Analysis on Residents' Acceptance and Its Influencing Factors of Waste Classification Policy

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Abstract. In order to investigate the implementation of Shanghai's waste classification policy, this paper uses multiple linear regression models based on field surveys and online questionnaire data from 2570 residents in Shanghai's six districts to empirically analyze the factors affecting the acceptance of urban residents' waste classification policies and their differences. The research results show that, first, among the residents, women, high education levels, and school students have higher acceptance of garbage classification policies. Second, the main factors affecting residents' policy acceptance are policy understanding, behavior attitudes subjective norms and effective perception of policies. Third, "the government has not provided a complete waste sorting facility" and "too far away from the waste disposal sites" are the main reasons for restraining residents from sorting waste.

Introduction

With the rapid development of China's economy and the improvement of people's material living standards, the annual output of Chinese garbage has increased dramatically, reaching about 400 million tons per year, and increasing at a rate of about 8% to 10% per year. However, landfill and incineration are still the mainly methods of treating urban waste in China, not only cause high social costs, but also bring significant environmental risks. Obviously, the classification recycling of household waste is China's most effective solution, not only can reduce the amount of waste by more than 60%, but also generate huge economic benefits, and the direct recycling rate can be no less than 33%. So far, 46 cities across the country have started garbage sorting. However, waste classification is a complex process involving multiple stakeholders such as residents, communities, enterprises, and the government, including waste separation, release, collection, transportation, and disposal. It is difficult to form a long-term effect and management mechanism only by the ineffective government, urban residents are the main force and backbone of the waste separation and promotion process. Therefore, in the context of China first implement waste classification policies, this article studies the willingness of Shanghai residents to classification waste policies, as well as the factors that promote or restrict the willingness of residents in policy in specific urban living places, and objective and in-depth understanding and analysis of these factors.

Review of Literature

In the 1960s, the western developed countries began to study the classification of garbage: (1) A research model focusing on psychological factors. Foreign scholars mainly use the theory of planned behavior (TPB) to explain the garbage classification of residents from a psychological
perspective. The theory believes that the main determinant of real behavior is behavioral will, behavioral attitude, subjective norms, and perceived behavior control act on actual behaviors through behavioral will\(^1\). However, some studies have pointed out that in order to understand why people do not implement garbage classification behavior, in addition to the factors provided by planned behavior theory, we must consider other factors, including cultural factors, public education, economic conditions, social pressure, opportunities to engage in environmental behavior, etc\(^2,3\). Cultural factors have a more significant impact on residents of countries that respect Confucian culture, such as China\(^4\). (2) Comprehensive research combining internal and external factors. In the mid-1990s, besides focusing on the influence of psychological factors on environmental behaviors, gradually began to pay attention to the direct influence of external factors on environmental behaviors. The A-B-C theory proposed by Guagnano in 1995 believed that the behavior of waste classification is the result of the combination of attitude variables and external conditions held by individuals on waste classification\(^5\). Steg and Vlek believe that an effective policy measure increases the attractiveness of environmental behavior, and people will develop a more positive attitude and a higher level of behavioral awareness\(^6\). Later, more researches explored the impact of policy factors such as government waste management policies, laws and regulations on waste classification and recycling.

In the 1990s, the concept of garbage classification was introduced into China. Domestic academic’s research on the classification of urban waste mainly focuses on two aspects: (1) Empirical policy analysis based on the macro policy level. Some scholars introduced the prominent problems, constraints and experience of the implementation of domestic waste classification policies in the main city of China, while others have refined the obstacles in the development of waste classification in China and provided corresponding policy recommendations nationwide. (2) Empirical research based on micro-individual level. In the 21st century, in addition to macro studies, scholars have widely applied the theory of planned behavior, taking residents in the classification of urban domestic waste as research objects, empirical research on the willingness, attitude, behavior, and demographic characteristics of its domestic waste classification has greatly expanded the research horizon of urban domestic waste classification. Nevertheless, many scholars believe that other variables should be included to improve the explanatory power of the model. Therefore, some scholars have added factors of traditional Chinese cultural values, effective perception of policies, and situational factors of residents' implementation of domestic waste classification on the basis of planned behavior theory, such as the convenience of waste classification and recycling facilities. In terms of demographic characteristics, scholars often join in gender, age, income, and education level. However, scholars have not reached consensus on the importance of the impact of various demographic variables. In fact, in recent years, more and more studies have shown that demographic and social statistical characteristics have weak explanations for residents' garbage classification behavior, but these variables are often added to control the heterogeneity of samples.

Although previous studies have discussed in detail the influencing factors that influence the classification of household waste, and research methods are becoming more and more abundant. However, previous studies were mostly studies that did not involve participation in the real waste classification policy background, it is difficult to consider the role of policies and regulations in promoting the implementation of municipal solid waste classification. Based on this, in the context of Shanghai's implementation of a mandatory classification policy for domestic waste, this paper uses the theory of planned behavior and the A-B-C theory to apply multiple linear regression...
Research Methods, Data Sources and Variable Selection

Research Methods

This paper studies the influence of six factors on the policy acceptance of residents. The acceptance of residents' policies is a five-level scale, which belongs to quantitative data. Therefore, multiple linear regression analysis is used for research. The general form of the model is:

\[ y = \beta_0 + \sum_{k=1}^{k} \beta_{ik}X_{ik} + \epsilon \]  

(1)

Among them, the explanatory variable \( y \) is Shanghai residents' participation in the compulsory classification of domestic waste policy, and the assignment is: \( y=5 \), very agree; \( y=4 \), relatively agree; \( y=3 \), general agree; \( y=2 \), do not agree; \( y=1 \), do not agree at all. \( X_{ik} \) includes the level of understanding of garbage classification systems, behavioral attitudes, subjective norms, perceived behavioral control, perceptions of policy effectiveness and demographic sociology. This article uses SPSS19.0 software for regression analysis. \( \beta_0 \) is a constant term, \( \beta_{ik} \) is a partial correlation coefficient of \( y \) corresponding to \( X_{ik} \), and \( \epsilon \) represents an error term or an interference term.

Data Sources

The data in this article are from field surveys and online questionnaires from the Shanghai University Summer Social Practice Survey Team from June to August 2019. The overall random sampling method is used to select six districts according to different economic development levels, including Shanghai Pudong New District, Xuhui District, Baoshan District, Jing'an District, Huangpu District, and Jiading District, a total of 2570 questionnaires were collected. The content of the questionnaire survey includes demographic and social statistical characteristics, acceptance of garbage classification policies, understanding of garbage policies, behavioral attitudes, and subjective norms. According to the sample survey results, some basic characteristics of the interviewees are summarized: Among them, the ratio of male and female respondents, Shanghai household registration residents and non-Shanghai household registration residents is more evenly distributed, with a higher proportion of undergraduates and above in education, reaching 44.4%; the age is mainly concentrated in the age of 15-25, accounting for 34.6%; the interviewed groups are mainly school students and business unit personnel, accounting for 39.2% and 37.6%; the monthly income level is mainly concentrated in 0-2500 level, which accounts for 33.6%.

Variable Selection

This study selected 27 independent variables in six categories, including demographic and social statistical characteristics, understanding of garbage classification policies, behavioral attitudes, subjective norms, perceived behavior control, and effective perception of policies. Among them, the item of behavioral attitudes, subjective norms, and policies effective perception is a Likert
five-point scale, and the item of perceptual behavior control is a ranking problem. The dependent variable selected Shanghai residents' participation in the mandatory classification policy of domestic waste. Establishing a hierarchical relationship of variables that affects the acceptance of household waste classification policies, as shown in Table 1:

| Demographics | Knowledge of waste classification policies | Behavior attitude | Subjective norms | Perceived behavioral control | Effective policy perception |
|--------------|--------------------------------------------|-------------------|------------------|-----------------------------|---------------------------|
| Gender, Age range, Education, Residence area, Household registration, Length of stay, Occupation, Honor frequency, Monthly income | Information dissemination | Environmental values | Herd mentality | Convenience | - |

**Table 1. Influence factor hierarchy.**

**Model Estimation and Result Analysis**

**Questionnaire Reliability and Validity Test**

Before using multivariate linear model to regress the variables, this paper tests the validity and reliability of the scale part of the questionnaire. The variables involved in the scale of this article are policy acceptance, behavioral attitude, subjective norms, and effective perception of policies, among which policy acceptance is the dependent variable. After calculation, the overall reliability of the questionnaire scale items is 0.732, indicating that the consistency of the questionnaire items is good. KMO and Bartlett spherical test dependent variable items were used. The KMO test value was 0.827, and the corresponding p value of the Bartlett spherical test was 0.000, which was less than 0.05, indicating that the data collected was suitable for factor analysis. Through the factor analysis, we can get six principal factors of environmental values, social supervision, herd mentality, rewards and punishments, social culture and effective policy perception. The cumulative variance contribution rate of the six principal factors is 81.98%, that is, the extracted six principal components can explain the information of 81.98% of the nine measurement questions.

**Regression Analysis**

Based on the extracted principal components, this paper uses the SPSS19.0 statistical tool to perform multiple linear regression analysis on the factors that affect the acceptance of urban residents' classification policies for household waste. The explanatory variables include information dissemination, above six principal components and perceived behavior control. At the same time, control variables such as gender, age range, education level, area of residence, household register, length of stay, occupation, honor frequency and monthly income are added. The analysis results are shown in Table 2.
Table 2. Summary table of multiple linear regression.

| Dependent variable: Policy acceptance | Non-standardized coefficient | B     | Standard error | t     | Sig.   |
|--------------------------------------|-----------------------------|-------|----------------|-------|--------|
| (constant)                           |                             | -1.825| .187           | -9.740| .000   |
| Control variable                     |                             |       |                |       |        |
| Gender (compared to female)          |                             | -.073*| .032           | -2.247| .025   |
| Age range                            |                             | -.008 | .020           | -.415 | .678   |
| Education level                      |                             | .093***| .017           | 5.598 | .000   |
| Xuhui District                       |                             | -.189***| .054           | -3.500| .000   |
| Baoshan District                     |                             | .072  | .054           | 1.330 | .184   |
| Jing'an District                     |                             | -.112*| .056           | -2.020| .043   |
| Huangpu District                     |                             | -.081 | .053           | -1.526| .127   |
| Jiading District                     |                             | -.264***| .071           | -3.699| .000   |
| Area of residence (compared to Pudong New Area) | |       |                |       |        |
| Whether it is a Shanghai household register (compared to a non-Shanghai household register) | | -.045 | .044 | -1.035 | .301 |
| How long have you lived in Shanghai |                             | .020  | .016           | 1.201 | .230   |
| Government agencies/public institutions/non-profit organizations | | -.311***| .084 | -3.719 | .000 |
| Business unit                        |                             | -.344***| .079           | -4.356| .000   |
| Freelancers                          |                             | -.522***| .096           | -5.436| .000   |
| Other                                |                             | -.026 | .122           | -2.17 | .082   |
| Independent variable                 |                             |       |                |       |        |
| Information dissemination            |                             | .090***| .020           | 4.427 | .000   |
| Environmental values                 |                             | .194***| .019           | 10.423| .000   |
| Social supervision                   |                             | .078***| .019           | 4.192 | .000   |
| Herd mentality                       |                             | .059***| .016           | 3.738 | .000   |
| Incentive measures                   |                             | .097***| .019           | 5.209 | .000   |
| Social culture                       |                             | .123***| .019           | 6.629 | .000   |
| Perceptual behavior control          |                             | -.009 | .016           | -5.89 | .556   |
| Effective policy perception          |                             | .072***| .019           | 3.768 | .000   |
|                                      |                             |       |                |       |        |
Among the individual characteristics, the influence of residents' gender on policy acceptance has passed the significance test ($\beta=-0.073$), indicating that compared with women, the acceptance rate of men's garbage classification policies is lower than that of women. This may be because the traditional division of labor still exists, and as a family behavior, women are still their main bearers. As a result, women are more involved than men. The influence of education level on policy acceptance has passed the significance test ($\beta=0.093$), which indicates that the higher education level of the residents have the higher degree of attention to the environment, and therefore more willing to participate in garbage classification. In terms of the residential areas involved in this survey, compared with Pudong New Area, Xuhui District and Jiading District have a very significant impact on policy acceptance ($\beta=-0.189$, $\beta=-0.264$), indicating that residents of Xuhui District and Jiading District compared with Pudong New Area residents' policy acceptance is lower. By comparing the education level of residents in Pudong New District, Xuhui District, and Jiading District, it can be found that the proportion of samples of undergraduates and above in Pudong New District is 52.1%, and that of Xuhui District and Jiading District respectively are 35.9% and 24.9%, further explaining that policy acceptance has a significant positive impact. Compared with school students, government agencies/public institutions/non-profit organizations, business units, and freelancers have a significant impact on policy acceptance ($\beta=-0.311$, $\beta=-0.344$, $\beta=-0.522$), explaining that residents of these occupations have lower policy acceptance than students at school.

Information dissemination passed the significance test at the level of 0.001 ($\beta=0.090$). Information dissemination will positively change the audience's cognitive structure and values, thereby promoting residents' environmental behavior. The impact of environmental values on policy acceptance is very significant ($\beta=0.194$). The stable attitude of accepting garbage classification policies will help people form and maintain their classification behavior habits. Social supervision ($\beta=0.078$), herd mentality ($\beta=0.059$), reward and punishment measures ($\beta=0.097$), and social culture ($\beta=0.123$) all passed the significance test at the level of 0.001. Rambalak and Govind believe that the traditional collectivist nature of the Chinese makes subjective norms have a greater impact on their tendency to buy green products[7]. Although the effect of perceived behavior control on policy acceptance is not significant, the direction is consistent with our expectations. The ability of residents and perceived difficulties in implementing waste classification will have a negative impact on residents' policy acceptance. Among them, "the government does not provide a complete garbage classification facility" and "the garbage classification drop-off location is too far and inconvenient" are the main reasons for restraining residents' policy acceptance. Effective policy perception ($\beta=0.072$) positively affected policy acceptance at the level of 0.001. When residents feel a policy is effective, they develop a more positive attitude and a higher level of behavior.

Summary

By studying the residents' acceptance of the waste classification policy in Shanghai and the analysis of the influencing factors of the effect of the policy implementation, we have a clearer understanding of the problems existing in Shanghai's implementation of the waste classification policy. Through the above analysis, the following conclusions can be drawn: First, among the residents, women, high education levels, and school students have a high acceptance of garbage classification policies. Second, the main factors affecting the acceptance of residents' policies are policy understanding, behavioral attitudes, subjective norms, and effective perception of policies. Third, "the government has not provided a complete garbage classification facility" and "too far away from the garbage disposal sites" are the main reasons for inhibiting residents from sorting.

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