots and other measures to encourage the public to participate in domestic garbage. Classification processing. Specifically, incentives



under incentives should include positive and negative incentives, material rewards and spiritual rewards. Among them, positive incentives refer to the promotion of public waste sorting behaviours, such as prizes and bonuses, through rewards. Negative incentives can also be seen as punishments, which mean that, through sanctions, incentives are imposed on non-compliant waste sorting behaviours, such as fines, notices of criticism and deductions. Material rewards refer to motivating the public to participate in the waste sorting process, such as bonuses and daily necessities, from meeting the material needs of the public. Spiritual reward refers to the purpose of satisfying the public’s spiritual needs and influencing the public’s psychological state, such as awarding honorary titles. From the perspective of economic means, the incentive system can further specifically divide incentives such as government subsidies, incentives for recycling enterprises, tax incentives and environmental protection points, as well as constraints such as minimum target recovery rate, payment system, deposit system and fee penalties. Large classes. From the specific aspects of waste sorting, the incentive system can be further divided into an incentive system for waste placement and collection, transportation and processing, such as the possibility of increasing the expected profit of the relevant enterprises in garbage discharge and collection, in garbage transportation and the processing links that subsidize related companies.

Figure 3 is a summary of the market-oriented model for the classification of urban domestic waste. Based on the analysis of the above theory, this paper adds the role of market factors and incentive mechanisms in the traditional urban waste separation process. It can be seen that the market-oriented operation from garbage sorting to classified collection, sorting, clearing and end-processing is inseparable from the participation of urban residents, enterprises and government multi-agents and that the



**Fig. 3** Marketization mode of all aspects of urban domestic waste classification and processing

higher the degree and investment of third-party enterprises are, the more favourable it is to promote the market-oriented development of the waste industry. As far as the current situation is concerned, it is necessary to clarify the relationship between the government and the market in each link and to solve the problem of domestic waste such as investment funds, waste sorting accuracy and harmless processing capacity through the use of multiple market forces while creating and inspiring more profit points, promoting the economies of scale of third-party enterprises and building a modernized and efficient market-oriented operation system for urban domestic waste sorting.

## **5 Concluding Notes: Improving the Market-Based Operations of the Waste Management Industry**

Under a constant development of the economy, more domestic garbage will further increase resources required for waste management and create burdens on the public funding. To reduce such a liability to the public funding government while fostering sustainable development, the Guangzhou municipal government should try to alter its roles and to formulate policies for regulating the practice of the waste management industry. As authority to the industries, the government is expected to lead and facilitate market-oriented operation mechanism, actively introduce social capital, participating in waste separation and recycling, reduce the input cost of waste separation processing intermediates by strengthening system construction, as well as to improve the efficiency of garbage disposal and promote the development of the waste management industry.

### ***5.1 Formulating a Clear Strategic Goal for the Market-Oriented Operations of the Waste Management Industry***

The market-oriented operation of the municipal solid waste industry in Guangzhou, for instance, should clarify two important overall strategic objectives. The first objective is to construct a rational market-oriented investment operation model for the domestic waste industry. We should break the traditional situation of domestic waste sorting and handling by the government and financial operation, vigorously introduce social capital, promote investment diversification and operational marketization in the domestic waste industry and gradually transform the behaviour of the original social welfare undertaking into the government. Market and economic behaviours should guide and supervise the market and operate as an investment entity. The second objective is to fully realize the source reduction of the domestic waste classification

link and promote the construction of a waste-free city. At present, the garbage revolution in Guangzhou is at the end of the garbage disposal period in Japan in 1970. Therefore, Guangzhou has taken the end-processing capacity of garbage disposal enterprises as the focus of the market development of the waste industry and to some extent ignored the importance of waste source reduction. In the process of further promoting the market-oriented operation of the domestic waste industry in Guangzhou in the future, we should pay attention to improving the terminal processing capacity of waste disposal enterprises and gradually shifting to reducing the amount of garbage generated from the source, that is, the amount of garbage generated before is an independent variable. The amount of treatment is the dependent variable. The amount of garbage generated will be landfilled or incinerated to treat the corresponding amount of waste. In the future, it will need to be reversed to set the final amount as the ceiling, effectively reducing the landfill and incineration amounts.

Figure 4 shows two distinct rationales for the garbage revolution. At present, Guangzhou mainly uses the rational of the left picture to promote the garbage sorting work, which focuses on improving the harmless end-disposal ability, but this paper believes that the future rational is inevitable. The future rational is in the right picture, which focuses on the reduction of the source, reducing the amount of harmless treatment.

At the same time, on the basis of clarifying the two overall strategic objectives, we should follow the relevant policy trends in China and formulate the phased strategic objectives for the market-oriented operation of the municipal solid waste industry in Guangzhou according to local conditions. Figure 5 is the “three-step” phased strategic goal of Guangzhou City to promote the “garbage revolution”. In the first stage, from now until 2020, the Guangzhou municipal government should vigorously introduce social capital to invest in the waste industry. At the same time, it should gradually implement the mandatory classification of garbage through legislation and improve the end-processing capacity of waste, from garbage mixed landfill to classification. In

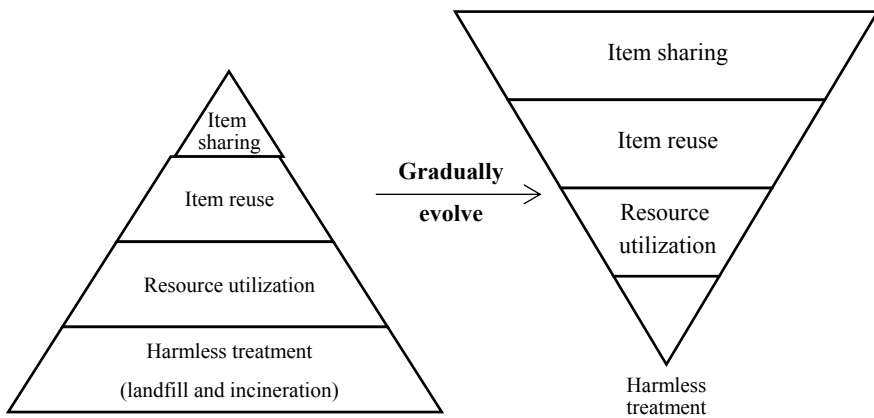
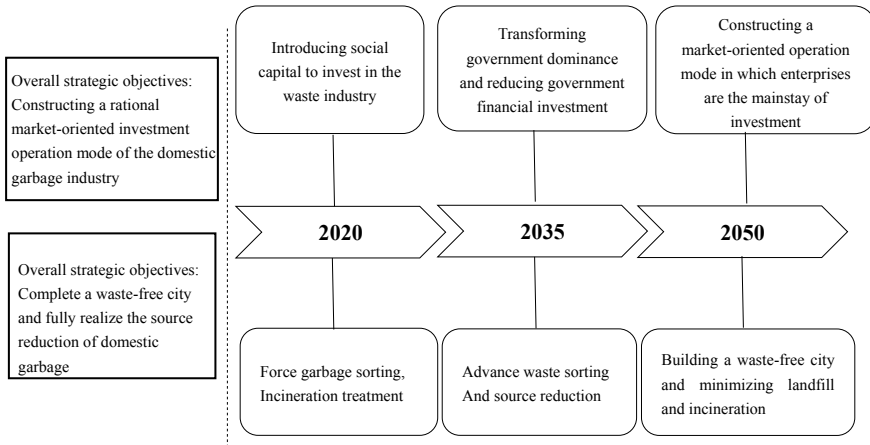


Fig. 4 Two rationales for the garbage revolution



**Fig. 5** Conception of phased strategic targets for promoting the “garbage revolution” in Guangzhou

the second stage, from 2020 to 2035, the Guangzhou municipal government should comprehensively change the status of the government-led market-oriented operation management of the waste industry and reduce the government’s financial input. At the same time, it must shift from positive growth in waste production to negative growth. In an economically low-waste society, the amount of landfill and incineration will be reduced, and waste sorting and source reduction will be realized. In the third stage, from 2035 to 2050, a market-oriented operation mode of the domestic waste industry will be constructed, which is operated by enterprises. The goal of building a city without waste is to minimize landfill and incineration amounts.

### ***5.2 Formulating and Implementing Long-Term Incentives and Regulatory Supervision Mechanisms to Deepen the Market-Oriented Development of the Waste Management Industry***

Compared with the traditional regulatory restraint system, the development of a long-term effective incentive mechanism can motivate Guangzhou residents to participate in garbage sorting and can produce better results. Seacat and Northrup [14] noted that “it is more important for the government not to care about whether the public understand how to classify waste, but to motivate the public to act for the benefit of society”. Japan’s strict penalties and regulatory mechanisms and a diverse support and incentive system are important aspects for the success of its waste sorting process. As a guide to promote the market-oriented operation of the domestic waste industry in Guangzhou, the Guangzhou municipal government should formulate and implement long-term effective economic incentives. On the one hand, the government should

actively guide more social capital to invest in the waste industry; on the other hand, the government should fully mobilize Guangzhou. City residents will be motivated to classify waste and deepen the market-oriented development of the waste industry.

According to different incentive methods and incentive subjects, economic incentives can be divided into three categories: taxation, subsidy and a fee system. Taxation and charging systems are the main economic means. In terms of the charging policy, it can be applied to different targets through economic incentives such as volume charging, product charging and a landfill tax. Specific charging mainly promotes garbage recycling and source reduction and alleviates government funding pressure. Product charges are used to deprive products that produce “high waste” from the source of production. The landfill tax is to promote the transformation of waste disposal methods and resource recycling. In terms of subsidy policy, it can be applied to different objects through economic incentives such as subsidies, tax incentives, a reduction or exemption, government priority procurements, recycling credits and primary resource taxes. In addition, a deposit refund system can be adopted to curb consumption, stimulate corporate recycling, promote consumer return and recyclable products, organize garbage collection activities and set up environmental sanitation awards to stimulate public waste sorting.

At the same time, with reference to the Japanese experience, while establishing a long-term incentive mechanism, synergy with market-based regulatory mechanisms will be more effective. In terms of supervision, the participation of professional third parties, the media, the National People’s Congress, the CPPCC, the public and other multi-supervised entities, use inspection, processing methods, spot checks, inspections, audits, fees, etc., can be used to reduce the amount of garbage generated. Supervision, such as investment company’s access and exit supervision, related facilities construction and operation supervision, garbage pollution and garbage disposal secondary pollution supervision, regulations and policies, policy formulation, implementation and feedback supervision, etc., severely punish enterprises or residents for illegal investment operations. Acts such as stealing, smuggling, wasting resources, polluting the environment, dereliction of duty, and standardizing and supervising the participants in the waste sorting and processing industry from the two levels of entity and procedure ensure the market-oriented development of the garbage industry in Guangzhou.

### ***5.3 Building a Market-Oriented Investment Mechanism for the Domestic Waste Industry and Regulating the Investment Market for the Waste Management Industry***

From the perspective of marketization, the sources of funding for the waste management industry should be composed of both public and private funding. The proportion of the waste management industry is a dynamic process that is affected by factors

such as economic development, government macro-control and market operation efficiency. At a time when the market-oriented investment operation of the domestic garbage industry in Guangzhou is in relative infancy, the Guangzhou municipal government should gradually build a mechanism to promote enterprises to invest in the domestic waste industry, vigorously introduce social capital and give full support to the superiority of the market mechanism for enterprises. Investors should carry out investment operations in the waste management industry to create a good development environment. For example, by leveraging on the green finance and investment trends, we can encourage and guide third-party environmental protection companies to develop relevant markets, expand the scope of waste separation, promote the transformation and upgrading of the waste industry structure, and promote investment cooperation and common use in emerging industries such as the domestic waste industry and the Internet development.

#### ***5.4 Improving Domestic Garbage Disposal Charging Policy and Market-Oriented Dynamics of the Waste Management Industry***

On the one hand, the domestic garbage disposal charging policy is the economic means that best reflects the will of the government. The domestic garbage disposal cost is also direct and rapid, which can effectively reflect the government's management orientation towards the market-oriented operation of the waste industry. On the other hand, the cost of domestic garbage is an important guarantee for the market-oriented operation of the waste industry, and it is a profit point that investment companies are very concerned about in the future, which can promote the problem of solving the bottleneck of garbage management. From the perspective of externality theory, garbage collection is reasonable. It not only combines personal interests with garbage classification but also breaks the masses' dependence on the government's inertia thinking in garbage classification and can effectively promote the source reduction of garbage. In July 2018, the National Development and Reform Commission issued the "Opinions on Innovation and Improvement of the Green Development Price Mechanism", proposing that by the end of 2020, national cities should comprehensively establish a domestic garbage disposal fee system.

For instance, Guangzhou City implements a household-based charging system, which has problems such as low awareness by residents and poor results in reducing the source of garbage. Drawing on the experience of Japan, according to the actual situation in Guangzhou, we can consider implementing a differential metering and charging system on the principle of "pay more for garbage, pay less and waste less". First, for the garbage delivery, the weight of garbage or the volume is calculated for the corresponding garbage disposal fee. Second, for the garbage collection, additional recycling and disposal costs should be charged for large pieces of garbage, such as

furniture and electrical appliances. The effect of the domestic garbage disposal charging system on the classified behaviour of Guangzhou residents is mainly reflected in its economic incentive and binding mechanism. If the metering and charging policy is implemented, the residents should pay more for garbage disposal. Through economic means, it restricts the garbage classification behaviour of residents, and at the same time, it can also stimulate the behaviour of residents who have less garbage. Due to the consideration of economic factors, residents are driven to reduce the generation of domestic garbage to a certain extent and consciously carry out the classification of garbage, which will constrain the behaviour of residents. Such policy for waste management can be introduced to the GBA so as to develop a shared value system as well as an integrated approach that will enhance sustainable development in the region.

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