

Chinese Residents' Willingness Changes toward Garbage Classification in the Past Two Decades: Influencing Factor Analysis

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Abstract. Nowadays, in the process of industrialization and urbanization in China, the urban environmental problems caused by garbage delivery have become increasingly prominent in society. Therefore, citizens' willingness to garbage sorting has a great impact on urban environmental problems. The paper reviews the changing course of citizens' willingness to perform garbage sorting. The paper concludes with three key factors that influence citizens' intentions regarding garbage classification. Moreover, the paper also gives some suggestions for further implementation of relevant laws and regulations of the society. At present, the publicity and education level of garbage sorting, the quality of garbage sorting facilities, and the maturity of relevant laws and regulations all have a great impact on citizens' willingness to garbage classification. The paper shows that in the past two decades, with the promotion of garbage classification knowledge, the improvement of citizens' understanding of garbage sorting, the optimization of relevant facilities, and the perfection of relevant laws and regulations, citizens' willingness to conduct garbage classification has increased significantly. This research helps people to have a more comprehensive understanding of the influencing factors of citizens' willingness toward garbage sorting to effectively improve citizens' awareness of garbage classification and alleviate environmental problems caused by household garbage in society.

Keywords: Garbage classification; publicity and education; garbage classification process and facilities.

1. Introduction

Nowadays, with the rapid development of China's economy, the process of urbanization has accelerated, and citizens' life quality has improved significantly. However, this improvement also puts great pressure on the urban environment, deteriorating the quality of the ecological environment continuously, and one of the main sources of pollution is a domestic waste. Firstly, a large amount of household waste piled in the suburbs of cities has occupied a huge area of farmland, aggravating the serious problem of grain shortage in China, which has increased the dependence on grain imports and made food prices unstable in the market. Secondly, the accumulation of household garbage would lead to serious air pollution. Garbage is a complex mixture of ingredients; in the process of transportation and open-air stacking, the organic decomposition could produce a foul odor and release a large amount of ammonia, sulfide, and other pollutants into the atmosphere; toxic gases contain many carcinogens and teratogens. Thirdly, according to the research made by Caietal, the arbitrary accumulation of household garbage would cause water contamination. The harmful components in the garbage called percolate can be washed away by the rain into the surface water [1]. Furthermore, plenty of acidic and alkaline organic pollutants and highly toxic heavy metals could be dissolved in garbage pilling or pit filling, and if these toxic liquids flow directly into rivers, lakes, or oceans, they will cause more severe pollution to the environment. Fourthly, not sorting garbage or wrong household waste classification could lead to the spread of severe diseases. Household waste contains plenty of microorganisms, which are perfect breeding grounds for bacteria, viruses, and pests, thus causing great safety risks to human health. Last but not least, not sorting household waste also increases the risk of fire. There are many flammable and explosive products in household garbage, such as batteries, toners, or gas tanks, so it is easy to cause fire by mixing all kinds of waste.

In conclusion, the lack of citizens' awareness of garbage classification would cause a series of irreversible consequences to society and the environment, and how to improve residents' willingness toward garbage classification has become a hot issue. According to these issues, the paper concludes on three key factors that influence citizens' intentions regarding garbage classification and gives some suggestions for further implementation of relevant laws and regulations in society. This study is beneficial to the rational social planning ecological development goals and could not only ensure our country's social security but also promote the development of residents' comprehensive quality.

2. Impact of publicity and education on residents' willingness of garbage classification.

2.1. Before 2015

Before 2015, most Chinese residents had little knowledge of garbage sorting. First of all, according to research by Yanjiang, in 2008, only 27.6% of Beijing residents conducted garbage classification, while 41.4% of people had never heard of garbage sorting or were unfamiliar with it. Furthermore, only 3% of the residents could accurately classify garbage [2]. Thus, a large number of people had never heard of garbage classification.

Moreover, most citizens in China could not accurately sort the garbage; hence they did not have an awareness of garbage classification before 2015. In 2014, a questionnaire survey of 565 residents in Nanjing showed that 42.3% of residents could not identify the types of garbage correctly, and only 1.4% of residents could accurately classify four types of garbage [3]. In this case, according to the research, it is obvious that Chinese citizens lack awareness of garbage classification before 2015.

2.2. After 2015

After 2015, the knowledge of garbage classification became popular in China. According to the data collected by Yun et al. in 2018, residents have gained more comprehensive information on garbage sorting after establishing pilot sites. In 2016, six pilot cities in China decided to establish a social notification system for the classification and transportation of household garbage: by posting notices in dumpster rooms, the residents can be informed about the garbage's classification and transportation time, which not only facilitates residents to understand the rules of garbage sorting but also helps residents to gain more knowledge of garbage classification [4].

Apart from that, Wang and her coworkers surveyed 1,176 residents about garbage sorting in 12 administrative regions of Hebei province in 2021, and the data shows that about 92 percent of residents approved garbage classification, and 37.3 percent of people could correctly discharge the garbage. In conclusion, after the Chinese government increased publicity and education on waste sorting in 2015, residents have a deeper understanding and knowledge of environmental protection. Thus, they have more consciousness to do garbage classification.

3. The impact of the garbage classification process and facilities on residents' willingness

3.1. Before 2016

Before 2016, Chinese communities did not have a standardized garbage classification process. Firstly, the garbage classification and collection systems are immature in society. Before 2016, China lacked a complete garbage sorting and recycling cycle chain: a garbage disposal system that puts in collects, transport, and processes household garbage. Furthermore, most Chinese cities only focus on the initial stage of garbage classification, which is garbage delivery. However, there is a serious shortage of waste-carrying trucks, which means the way of garbage disposal was not well-organized, and the structure of garbage classification was not well optimized. Apart from that, to reduce the cost of recycling, the Chinese government used the single garbage truck to collect all types of garbage,

which means that instead of carrying different types of garbage with designated garbage trucks, a single garbage truck would collect different types of garbage together and mixed transport to a landfill. This behavior definitely ignored the achievement of garbage sorting by residents, who had already properly sorted different kinds of garbage before the arrival of garbage trucks. Hence, this improper recycling method has aroused a huge dissatisfaction among citizens because they thought that the government had ignored their behavior of garbage sorting and that the government itself does not care much about garbage sorting. In conclusion, since no matter how carefully citizens sorted their waste, the garbage would eventually be mixed together, fewer citizens did classification again. Therefore, this undesirable garbage sorting process has discouraged citizens' willingness to garbage classification.

3.2. After 2016

After 2016, the Chinese government gradually optimized the garbage sorting and recycling system. To start with, in 2016, Guangzhou established more than 3100 new recycling stations which combined the function of both traditional recycling stations and garbage collection stations, and according to field research conducted by experts from the China Association of Renewable Resources and Recycling and the China Association of Environmental: Health, this integration of garbage stations could effectively reduce the total amount of household waste by 82 percent, which was a huge success in that days [4].

Moreover, in 2018, Shanghai implemented separate transportation of glass and hazardous waste, set up a notice board of different types of garbage collection times, and used different garbage-carrying vehicles to transport specific types of waste to optimize their garbage classification measures.

Last but not least, in 2018, Anhui province banned the mixed transportation of household garbage that had already been sorted and collected, which dramatically reduced the dissatisfaction of citizens and improved their enthusiasm for garbage sorting [4]. In conclusion, the separate recycling of all types of garbage and the integration of waste recycling stations have effectively perfected the Chinese garbage recycling process, and all these measures of improvement have enhanced residents' enthusiasm for garbage classification.

4. The impact of regulations and laws on residents' willingness

4.1. Before 2015

Before 2015, the Chinese government's measures of garbage classification are cumbersome and unworkable. First of all, in 2000, many Chinese cities tried to introduce policies of garbage sorting to enhance citizens' willingness to garbage classification. However, since the relevant departments did not consider the feasibility and sustainability of the specific implementation of those policies, and those policies were not mandatory for the public, residents did not want how that do garbage sorting in specific. Therefore, according to Peng and her coworkers' research, They did not have the obligation of garbage classification. Thus, the process of garbage classification failed in most of China's pilot cities in 2003 [5].

In addition, in April 2007, the relevant departments of China promulgated a measure called "Municipal solid waste management", which clearly stipulates the areas and units responsible for garbage sorting. Furthermore, the measure also defined the requirements for residents to separate their garbage. Nevertheless, according to Wang and her coworker Liu's research, since the lack of public awareness, the lack of publicity, and poor management, the garbage classification rate in China's pilot cities did not exceed 15% before 2008 [6].

In conclusion, due to these failed cases, two factors led to the lack of willingness to garbage classification among residents: complicated and infeasible government regulations and the lack of government enforcement.

4.2. After 2015

Fortunately, after 2015, the new policy has not only increased the feasibility of garbage classification but also added a number of incentives and penalties for garbage sorting. First of all, in 2015, Shanghai implemented an incentive system for garbage classification: By correctly sorting their garbage, residents can earn points in their garbage classification accounts that can be redeemed for a variety of goods and services. Surprisingly, according to Peng yun and her coworkers' research, the accuracy rate of garbage sorting in Shanghai increased by about 38 percent within a month after the reward points system was implemented [7].

In addition, in June 2016, 46 pilot cities in China implemented mandatory household waste classification, and these cities have proposed to establish a standard system of garbage classification laws by the end of 2020, forming a reproducible and popularized household garbage classification model. Apart from that, these pilot cities aimed to increase the recycling rate of their household waste to more than 35 percent by 2020. It is worth mentioning that every city has its different garbage classification methods. For instance, Beijing has divided household waste into recyclable waste, kitchen waste, and other waste; Shanghai has proposed four categories of household waste, which are kitchen waste (wet waste), recyclable waste, toxic waste, and other waste (dry waste); Chongqing has divided waste into five categories, including kitchen waste, fruit, and vegetable, glass, metal, plastic, and paper waste. Furthermore, in 2018, the Qingdao government put forward a series of countermeasures based on their local garbage classification problems: Firstly, the government established a coordination mechanism and supervision mechanism for garbage sorting. Secondly, the government encouraged the development of a new waste reprocessing industry by establishing a mechanism for garbage collectors to provide collection services in different regions. Thirdly, the government set up a garbage charging mechanism, a points reward system, and mandatory measures to enhance the garbage classification rate of residents [3]. Hence, these measures have improved the efficiency of garbage classification in a short time and increased residents' enthusiasm for garbage sorting.

Last but not least, according to a draft submitted by the Standing Committee of the Xiamen Municipal People's Congress in 2017, Residents who fail to sort out household waste in accordance with regulations or who refuse to do garbage sorting will be fined between 10,000 RMB and 50,000 RMB for companies and between 300 RMB and 1,000 RMB for individuals [7].

In conclusion, by means of encouragement or coercion, the improvement of these laws and regulations has greatly enhanced residents' willingness to conduct garbage classification.

5. Suggestions on further implementation of relevant laws and regulations

Firstly, the government should increase residents' sense of participation in garbage classification. For instance, the Chinese government should adopt Citizen Science as an intelligent tool to involve citizens. Researchers proposed the need for academic institutions, local governments, and concerned active governing bodies to initiate HSWSB-related Citizen Science projects given that HSWSB requires citizen attention and seriousness. Citizen Science can improve the acceptability of ecological/environmental policies because its projects promote scientific knowledge among citizens. Hence, in the context of HSW, Citizen Science-based projects and initiatives are required for citizens to obtain a sense of participation, contribution, and involvement in HSW and related initiatives [8]. In addition, instead of limiting residents' thinking to garbage classification, the relevant government departments could extend residents' vision from garbage sorting to environmental protection, broadening people's horizons and increasing citizens' sense of responsibility for environmental issues.

Moreover, since landfills and incineration plants have caused serious pollution to the surrounding environment, the government could increase the utilization rate of recyclable waste to reduce the construction of those refuse processing plants. Therefore, reducing environmental pollution could also enhance residents' enthusiasm for garbage classification.

Last but not least, the relevant departments should strengthen the connection between the government and residents. The author claims that in the present situation, most citizens believe that HSW management is solely the duty of the government (as a public service) (Lv and Du, 2016). However, in the context of successful HSW management initiatives in neighboring countries (i.e., Japan), the holistic approach involves four distinctive stakeholders (government, enterprises, residents, and residents' council). Under such a linkage system, the residents' council can serve as a bridge between the government and residents and plays a key role in communicating and implementing related government policies to achieve fruitful results [9]. Apart from that, the author also argues that the publicity and education of waste sorting, from garbage classification methods to waste disposal modes, should be strategically communicated to citizens in detail. Waste sorting should be communicated to the public through different modes and media to reach all members of society. Moreover, reducing HSW production by relying only on citizens for HSW management can potentially lead to less smart solutions [10].

6. Conclusion

With the rapid development of scientific technology and industry, thousands of industrial and household wastes have been produced by humans. If people do not properly classify those wastes, then millions of garbage will have a huge negative impact on human society. Moreover, any further delay in garbage classification would lead to irreversible consequences. Thus could not secure a liveable and sustainable future for all. Residents' willingness to rational garbage classification is the key factor in solving this serious problem. By collecting data from China in the past two decades, the essay summarizes three main factors: publicity and education, the relevant process and facilities, and the relevant regulations and laws on garbage classification that affect residents' willingness to classify household waste. The paper also puts forward some reasonable solutions to the existing problems, including increasing the participation of residents in garbage sorting, reducing the use of environmentally unfriendly waste disposal methods such as landfills and incinerators, and strengthening the communication and interaction between relevant departments of garbage classification and citizens. In that case, more residents would realize the importance of garbage sorting, and more people would have the willingness to do garbage classification.

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