Classification and treatment of urban domestic garbage in China

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Abstract. In recent years, China's urbanization and industrialization have developed rapidly. As cities continue to expand and people's living standards continue to increase, the amount of domestic waste produced has also increased with each day, and has become more and more diversified, leading to prominent problems in urban waste disposal. With the rapid development of urbanization, the phenomenon of "garbage siege" has become increasingly prominent, and the living environment of residents has also gradually deteriorated. From the perspective of sustainable development strategies, strengthening the classification of urban waste is of great significance and will become a social Big development trend. The effective classification of garbage is not only good for the environment, but also beneficial to human beings. By comparing the current status of domestic garbage disposal at home and abroad, this article summarizes the problems of urban domestic garbage in China and gives a reasonable treatment plan.

Keywords: Urban waste; classification; current situation; treatment measures.

1. Introduction
In recent years, with the rapid development of urbanization, "garbage siege" is frequently reported. Among urban waste, domestic waste still accounts for the main part. Due to the accumulation of people and time, a huge amount will be formed. The city can't digest it slowly. When it is transported to the surrounding areas, "garbage siege" appears over time, and the separate collection of waste is the key to cracking the siege of garbage. In 2019, Shanghai took the lead in comprehensively implementing the separate collection of urban domestic waste. Pilots of garbage sorting in key cities are underway. Under the effective leadership of the local party committee and government, and with the concerted efforts of all sectors of society, actively explore a long-term management mechanism for garbage sorting.

This article compares the current status of domestic garbage classification at home and abroad, and adopts a questionnaire to analyze the attitudes of residents in the pilot communities on the disposal of domestic garbage, so as to summarize the problems existing in the classification of urban garbage in China and provide some reasonable countermeasures.
2. Status of domestic waste at home and abroad

2.1. Status of Domestic Waste Classification in Foreign Countries

2.1.1. Foreign domestic garbage related regulations. In response to the problems of waste of resources and incomplete recycling of garbage, the Japanese government formulated the Law on Promoting the Classified Recycling of Containers and Packaging, the Home Appliance Recycling Law, the Building and Material Recycling Law, the Food Recycling Law, and the Automobile Recycling Law. This law strengthens the relationship between producers, sellers, and consumers of commodities. In the formulation of the basic laws of the central government, the Japanese government has formulated the Basic Law for the Promotion and Development of a Recycling Society.

In 1991, the German government publicly issued the "Avoidance and Utilization of Packaging Waste Act", which for the first time reflects the packaging waste Recycling economy concept. Until 1996, Germany promulgated and implemented the Basic Law "Circular Economy and Waste Management Law", which laid the legal foundation for the management of domestic garbage recycling in Germany. The 2012 "Recycling Law" was publicly implemented. It is required to comprehensively ensure the environmental protection treatment of domestic garbage waste and promote the circular economy in accordance with the law.

In 1976, the U.S. began to implement the Resource Protection and Recycling Act, which was the first to reflect this in waste disposal. The concept of a circular economy. Later, the United States introduced the Comprehensive Environmental Response. In 1990, The United States promulgated the Pollution Prevention and Control Law, which advocated the recycling of waste and cleaner production, reflecting that cleaner production is an environmental benefit and economic benefits of the win-win choice.

2.1.2. Classification of Garbage. Since the 1970s, the Japanese have gradually realized the importance of waste resources for the development of the country, and have gradually started the classification of domestic waste. By the 1980s, the Japanese government officially implemented a method of waste separation and recycling throughout the country. And gradually form a garbage classification system suitable for itself. After the adoption of the Packaging Regulations in the 1990s in Germany, more facilities for the classification of domestic waste gradually appeared, and the classification of household waste officially began at this time. In the 1990s, the United States first established a strategy for grading domestic waste, required it to achieve sustainable development management, and wrote federal regulations to determine its importance.

Table 1. Comparison of the classification of domestic wastes in Japan, Germany and the United States

| country   | Category                                                                 |
|-----------|--------------------------------------------------------------------------|
| Japan     | Resources: newspapers, books, glass drink bottles, etc.                  |
|           | Non-flammable: waste small appliances, toys, iron containers, etc.      |
|           | Combustible: combustible (including kitchen waste), but excluding plastics, rubber tablets, etc. |
|           | Harmful category: substances harmful to the human body such as batteries |
|           | Large category: bedding, electrical products, bicycles, etc.             |
| Germany   | Paper: waste cardboard, newspapers, magazines, etc.                      |
|           | Organic waste: kitchen waste and garden waste                           |
|           | Large garbage: large pieces of furniture, large appliances, etc.        |
|           | Lightweight packaging waste: specifically packaging with a "green dot" logo, including some |
|           | Hazardous waste                                                         |
|           | Old glass                                                               |
| United States | Recyclable waste: paper, plastic and metal boxes (bottles), etc.       |
|           | Special waste: large pieces of furniture, household appliances, hazardous waste, etc. |
|           | Organic waste: garden waste and food waste, etc.                        |
|           | Other garbage                                                           |
Source: Public data collation

It can be seen from Table 1 that the methods of garbage classification are not the same in Japan, Germany, and the United States. The recycling methods are also different from those in China. For example, China recycles daily. And in some areas of Japan, Tuesday and Friday are combustible garbage collection days, and Thursday is the day when resources are placed. Most U.S. states collect on a specific date, and the frequency of collection varies according to the type of garbage.

2.1.3. Reward and punishment measures for garbage classification. In the system of rewarding and punishing garbage classification, Japan's punishment method is that after each family sorts garbage, it needs to be placed at a designated place and time. When the clearance company finds that there is a classification violation, it will retrieve the wrongly placed family and conduct it. Fines. In terms of incentives, credit loans to waste recycling personnel and sorting personnel will be given as incentives to promote the optimization and upgrading of its industrial structure.

The punishment system in Germany is very strict. When the garbage collection company collects garbage, it is found that the garbage bin is not properly sorted. Households sharing this garbage bin will receive a warning letter. If they do not change it, the cleaning party will withdraw. The original garbage bin was replaced with a higher-capacity, larger-capacity garbage bin, which increased the burden on households' garbage disposal costs.

Some U.S. cities will also adopt similar economic incentives to encourage residents to implement waste sorting. For example, in Philadelphia, since 2004, the use of merchandise vouchers as a reward method has increased the correct rate of household waste sorting. At the same time, the government has also engaged in garbage Classification-related companies have adopted preferential policies, such as tax reductions and increases in compensation.

2.2. Status of Domestic Waste Classification in my country

In 2017, the amount of domestic garbage generated in 202 large and medium-sized cities nationwide was 202 million tons, an increase of 7.13% year-on-year. This is only the amount of garbage generated by large and medium-sized cities has exceeded 200 million tons, and more than 1,500 counties have generated nearly 70 million tons. According to the calculation of the proportion of urban resident population, the total domestic garbage production will exceed 450 million tons. Among them, Beijing's per capital domestic garbage production is the largest, reaching 9.018 million tons, followed by Shanghai, Guangzhou, and Sichuan Province.

| Ranking | City                        | Municipal solid waste production (10,000 tons) |
|---------|-----------------------------|-----------------------------------------------|
| 1       | Beijing                     | 901.8                                         |
| 2       | Shanghai                    | 899.5                                         |
| 3       | Guangzhou, Guangdong        | 737.7                                         |
| 4       | Shenzhen City, Guangdong Province | 604                             |
| 5       | Chengdu, Sichuan Province   | 541.3                                         |
| 6       | Xi'an, Shaanxi Province     | 422.5                                         |
| 7       | Hangzhou, Zhejiang          | 400                                           |
| 8       | Wuhan, Hubei                | 396.4                                         |
| 9       | Dongguan City, Guangdong Province | 392.6                           |
| 10      | Foshan City, Guangdong Province | 390                                           |
|         | total                        | 5685.8                                        |

The current treatment of waste in China is government-led, with government finances paying operating costs, and overall management and supervision of waste generation to landfill or incineration.
In April 2015, five ministries and commissions, including the Ministry of Housing and Construction, identified 26 cities (districts) as the first batch of demonstration cities (districts), and some demonstration cities (districts) formed valuable experience in waste classification in specific areas, including recycling of renewable resources. The "Suzhou Experience" used mainly forms the recycling resource utilization experience by standardizing the community recycling network system, innovating the community recycling network model, and establishing a renewable resource recycling network system. The "green account" is a positive incentive mechanism to promote waste classification and mass participation. The "Shanghai Model" is encouraging and guiding citizens to properly implement waste separation management regulations and participate in daily interventions.

On December 20, 2017, in order to accelerate the progress of urban domestic waste classification nationwide, the Ministry of Housing and Urban-Rural Development identified 46 cities, including Beijing, Tianjin, Shanghai, and Chongqing, as key cities for the implementation of domestic garbage classification in the country. The target of recycling rate is 20%, reaching international cash level by 2035.

3. The main problems of garbage classification in China
In order to understand the classification of public domestic waste, the author adopted a network survey questionnaire, a total of 80 questionnaires were distributed, and 76 valid questionnaires were collected; the object covered the entire social group, and the survey time was January 2020. At the same time, combined with the status of domestic and foreign garbage classification Analysis and research, summarized several problems in the classification of domestic garbage in China.

3.1. Inadequate laws, regulations and policies
First, the basic regulations of waste classification are not clearly defined. The Law on the Prevention and Control of Solid Waste Pollution Environment can be regarded as the basic law of waste classification in China. It pays more attention to the end-of-waste treatment and pollution prevention to discuss and improve the legal construction and treat waste as a hazard rather than a resource to deal with.

Second, the supporting regulations for waste classification are not in place. The supporting regulations for waste classification in China's laws are not comprehensive. The "Regulations on the Management of the Recycling and Disposal of Waste Electrical and Electronic Products" is the only supporting regulation for waste classification in China. Unlike Japan and Germany, More targeted laws such as the Home Appliance Recycling Law and the Packaging Regulations.

Third, the legal responsibility for garbage classification is unclear. The current laws and regulations related to garbage classification (including local regulations formulated by representative cities) mostly emphasize the follow-up work of urban domestic garbage treatment, but rarely mention the waste producers and classification participants.

3.2. Insufficient incentives for related measures
At present, for the classification of urban domestic waste in China, the motivation of the general public to participate is still in the realization stage of self-interest, and the public will pay more attention to their own interests. Waste sorting requires a lot of time and energy from the public, and it is difficult for the public in a short time. Seeing the results of environmental improvement after their own efforts, once interest-driven and incentive measures are lacking, people's domestic waste sorting will be in trouble. If no exchange mechanism or credit line is set up as abroad, residents' enthusiasm for waste sorting will be reduced.

3.3. Classification knowledge reserve and insufficient action
From the data of the questionnaire, 78.95% of the survey respondents expressed their willingness to dispose of garbage in accordance with the classification requirements; however, in the way of processing domestic waste, 51.3% of the sample would put all domestic garbage in the same garbage bin, 32% Of
the investigators said that they were not clear or even did not understand the knowledge of garbage classification and recycling. 28.95% of the respondents felt that even if they sorted by themselves, the later work was still not in place. Participation motivation in categories.

3.4. Inadequate public facilities and backward end processing systems
There are problems with imperfect public facilities in China's garbage classification pilot cities, such as the serious lack of classified garbage bins, the lack of scientific and humanized placement and layout, which has caused a lot of inconvenience for residents' garbage disposal. The quantity is large, the regional distribution is scattered, the quantity and types of daily garbage are large, and the number of garbage bins can no longer satisfy the residents' willingness to put in. In addition, the end-of-life treatment system in China is relatively backward, and most of the waste is treated by extensive waste treatment methods: Older garbage processing machinery and equipment often cause garbage accumulation.

4. Management countermeasures of municipal waste classification

4.1. Improve relevant regulations and policies
Establish a complete waste classification and management system for classified release, classified collection, classified transportation, and classified processing. First, the government must play a guiding role and mobilize the various forces of society to participate in the waste classification work, especially to guide the residents of the waste classification subject to the autonomous participation awareness. Form a multi-substance waste classification and governance mechanism with residents as the core, and then improve the efficiency of waste classification and treatment. Second, the government must coordinate the planning of infrastructure construction that is compatible with all aspects of urban domestic waste classification, which is the classification and treatment of garbage. Material basis. The third is that the government should actively promote the formulation and improvement of relevant laws and regulations on the classification and treatment of domestic waste, and there are laws that can truly implement the classification and treatment of urban domestic waste.

4.2. Publicize and guide residents to participate in waste classification
The classification and treatment of urban domestic garbage is a key step to solve the problem of urban domestic garbage from the source. We should increase publicity and encourage people to develop the habit of separating and placing garbage. In the Internet era, the form of Internet + can be used to promote garbage. The classification management concept can use mobile phone apps and We Chat public accounts to push the relevant knowledge about garbage classification to citizens, and provide real-time garbage query services, so that users can quickly learn the type of garbage when logging in to the operation interface, and improve the correct placement of garbage.

4.3. Establishing a multi-agent classification and recycling industry chain
It can learn from the U.S. waste management system, and it is recommended that rough classification should be adopted at the source of domestic waste, that is, households and residents, such as separating domestic waste into kitchen waste, recyclable waste and non-recyclable waste. Recyclable waste is handed over to professional Resources recycling enterprises, such as waste classification workers or environmental protection organizations; the coarsely sorted non-recyclable waste is handed over to the sanitation department, and the recyclable part is still handed over to professional waste disposal companies, non-recyclable waste is land filled or incinerated, and kitchen waste Then, composting and other harmless treatments are performed.

5. Summary
The classification and recycling of urban domestic waste is an inherent requirement of the construction of urban ecological civilization and the development of circular economy. It is urgent to use legal means
to provide legal guarantees with a sound system. At present, China's legislation on the classification and recycling of urban domestic waste is still in its infancy. In the context of comprehensively advancing the rule of law, the existing legislation has system dilemmas such as unsystematic, incomplete specialized legislation, and inadequate supporting systems, and in-depth legal research is urgently needed to provide theoretical support.

Based on the current status of China's urban domestic garbage classification and recycling legal system, this paper fully draws on Japan, Germany, the United States and other developed countries' legislative experience and has put forward countermeasures to improve the legal system for the classification and recovery of municipal domestic waste in China, that is, to promote the systematization of the legal system for the classification and recovery of municipal domestic waste, improve specialized legislation, and supportive systems such as garbage classification, garbage charging, and incentive systems for garbage classification and recovery.

In the grand era of China's comprehensive promotion of administering the country according to law and building an ecological civilization, the gradual improvement of the legal system for the classification and recovery of urban domestic waste will undoubtedly provide a sufficient and powerful legal guarantee for the promotion of urban ecological civilization.

References

[1] Wu Lingqiong. Influencing factors and mobilization implications of urban residents' classification of domestic waste [J]. Modern Commercial Industry, 2019, 40(27): 91-93
[2] Liu Ye. Study on the influencing factors of urban residents' waste classification behavior [D]. Northwest University, 2018
[3] Liu Mei. The waste classification experience in developed countries and its enlightenment to China [J]. Journal of Southwest University for Nationalities (Humanities and Social Sciences), 2011.32 (10): 98-101
[4] Li Ming, Li Zhenqing. Countermeasures for Municipal Waste Classification [J]. China Science and Technology Information, 2019 (20): 38-39.
[5] Kong Jing. Problems in the classification and treatment of urban domestic garbage in China and their management methods [J]. Liaoning Economics, 2020 (01): 49-51.
[6] Zaman, Atip Uz. A comprehensive study of the environment and economic benefits of resource recovery from global waste management systems [J]. Journey of cleaner production, 2016, 124:41-50