

A Review on Municipal Household Waste Classification Behavior in China

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Abstract: With the development of urbanization in China, rural residents move to the central cities continuously. The rapid growth of the population has brought the development of the city, but it also made a series of urban problems, such as a significant increase in municipal household waste. In recent years, in order to improve the reduction, recycling and harmlessness of household waste, the government has issued a series of policy measures, which included the municipal household waste classification. Residents' participation in classification and recycling of municipal household waste is a critical factor for the success of municipal household waste management. Through the literature review, this paper concluded that the research on municipal household waste classification in China has undergone four stages. Based on the characteristics of these four stages, this paper analyzed the public policy of municipal household waste classification and summarized the influence factors of municipal household waste classification behavior in China. The results of this study could provide the research framework for the future.

Keywords: Waste classification behavior; Influence factors

1. Introduction

With China's economic and social development and the improvement of residents' material consumption level, the output of municipal solid waste is also growing rapidly. According to the data of the National Statistical Bureau, the amount of municipal solid waste clearance and transportation in 2017 has reached 215.21 million tons, compared with 178.81 million tons in 2012, the annual average growth of municipal solid waste is about 9 million tons [1]. China Youth Daily quoted data from a survey conducted by the Ministry of Construction to show that more than one third of the cities in the country are surrounded by garbage [2]. The huge garbage output and the waste of resources, land occupation, soil water source and air pollution in the process of transportation and treatment make the problem of household garbage become an important factor restricting the sustainable development of cities. In this context, in order to realize the reduction and recycling of MSW sources, China put forward as early as 1995 that "MSW should be collected by classification gradually". The implementation of municipal solid waste classification is not only to follow the requirements of reducing, recycling and harmlessness of municipal solid waste, but also to effectively improve the living environment of residents, promote the recycling of resources and improve the level of urban ecological civilization construction. However, from the current point of view, although China's domestic waste classification work has achieved some results, but there is still a long way to go from the expected goal. Therefore, it is of practical significance to study the influencing factors of

municipal solid waste classification behavior of urban residents.

Based on the literature review of domestic urban household garbage classification, this paper points out that the research on domestic urban household garbage classification can be divided into four stages: initial stage (1990s), exploratory stage (2000-2007), gradual development stage (2008-2015) and rapid development. Exhibition phase (2016 to date). On this basis, this paper further analyzed the policy characteristics of different research stages and the factors affecting the behavior of urban residents in domestic waste classification, hoping to provide a theoretical basis and research framework for further explaining and predicting the behavior of urban residents in domestic waste classification.

2. Research Development and Main Influencing Factors

The research on the classification behavior of urban household waste in China started relatively late. By searching for the literature on the subject of "garbage classification" on HowNet, we found that there were 3,868 articles in total from 1993 to 2018. The specific distribution chart arranged according to time is as shown in Figure 1 of the statistical table of the literature on the classification of urban household waste. From the perspective of inter-dimension and horizontal research scale, the research development process of domestic waste classification behavior of urban residents in China can be roughly divided into four stages.

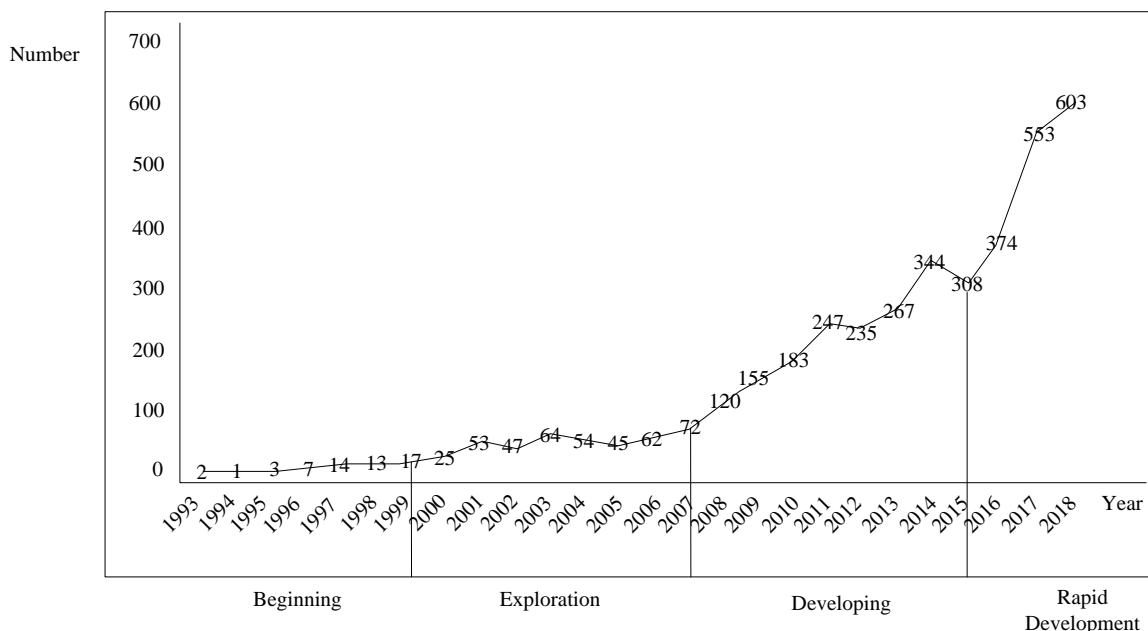


Figure 1. Statistical table of research literature on urban residents' domestic waste classification

2.1. The 1990s were the initial stage of the research on MSW classification

In 1992, the United Nations held the Conference on Environment and Development in Brazil. 178 countries, including China, adopted Agenda 21 at the Conference. Chapter 21 of the Agenda clearly states that countries should take substantive actions towards the goals of waste reduction, waste reuse and waste recycling in solid waste management. In order to gradually implement the reduction, resource utilization and harmlessness of municipal solid waste treatment, the Ministry of Construction formulated the Measures for the Management of Municipal Solid Waste in August 1993, first mentioning that "municipal solid waste should be collected, transported and treated by classification gradually". In 1995, the National People's Congress passed the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste, pointing out that municipal solid waste should be collected, stored, transported and disposed of step by step from the legal level. But at that time, the concept of environmental protection was not deeply rooted in the hearts of the people, and domestic scholars did not pay too much attention to the issue of waste classification. Only some scholars, through studying and investigating the experience of waste classification in Japan, Finland and other countries, believe that the transformation of public perception and the popularization of environmental awareness are the primary conditions for realizing waste classification [3,4]. On the incentive mechanism of garbage classification,

Quan Hongdong (1993) combined with the theory of circular economy proposed to use economic means to encourage residents to classify domestic garbage, Hu Xiuren and Lei Xiudong (1998) proposed to encourage residents to classify garbage by means of media publicity and government legislation [5,6].

2.2. 2000-2007 is the exploratory stage of MSW classification research

Entering the 21st century, with the rapid development of domestic economy and the improvement of people's consumption level, urban household garbage is increasing day by day. The problem of garbage siege and the consequent encroachment on land and pollution of water sources are gradually highlighted. In 2000, the Urban Construction Department of the Ministry of Construction held a symposium on the pilot work of municipal solid waste sorting collection in Beijing, pointing out that "in the current situation of rapid economic development and general improvement of public environmental awareness, it is necessary to start the pilot work of municipal solid waste sorting collection in a timely manner." In the same year, the Ministry of National Construction designated eight cities, including Beijing, Shanghai, Guangzhou, Shenzhen, Hangzhou, Nanjing, Xiamen and Guilin, as the first pilot cities for sorting and collecting domestic waste. In 2003, the State issued the "Classification Mark of Municipal Domestic Waste" and formulated 14 diagrams to distinguish different types of garbage. In 2004, the Ministry of Construction approved the Standard for Classification and Evaluation of Municipal Domestic

Waste (MSW) as an industry standard. This standard provides municipal environmental sanitation workers with requirements for classification of MSW, regulations for delivery and clearance, and evaluation indicators.

This stage is the initial stage of municipal solid waste classification work in the Mainland. The relevant policies still remain on the provisions of the middle-end sorting, transportation and end-processing procedures. Residents have neither a reference classification guide nor relevant incentive or restraint mechanism when classifying municipal solid waste. At this stage, researchers believe that the classification mode of domestic waste, relevant policies and regulations, garbage classification facilities are the key factors affecting the smooth development of garbage classification work.

Classification mode: He Dewen, Chai Liyuan and Zhang Chuanfu (2003) proposed that urban residents should adopt rough classification of domestic waste, and classify them according to dry waste, wet waste and harmful waste [7]. Man Guohong, Ji Chongchao, Zhang Yun and Man Guodi (2005) considered that the difficulty of domestic waste classification had an impact on the residents' garbage classification. Therefore, it was suggested that the simple and extensive classification method should be adopted before the complex and detailed classification should be gradually carried out.

Policies and regulations: Zheng Manying, Chen Jianzhi and Guo Xiaoqi (2004) surveyed eight demonstration sites of municipal solid waste classification in Guangzhou, and found that the utilization rate of domestic waste recycling was less than 5%. They believed that because there were no relevant policies and regulations, incentives and restrictions, it was difficult for residents to actively classify domestic waste [9].

Jiangyuan, Kang Muyi, Zhang Xiangen and Zhou Yanfang (2002) surveyed the residents of Beijing, Shanghai, Shenzhen and other five big cities on their recognition of garbage classification policies. It was found that with the pilot work of garbage classification, most urban residents have a certain understanding of garbage classification. Through interviewees on garbage charges. Surveys on the awareness of system, bottle/box deposit system and waste acquisition policy suggest that household garbage classification can be stimulated by implementing the policy of charging household garbage according to quantity, so as to improve the utilization rate of garbage recycling [10].

Supporting facilities: Lin Meizhen and Xialina (2004) studied the classification of municipal solid waste in Guangzhou, and found that there were serious problems in the waste classification system, such as the uneven distribution of sorting bins and the fact that most residents still mix all kinds of garbage in one garbage bag. Therefore, they suggested developing a kind of degradable garbage sorting and recycling system. Bags, which

represent different types of garbage in different colors, are distributed to residents for use without compensation, thus promoting garbage sorting behavior [11].

At this stage, scholars have begun to study the influencing factors of urban household waste classification behavior, but mainly concentrated on external factors such as policies, regulations, supporting facilities and so on.

2.3. 2008-2015 is the stage of gradual development of domestic waste classification research

In August 2008, the State promulgated the Circular Economy Promotion Law of the People's Republic of China, which is different from the single emphasis on "end-treatment" of domestic waste in previous policies and regulations. This law puts forward the importance of "source prevention" from the perspective of circular economy theory, that is, reducing the production and discharge of garbage from the source. As a result, the domestic regulation of municipal solid waste management has shifted from end pollution control to source control. Soon, with the introduction of local regulations or regulations on municipal solid waste classification management in Guangzhou, Beijing, Hangzhou and other places, municipal solid waste classification has gradually become a social hot spot. At this stage, Mainland scholars began to study household garbage sorting behavior from personal micro and policy macro perspectives.

Personal micro-level: Quying, as a representative of some scholars, has studied the influencing factors of urban residents' garbage sorting behavior from a personal micro-perspective. They believe that although Quying, 2009, 2011, has carried out pilot projects in relatively developed cities, the effect is not obvious. The main reason is the neglect of the main actors, so Quying yi based on the classical theory of social psychology-the theory of planned behavior, seven factors, including environmental attitude, subjective norms, perceived behavioral obstacles, perceived behavioral motivation, propaganda and education, altruistic environmental value and self-interest environmental value, are analyzed quantitatively. The results show that residents' environmental attitudes, subjective norms, perceived behavioral motivation, propaganda, education and altruistic environmental values are positively correlated with garbage classification intention, while perceived behavioral barriers and their environmental values are negatively correlated with garbage classification intention [12,13].

Macro level of policy: According to the survey of 90 communities in Beijing urban area conducted by Friends of Nature of Environmental NGO in 2010-2011, only 4.4% of the communities have achieved the correct classification of garbage, indicating that after many years of pilot work, the effect of garbage classification in Beijing is still not significant [14]. Some scholars try to find out the factors that affect the residents' garbage classification

behavior from a macro point of view. They point out that lack of perfect legal system, no feasible incentive and restraint mechanism, and inadequate government work are the reasons why it is difficult to achieve results in domestic garbage classification [15-18].

At this stage, the research on the influencing factors of domestic waste classification behavior of inland urban residents is no longer limited to external factors or macro-perspective.

2.4. From 2016 to now, garbage classification research has developed rapidly

In order to build a resource-saving and environment-friendly society, in June 2016, the National Development and Reform Commission and the Ministry of Housing and Construction jointly issued the "Mandatory Waste Classification System Scheme" (draft for comments). The mandatory classification of domestic waste was proposed as an important measure to promote green development and innovative urban management. In December of the same year, Xi Jinping's General Book In the Fourteenth Meeting of the Central Leading Group on Finance and Economics, it was proposed that the general implementation of the waste classification system would improve the living environment of more than 1.3 billion people, and whether waste could be reduced, resourced and disposed of harmlessly. In March 2017, the National Development and Reform Commission and the Ministry of Housing and Urban-Rural Construction issued the Implementation Plan of Domestic Waste Classification System, which is different from the previous proposed laws and regulations. The plan clearly proposes that the compulsory classification of domestic waste should be implemented in 46 cities first, and puts forward specific objectives: by the end of 2020, the compulsory classification of domestic waste should be implemented. In cities of Class I, the utilization rate of domestic waste should reach 35%. Moreover, the scheme attaches great importance to the main body of domestic waste classification, and proposes that residents can be guided to consciously classify garbage by formulating guidelines for the classification of domestic garbage or setting up propaganda boards and supervisors for the classification of garbage in the community. It also provides a more operational garbage classification model, such as guiding residents to "dry and wet garbage". Classified collection, classified delivery, gradually achieve "wet garbage" daily production and in-depth classification of dry garbage, etc. In addition, the program in strengthening the construction of domestic garbage classification supporting system, also put forward the requirements of "improving the relevant signs of garbage classification, equipped with clear classification collection containers" and so on.

With the implementation of garbage classification in various places, mainland scholars began to try to study the

influencing factors of domestic garbage classification behavior of urban residents in the mainland from the perspectives of individual psychology, facility convenience, government measures and community behavior. The research methods also gradually developed from previous analytical descriptions to empirical research.

At the level of individual psychological factors, domestic scholars began to draw lessons from the western research model, using planned behavior theory to study household garbage classification behavior. Yin Xin, Wang Yu, Cheyue and Yang Kai (2017) conducted an empirical study on residents of 25 communities in Shanghai. The effects of behavioral attitudes, subjective norms and perceived behavioral control on household garbage sorting behavior were examined. It was found that two variables, attitudes and perceived behavioral control, had significant effects on household garbage sorting behavior intention. The positive effect of the study is that the residents with more positive attitude and stronger ability to perceive and control behavior have stronger intention to classify domestic waste, while the subjective norms have no significant influence on the intention to classify domestic waste [19]. Xu Lin, Ling Maoliang and Lu Yujie (2017) added perceived value variable on the basis of the theoretical model of planned behavior. They believed that the variable was to measure residents' value perception of household garbage sorting behavior, that is, whether the garbage sorting behavior can bring individual benefits, social benefits and whether it has any. Moral value [20]. Individual interests can be understood as the residents' economic benefits and sense of achievement from the classification of domestic waste. Social interests include residents' recognition that the classification of domestic waste is conducive to environmental protection, while moral values reflect the moral significance of individual classification in altruism. They found that perceived value, behavioral attitudes, subjective norms and perceived behavioral control had significant positive effects on household garbage sorting behavior in seven communities of a street in Hangzhou.

In terms of convenience conditions, Yin Xin et al. (2017) believed that garbage classification equipment and its degree of convenience would affect residents' intention of garbage classification behavior. Meng, Tan, Wang, Wen, Tao, and Qian (2019) conducted an empirical study of 709 residents in Suzhou. The results showed that supporting facilities and services had a significant positive impact on household garbage sorting behavior [21].

At the level of government measures, Wu Xiaolin and Deng Conghui (2017) believe that the domestic research on the government's construction of garbage classification order is still at the level of "policy proposition" and has not solved the key proposition of "how government intervention works". They believe that under the current situation of weak awareness of domestic residents' gar-

bage classification, the government should take action. It is expected that "strong intervention" such as legislation and punishment should be the main means, and "weak intervention" such as propaganda and education should be supplemented by [22]. Zhang Shuang, Sun Shaorong and Ma Huimin (2018) used evolutionary game model to study the evolutionary process of residents' garbage classification behavior and government charging behavior, and obtained residents' garbage through theoretical analysis and simulation experiments. Classification behavior is related to environmental awareness and government charging policy. Scientific and reasonable charging policy can effectively promote garbage classification [23]. Xu Lin and others (2017) believe that perceived policy effectiveness has a positive impact on household garbage classification behavior. That is, the stronger the residents' perception of policy effectiveness, the more likely they are to participate in garbage classification. Through an empirical study in Hangzhou, they demonstrated that perceived policy effectiveness has a direct impact on household waste classification behavior.

At the community level, the definition of "community" was first proposed by German sociologist Tönnies. It refers to the traditional community of social life with human feelings and identity based on blood, geography, emotion and natural will. After a period of development, the community is also used to express the modern urban living space with social interaction and identity within a certain geographical range. With the progress of society, in the interior of our country, the community based on Region.

3. Conclusions and Prospects

Through the analysis and collation of the existing literature, it can be found that there has been a great leap forward in the study of domestic urban residents' garbage classification behavior. From the initial consideration of policies, regulations, classification models and other factors on garbage classification behavior, recently many scholars have begun to consider external factors as well as external factors. Considering the influence of individual psychological factors on household garbage sorting behavior of residents. However, due to the fact that domestic research on urban residents' garbage classification behavior has just started, most of the influencing factors of garbage classification behavior remain in descriptive qualitative research, lacking empirical research for theoretical support. On the other hand, because the domestic waste classification has not been carried out nationwide, most of the urban domestic waste classification work is still in the exploratory stage, limited by the sample size, the study still lacks a systematic research system. Therefore, in future research, we can measure the impact of policies and regulations on household garbage classification behavior, but also need to measure the impact of

individual psychological factors such as behavior attitude, ethics and so on. At the same time, we can take into account the characteristics of domestic residential environment and community factors to classify household garbage.

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