IHS
Making cities work

IHS is the international institute of urban management of Erasmus University Rotterdam

MSc Program in Urban Management and Development

Rotterdam, The Netherlands

September 2017

Thesis

Title: Analysis of resident's behavior intention of Municipal Solid Waste (MSW) classification in Beijing, China

Name: Handi Yuan

Supervisor: Ms.Julia Skinner MSc

Specialization: **Managing and Financing Urban Infrastructure (MUFI) UMD13**

MASTER'S PROGRAMME IN URBAN MANAGEMENT AND DEVELOPMENT

(October 2016 – September 2017)

Title

Analysis of Resident's Behavior Intention of MSW Classification in Beijing

Name **Handi Yuan**

Country **China**

Supervisor: **Ms. Julia Skinner MSc**

UMD 13 Report number: 1007

Rotterdam, September 2017

Summary

With the rapid urbanization in China, the municipal solid waste (MSW) in cities has become one of the most important problems needed to be resolved from the city development point of view. Although MSW classification is considered a critical process in waste management, it is not easy to implement it and bring satisfactory performance.

As the main action body of MSW classification, the residents' participation is significant. Although their environmental attitude and value could not affect the environmental behavior directly, it could put influence on the behavior through the environmental behavior intention. In other words, the behavior intention is an important factor of the behavior. As a result, to improve the resident's enthusiasm of participating in classification, it is important to dig deep into the main factors that influence people's MSW classification behavior intention, the effect degree of each factor, and how they put influence on people's classification behavior intention at household level.

With the residents in Beijing as research targets, this thesis analyzes and identifies factors impacting residents' behavior intention of MSW classification behavior. The strength of those factors on the behavior intention is also studied, and a theoretical framework about resident's behavior intention of MSW classification is developed. Based on these analyses and finding, some suggestions are provided for municipal governments to understand the status quo and influencing factors of resident's behavior intention of MSW classification in Beijing. The main contents and results of this study are as follows:

1. Based on the literature review, considering the reality of Beijing, this thesis develops a theoretical framework of residents' behavior intention for MSW classification in Beijing with the Theory of Planned Behavior, Infrastructure-Service-Behavior model as well as Environmental Behavior theory as theoretical basis. According to the theoretical framework, those factors, as main research variables are identified that have close relationship with residents' behavior of MSW classification, that is, phycological variables, situational factors and environmental factors.
2. Based on the theoretical framework of residents' behavior of MSW classification in Beijing, this thesis develops a questionnaire which includes all the variables mentioned above. By the means of random sampling, this thesis tests the reliability and validity of the questionnaire which confirm that the data are suitable for statistic analysis.
3. This thesis analyzes the relationships between behavior intention and the relevant factors systematically by means of the empirical research method. Statistic results show that the psychological and situational variables have influence on behavior intention, well the environmental variables have no influence on it.

This thesis reveals the relationship between residents' behavior intention of MSW classification in Beijing and it relevant factors, which provides an analysis tool and

theoretical reference for promoting residents' enthusiasm to participate in MSW classification.

Keywords

MSW classification; Behavior intention; Psychological variables; Situational factors; environmental factors

Acknowledgements

First, I am exceptionally grateful to my supervisor Ms. Julia Skinner for her guidance, encouragement and patience in my research. I really appreciate her support and I think I could not have had any better supervisor than her. Thank you, Ms. Julia Skinner!

Thank to my whole family, especially to my dad Zhijing Yuan and my mom Linmo Li. I would not finish my study without your unconditional support and courage. I am deeply missing you very much!

I want to give all my love to Yongkang Sun. You did whatever you can for me during the last three years, thank you! And I hope you can get your degree well, you are the best!

I will also grateful to all the professors and staff in IHS for their help and knowledge during my study period. It's a great honor for me to be here with you for the past year.

To my friends and colleagues, Wejia Wang, Shiying Zhang, thank you for your help and for the memorable year we spend together. Hope you can get a better life in

Finally, I would say thanks to the beautiful Rotterdam and the comprehensive Netherlands!

Because all of you, I have spent a wonderful year in my life.

Abbreviations

MSW	Municipal Solid Waste
TPB	Theory of Planned Behavior
SW	Solid Waste
SWC	Solid Waste Classification
BI	Behavior Intention
A-B-C Theory	Attitude-Behavior-Condition Theory
EV	Environment Value
EK	Environment Knowledge
ISB	Model of Infrastructure-Service-Behavior
PEAC	Public Education and Awareness Campaigns
SN	Subjective norms
SV	Situational Variable
BOI	Behavior objective intention
BEI	Behavior executive intention
EFA	Exploring Factor Analysis
KMO Index	Kaiser-Meyer-Olkin Index
TPB	Theory of Planned Behavior

List of Figures:

List of Tables

Content

Chapter1 Introduction

1.1Introduction

For many decades, the China government has been working on managing the municipal solid waste. Beijing as the capital city facing the serious situation of municipal solid waste problem. To figure out the problem, this study kept the eye with the beginning of management of municipal solid waste- classification. Understanding the influence factors of the resident's classification behavior intention in Beijing is essential to the whole picture. This chapter provides the reader an overview about the municipal solid waste background in Beijng and further presents the problem statement as well as the objective, the main and sub research questions. Finally, the significance of the study and the scope as well as the limitations in the conduct of this research are outlined.

1.2 Background

Since the industrial revolution, the level of industrialization in the world has gradually increased, followed by improvement of the product circulation rate, and the acceleration of the consumer purchasing power. This created a negative impact on the dramatically increased amount of Municipal Solid Waste (MSW) (Gu et al., 2015)**.** MSW—more commonly known as trash or garbage—which consists of everyday items we use and then throw away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries. This comes from our homes, schools, hospitals, and businesses (U.S. Environmental Protection Agency, 2016). In this research, the MSW specifically means the garbage produced in resident's everyday life. MSW is regarded as both negative and useful materials, of which could provide a potential source of income if we deal with it properly. However, if not, it would be dangerous, not only causing air pollution, water pollution, soil pollution, but also making serious damage to urban living environment that could have bad influence on the people's living standards (Qu,2009). Besides, it would make a great waste of resources.

Most of the countries in the world, including China, are facing the increasingly serious problem of managing MSW (Hong, 2017). At present, China's MSW production continues to grow at an annual rate of 8 to 10 percent per year, with garbage production per capita reaching 1.2kg (Mao, 2010). In 2004, China has replaced the United States, and become the biggest generator of MSW. About two-thirds of the cities in China are facing the situation of being sieged (Chen, 2010), Beijing is one of them surrounded by a huge garbage ring. We can see in the Fig1, the red point is the garbage.

Fig.1 Beijing garbage sieged situation Source: http://dhscape.com/projects/garbage-siege-garbage-landscaping/

Being confronted with increasing social and environmental contradictions, and a situation of natural resources shortage. How to manage the MSW has became a hot spot in China. Based on Ahsan (2014), the typical MSW management step is as indicated in Fig.2.

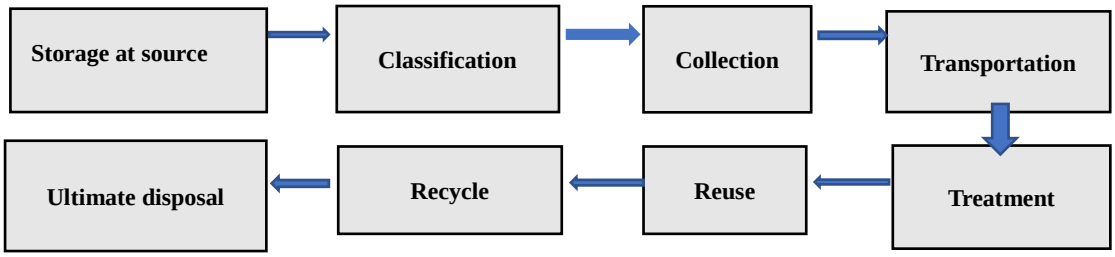

Fig.2 MSW Management Step (Ahsan, 2014)

Among the eight steps mentioned above, China has long considered classification[1] as major foundation in MSW management policies and regulations (Tai et al., 2011). For example, in 2004, the central government came up with the national regulations-''Classification and evaluation standard of municipal solid waste'' [2]and in 2008, "The classification signs for municipal solid waste[3]'' was introduced. The latest policy was introduced this year, the general office of the State Council of China issued the notice on the *Implementation scheme of municipal waste classification system* in 2017, requiring 46 cities to implement the mandatory classification of municipal solid waste

[1] Classification mentioned in the paper is referred to the residents' behavior of segregating the MSW at source into biodegradable and recyclable material and put them into corresponding waste containers (Rathi, 2006), many scholars are defining it as segregation at source (Hamer, 2003).

[2] This regulation is introduced by Ministry of Housing and Urban-Rural Development of the People's Republic of China in 2004.It is intent to promote the MSW classification and recycle standard,

[3] This regulation is introduced by Ministry of Housing and Urban-Rural Development of the People's Republic of China in 2008. It is intent to formulate the standard of MSW classification.

in the first place by the end of 2020. This policy is specific to the city residents, to force them to participate in the classification step. Here in Fig.3 is the specific classification legislation system in China.

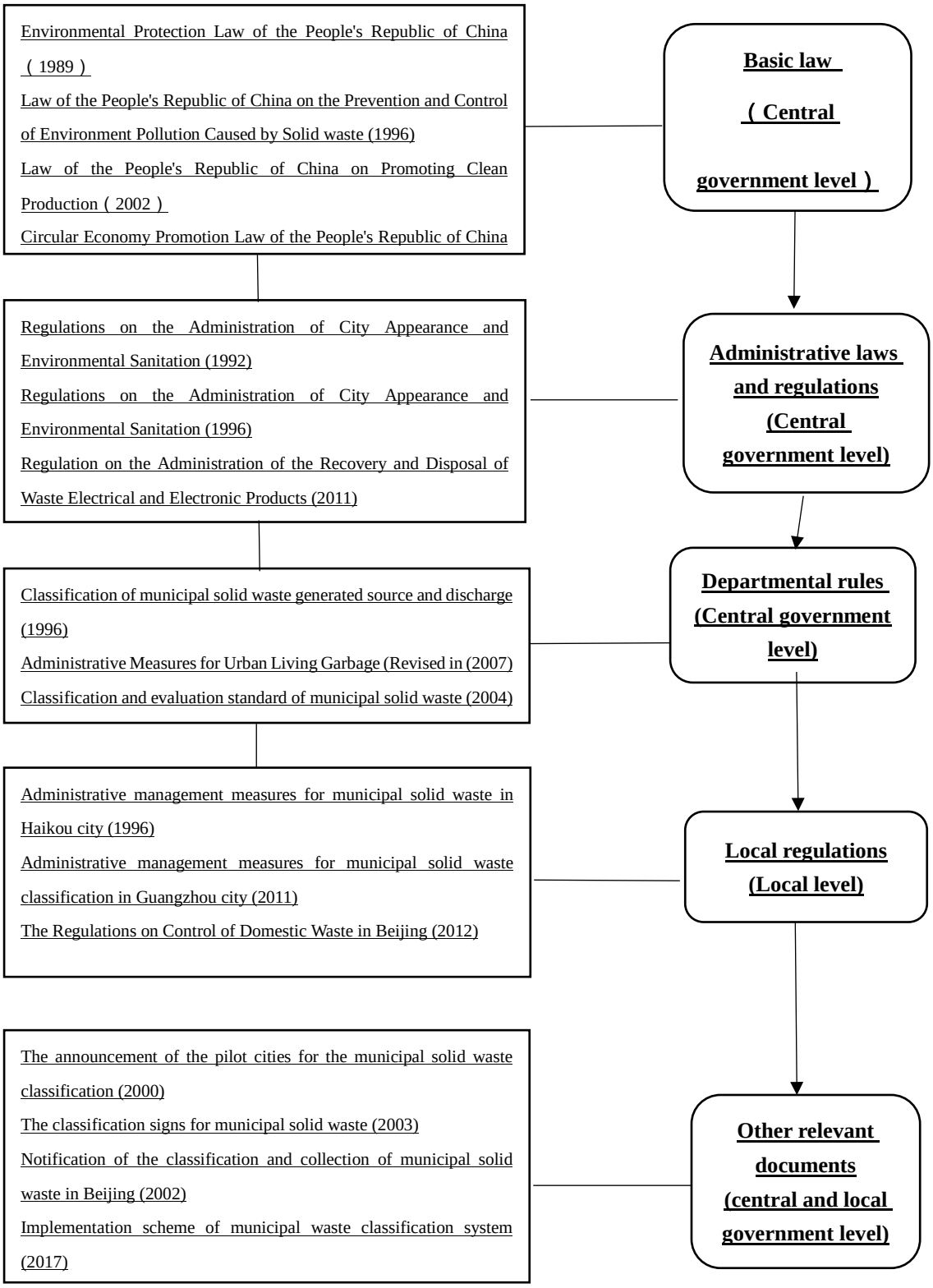

Fig.3 Chinese municipal solid waste classification legislation system

Source: (The central people's government of the people's republic of China, 2017)

The starting point of the MSW management system is the household or the residents, without the good cooperation of the residents, the MSW classification could not be effectively implemented at the beginning, thus affecting the recovery system. Besides, the attitude and behavior of the residents towards it is the key to the success of the MSW classification which would also be an important guarantee of the follow-up steps in MSW management system (Zhao,2008). In conclusion, the residents are the major participant body of MSW classification.

The research took place in Beijing, the reason is as follows. First, as the capital of the People's Republic of China, Beijing is the national political, cultural, international communication, science and technology innovation center. The MSW is keep increasing these years. Until the end of 2016, the population of Beijing was 21.729 million[4]. With the continuous growth of population in Beijing and the improvement of living standards, the production of MSW is increasing dramatically, in 2015, the total amount of MSW was 7.9 million tons. See as Table.1.1

Tab.1.1 Beijing municipal solid waste (MSW) treatment situation

Year	MSW (million tons)	Per capita living MSW (kg/d)	Population (million person)
2000	2.96	0.59	13.64
2001	3.10	0.61	13.85
2002	3.21	0.62	14.23
2003	4.55	0.86	14.56
2004	4.91	0.90	14.93
2005	4.55	0.81	15.38
2006	5.38	0.92	16.01
2007	6.01	0.98	16.76
2008	6.57	1.02	17.71
2009	6.56	0.97	18.60
2010	6.33	0.88	19.61
2011	6.34	0.86	20.19
2012	6.48	0.86	20.69
2013	6.72	0.87	21.15
2014	7.34	0.93	21.52
2015	7.90	1.00	21.71

According to Beijing Statistical Yearbook (2001-2016)

Nowadays, the landfill is still the main way to deal with the MSW, but the existing 13 landfills are about to be filled in time[5]. the MSW disposal has become the obstacle standing in the process of urban sustainable development in Beijing (Wang, 2013). Second, as elaborated before, Beijing is the typical “Sieged City[6]” (Chen,2010), and in 2017, the central government of China announced the list of pilot cities that were going

[4] Beijing Statistical Yearbook (2016)

[5] There is no precise data shows when they would be filled.

[6] “Sieged city” refers to the city that is surrounded by garbage.

to start the implementation of mandatory classification policy from2018, Beijing is one of them. Beijing has been working on MSW source classification since 1996, (Beijing Municipal Commission of City Management, 2016) but there are still many problems, the classification rate is still low, for instance, Haidian district (which is one of the core districts located in the north-west in Beijing) has been carrying out classification campaigns over 10 years, but the classification is still 10%, the same as 2005. (Rong,2015) There are many reasons of the rather low classification rate, in summary, the reasons are as follows: First, the public's classification awareness is weak; Second, imperfect policy and regulations make it hard to implement the classification; Third, the classification facilities are not insufficient (Shen,2011).

1.3 Problem statement

In general, the municipal authority takes main responsibility to carry out the MSW management system and encourage residents to participate in the classification system. However, as the main action body, the resident's perception and action towards MSW classification is very crucial (Qu, 2009). For instance, Bernstad (2014) pointed out that without the high level of resident's involvement at the classification at source, the effective system of MSW management in the developed countries such as Netherland, Japan, Sweden would not exist. As Barr (2004) found out when he conducted the resident MSW management research, the environmental attitude and value could not affect the environmental behavior directly, it could put influence on the behavior through the environmental behavior intention. In other words, the behavior intention is an important factor which influence the behavior. As a result, to improve the resident's enthusiasm of participating in classification, it is important to dig deep into the main variables that influence people's MSW classification behavior intention, the effect degree of each variable, and how they put influence on people's classification behavior intention at household level.

Since 2010, Beijing's government carried out a new round of MSW classification promotion campaigns in order to improve the classification rate at source, the number of MSW classification pilot communities keeps increasing; until 2016, the number reached 3000, occupied half of the communities in Beijing, the final goal is until the end of 2019, all communities in Beijing must have implemented MSW classification (Qu, 2009). However, the implementation effect is not good, according to Sun' research, even in the pilot communities, 65% residents do not know that they have to conduct classification, they still mix all the waste and put them in the bin randomly (Sun, 2016). Based on the theory of planned behavior (TPB) (Ajzen ,1975), resident's behavior is influenced by behavior intention which are affected by attitude, perceived behavior control and subjective norm(Ajzen,1975). The attitude is also an important factor which is mentioned in A-B-C theory(Ajzen,1975). Attitude towards a certain behavior could determine whether the individual wants to conduct the behavior or not. The attitude of whether this behavior would get a valuable result would impact people's judgement about a behavior. If the individuals hold a positive idea about the behavior result, they would have a positive attitude towards the behavior. There are a few variables that

would put influence on the MSW classification attitude. For example, the insufficient public education and awareness propaganda about the classification would further lead to the absence of the classification attitude. Another variable that may influence resident' attitude is social demographic variables such as age, professions and sex. Based on Stern (2000), social demographic variables could influence resident's attitude towards the classification behavior intention, but how they influence the behavior is still on debate.

As for the perceived behavior control, it is divided into the perceived behavior dynamics such as the economic rewards that would encourage people participating in the classification and perceived behavior barrier which is the "troubles" that would be caused by the classification behavior. And the subjective norm indicates that other people's behavior intention and the accept level of the behavior is an important influence factor that the individual decided whether to conduct the behavior or not. All the factors mentioned above are based on the psychological point of view which shows that it is possible to predict residents waste classification behavior intention based on the public education and awareness propaganda, perceived behavior control and subjective norm (Tonglet, Phillips,et al .,2004).

Timlett (2008) pointed out that classification participation intention could be influenced not only by psychological factors, but also other factors. One is the situational variables, which indicate the external variables that put influence on the individuals when they conduct classification behavior. According to Deng (2013), the backward classification facilities is another important factor that would affect people's classification behavior. For example, the label on the waste bin is not clear about what kind of waste should be put in there and the location and clean level of the waste bin also influence the residents' behavior. Lou(2016) detected people's perception on the "garbage collection situation", which shows the unsatisfied emotion to the current collection status make a certain contribution to the inactive participation of classification, residents' enthusiasm would disappear when they found that the classified waste be collected and transported in a mixed way. And the other one is residents' environmental behavior. According to Song (2013), Beijing has paid great attention to the popularization of specific MSW classification knowledge[7], but the classification of MSW requires a rather specific knowledge (such as how to identify the type of waste, what kind of waste can be used as composite and what is not), the lack of which makes it difficult to achieve the high level of participation of residence in the classification process. Based on the research conducted by Lou (2016), residents' environment value is an important factor that influences their classification behavior intention. Therefore, given the rather unsatisfied residents' participation in MSW classification, it is important to understand which factors (psychological and situational and environmental) influence residents' intention to participate in MSW classification.

[7] MSW classification knowledge is defined here as why the residents should classify their household garbage, and how to put them in the right waste bin and the meaning to do that

1.4 Research objectives

The main objective of the study is to explain how psychological variables, situational variables and environmental variables affect resident's MSW classification behavior intention in Beijing and to what extent they affect the resident's classification behavior intention.

1.5 Provisional research questions

1.5.1 Main research question:

To what extent do psychological variables, situational variables and environmental variables could affect the resident's classification behavior intention of MSW in Beijing?

1.5.2 Sub Research Questions:

1. In what way do psychological variables affect the resident's classification behavior intention in Beijing?
2. In what way do the situational variables affect the resident's classification behavior intention in Beijing?
3. In what way do the environmental variables put influence on the resident's classification behavior intention in Beijing?

1.6 Significance of the study

With the new *Implementation scheme of municipal waste classification system* promulgated in the March of 2017, this study focuses on the resident's MSW classification behavior intention in Beijing. Although there are some researches focus on the significance of resident's classification habits or the factors that influence the MSW classification, it is hard to find a deep research about the way and the extent of which these factors affect resident's MSW classification cognition. This study is based on Beijing area, studying deeply the specific influence factors of resident's classification behavior intention. Through empirical survey to find out the resident's real thoughts, and further provide effective advices to the government.

1.7 Scope and limitations

The research focused on MSW classification in the household level. Therefore, the definition of MSW was limited to household garbage, and the classification was limited to the resident 's behavior of separation. This study was mainly to explain in what way the variables we found out through literature review influence the resident's classification behavior intention of MSW in Beijing. The relationship between the classification behavior intention with the specific behavior was not included in the study due to the time limit. Because of limitation of time and budget, I used the six main urban districts which are Dongcheng district, Xicheng district, Chaoyang district, Haidian district, Fengtai district, Shijingshan district in Beijing as the sample area to

give out the questionnaires[8].

Since the classification policy in Beijing has been conducted over 20 years, and all different kinds of public campaigns and education are organized in different levels, so it is impossible to find all the records of each campaign and compare them. Besides, there are different policies, populations, culture and habits in other cities of China, therefore, the main research results are suited only for the Beijing.

8 The main six districts in Beijing is the official region divide results which includes the 6 main districts in Beijing as one of the function zone.

Chapter 2 Literature review

2.1 Introduction

This chapter reviewed literature related to the MSW classification behavior intention. In the beginning it introduced the concepts that relevant to MSW classification to make sure the readers are clearly understanding each concept we used in this research, and the second section focused on understanding variables affect resident' MSW classification behavior intention from psychological, situational and environmental point of view. Four different theories were used to understand the variables: Theory of Planned Behavior(TPB), A-B-C theory, the Environmental Behavior Theory, and the model of Infrastructure-Service-Behavior(ISB). As the TPB and A-B-C theory are mainly based on psychological point of view, this research added the Environmental Behavior Theory and ISB model to help better explaining the resident's classification behavior intention in the situational and environmental point of view. In the last, based on the theories and concepts, this chapter came to the theoretical framework.

2.2 Definition of Relevant Concepts

2.2.1 Definition of Solid Waste (SW)

Based on the *Law of the People's Republic of China on the Prevention and Control of Environment Pollution Caused by Solid Wastes* (*Solid Waste Low*) which was introduced in 1995, the solid waste means wastes in solid or semi-solid state generated in the production, construction, daily life and other activities, which pollute the environment. And in 2005, the modified *Solid Waste Law* gave new definition to the solid waste- "solid waste is the wastes in solid or semi-solid state generated in the production, construction, daily life and other activities, which have already lost the use value or have not lost the use value but is being deserted materials. The new definition reflects two substantive characteristics of SW-Lose of utilization value and being thrown away. According to the *Solid Waste Law*, the solid waste can be divided in three types which are municipal solid waste, industrial solid waste, hazardous solid waste. The main definition used in this thesis is the one mentioned in the *Solid Waste Low.*

2.2.2 Definition of Municipal Solid Waste (MSW)

Based on <Solid Waste Law>, MSW refers to the solid waste generated in urban everyday life or activities that offer service to urban life. It includes household solid waste, commercial solid waste, street solid waste (waste in the street), solid waste produced by schools, institutions and so on. In this paper, MSW refers to the household solid waste part.

2.2.3 Definition of Solid Waste Classification (SWC) at source

About the definition of SWC, the most widely accepted definition is from Robertson

(1982). He defined it as: in the MSW management process, the waste always generated on the household level. The behavior that each household has sorting and collecting their waste based on specific categories and bringing them separately to the assigned place is called SWC. SWC is considered to be a necessary precondition of effective MSW management (Emery, 2007). In result, when it comes to improve the MSW management system, SWC is the preferred way (Chuang, 1999).

2.2.4 Definition of Behavior Intention (BI)

Fishbein and Ajzen defined the behavior intention in their Theory of Reasoned Action (TRA) as follows: behavior intention (BI), the intention to act, and the tendency and motivation to act before action. In this study, the definition of "behavior intention" is the tendency of behavior, it is also could be illustrated as people's attitude toward the behavior which could lead to the ideological trend and motive of action before action.
At the same time, according to Gollwitzer (1990), the behavioral intention could be divided into two dimensions: behavior objective intention(BOI) and behavior executive intention(BEI). BOI means that residents know exactly how to classify the waste, such as plastics, paper; as for the BEI, it refers to an act intention to conduct the classification of waste, such as sacrificing their own time for classification, paying out labor and energy to carry out the classification.

2.3. Understanding MSW Classification behavior

2.3.1 Theory of Planned behavior

Social psychologists always work in constructing relevant theories to predict and explain people's behavior under different circumstances. "The theory of planned behavior" (TPB) is an important theory that is about the relationship between attitude and behavior based on "the theory of reasoned behavior" which was developed by Ajzen in 1975.

According to the TPB framework as illustrated in Fig.4, the main determining variable that influence behavior is behavior intention; As for the influence variables of behavior intention, there are attitude toward the behavior (the attitude of whether this behavior would get a valuable result), and subjective norm (the influence from the social pressure, generally means the other individual or group's behavior may impact individual's decision) and perceived behavior control (the perception or prediction of the difficulty level of certain behavior, also appears as the prospect of the obstacle in conducting a certain behavior). In regular, the more positive the attitude and subjective norms, the greater perceived control, the individual's intention to conduct the behavior is stronger and there would be more chance they would do it. (Ghani, 2013)

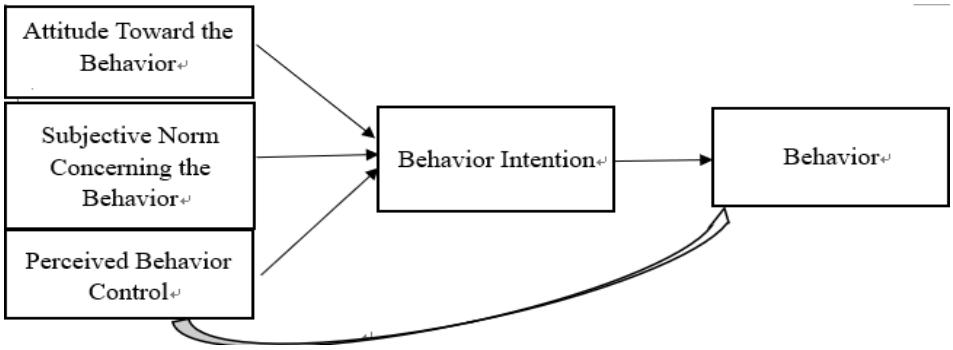

Fig.4 The framework of TPB

Based on the framework of TPB, we can analyze that the MSW classification behavior conducted by residents in household level. The resident's attitude towards the classification behavior would influence the behavior intention. In general, the attitude is stable, but that does not mean it could not be changed. Through guiding residents to take part in relevant activities, conduct education propaganda, the attitude could be altered. The subjective norm in MSW classification refers to the social pressure the individual feels regard to whether do people classify the waste or not. That means the positive classification environment would affect the resident' s behavior intention to some extent. The perceived behavior control in MSW could be considered in the complex of the classification scheme, the classification knowledge would impact resident's classification behavior intention and habits.

In the field of MSW management behavior, the most commonly used theoretical mode is planned theory (Pakpour, Amir H 2014), however, there are doubts about it. For example, Callaghan (2012) pointed out that besides the factors provided by planned theory, there are more factors would put influence on resident's the behavior intention, therefore, A-B-C theory was taken into my consideration.

2.3.2 Attitude-Behavior-Condition Theory (ABC)

In 1995, scholar Guagnano (1995) came up with the A-B-C theory to analyzing the MSW recycling behavior. It is based on the Environmental Behavior Model presented by Stern and Oskamp in 1987; The environmental behavior model pointed out that environmental behavior is a result caused by the interaction of a series of internal and external factors (Stern, 2000). Among the external factors include the social regulations, public opinions, economic stimulations and so on. The internal factors include the environment attitude and belief, and behavior intention. Based on this model, the A-B-C theory considers the MSW recycling behavior (B) is the interactive results of the internal attitude (A) and external condition (C). The model is as Fig.5.

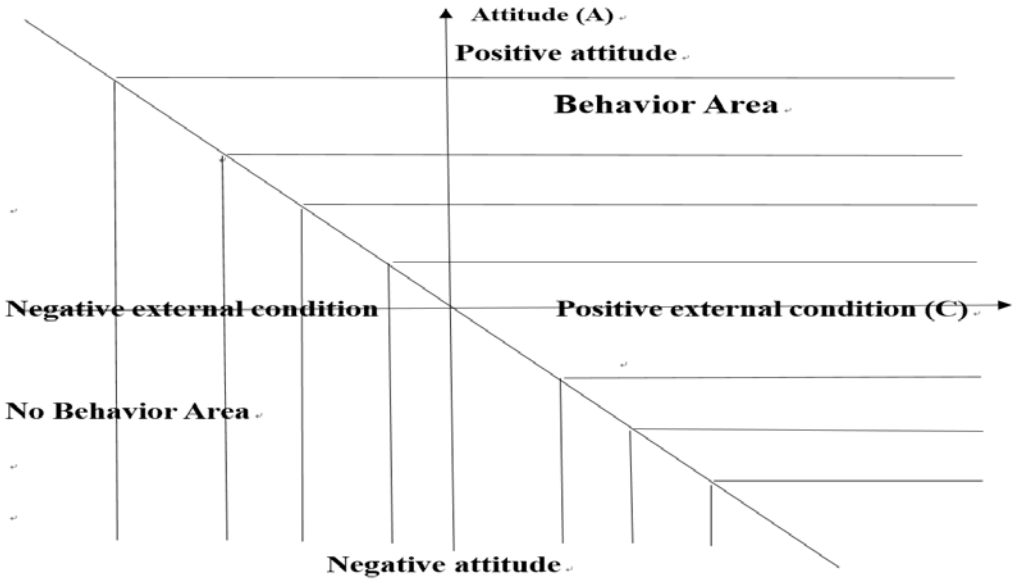

Fig.5. A-B-C Theoretical Framework

The horizontal axis shows the external condition, which means all external resource that support or reject the behavior, including the physical resources, financial resources, legal resources, and social resources. In the MSW classification point of view, that would refer to the convenience of classification and clean degree and location of waste bins and so on. The external conditions could be divided into positive external conditions and negative external conditions. The positive axis refers to the positive external conditions, the negative axis refers the negative external conditions. The vertical axis represent the attitude towards MSW recycling behavior. The positive axis refers to the positive attitude, which indicate that individuals would actively conduct the behavior. Well the negative axis shows the negative attitude which means the individual would probably do the behavior only by force. The diagonal is the boundary of behavior. Below the boundary means the recycling behavior would not happen, in the country, beyond the boundary means it would happen. In the first quadrant, the positive attitude and external condition, people must implement the recycling, well in the third quadrant, the negative attitude and external condition, people must not implement the recycling. In the second quadrant, only the rate of attitude greater than the rate of external condition, the recycling behavior would happen; and in the fourth quadrant, only when the external condition rate greater than the attitude rate, the recycling behavior would be conducted.

A-B-C theory is the first theory that is specially target to the MSW recycling behavior, and it is pointed out that the MSW recycling behavior is the interaction of attitude and external conditions, which is a supplement and development theory of MSW management behavior in the psychological point of view.

As we found out above, the TPB and A-B-C theory were based on the psychological point of view. As it explained in the TPB theory, the attitude towards behavior, subjective norms and perceived behavioral control could be classified as psychological variables. And the attitude in the A-B-C theory could also be sorted in it.

“Psychological variables reflect the specific perceptions that individuals hold towards

particular behaviors and have been used extensively to examine how people react to certain policy choices" (Gilg, 2005, P594). The researches about psychological variables were mainly focusing on applying varies of psychosocial theories to predict people's behavior. The early researches about MSW classification using psychosocial theory were using economic and material motivations to encourage people implement and carry on classification behavior. Geller, Winnett and Everett (Geller,1982) found out that economic return was the main motive power to drug them conducing recycling behavior. As for the public education and awareness campaigns, it could also be classified as psychological variables since it always influencing resident's classification attitude before affecting their final behavior (Tai, 2011). Here I divided the phycological variables into four categories.

• Public education and awareness campaigns

Public education and awareness campaigns is the campaign conducting propaganda among the masses targeting specific theme in some ways (Guerra, 1992). A lot of scholars thought it has positive influence on developing resident's awareness and habits. Wellar and Barry (1981) got a conclusion that conducting propaganda about recycling before the implement of MSW recycling project would stimulate residents' awareness and interests which would be beneficial for the effectiveness of the project. A Chinese professor Li (2004) also mentioned this link in her work in MSW management that people's outdated idea in MSW disposal is an important reason that the MSW pollution is getting more and more serious in cities, thus the education and propaganda is necessary to improve the resident's awareness and behavior of MSW classification.

• Social demographic Variables

Social demographic variables are the variables of the characteristics of a certain group, such as age, sex, educational level, income and position. Social demographic could not only reflect people's attitude of MSW management, it could also predict resident's MSW management behavior in a certain level. The relationship between social demographic variables and resident MSW management behavior is not unified yet. Among the different variables, a lot of studies get the conclusion that sex is related to environment behavior, women are more environment-friendly than men (Webster, 1975), Vining (1990) and Lansana (1992) found out that age is significantly associated with MSW recycling behavior, the older people are more willing to conduct recycling behavior. However, Gamba (1994)108 got the opposite conclusion. The income is also mentioned in the relevant research, residents with higher income have much chance to participate in the MSW management programs. The correlation between the education level and resident' MSW management behavior is getting widely evidence (Stern, 2000). Robert found out that well-educated people is more positive toward MSW recycling.

- **Perceived Behavioral control**

The perceived behavioral control could be divided into the perceived behavior dynamics and the perceived behavior barriers.

Perceived behavioral dynamics

Perceived behavior dynamics means the satisfaction people get after conduct a particular behavior. De Yong (1986) thought, people could get great satisfaction in the activities that is strongly recommended by others such as environment protection behavior. In his research (1990) about MSW recycling behavior in America he pointed out that the main factor that push people do conduct the recycling behavior is not economic return but the internal satisfaction they got through the action. Werner and Makela (1998) also found out the good feeling and satisfaction people get from recycling behavior is important to maintain the behavior.

Perceived behavioral barriers

De Yong (1990) pointed out that the perceived behavioral barriers is an important variable that influence residents MSW recycling behavior. The perceived behaviors include the feeling and perception of absence of certain knowledge, information, ability and conditions when you conduct a behavior, which could reflect the difficult and easy level of conducting a certain behavior. According to the research about the behavioral barriers in MSW management behavior, the writer found out that 3 barriers that constrain MSW management behavior. Time (the time to take do conduct a certain behavior) convenience (the easy level to conduct a certain behavior) and the space to store the MSW.

Vinning and Ebreo (1990) found out that the main difference between recycler and non-recycler is non-recycler consider it has great “trouble” to recycle. The trouble in here include the distance to the recycling site and shortage of time. Gamba and Oskam (1994) got the similar decision. Howwenstine (1993) did research about the influence factors of residents’ recycling behavior in Chicago. Through factor analysis, he found out three main factors that contribute to the non-recycling behavior: Trouble (convenience, storage space, time), the location of waste bin and lack of concern.

- **Subjective norms**

Fishbein and Ajzen (1975) and Tucker (1999) thought that subjective norms have significant impact on people’s behavior. Based on their research, other people’s behavior intention and the accept level of the behavior is an important influence factor that the individual decided whether to conduct the behavior or not. The subjective norm concept we used here is came up by Ajzen (1975), which means the tendency level of individuals conducting a certain behavior when they influence by other people and the expectation of society.

Although the Theory of Planned Behavior (TPB) and A-B-C theory is the most common theories used dealing with MSW management problems, there are two loopholes that exist in the planned theory and A-B-C theory: First, the relationship between attitude and behavior is not yet sure. Second, there are other factors should be taken into account. The research of residents’ MSW classification behavior in Canada also prove the point above. Liska (1984) and Bagozzi (1992) both found out that even though the TPB and A-B-C theory provide a logical model to analyzing environment behavior, but the reality is more complicated and that more factors could influence human’s behavior intention. Ghani also found out that the TPB theory could miss some essential factors

in the food classification management research (Ghani,2013). As a result, the Environmental Behavior theory and Infrastructure-Service-Behavior Model are taken into consideration in this context.

2.3.3 Environmental Behavior Theory

Individuals environment-behavior is the key element to solve the environmental problem (Eilam, 2012). Environment-behavior study is specifically focus on the relationship and complex interactions between environment and people's behavior. It attempts to use the theoretical method of psychology to study human's action in a certain environment and the reaction to the environment, by doing that to achieve the goal of improving the environment (Kollmuss, 2002). Considering residents' MSW classification is part of the MSW management, the meaning of Environment-Behavior study is that it could help us understanding the how resident's behavior is related to the surrounding environment. The environmental variables would be extracted in this theory.

Behavior is what people do, it is an obvious and observable reaction of people in a certain circumstance (Zsóka, Ágnes 2013). There are two types of environment behavior, sample individual behavior and complex; group based, long-term behavior. The former is easy to change, but the latter is not. Hernandez and Monroe (2007) pointed out that the MSW classification behavior is the former, it could lead to the direct and instant results which is not difficult to change. As we mentioned the environment behavior, there are other two highly relevant concepts we must take into consideration that would have great impact on people's environment behavior (Truelove, 2014). And in this research, we would test whether the environment value and environment knowledge would affect resident's behavior intention.

• Environment Value (EV)

Environment value is the underlying orientation of individuals towards environment and environment problems based on their personal philosophy (Barr, 2007) According to the research about EV and environment attitude, there are two layers of EV. First layer is social values, it has important impact on the environment behavior, people who pay much attention to the environment is much easy to change their behavior and habits (Stern, 1995). The second layer is universal value which indicate that everything in the universal is equal, human is not above the nature. People who hold that idea shows much friendly environment behavior. Besides, Shen (2004) came up a concept of ecological unconscious, which argues that ecological unconscious is the internal emotional link between human and nature, if being waken up, it can promote human's environment protect behavior effectively.

• Environment Knowledge (EK)

The research about the environment knowledge indicate that it has significant influence on the environment behavior. Besides, large amount of research shows that knowledge is important to the decision making. Kaplan (1991) think the level of knowledge to a certain problem would affect individual's decision directly. De Young (1988) found out that resident's level of knowledge towards recycling influence their behavior directly.

Schahn and Holzer (1990) divided knowledge into general environment knowledge and concrete environment. The former is the basic knowledge such as the understanding of environment; the concrete environment knowledge is the specific comprehension to conduct an action or in other words, knowledge of action. To texting the two types of knowledge, they studied the MSW management behavior of German residents, the result indicate that the general environment knowledge has a minimal effect in their MSW management behavior, well the concrete environment knowledge has significant impact on their behavior.

As we analyzed above, the TPB and ABC theory, as well as the environment behavior theory are based on individual' internal factors. Given the significance of the external factor that would also impact people's classification behavior intention, this study would introduce the infrastructure-service-behavior model.

2.3.4 Model of Infrastructure-Service-Behavior (ISB)

In people's real life, their behavior is always influenced by the surroundings where they conduct the behavior (Bernstad,2014). Based on Bernstad, the convenience and the availability of certain infrastructure are important factors that would make the residents participate in classification. This model is also described as situational variable, which is considered have great influence in the success of classification career (Timlett,2008).

Situational variable indicates the external factors that put influence on the individuals when they conduct environment behavior. Environ (2014) pointed out that the situational variable could influence individual's behavior using meta-analysis. In the field of MSW management field, the situational factors can be summarized as follows:

- **The set of classification bin**

Barr (1998) made a research about the residents recycling behavior in England, he found out that the exist of classification bin and the distance between the bin and residential building has significant influence on resident's recycling behavior. Guagnano (1995) also took deep study toward the relationship between the existence and location of classification bin and the recycling behavior. He got the same conclusion as Barr, when it is convenient to put the waste into the classification bin, those who have less environment awareness would classify the waste and put them in the corresponding bin. Another research also supports this conclusion, they added that the existence of the classification bin could imply that MSW should be classified at source and help residents to develop the classification habits.

- **The frequency, pattern of MSW collection**

Macey and Brown (1983) conducted a research about the MSW transportation, they found out that it does not matter what mode of transportation they use to ship the waste, as long as the collecting and transporting waste process is sustained and steady, it could promote people's development of classification habits. Li (2004) and Xu (2005) got the opposite results, they pointed out that the pattern of MSW collection and transportation

has significant impact on people's behavior of classification, and they also noticed that the frequency of classified waste collection and how they collect them (whether they put all the waste in different type bins together in the same waste truck) also have influence on people's behavior.

In summary, after considering the TPB theory, ABC theory, Environmental Behavior theory, and the ISB model, all the variables mentioned above that influence residents' behavior intention to participate in MSW classification were divided into psychological and environmental variables and situational variables.

2.4 Conceptual Framework

Based on the literature and the theories mentioned above, the research constructs a conceptual framework. And it will focus on explaining the influence of psychological and situational, environmental variables towards resident's participation behavior intention in MSW classification. The psychological variable attained from the Theory of Planned Behavior (Ajzen,1991), which includes of social demographic variables, perceived behavioral control and subjective norm and public education and awareness campaigns. The situational factor was come from the Model of Infrastructure-Service-Behavior (Timlett and Williams,2008), which consists of the set of classification bin and the frequency, pattern of MSW collection. As for the environmental factors, it consists of environmental value and environmental knowledge. Fig 7shows three groups of factors that may influence this participation behavior intention.

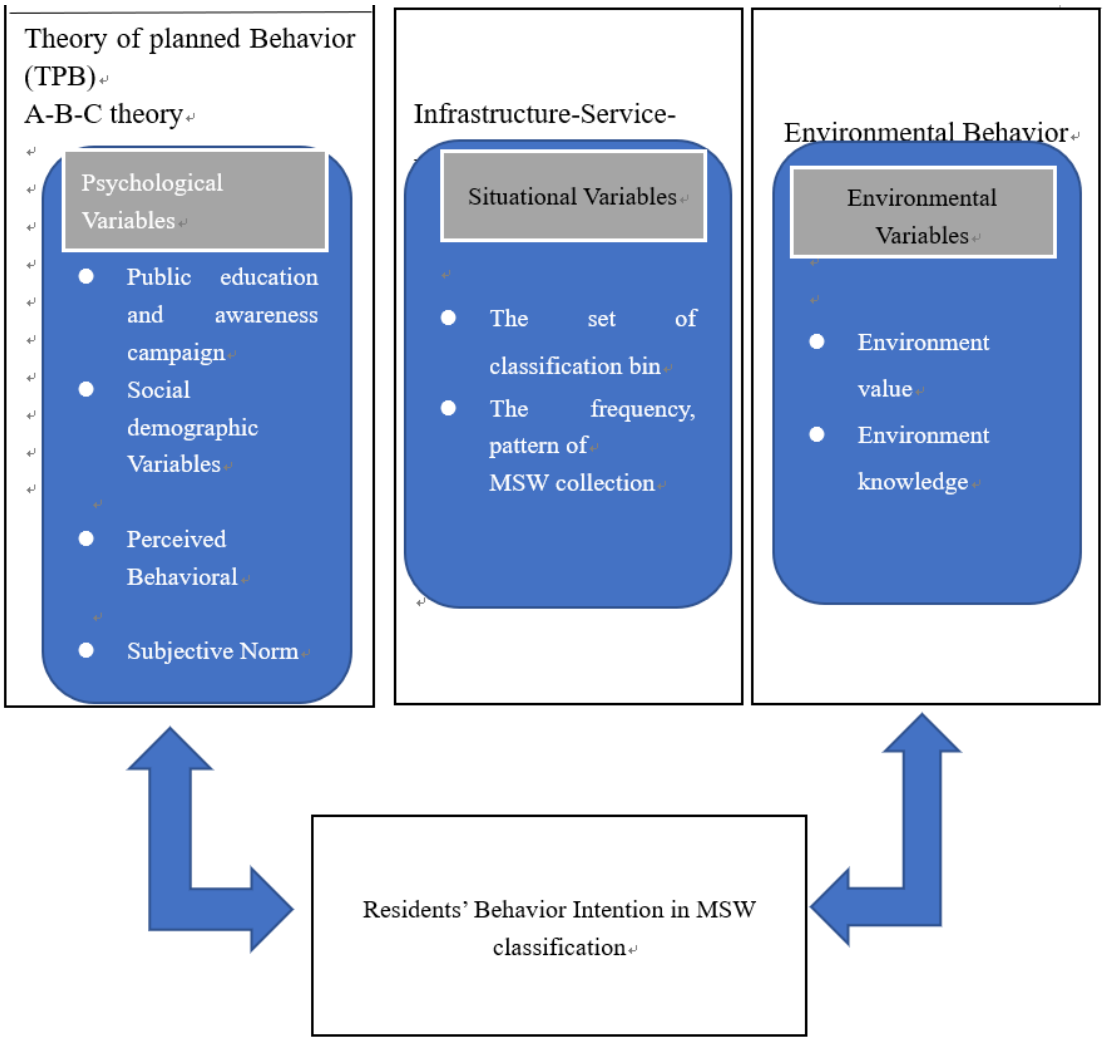

Fig 6 Final theoretical framework

Chapter 3: Research Design and Methods

3.1 Introduction

This chapter explains definitions of theories in the study, concepts, variables and indicators, data collection instrument, sample size and selection. The chapter also present the fieldwork for data collection, analysis methods, variables and indicators used and linked to the research questions and touches on validity and reliability issues.

3.2 Reviewed Research Questions

To attain the objective of the study, these research questions were formulated:

3.2.1Main Research Question

To what extent do psychological variables, situational variables and environmental variables could affect the resident's classification behavior intention of MSW in Beijing?

3.2.2 Sub Research Questions

To answer the main research question, the sub research questions of this study are:

In what way do psychological variables affect the resident's classification behavior intention in Beijing?

In what way do the situational variables affect the resident's classification behavior intention in Beijing?

In what way do the environmental variables put influence on the resident's classification behavior intention in Beijing?

3.3 Operationalization

The operationalization of this research was formed based on the heoretical framework presented in chapter 2. The following table displays the concept, variables, and indicators used in the research. The scale of measurement of the indicator was Likert scale and the data collection method was questionnaire. Berdie (1989) pointed out, the five-point Likert scale was the most reliable in most cases, so it was used in the questionnaire.

Tab.3.1: Operationalization of Study Variables and Indicators

Theory /Concept	Variable	Factors		Indicator	Scale of Measurement	Data Collection Methods
Theory of Planned Behavior (TPB) A-B-C Theory.	Behavior intention	Behavior objective intention (BOI)		The agreement level of the individual would do the specific MSW classification job.	Ordinal, Likert scale	Questionnaire
		Behavior executive intention (BEI)		The agreement level of the individual would act the behavior.		
	Psychological variables	Perceived Behavioral Control	Public education and awareness campaign	The agreement level of the public education and propaganda could make individual concern about MSW.		
				The agreement level of the public education and propaganda could make individual know how to classify the MSW		
				The agreement level of the continuous public education and propaganda could make individual keep classifying the MSW		
			Social demographic factors	Sex	Nominal	
				Age		
				Education		
				Monthly income		
				career		
			Perceived behavioral dynamics	The agreement level of the opinion that the corresponding reward could encourage individual conducting classification.	Ordinal, Likert scale	
				The type of award they would like to get: honorary citizen; environmental citizen; Economic return; the other	Nominal	
			Perceived behavioral barriers	The perceived easiness in term of capabilities to classify waste	Ordinal, Likert scale	
				The perceived easiness in term of time availability to classify waste		
				The perceived easiness in term of space availability to classify waste		
		Subjective Norm		How family member view on MSW classification		
				How neighbors view on MSW classification		
Infrastructure-Service-Behavior Model(ISB)	Situational variables	The set of classification bins		The agreement level of the opinion that the clear classifying label in waste bins is important for individual to decide whether to		

			classify the waste or not.
			The agreement level of the opinion that the convenience of the waste bin is important for individual to decide whether to classify the waste or not.
			The agreement level of the opinion that the clean environment around the waste bin is important for individual to decide whether to classify the waste or not.
		The situation of MSW collection	The agreement level of the opinion that the regular frequent waste classified collection and transport is important for individual to decide whether to classify the waste or not.
			The agreement level of the opinion that the long-last conducting MSW classification would encourage individual classify waste.
Environment Behavior Theory	Environmental variables	Environmental value	The agreement level of the opinion that the nature and environment has the same value as human being
			The agreement level of the opinion that the environment problem is the main concern in the future development of city
			The agreement level of the opinion that MSW problem is the problem that residents should concern and help to solve.
			The agreement level of the opinion that resident conducting classification is important
		Environmental knowledge	Whether or not the plastic should be classified
			Whether or not paper should be classified
			Whether or not mental should be classified
			Whether or not bottle should be classified
			Whether or not classification is beneficial to the recycling management and environment

3.4Research Strategy

In this research, I conducted survey as my research strategy. Questionnaire survey research has become the mainstream research method used in social science, psychology, and behavioral science. Through the large amount of literature review, this study found out that questionnaire survey has become a common quantitative research strategy used in MSW management behavior field. Based on the definition of

Dillman (2014), there are three main characteristics of the questionnaire research.

1. The main purpose of the questionnaire survey research is to describe quantitatively of some aspects of the research subject. The questionnaire survey research could concern about the relation between variables, or the specific details of the research subject. It is a quantitative research method which needs to collect and understand the information about the research subject, and these information is always numerical in kind. The research subject could be individual, organization or project.
2. The main method to collect information and data through questionnaire survey is to ask respondents well-structured questions designed early. The answer constitutes the data base to be analyzed.
3. The information and data usually comes from a part of the research population, which is sample. However, the collect method of data has to make sure that the research results could generalize to the other unit of the general.

The main reasons that the questionnaire is common used are as follows:

1. The research process is easy to manage, the values and codes of data are relatively simple.
2. It is rather easy to ensure the value of variables and the relations of variables.
3. The results could be generalized to the other unit of the study population, or the similar population.
4. It is relatively easy to repeat the research procedure. Therefore, it could be simpler to compare the difference results of different group, time, and area.
5. It could be used to predict the behavior.
6. It could be used to test and deepen the results of qualitive research.

Based on the analysis above, and the theoretical basis, research content and research objective of the research, questionnaire survey method would be used to identify the variables that influence resident MSW classification behavior intention, and to explore to what extent they influence it.

3.5 Sample Size and Selection

The research was about explaining the influence variables of residents' MSW classification behavior intention in Beijing, considering the time and budget limitation, the simple random sampling method was used. The researcher randomly selected 20 communities in Beijing main districts, and sent 400 questionnaires, got 360 back and 314 are effective. The other 46 were considered invalid due to the missing value was over 30%. Through the sampling survey mentioned above, the effective rate of the questionnaire was 78.2%.

Due to the time limitation, the study area was Main six districts in Beijing. Here was the process of get the sample size for the research. The population of the area was

12828000 in 2016 [9]**.** The study used the sample size techniques introduced by Sloven (1960) to determine the final sample size. The formula was as followed.

$$n = \frac{N}{N.d^2 + 1}$$

Tab.3.2 Simple size

Confidence level	The cumulative probability values	Z Value	Probability	Tolerable error	Simple size	Population
95%	97.500%	1.959963985	0.5	5%	364.1228763	12828000

In here, n=Number of Samples, N= Total population, and e= Error of Tolerance

3.6 Data Reliability and Validity

- **Reliability Test**

Reliability refers to the stability and consistency of the results of measurement tools. A tool of high stability means that a group of people receive the same measurement in different time and space, but the result is very similar. There are generally three kinds of test of reliability: test-retest reliability, parallel-forms reliability and internal consistency reliability.

1.Test-retest reliability

Using the same set of scales to interview the same group of respondents 2 times at intervals, and the correlation coefficient between the two answers is the test-retest reliability. Test retest reliability of 3 problems: A. The longer the time interval between the interview, the lower reliability is. B. If there is a significant change before the interview, the attitude of the respondents may alter, the researchers cannot distinguish whether it is due to "change" or "reliability of the scale is low". C. The test-retest reliability often over-estimate.

2.Parallel-forms reliability

Using two similar content scales (original and duplicate) to interview the same group of interviewees. The correlation coefficient between the original and the duplicate is parallel-forms reliability. It could correct many of the shortcomings of test-retest reliability, but the difficulty of this method is to find so-called equivalents. At the same time, the values of the parallel-forms coefficients are usually close to the internal consistency reliability.

[9] Based on the < The statistical Yearbook of Beijing-2016>

3. Internal consistency reliability

The test-retest reliability and parallel-forms reliability are considering the consistency of the measurement (stability) and the consistency cross-form separately, and internal consistency mainly reflects the relationship between the test subjects, examines whether each topic measures the same content or quality. Compared with the internal consistency reliability, the test-retest reliability and parallel-forms reliability are more difficult to measure and have too many disadvantages. Therefore, this study used the internal consistency reliability to test the reliability of the questionnaire.

Internal consistency reliability analysis is done by calculating the coefficient of reliability, also known as the Cronbach's alpha. The meaning of the value of Cronbach's alpha is as Tab3.3 shows.

Tab3.3 The meaning of Cronbach's alpha coefficient

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source: Tavakol, 2011

- **Validity Test**

The validity of the measurement tool which is considered to be the degree to which the tool measures what it need to be measure, in other word, the validity is an equivalent to accuracy. The higher the validity of the measurement, the more likely that the outcome of the measurement will show the true characteristics of the subject to be measured. Validity is a multifaceted concept, which is relative to specific research purposes and research side. Therefore, the test validity must be collected from different angles for specific purposes, functions and scope of application. The concept of validity can often be understood in the following aspects:

1. Validity is a holistic concept, and the ideal validity test contains several forms of evidence
2. Validity could not be measured directly, but it can be inferred from other data
3. Validity is a process of perpetual development
4. Validity is the difference in degree, not all or nothing
5. The validity have specificity in the purpose of use and the context, it should not be regarded as universal characteristics.

Therefore, it is not easy to test the validity of a measurement tool. Only after a long period of collecting evidence and establishing various patterns and theories, can the validity be determined. As Straub (1989) said, it is difficult to develop an effective

measurement tool, but it is harder to test the validity of measurement tools because the possible measurements are almost limitless.

1. Content validity

Examining content validity aims at systematically testing the appropriateness of the measurement content, and identifying whether the content reflects the nature of the concept according to our understanding of the concepts. To exam the content validity is to test whether the empirical deduction from concept to index is logical and valid. According to Straub (1989), the best way to ensure the content validity of a measurement tool is to ask the experts who are familiar with the field to review of the scales until the final agreement is reached. In addition, in order to establish a content validity of the questionnaire, the researcher must follow the theoretical framework, to collect all of the relevant issues and variables, and choose from which to make sure all the problems under the research scope is covered, so as to make the research tool with full content validity.

In this research, through the chapter 2 of large-scale literature review and the chapter 3, a more rigorous theoretical research operationalization was established. The measurement of each variable is based on the full literature review. In addition, this study tried to avoid all kinds of errors from the initial stage of the questionnaire design. The questionnaire is complete, unbiased, the writer paid attention to the layout, made it much more readable. The time to answer the questionnaire was controlled in 15 minutes, so that the respondents would not get tired of it. The content design also referred to the mature experience in designing the questionnaire, to make it clear to understand and trustworthy. In order to test the quality of questionnaire, before the formal testing, the questionnaire was pre-tested, and according to the feedback information of pre-testing, some of the entries were deleted and merged, to make it more consistent with the actual situation and avoid excessive entry to bring difficulties to respondents. The adjusted questionnaire again solicited the interviewees' opinions.

In addition, the other test criterion that is commonly used is content validity, that is, the proportion of incomplete surveys. The interviewees discontinued the investigation before the investigation was completed. The discontinuation reflects the possible problems of the content validity of the questionnaire. In this study, 400 questionnaires were distributed and 314 questionnaires were answered efficiently. The effective rate reached 78.5%, which make sure the content validity of this research.

Based on the rigor and reliability of the process, this study suggests that the behavior intention and influencing factors content of the validity can be guaranteed basically. Therefore, the content validity would not be mentioned below.

2. Construct validity

Construct validity is "the degree to which a test measures what it claims, or purports, to be measuring."(Cronbach, 1955, P15) Study on the construction of validity is to understand whether the measurement tools reflects the internal structure of concepts and questions, that is to say if the measurement tool results in groups of two or more types of comparison, and the expected relationship between the two kinds do exist,

indicates that the measuring tools has some degree of construct validity. Since this method is tested by the comparison with theoretical assumptions, it is also called theoretical validity.

The construct validity is divided into convergent validity, and discriminant validity. When measuring the same dimension in different ways, the results of the two measurements should have a rather high correlation degree, namely, convergent validity. If the different dimensions are measured in the same way, there should be a rather low correlation between the two measurement results, which is discriminant validity.

In this paper, principal component factor analysis was used to test the construct validity. While conducting the principal component factor analysis, if measuring a group of questions within the same dimensions, the results is one factor which indicate the scale has convergent validity. When the theoretically different dimensions are not highly correlated, the scale has discriminant validity.

3.7 Data Collection Method

This research applied a primary data collection. The hard copy questionnaire was used as the main data collection method to get the primary data. The design of questionnaire was based on the deep literature research, and the experience of other scholars. The questionnaire was composed of 4 parts, in total there were 38 questions, through pre-text, it took 10 minutes to finish. All the questions in the questionnaire were using Likert scale which is a common psychometric scale commonly involved in questionnaire. The specific information was as follow Tab.3.4.

Tab.3.4 The structure of scale

Variables	Dimension	Likert Scale point	Question
Behavior Intention(BI)	Behavior Objective Intention (BOI)	5-piont Likert Scale	Q2.1-Q2.6
	Behavior Executive Intention(BEI)		
Psychological variables	Public education and awareness campaign	5-piont Likert Scale	Q2.8-2.10
		2-point Likert Scale	Q2.12
	Perceived Behavior control	5-piont Likert Scale	Q2.13
	Subjective Norm	5-piont Likert Scale	Q2.16-Q2.17
Situational factors		5-piont Likert Scale	Q3.1-3.4

Environmental factors	Environment value Environmental knowledge	5-point Likert Scale 2-point Likert Scale	Q4.1-Q4.4 Q4.6-Q4.10

3.8 Data Analysis Methods

This research was conducted using quantitative analysis. SPSS 22 was used to help to process the quantitative data. Charts and tables were also used to make it easier for analysis. In addition, the quantitative data from questionnaire in this research was analyzed using both descriptive and statistical analysis as follow.

3.8.1Descriptive Analysis

The process of data analysis often begins with understanding the basic characteristics of data, that is, from the calculation and description of basic statistics. Statistical analysis of data can be divided into two parts: descriptive statistics and inferential statistics. Descriptive statistics provides methods for sorting raw data into useful charts. These methods include collecting, sorting, describing the relevant data information. In this study, descriptive analysis was used to describe the basic information we can get from the questionnaire data and help the readers to get a general idea of the research results.

3.8.2Statistical Test

In this research, the factor analysis method was used to test the validity and reliability, and the correlation analysis and linear regression analysis was used to analysis the data and answer the research question. Then the independent sample test and variance analysis are used to investigate the differences in behavior intention between social demographic variables

Chapter4 Research Findings

4.1 Introduction

In this chapter, the data collected through questionnaire would be analyzed. First, conducting the descriptive analysis and presenting the mean value and standard deviation of each question. Then, doing factor analysis to the data, and extracting the principle factors which would be tested on reliability and validity. At last, using linear-regression analysis to analysis the data. The explanation of how the research findings would answer the research questions would also be mentioned in the analyzing process. In general, this chapter was divided and presented into two major parts that consist of:

1. Description of the study area
2. Research findings and analysis supported by statistical results.

4.2. Description of the study area

Beijing, the capital city of China, is located in the north-east of China. Show as Fig.4.1 In today's Beijing municipal district, Dongcheng and Xicheng district is located in the central area of the city, the jurisdiction is also within the scope of the present 2-ring road, mainly in the traditional sense is named as urban areas. See as Fig.4.2 With the Beijing city urbanization process, population growth and the expansion of the city, most of the area of Chaoyang District, Haidian District, Fengtai District and Shijingshan District are gradually being recognized as the city area, so with the original two-Dongcheng and Xicheng, the combination of the six districts are considered as the six main districts of the city. Based on the the planning, the urban area of Beijing city is within 5-ring road, with an area of about 667 square kilometers.

Fig.7 The location of Beijing

The city area of Beijing is divided into four layers according to its function, from the inside to the outside: capital functional core area, urban function expansion zone, urban function new district and ecological conservation area. Today, the narrow sense of Beijing can only refer to the urban area of Beijing- the city's six main districts, while the broad sense of Beijing refers to the suburbs, including the the Suburban counties.
In this study, the study area is limited in the narrow sense of Beijing-the six main districts.

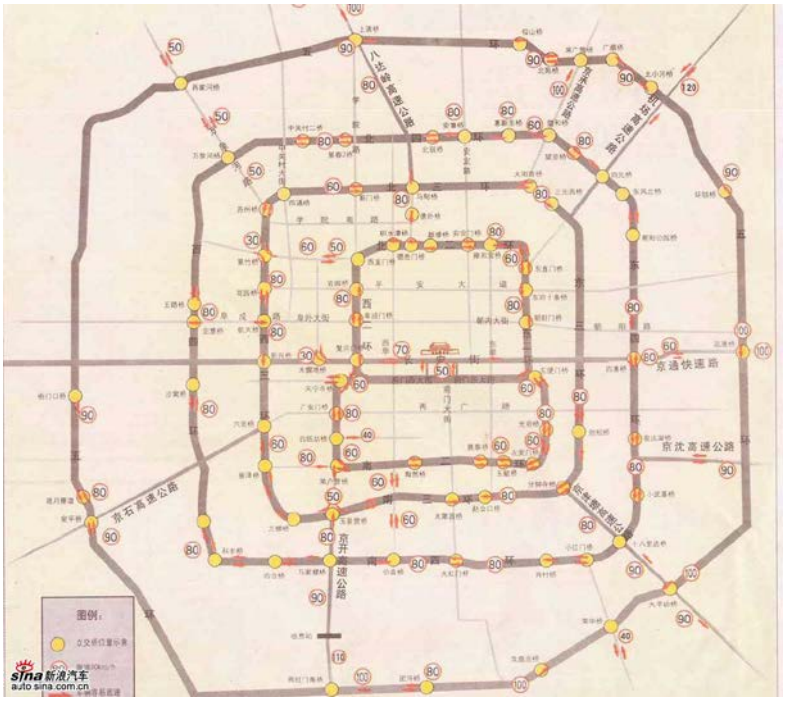

Fig.8 The 5-ring road in Beijing

4.3 Descriptive analysis

This part is separately analyzing the behavior intention, psychological variables, situational factors, and the environmental factors descriptive analysis method, considering the Mean and Std. deviation in general. Since most of the questions were using 5-point Likert Scale method, it is simple to use mean value to describe the tendency of the answer. If the mean value is over 3.5, which indicate the rather positive tendency, on the country, if the value is below 3.5, the answer is tend to the other direction. In this research questionnaire, the questions about the behavior intention are seven, and the questions about psychological variables are 17 divided into 3 parts which are public education and awareness campaign (5 questions), perceived behavior control (3 questions) and subjective norm (2 questions). The questions about the situational factors are 4 and the questions about the environmental factors are 10 which is composed of 5 questions about environment value and 5 questions about environment knowledge.

\

Tab.4.1 Descriptive analysis of behavior intention towards MSW classification

		2.1 Separately collecting plastic products	**2.2** Separately collecting paper products	**2.3** Separately collecting metal products	**2.4** Taking time to do MSW classification	**2.5** Taking energy to do MSW classification	**2.6** Separating the MSW as kitchen waste/ the other
N	**Valid**	314	314	314	314	314	314
	Missing	0	0	0	0	0	0
Mean		3.77	3.76	3.64	3.44	3.40	3.79
Std. Deviation		1.141	1.190	1.234	1.211	1.207	1.212

From the Mean of the data above, only the Q2.4 and Q2.5 is below the 3.5 which indicate that most people tend to not take time and energy to do MSW classification, the behavior executive intention (BEI) is rather low. The other 4 questions' mean values are between 3.5 and 3.8 which indicate most people tend to separately colleting plastic, paper and metal products and are willing to separating the MSW as kitchen waste and the other. Their behavior objective intention (BOI) is rather high. This is an interesting finding that the same group of individuals possess higher BOI than BEI.

As for the Q2.7, it's open question. Do you classify MSW, if you do, since when? Only 120 is answering this question, 110 people's answer is no, they never classify the MSW. And 10 individual's answers are always, they start to classify the MSW since they were children. Although the answering number is rather less, we can still get the conclusion that most people do not classify MSW. Since the insufficient answer of this question, it would be delated in the following analysis.

Tab.4.2 Descriptive analysis of public education and awareness campaign

	N	**Mean**	**Std. Deviation**
Q2.8 The public education and propaganda could make individual concern about MSW problem	314	4.11	.987
Q2.9 The public education and propaganda could make individual know how to classify the MSW	313	4.12	.987

Q2.10 The continuous public education and propaganda could make individual keep classifying the MSW	313	4.00	1.053

From the data above, the mean number of Q2.8 to Q2.10 are between 4.0-4.2, which shows that the residents are more tends to believe in the idea that public education and awareness campaign is helpful in promoting the MSW classification career.

And for the Q2.11, the option of individual' favorite way to accept public education and propaganda, 68% choose TV and the newspaper and poster are tie for second place.

Tab.4.3 Descriptive analysis of the option of favorite channel to get PEAC

Option	Number	Percentage
TV	213	68%
Newspaper	60	19%
Radio	29	9%
Poster	59	19%
Booklet	8	3%
Leaflet	14	4%
Community notice board	22	7%
Propaganda organized by work unit	13	4%
Internet	16	5%

As for the Q2.12-Has there been any education/awareness campaign that really made you understand the problem and classify your garbage, 39 individuals choose yes, but did not mention the name of the campaign, well 172 individuals choose no. Only 4 people write down the answer as "when the classified waste bin set, they start to be aware the classification of MSW", but they also not mention the name. It is like a paradox, in the one hand, most people believe the education and awareness campaign could make them concern of the MSW classification, on the other hand, most of them not even recall one name of the relevant campaign.

Tab.4.4 Descriptive analysis of Perceived Behavior control

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Q2.13. The corresponding reward could encourage individual conducting classification	314	1	5	4.06	1.126
Valid N	314				

For the Q2.13, we can see form the mean value- 4.06 that most people consider that the corresponding reward could encourage individual conducting classification. And according to Tab.4.5, over half of the individuals think the economic return is the most attractive. From this part we can see that the perceived behavioral dynamics especially

the economic return do have positive effect on resident's behavior intention.

Tab.4.5 Descriptive analysis of the favorite return of MSW classification

		Frequency	Percent	Valid Percent
Valid	**1.Honorary citizen**	84	26.8	27.3
	2.Environmental citizen	42	13.4	13.6
	3. Economic return	178	56.7	57.8
	4.The other	4	1.3	1.3
	Total	308	98.1	100.0
Missing	**System**	6	1.9	
Total		314	100.0	

As for Q2.14 and Q2.15, ranking the barriers that stand in the classification process based on the difficulties, the result is as follows: E>C>A>B>D. The order is E (above all the reasons)> C (take too much energy) >A (too difficult)> B (take too much time)>D (take too much space). See the Tab.4.6 below.

Tab.4.6 Descriptive analysis of the barriers stand in the classification process

	A	B	C	D	E
Mean	2.730942	2.70852	2.7713	2.578475	4.116592
Std. Deviation	1.485138	1.028852	1.005225	1.292227	1.563268

The data in Tab.4.7 indicates that most people is in the middle about whether their family think they should classify the waste and they tend to believe that their family would support them to classify the MSW at home. Well people tend to not think their neighbor would care about whether they classify the MSW at home or not, so the mean value of Q2.17 is 3.18, much lower than 3.5.

Tab.4.7 Descriptive analysis of Subjective Norm

		Q2.16 My family would think I should classify my waste at home	**Q2.17.** My neighbors would think I should participate in MSW classification at home
N	**Valid**	314	314
	Missing	0	0
Mean		3.62	3.18
Std. Deviation		1.172	1.087

From the descriptive analysis above about the psychological variables, we got the conclusion that the public education and awareness campaign do have impact on individual's behavior intention, however this results still need further analyzed since most people do not remember the name of the campaign that influence them. As for the perceived behavioral control, we could see that perceived behavioral dynamics do have impact on resident's behavior intention, especially the economic return encourage them more to conduct the classification behavior, which was contract to the De Yong (1986) and Makela' (1998) findings, which were suggested that the main factor that push people do conduct the recycling behavior is not economic return but the internal

satisfaction they got through the action. For the perceived behavioral barriers, De Yong (1990) as well as Vinning and Ebreo (1990) suggested that the time, space and convenience are the main barriers of conducting the MSW management behavior, and through the analysis above, the energy to classify and difficulty to classify beats the time and space, became the main barriers of conducting the classification behavior. As for the subjective norm, based on the description analysis of it, it did has influence on the classification behavior, but the influence was not that obvious, the further analysis of it would be illustrated below.

Tab.4.8 Descriptive analysis of Situational Variables

		Q3.1 The distance between the waste bin and your home is important for individual to decide whether to classify the waste or not	**Q3.2** The clean surrounding of the waste bin is important for individual to decide whether to classify the waste or not	**Q3.3** The regular (weekly/ biweekly) frequent waste classified collection and transport is important for individual to decide whether to classify the waste or not	**Q3.4** The clear mark of the waste bin is important for individual to decide whether to classify the waste or not
N	**Valid**	314	314	314	314
	Missing	0	0	0	0
Mean		3.59	4.00	4.07	4.20
Std. Deviation		1.323	1.103	1.080	1.049

From the data of Tab 4.8, the mean number of Q3.1 is a little above 3.5 which indicates that people stand in the middle position and tend to agree with the distance between the waste bin and home is important for individual to decide whether to classify the waste or not and the mean numbers of the other questions are between 4.0 to 4.2 which indicate people tend to agree more with the idea that the clean surrounding to the waste bin, the regular waste collection and the clear mark of the waste bin are important for individual to decide whether to classify the waste or not.

From the analysis about the situational variables above, we could see that it does have certain impact on resident's classification behavior intention, which is consistent with Bernstad's (2014) research finding that the convenience and availability of certain infrastructure are important factors that would make the residents participate in classification.

Tab.4.9 Descriptive analysis of Environment value

		Q4.1 The nature and environment have the same value as human being, we need to protect and respect the nature and environment.	**Q4.2** The environment problem is the main concern in the future development of city	**Q4.3** MSW problem is the problem that residents should concern and help to solve	**Q4.4** MSW problem is the problem that is only for the government to solve
N	**Valid**	314	314	314	314
	Missing	0	0	0	0
Mean		4.52	4.43	4.24	2.35
Mode		5	5	5	1
Std. Deviation		3.038	1.006	1.037	1.420
Variance		9.228	1.012	1.075	2.017

From the data of Tab 4.9, most of the people agree that the nature and environment have the same value as human being, and the environmental problem is the main concern in the future development of city, and most of them also think the MSW problem is the problem not only for the government to solve, but the residents should concern and help with it.

The last part of the questionnaire is about the environmental knowledge, the five questions are using 2-point Likert Scale. There are two answers: Yes and No for each of them. We can see form the Tab.4.10 that most people consider that plastic, metal, paper and bottle should be classified separately, the percentage of the correct answer yes is over 89%. And 96.8% of the individual think that the MSW classification is an important precondition of the whole MSW disposal system.

We could get the conclusion through the data that most residents hold correct environmental values and knowledge, even though the classification situation in Beijing is still not good, which is contrast with the Stern' theory (2012) that the people who hold right environment values would be easy to change their behavior and habit. And the result of the environmental knowledge was also contrast with Kaplan (1991) and De Young' s(1988) opinion that the residents' level of knowledge towards the waste management problem would influence their behavior directly.

Tab.4.10 Descriptive analysis of Environmental knowledge

Questions	**Number of Yes**	**Number of No**	**Percentage of Yes**	**Percentage of No**
Q4.6 Do you think plastic should be classified	286	28	91.1%	8.9%

Q4.7 Do you think paper should be classified	282	32	89.8%	10.2%
Q4.8 Do you think mental should be classified	300	14	95.5%	4.5%
Q4.9 Do you think bottles should be classified	267	47	85%	15%
Q5.0 Do you think MSW classification is an important precondition of the whole MSW disposal system	304	10	96.8%	3.2%

4.4 Exploring factor analysis and the reliability coefficient and validity testing

4.4.1 Behavior Intention of MSW classification

• Item-to-total correlations analysis

item-to-total correlations analysis is using to exam whether the question is related to the dimension it belongs and if this connection has theoretical meaning. The table below shows the item-to-total correlations of each question of behavior intention. If the question's item-to-total figure is below 0.35, the question should be delated. In here, all the item-to-total correlations figure is above 0.35, there is no question to be delated.

Tab.4.11 Item-to-total correlation of behavior intention

Question	Item-to- total correlations
Q2.1	.741
Q2.2	.769
Q2.3	.748
Q2.4	.702
Q2.5	.703
Q2.6	.741

- **Exploring Factor Analysis (EFA)**

Exploring factor analysis is a statistical approach which studying the internal dependency of the correlation matrix, and combining a number of variables X1,X2……. Xp into a few factors F1, F2…. Fm to recalculate the relations between factors (Cheng,2002). It is a method to exploring the common characteristics of the analyzed indexes and extracting the indexes which shares big common characteristics as new indicators, thus achieving the goal of reducing the dimension. Namely, reducing the number of variables. The premise that the data can be factor analyzed is that there

are similarities among the variables, and item-to-total correlations analysis is a statistical method to test whether the variables have commonness

Besides, based on Kaiser (1974), whether the questions are suitable to using factor analysis method could be judged by the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO). KMO index is used to compare the simple correlation and partial correlation coefficients between variables. The closer the figure is to 1, the more suitable the data is for factor analysis. The standard value of KMO is as below.

Tab.4.12 Standard value of KMO in factor analysis

KMO statistic	Factor analysis adaptability
>0.9	extremely suitable for factor analysis
0.8~0.9	Suitable of factor analysis
0.7~0.8	Possible for factor analysis
0.6~0.7	Reluctantly possible for factor analysis
0.5~0.6	Not suitable for factor analysis
<0.5	Very unsuitable for factor analysis

Before the factor analysis, the correlation matrix between variables can be observed. A group of variables with too high or too low correlation will cause difficulties in performing the factor analysis. Too low correlation makes it difficult to extract a stable set of common factors which are not suitable for factor analysis. Generally, when the absolute value of the correlation coefficient is less than 0.3, it is not suitable; however, if the correlation coefficient is too high, the collinearity problem of regression analysis will occur, and the discriminant validity remains to be tested. In order to simplify research questions and data analysis, the items that are close to each other on two or more factors, which are close to 0.35, and which are very close to each other, should be deleted. After the investigation on the remaining items, the factor analysis process continuing, until the results meet the requirement which is no one research item in two or more of the load factor is greater than 0.359 (Lai,2004).

Through the exploring factor analysis of the initial variables, the KMO figure is 0.783, indicating that this group of data is suitable for exploring factor analysis method. Based on eigenvalues greater than 1 and varimax rotation method, 2 new factors could be extracted as the principal factors of the 1 initial variables. As for Q2.6, the load on the two main factors was 0.453 and 0.553 respectively, considering the two values is quite different from each other, this research reserved the Q2.6. The accumulative contribution rate is 82.389%, which means they could reflect 82.389% of the original variables' information. The specific information is showed as tables below.

Tab.4.13 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.783
Bartlett's Test of Sphericity	Approx. Chi-Square	1487.393
	df	15
	Sig.	.000

Tab.4.14 Eigenvalue and cumulative percentage of factors

Principal factor	**1**	**2**

eigenvalue	3.854	1.089
The accumulative contribution rate%	82.389	82.389

Tab.4.15 EFA results for Behavior Intention

Rotated Component Matrixa

Question number	Component	
	1	2
Q2.1	.907	
Q2.2	.890	
Q2.3	.886	
Q2.4		.931
Q2.5		.930
Q2.6	.453	.553

Based on the results of the exploring factor analysis and the original information the principal component is extracted, the two principal components could be redefined as two factors. Factor 1 is **behavior objective intention(BOI)** which means the behavior intention to conduct the specific classification behavior. Factor 2 is **behavior executive intention(BEI)**, which means the behavior intention to put effort to conducting the MSW classification.

Tab.4.16 Factors and Meanings

Factor	The questions included	Meaning	Cronbach's Alpha
Factor 1	Q2.1~Q2.3, Q2.6 (4)	BOI	0.879
Factor2	Q2.4~Q2.5 (2)	BEI	0.945

- ## Reliability Test

Reliability refers to the stability and consistency of the results of measurement tools. A tool of high stability means that a group of people receive the same measurement in different time and space, but the result is very similar. There are generally three kinds of test of reliability: test-retest reliability, parallel-forms reliability and internal consistency reliability.

1.Test-retest reliability

Using the same set of scales to interview the same group of respondents 2 times at intervals, and the correlation coefficient between the two answers is the test-retest reliability. Test retest reliability of 3 problems: A. The longer the time interval between the interview, the lower reliability is. B. If there is a significant change before the interview, the attitude of the respondents may alter, the researchers cannot distinguish whether it is due to "change" or "reliability of the scale is low". C. The test-retest reliability often over-estimate.

2.Parallel-forms reliability

Using two similar content scales (original and duplicate) to interview the same group of interviewees. The correlation coefficient between the original and the duplicate is parallel-forms reliability. It could correct many of the shortcomings of test-retest reliability, but the difficulty of this method is to find so-called equivalents. At the same time, the values of the parallel-forms coefficients are usually close to the internal

consistency reliability.

3. Internal consistency reliability

The test-retest reliability and parallel-forms reliability are considering the consistency of the measurement (stability) and the consistency cross-form separately, and internal consistency mainly reflects the relationship between the test subjects, examines whether each topic measures the same content or quality. Compared with the internal consistency reliability, the test-retest reliability and parallel-forms reliability are more difficult to measure and have too many disadvantages. Therefore, this study used the internal consistency reliability to test the reliability of the questionnaire.

Internal consistency reliability analysis is done by calculating the coefficient of reliability, also known as the Cronbach's alpha. The meaning of the value of Cronbach's alpha is as Tab.4.17 shows. Through the analysis, the study of behavior intention extract two factor, Cronbach's alpha coefficients are 0.879 and 0.945, the values are greater than 0.70, thus ensuring the consistency of factor structure of this part of questionnaire.

Tab.4.17 The meaning of Cronbach's alpha coefficient

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source: Tavakol, 2011

- **Validity Test**

The validity of the measurement tool which is considered to be the degree to which the tool measures what it need to be measure, in other word, the validity is an equivalent to accuracy. The higher the validity of the measurement, the more likely that the outcome of the measurement will show the true characteristics of the subject to be measured. Validity is a multifaceted concept, which is relative to specific research purposes and research side. Therefore, the test validity must be collected from different angles for specific purposes, functions and scope of application. The concept of validity can often be understood in the following aspects:

1. Validity is a holistic concept, and the ideal validity test contains several forms of evidence
2. Validity could not be measured directly, but it can be inferred from other data
3. Validity is a process of perpetual development
4. Validity is the difference in degree, not all or nothing
5. The validity have specificity in the purpose of use and the context, it should not be regarded as universal characteristics.

Therefore, it is not easy to test the validity of a measurement tool. Only after a long period of collecting evidence and establishing various patterns and theories, can the validity be determined. As Straub (1989) said, it is difficult to develop an effective measurement tool, but it is harder to test the validity of measurement tools because the possible measurements are almost limitless.

3. Content validity

Examining content validity aims at systematically testing the appropriateness of the measurement content, and identifying whether the content reflects the nature of the concept according to our understanding of the concepts. To exam the content validity is to test whether the empirical deduction from concept to index is logical and valid. According to Straub (1989), the best way to ensure the content validity of a measurement tool is to ask the experts who are familiar with the field to review of the scales until the final agreement is reached. In addition, in order to establish a content validity of the questionnaire, the researcher must follow the theoretical framework, to collect all of the relevant issues and variables, and choose from which to make sure all the problems under the research scope is covered, so as to make the research tool with full content validity.

In this research, through the chapter 2 of large-scale literature review and the chapter 3, the establishment of a more rigorous theoretical research framework. The measurement of each variable is based on the full literature review and the maturity scale in the classical related research papers. In addition, this study tries to avoid all kinds of errors from the initial stage of the questionnaire design. The questionnaire design information is complete, unbiased, pay attention to the layout, making it much more readable. The time to answer the questionnaire is controlled in 15 minutes, so that the respondents would not get tired of it. The content design also refers to the mature experience in designing the questionnaire, to make it clear to understand and trust. In order to test the quality of questionnaire, before the formal testing, the questionnaire was pre-tested, and according to the feedback information of pre-testing, some of the entries are deleted and merged, to make it more consistent with the actual situation and avoid excessive entry to bring difficulties to respondents. The adjusted questionnaire again solicited the interviewees' opinions.

In addition, the other test criterion that is commonly used is content validity, that is, the proportion of incomplete surveys. The interviewees discontinued the investigation before the investigation was completed. The discontinuation reflects the possible problems of the content validity of the questionnaire. In this study, 400 questionnaires were distributed and 314 questionnaires were answered efficiently. The effective rate reached 78.5%, which make sure the content validity of this research.

Based on the rigor and reliability of the process, this study suggests that the behavior intention and influencing factors content of the validity can be guaranteed basically. Therefore, the content validity would not be mentioned below.

4. Construct validity

Construct validity is "the degree to which a test measures what it claims, or purports,

to be measuring."(Cronbach, 1955, P15) Study on the construction of validity is to understand whether the measurement tools reflects the internal structure of concepts and questions, that is to say if the measurement tool results in groups of two or more types of comparison, and the expected relationship between the two kinds do exist, indicates that the measuring tools has some degree of construct validity. Since this method is tested by the comparison with theoretical assumptions, it is also called theoretical validity.

The construct validity is divided into convergent validity, and discriminant validity. When measuring the same dimension in different ways, the results of the two measurements should have a rather high correlation degree, namely, convergent validity. If the different dimensions are measured in the same way, there should be a rather low correlation between the two measurement results, which is discriminant validity.

In this paper, principal component factor analysis is used to test the construct validity. While conducting the principal component factor analysis, if measuring a group of questions within the same dimensions, the results is one factor which indicate the scale has convergent validity. When the theoretically different dimensions are not highly correlated, the scale has discriminant validity.

In the factor analysis of the attitude towards MSW classification, the KMO value is 0.783, indicating that this data is suitable for factor analysis, therefore, the design of behavioral intention measurement tools basically meets the requirements of convergent validity.

According to the method introduced by Gaski (1986), if item-to-total correlations between each pair of dimension is less than the Cronbach's alpha coefficients of any dimension, the scale is considered to have discriminant validity.

In this study, item-to-total correlations between 0.702-0.769, as tab 4.11, which are less than The Cronbach's alpha coefficients of the extracted principal factors 0.879,0.945, so that this part of the scale meets the requirement of discriminant validity.

4.4.2 The other influence variables

• Item-total correlation analysis

As illustrated above, the item-total correlation is used to test if all the questions are related to the dimension they belong and whether this correlation has theoretical meaning. The tab.4.18 gives the item-total correlation coefficients of each questions in the variables. If the value is lower than 0.35, the question should be delated. In this part, all the questions' item-total correlation coefficients is over 0.35, so no question is delated.

Tab.4.18 Item-total correlation of the influence factors

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q2.8.	.543	.732
Q2.9.	.549	.732
Q2.10	.523	.732

Q2.16.	.496	.733
Q2.17.	.391	.742
Q3.1	.432	.737
Q3.2	.616	.724
Q3.3	.690	.719
Q3.4.	.672	.721
Q4.1.	.486	.805
Q4.2	.641	.725
Q4.3	.638	.724
Q4.4	.565	.787
Q4.6	.567	.762
Q4.7	.542	.762
Q4.8	.441	.762
Q4.9	.495	.762
Q4.10	.565	.762

- ## Exploring factor analysis

Through the exploring factor analysis of the initial variables, the KMO figure is 0.832, see tab.4.19 below, indicating that this group of data is suitable for exploring factor analysis method. Based on eigenvalues greater than 1 and varimax rotation method, 5 factors could be extracted as the principal factors of the initial questions. The accumulative contribution rate is 72.375%, the specific information is as the table below.

Tab.4.19 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.832
Bartlett's Test of Sphericity	Approx. Chi-Square	2575.622
	df	153
	Sig.	.000

Tab.4.20 Eigenvalue and cumulative percentage of factors

principal factor	**1**	**2**	**3**	**4**	**5**
eigenvalue	5.650	2.322	1.553	1.470	1.103
The accumulative contribution rate%	40.360	51.656	62.196	69.402	72.375

Tab.4.21 EFA results for the other factors

Rotated Component Matrixa					
	Component				
	1	**2**	**3**	**4**	**5**
Q3.2	**.829**				
Q3.3	**.823**				
Q3.4.	**.766**				
Q3.1	**.696**				
Q2.8.		**.897**			

Q2.9.		**.896**			
Q2.10		**.813**			
Q4.8			**.794**		
Q4.9			**.746**		
Q4.6			**.723**		
Q4.7			**.704**		
Q4.10			**.735**		
Q2.17.				**.870**	
Q2.16.				**.816**	
Q4.4					**.766**
Q4.1.					**.750**
Q4.3	**.470**				**.638**
Q4.2	**.480**				**.616**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Based on the results of the exploring factor analysis and the original information the principal component is extracted, the 5 principal components could be redefined as 5 factors. Factor 1(Q3.1-Q3.14): Situational Variable(SV); Factor 2(Q2.8-Q2.10): Public Education and Awareness Campaign(PEAC); Factor 3 (Q4.1-Q4.4): Environmental Value (EV); Factor 4 (Q2.16-Q2.17): Subjective Norm (SN); Factor 5 (Q4.6-Q4.10): Environment Knowledge (EK).

Tab.4.22 Factors and Meanings

Factor	The questions included	Meaning	Cronbach's Alpha
Factor 1	Q3.1-Q3.14	SV	0.868
Factor2	Q2.8-Q2.10	PEAC	0.915
Factor 3	Q4.1-Q4.4	EV	0.876
Factor 4	Q2.16-Q2.17	SN	0.807
Factor 5	Q4.6-Q4.10	EK	0.783

- **Reliability Test**

Based on the analysis and explanation above about the reliability test, this part's reliability test is still using the internal consistency reliability indicator. Through analyzing, the Cronbach's alpha coefficients of the 5 principle factors are: 0.868, 0.915, 0.876, 0.807, 0.783 as shows in tab.4.22, all the Cronbach's alpha coefficients are over 0.70, which make sure the Consistency of factor structure in this part of questionnaire.

- **Validity Test**

Based on the analysis of content validity above, the part meets the requirements of the content validity.

The KMO value is 0.832, which indicates this part of data is suitable for factor analysis, therefore, the measuring tool for influence factors in this study basically meet the requirements of convergent validity.

The item-total correlation coefficients are between 0.391-0.690 (see tab.4.18), are lower than the Cronbach's alpha coefficients of any principal factor(see as tab.4.22), so that this part of the scale meets the requirement of discriminant validity.

4.4.3 regression analysis

This research has two main purposes of conducting regression analysis, the first is to illustrate the explanation degree of the dependent variable and the contribution the independent variables make. The second purpose is to test the multiple co-linear problems of the model. Therefore, the following analysis is carried out in this part: regression analysis of objective intention, executive intention as dependent variable and the other influence factor as independent variables.

- **correlation analysis**

To explore the specific correlation structure of influencing factors and behavioral intention, we need to do the correlation analysis between the 5 influence factors extracted through above exploring factor analysis and two behavioral intention factors. The correlation analysis is used to describe the compact degree of two variables, which reflects the degree of variation of one variable when you control the other variable. The results of the correlation analysis on the 5 influence factors and the two behavioral intention factors are as Tab.4.23.

(1) Inside all the factors, Situational Variable(SV), Public Education and Awareness Campaign(PEAC), Environmental Value(EV) and Subjective Norm(SN) is positively correlated with (BOI) and significant at 0.01 level. But there is no significant correlation between EK and BOI.
(2) In all factors, Situational Variable (SV), Public Education and Awareness Campaign(PEAC), Environmental Value(EV) and Subjective Norm(SN) is significant correlation (P<0.01) with the BEI (P<0.01), and all are positively correlated. There is no significant correlation between EK and BEI.
(3) Comparing the correlation coefficient of the BOI and BEI, the correlation coefficient of BOI with each factor including the Situational Variable (SV), Public Education and Awareness Campaign (PEAC), Environmental Value (EV) and is greater than that with BEI, indicating that these influence factors is better correlated with BOI than BEI. However, the correlation between Subjective Norm (SN) and BEI is better than BOI.

Tab.4.23 Correlation analysis for influential factors with BOI, BEI

Correlations

		BOI	BEI	SV	PEAC	EV	SN	EK
BOI	Pearson Correlation	1	.553**	.479**	.468**	.281**	.280**	-.040
BEI	Pearson Correlation	.553**	1	.412**	.223**	.171*	.341**	-.074
SV	Pearson Correlation	.479**	.412**	1	.523**	.680**	.393**	-.230**
PEAC	Pearson Correlation	.468**	.223**	.523**	1	.526**	.255**	-.205**
EV	Pearson Correlation	.281**	.171*	.680**	.526**	1	.366**	-.265**
SN	Pearson Correlation	.280**	.341**	.393**	.255**	.366**	1	-.158*

EK	Pearson Correlation	-.040	-.074	-.230**	-.205**	-.265**	-.158*	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Regression analysis

In order to further illustrate the relationship between influence variables and behavior intention, first the study carries on the regression analysis of influence variables to behavior intention; second, to state the explanation degree and contribution of the influence variable to behavior intention, the study conducts the regression analysis method to analyze the influence variables of BOI and BEI separately. This study used stepwise regression method as the selected method of independent variables. First calculated the contribution degree of each independent variable on the dependent variable, and picked up the largest contributing one to the regression equation and then re-calculated the contribution of each variable on the dependent variable, investigated whether the variables in the equation was no longer had statistical significance due to the introduction of new variable. If so, it should be eliminated and the contribution of the independent variables to the dependent variable has to be recalculated. If there were still variables below the inclusion criteria (criteria: entry probability <0.05, removal probability <0.1), then continued to consider excluding, until the equation does not have variables could be eliminated, there was no variable outside the equation could be introduced (197). The result of specific regression analysis is shown in Tab.4.24.

Tab.4.24 Regression analysis

Dependent variable	Independent variable	Standardized Coefficients Beta	t	Sig.	R Square	Std. Error	Durbin-Watson
BOI	**PEAC**	.304	5.431	.000	.225	.93083	2.041
	SV	.252	4.503	.000		.90334	
BEI	**SV**	.226	3.761	.000	.198	1.0938	1.895
	SN	.212	3.803	.000		1.0671	
	PEAC	.140	2.436	.015		1.0587	

Before doing specific analyzing the regression model, there are some concepts in regression analysis we need to illustrate.

Std. Error: To illustrate the multicollinearity degree between independent variables. The closer the value to 1 indicates that there was no multicollinearity problem between the independent variables. The two case of regression analysis in this research, the Std. Error figures were close to 1, which indicated there is no multicollinearity problem between variables.

Durbin-Watson (DW) statistic: To re-diagnosis the model after fitting, the correlation of residual sequences is mainly analyzed. The range of values is between 0~4, if the residuals are independent to each other, the value should be around 2. From the table above, the regression models in this research, the DW value are 2.041,1.895, very close

to 2. Therefore, there are no obvious correlation, indicate further that the fitting effect of the model is very good.

The regression model was using the BOI as dependent variable, the R^2 was 0.225, the F test value was 25.578, and the significance level was 0.000, indicated that the model was statistically significant. Only two influence factors were eventually entering into the regression model, EV and SV is not into the model. Based on the mathematical meaning of the results of regression model, the relation model of the influence factors and BOI could be expressed as follows:

$$BOI=0.304\ PEAC+0.252\ SV$$

Through the analysis above, we got the conclusion that the public education and awareness campaign (PEAC) and situational variable(SV) had positive influence on the BOI, and the PEAC has more influence on it compared to SV. As illustrated above, the PEAC was a variable belongs to the psychological variables. Therefore, we could get the conclusion that the psychological variables would affect resident's classification behavior objective intention through the public education and awareness campaign, and SV could also affect resident' behavior objective intention.

The regression model using the BEI as dependent variable, the R^2 was 0.198, the F test value was 45.262, and the significance level was 0.000, indicating that the model was statistically significant. Three influence variables were eventually entering to the regression model, EV, SN and SV were not into the model. Based on the mathematical meaning of the results of regression model, the relation model of the influence variables and BOI could be expressed as follows:

$$BEI=0.226\ SV+0.212SN+0.140\ PEAC$$

Through the analysis above, we got the conclusion that the situational variable(SV), subjective norm (SN) and the public education and awareness campaign (PEAC) had positive influence on the BEI, and the influence sequencing as SV, SN, PEAC. As illustrated above, the SN and PEAC were variables belong to the psychological variables. Therefore, we could get the conclusion that the SV could affect the resident' s behavior executive intention, and the psychological variables would affect resident's classification behavior executive intention through the subjective norm and the public education and awareness campaign.

As we mentioned in the descriptive analysis, the perceived behavior control has certain impact in the resident behavior intention. But since the questions about the perceived behavior control were designed as sorting question and multiple-choice question, they could not be presented in the regression analysis, so the impact degree of the perceived behavior control to the BOI and BEI were not clarified in this research, which was also one limitation of the research. And the environmental variables do not make contribution to the resident' classification behavior intention.

4.4.4 Differential analysis of social demographic variables

The social demographic variables include four variables: gender, age, education and monthly income. The profession and living status are also included in this study. In this

part, *the independent sample test* and *variance analysis* are used to investigate the differences in behavior intention between social demographic variables.

Gender

The independent sample test was used to investigate the differences caused by gender to the behavior intention. From the data in the table, we can see that there is a significant difference between the gender in executive intention and behavior intention. According to the difference of mean between executive intention and behavioral intention, the female executive intention and intention are stronger than that of male

Tab.4.25 Results of Independent Samples T-test (Grouping variables-gender)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
BOI	Equal variances assumed	3.328	.069	-2.440	312	.015	-.28350	.11618	-.51209	-.05490
	Equal variances not assumed			-2.397	261.013	.017	-.28350	.11829	-.51642	-.05057
BEI	Equal variances assumed	.838	.361	-1.468	312	.143	-.1974	.1344	-.4619	.0671
	Equal variances not assumed			-1.456	271.273	.147	-.1974	.1356	-.4643	.0696

Age

In this study, one-way analysis of variance (one-way ANOVA) was used to examine the differences in the behavior intention caused by age. The ANOVA result is shown in Tab.4.26. Through the data in the table, we can see that there is significant difference in age and behavior intention. Based on the result, the P value of age with BOI(P=0.002) and with BEI (P=0.000) both less than 0.05, therefore, there is significant influence on BOI and BEI at different ages, through the ultiple omparison nalysis method Duncan Test, the older the age are, the stronger of the behavior intention.

Tab.4.26 Results of One Way ANOVA analysis (Factor-age)

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
BOI	**Between Groups**	15.405	3	5.135	5.098	.002
	Within Groups	312.249	310	1.007		
	Total	327.654	313			
BEI	**Between Groups**	29.573	3	9.858	7.565	.000
	Within Groups	403.936	310	1.303		
	Total	433.510	313			

Through the Duncan analysis (Tab.4.27) we can see that the highest BOI value lies in

the age between 30-50,then is >65,50-65, the BOI value of 18-30 is the minimum. The specific reason of that the residents between 30-50 are taking responsibility to household jobs, therefore their behavior intension to conduct the MSW classification is stronger. As for the residents between 18 to 30, most of them are single, they tend to choose to rent a place with others or live in a dormitory, so that their BOI value is rather low. As for the residents who are older, they show stronger behavior intension may reflected the lifestyle and life habit of the old difficult age.

Tab.4.27 BOI Duncan analysis of Age

			alpha = 0.05
Age:	**N**	**1**	**2**
18-30	173	3.5520	
50-65	54	3.8519	3.8519
>65	26	3.9135	3.9135
30-50	61		4.0984
Sig		.088	.247

Through the Duncan analysis (Tab.4.28) we can see that the highest BEI value lies in the age between 30-50,then is50-65, >65, the BEI value of 18-30 is the minimum. Compared with the results of BOI, the only difference is the order of 50-65 and>65. The reason of that is the ability to conduct the MSW classification is getting lower because of the age.

Tab.4.28 BEI Duncan analysis of age

			alpha = 0.05
Age:	**N**	**1**	**2**
18-30	173	3.179	
>65	26	3.385	
50-65	54	3.602	3.602
30-50	61		3.959
Sig		.079	.117

Educational level

In this study, one-way analysis of variance (one-way ANOVA) was used to examine the differences in the behavior intention caused by educational level. The ANOVA result is shown in Tab.4.29. Through the data in the table, the P value of BOI（P=0.320）and BEI(P=0.522)， both greater than 0.05, we can see that there is no significant difference in education level and behavior intention.

Tab.4.29 Results of One Way ANOVA analysis (Factor-educational level)

		Sum of Squares	df	Mean Square	F	Sig.
BOI	Between Groups	4.923	4	1.231	1.178	.320
	Within Groups	322.731	309	1.044		
	Total	327.654	313			
BEI	Between Groups	4.476	4	1.119	.806	.522
	Within Groups	429.033	309	1.388		
	Total	433.510	313			

Monthly Income

In this study, one-way analysis of variance (one-way ANOVA) was used to examine the differences in the behavior intention caused by monthly income. The ANOVA result is shown in Tab.4.30. Through the data in the table, the P value of BOI(P=0.586)and BEI(P=0.217)both greater than 0.05， we can see that there is no significant difference in monthly income and behavior intention.

Tab.4.30 Results of One Way ANOVA analysis (Factor-monthly income)

		Sum of Squares	df	Mean Square	F	Sig.
BOI	Between Groups	2.034	3	.678	.646	.586
	Within Groups	325.620	310	1.050		
	Total	327.654	313			
BEI	Between Groups	6.171	3	2.057	1.492	.217
	Within Groups	427.338	310	1.379		
	Total	433.510	313			

Profession

In this study, one-way analysis of variance (one-way ANOVA) was used to examine the differences in the behavior intention caused by profession. The ANOVA result is shown in Tab.4.31. Through the data in the table, the P value of different profession to BOI(P=0.002) is lower than 0.05, which indicate there is significant influence on BOI. The P value of different profession to BEI(P=0.159) is greater than 0.05, so there is no significant influence on BEI. Through the multiple comparison analysis method (Duncan Test), see Tab.4.32, we can see the different profession has different impact on the BOI.

Tab.4.31 Results of One Way ANOVA analysis (Factor-profession)

		Sum of Squares	df	Mean Square	F	Sig.
BOI	Between Groups	27.006	9	3.001	3.034	.002
	Within Groups	300.648	304	.989		
	Total	327.654	313			
BEI	Between Groups	18.046	9	2.005	1.467	.159
	Within Groups	415.463	304	1.367		
	Total	433.510	313			

The BOI Duncan analysis shows that the retiree, administrative staff and the other profession has significant influence on BOI, the main reason of which is these profession is rather idle, especially the BOI value of retiree is higher than other professions.

Tab.4.32 BOI Duncan analysis of profession

			alpha = 0.05
Profession:	**N**	**1**	**2**
Normal worker	20	3.2375	
Administrative staff	19	3.4605	3.4605
Student	56	3.4688	3.4688
House wife	10	3.6750	3.6750
Technical staff	65	3.7692	3.7692
Government stuff	60		3.8750
The other	34		3.9779
Retiree	48		4.0781
Sig		.084	.051

Living status

In this study, one-way analysis of variance (one-way ANOVA) was used to examine the differences in the behavior intention caused by living status. The ANOVA result is shown in Tab.4.33. Through the data in the table, we can see that different living status has significant influence on BOI, the P value is 0.01, below 0.05. While it has no significant influence on BEI, the P value is 0.15, greater than 0.05. Through the multiple comparison analysis method (Duncan Test), see Tab.4.34, we can see the different living status has different impact on the BOI.

Tab.4.33 Results of One Way ANOVA analysis (Factor-living status)

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
BOI	Between Groups	17.651	3	5.884	5.884	.001
	Within Groups	310.003	310	1.000		
	Total	327.654	313			
BEI	Between Groups	14.387	3	4.796	3.547	.015
	Within Groups	419.123	310	1.352		
	Total	433.510	313			

The BOI Duncan analysis shows that the individuals who lives alone has higher enthusiasm to conduct MSW classification, then the dormitory, and the lowest value of BOI is living with others. The main possible reason of which is people would not

want to do the classification when the living place is shared with other people.

Tab.4.34 BOI Duncan analysis of living status

			alpha = 0.05
Living status	**N**	**1**	**2**
Living with others	43	3.3081	
Dormitory	79	3.6013	3.6013
Living alone	192		3.8932
Sig		.079	.080

Chapter 5 Conclusion and Recommendation

5.1 Introduction

Based on the results of the data analysis and the literature review, this chapter summarizes the results of the study and proposes recommendation to promote the implementation of MSW classification behavior of residents.

5.2 The conclusion

The basic purpose of this study is to explain how psychological variables, situational variables and environmental variables affect resident's MSW classification behavior intention in Beijing and to what extent they affect the resident's classification behavior intension by empirical research methods. Therefore, according to the relevant MSW management experience, combined with China's cultural characteristics, this study developed the research scale about the MSW classification behavior intention, and the various variables. A sampling survey was conducted for residents-effective questionnaires. Through data analysis, the thesis focused on several key research questions raised in the first chapter. The main research conclusions, policy recommendations and innovations were as follows.

1. Most people tend to not taking time and energy to do MSW classification, but they tend to separately colleting plastic, paper and metal products and are willing to separating the MSW as kitchen waste and the other. This is suitable for the reality that a large amount of informal waste pickers is existed in China, the residents would collect the plastic, paper and metal products to sell them to the waste pickers for the economic return. But when comes to take time and energy to classify the MSW and do not get the payback surely, their intention of classification would become rather low.

2. As for the public education and awareness campaign, residents are more tends to believe in the idea that public education and awareness campaign is helpful in promoting the MSW classification career, but most of them do not consider that there are any activities make them really understand the problem and classify your garbage. This is an interesting finding. Through further analysis, we found out that the public education and awareness campaign do have great impact on both the objective intention and the executive intention of resident' classification behavior. It could be seen as the

most important factor in psychological variables that influence resident' classification behavior intention. We could deduce that during the last decades, a lot of relevant public education and awareness campaigns were conducted that the public could learn a lot from them (we could deduce this conclusion from the rather high correct rate of the environmental knowledge questions), it is normal that most of the people could not remember the name of so many campaigns.

3. As for the perceived behavior control, most people considered that the corresponding reward could encourage individual conducting classification. And over half of the individuals think the economic return is the most attractive. And the energy to classify and difficulty to classify beats the time and space, became the main barriers of conducting the classification behavior. Due to the type of the questions of the perceived behavior control part, this study did not put it in the regression analysis model. But based on the descriptive analysis results, the perceived behavior control as one of the variable of psychological variables has impact on the resident' classification behavior intention in Beijing.

4. As for the subjective norm, it is interesting that during the questionnaire, a lot of respondents are confused about these two questions especially the question about whether their neighbor' opinion would affect their behavior intention. Since in the urban area especially in the big city like Beijing, neighbors are not connected with each other, normally they not even know each other, which would explain this interesting phenomenon. During the further regression analysis, it as one of the variable of psychological variables has impact on resident' classification behavior executive intention.

5. Most of the people agree that the nature and environment have the same value as human being, and the environmental problem is the main concern in the future development of city, and most of them also think the MSW problem is the problem not only for the government to solve, but the residents should concern and help with it. As for the environmental knowledge, most respondents' answers are right. But in further analysis, we found out that the environmental variables do not have influence on resident' classification behavior intention.

6. The public education and awareness campaign and situational factor has positive influence on the BOI, and the PEAC has more influence on it compared to SV. situational variable, subjective norm and the public education and awareness campaign have positive influence on the BEI, and the influence sequencing as SV, SN, PEAC. Which would answer the main research question: The psychological factors (PEAC, SN) as well as situational variables do have influence on the resident's classification behavior intention in Beijing. As for the environmental factors, they do not have influence on the resident's classification behavior intention in Beijing.

7. Social demographic variables differ in behavioral intention:

A. There is significant influence on BOI and BEI at different gender. According to the difference of mean between BOI and BEI, the female' BOI and BEI are stronger than that of male

B. There is significant influence on BOI and BEI at different ages. The age between 30-50 has highest objective behavior intention and executive intention.

C. Education level has no significant influence on behavior intention.

D. Monthly income has no significant influence on the behavior intention.

E. Different profession has significant influence on BOI while it has no significant influence on BEI. And the retiree, administrative staff has highest objective intention to conduct MSW classification.

F. Living status has significant influence on BOI, while it has no significant influence on BEI. The people who lives alone has rather high objective intention to conduct MSW classification.

5.3 Recommendation

1. Improving the MSW management infrastructure and the supporting construction to ensure the relevant services is important to improve residents' MSW classification behavior intention. Form the research we can see that situational factors have impact in both BOI and BEI, which shows it is important to provide classification bins with clear marks, keep the environment around clean, provide timely collection and transport service. So that the residents could better promote their MSW classification behavior intention.

2. The popularization of the relevant information on the MSW classification should be based on television and newspapers, and be supplemented with tips and posters on the water and electricity bills. Through the analysis of survey data in the choice of preferred channels in the public education and awareness campaign, about 68% of the resident love TV as the channel to understand the government's information of MSW classification, followed by the newspaper. This study suggests that the television and newspapers as the main way of the public education and awareness campaign.

Reference:

Ahsan, A., Alamgir, M., El-Sergany, M. M., Shams, S., et al., 2014. Assessment of municipal solid waste management system in a developing country. Chinese Journal of Engineering, 2014.

Barr, S., 1998. Making Agenda 21 Work: Recycling Use in Oxfordshire. Devon, UK: University of Exeter.

Barr, S., 2007. Factors influencing environmental attitudes and behaviors: A UK case study of household waste management. Environment and Behavior, 39 (4), pp. 435-473.

Bagozzi, R. P., 1992. The self-regulation of attitudes, intentions, and behavior. Social Psychology Quarterly, pp. 178-204.

Beijing Municipal Commission of City Management, 2016. Beijing Municipal Commission of City Management [Online] Available at: http://www.bjmac.gov.cn/hjwsbz/ztzl/shljfl/ljfldsj/201606/t20160624_15520.html

Boldero, J., 1995. The prediction of household recycling of newspapers: The role of attitudes, intentions, and situational factors1. Journal of Applied Social Psychology, 25 (5), pp. 440-462.

Callaghan, P., Moloney, G. and Blair, D. 2012. Contagion in the representational field of water recycling: informing new environment practice through social representation theory. Journal of Community & Applied Social Psychology, 22 (1), pp. 20-37.

Chen X., Geng Y., Fujita T. An overview of municipal solid waste management in China [J]. Waste Management, 2010, 30(4): 716-724.

Cheng, M., 2002. Economic return. Journal of Applied Statistics and Management, 21 (1), pp. 19-24.

Chung, S. and Poon, C. 1999. The attitudes of Guangzhou citizens on waste reduction and environmental issues. Resources, Conservation and Recycling, 25 (1), pp. 35-59.

Cronbach, L. J. and Meehl, P. E. 1955. Construct validity in psychological tests. Psychological Bulletin, 52 (4), pp. 281.

De Young, R., 1988. Exploring the difference between recyclers and non-recyclers: The role of information. Journal of Environmental Systems, 18 (4), pp. 341-351.

De Young, R., 1986. Some psychological aspects of recycling: the structure of conservation-satisfactions. Environment and Behavior, 18 (4), pp. 435-449.

De Young, R., 1990. Recycling as appropriate behavior: a review of survey data from selected recycling education programs in Michigan. Resources, Conservation and Recycling, 3 (4), pp. 253-266.

Deng J, 2003. The beginning of resource utilization ——Analyzing the Solid Waste classification. Construction Science & Technology, (11), pp. 52-53.

Dixon, N. and Langer, U. 2006. Development of a MSW classification system for the evaluation of mechanical properties. Waste Management, 26 (3), pp. 220-232.

Dillman, D. A., Smyth, J. D. and Christian, L. M., 2014. Internet, phone, mail, and mixed-mode surveys: the tailored design method. John Wiley & Sons.

Eilam, E. and Trop, T. 2012. Environmental Attitudes and Environmental Behavior—Which Is the Horse and Which Is the Cart? Sustainability, 4 (9), pp. 2210-2246.

Feng, H. and Lu, M. 2010. The mode of waste recycle system in Germany. Urban Problems, 2 pp. 86-90.

Fishbein, M. and Ajzen, I. 1977. Belief, attitude, intention, and behavior: An introduction to theory and research.

Gamba, R. J. and Oskamp, S. 1994. Factors influencing community residents' participation in commingled curbside recycling programs. Environment and Behavior, 26 (5), pp. 587-612.

Gaski, J. F., 1986. Interrelations among a channel entity's power sources: Impact of the exercise of reward and coercion on expert, referent, and legitimate power sources. *Journal of Marketing Research*, pp. 62-77.

Geller, E. S., Winett, R. A., Everett, P. B. and Winkler, R. C., 1982. Preserving the environment: New strategies for behavior change. Pergamon Press New York.

Ghani, Wan Azlina Wan Ab Karim, Rusli, I. F., Biak, D. R. A. and Idris, A. 2013. An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. Waste Management, 33 (5), pp. 1276-1281.

Gliem, J. A. and Gliem, R. R., eds., 2003. Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales, Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.

Gilg, A. and Barr, S. 2005. Encouraging 'environmental action'by exhortation: evidence from a study in Devon. Journal of Environmental Planning and Management, 48 (4), pp. 593-618.

Given, L. M., 2008. The Sage encyclopedia of qualitative research methods. Sage Publications.

Gu, B., Wang, H., Chen, Z. et al. (2015). Characterization, quantification and management of household solid waste: A case study in China. Resources, Conservation and Recycling, 98, pp.67-75.

Guagnano, G. A., Stern, P. C. and Dietz, T. 1995. Influences on attitude-behavior relationships a natural experiment with curbside recycling. Environment and Behavior, 27 (5), pp. 699-718.

Guerra, S., 1992. Markets for recyclables: The challenge for local government recycling programs. The Municipal Yearbook.Washington, DC: ICMA. (59), pp. 16-26.

Ghani, Wan Azlina Wan Ab Karim, Rusli, I. F., Biak, D. R. A. and Idris, A. 2013. An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste. Waste Management, 33 (5), pp. 1276-1281.

Hamer, G., 2003. Solid waste treatment and disposal: effects on public health and environmental safety. Biotechnology Advances, 22 (1), pp. 71-79.

Hernandez, O. and Monroe, M. C. 2000. Thinking about behavior. Environmental Education and Communication for a Sustainable World: Handbook for International Practitioners, pp. 7-15.

Hines, J. M., Hungerford, H. R. and Tomera, A. N. 1987. Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. The Journal of Environmental Education, 18 (2), pp. 1-8.

Howenstine, E., 1993. Market segmentation for recycling. Environment and Behavior, 25 (1), pp. 86-102.

Huang K，Liu K，Wang H. 2002 The MSW disposal and management solution in Beijing. Journal of Beijing University of Agriculture. 17（1），pp. 32-34

Ji, p. and Wang, j. 2002. Investigative Analysis on Environmental Awareness of Partial Area Residents in Shanghai. Shanghai Environmental Sciences, 21 (6), pp. 383-385.

Kaplan, S., 1991. Beyond rationality: Clarity-based decision making. Environment, Cognition, and Action: An Integrative Multidisciplinary Approach, pp. 171-190.

Kaiser, H. F., 1974. An index of factorial simplicity. Psychometrika, 39 (1), pp. 31-36.

Kang, W., Duan, W. and Chu, Z. 2011. The comparation of the MSW charging method between cities in Chinese and America. Academic Exchange, (2), pp. 115-119

Kollmuss, A. and Agyeman, J. 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research, 8 (3), pp. 239-260.

Lansana, F. M., 1992. Distinguishing potential recyclers from nonrecyclers: A basis for developing recycling strategies. The Journal of Environmental Education, 23 (2), pp. 16-23.

Lai, K., 2004. Service capability and performance of logistics service providers. *Transportation Research Part E: Logistics and Transportation Review*, 40 (5), pp. 385-399.

Li, D., Wang, J., Zhang,Fenge,Chen,Yaocai and Cai, Y. 2004. On the influence factor of selecting Urban domestic waste treatment model. Environmental Sanitation Engineering, 12 (4), pp. 223-226.

Li, G.Y. (2015). Solid Waste Treatment and Resource Utilization Beijing China Environmental Science Press, pp.14-15.

Li, Y., 2004. Analyzing the MSW management in China. Journal of Shaanxi Normal University, 32 (2), pp. 112-116.

Liska, A. E., 1984. A critical examination of the causal structure of the Fishbein/Ajzen attitude-behavior model. Social Psychology Quarterly, pp. 61-74.

Linzner, R. and Salhofer, S. (2014). Municipal solid waste recycling and the significance of informal sector in urban China. Waste Management & Research, 32(9), pp.896-907.

Liu, S., 2007. The Waste Management in Switzerland. Resource Recycling, (11), pp. 46-47.

Liu, T., Wu, Y., Tian, X. and Gong, Y. (2015). Urban household solid waste generation and collection in Beijing, China. Resources, Conservation and Recycling, 104, pp.31-37.

Liu, M., 2011. The Experience of Refuse Sorting in Developed Countries and the Enlightenment to China. Journal of Southeast University for Nationalities, 32 (10), pp. 98-101.

Lou, M. and Gu, Q. 2016. Study on Factors of Resident's Participation in Garbage Classification Based on Factor Analysis. Value engineering, 35 (3), pp. 12-14.

Lu, j. and Liu, l. 2006. On the essence of environment consciousness and its effect. Ecological Economy, 2006 (8), pp. 138-141.

Ma, S. and Ma, J. 2007. Present situation and countermeasure of Municipal Solid Waste Sorting collection in China. Environmental Sanitation Engineering, 15 (1), pp. 12-14.

Macey, S. M. and Brown, M. A. 1983. Residential energy conservation: The role of past experience in repetitive household behavior. Environment and Behavior, 15 (2), pp. 123-141.

Mao, G., Zhang, Y., Wen, W. and He, D. 2010. The MSW disposal situation and the feasibility of incineration. Urban Studies, (9), pp. I0012-I0016. [Accessed 6/5/2017 9:26:02 AM].

Pakpour, A. H., Zeidi, I. M., Emamjomeh, M. M., Asefzadeh, S., et al., 2014. Household waste behaviours among a community sample in Iran: an application of the theory of planned behaviour. Waste Management, 34 (6), pp. 980-986.

Qu X; Zhang L, Yang L and Li Z 2009. The municipal solid waste classification system in Beijing: problem diagnosis. Environmental Pollution & Control, 31(5), pp.83-86.

Rathi, S. (2006). Alternative approaches for better municipal solid waste management in Mumbai, India. Waste Management, 26(10), pp.1192-1200.

Robertson, R., 1982. Preserving the Environment: New Strategies for Behavior Change. E. Scott Geller, Richard A. Winett, and Peter B. Everett. Journal of Leisure Research, 14 (4), pp. 365.

Rong, T. and Ren, R. 2015. Thinking about the MSW management in China's magacity- A case of Beijing. Macroeconomics, (9), pp. 144-150.

Schahn, J. and Holzer, E. 1990. Studies of individual environmental concern: The role of knowledge, gender, and background variables. Environment and Behavior, 22 (6), pp. 767-786.

Schultz, P.W. and Zeleny, L.C. (2000). Promoting environmentalism. The Journal of Social Issues, 56, 443-457.

Shen, H., 2004. Understanding of psychoanalysis. Beijing: SDX Joint Publishing Company

Song, L. J., Liu, B. Y., Xia, T. (2013). Residents' cognition and its impact factors of garbage sorting in Beijing. Journal of Beijing Forestry University. 12(3), pp.64-68

Stern, P. C., Dietz, T. and Guagnano, G. A. 1995. The new ecological paradigm in social-psychological context. Environment and Behavior, 27 (6), pp. 723-743.

Stern, P. C., 2000. Towards a Coherent Theory of Environmentally Significant Behavior, Journal of Social Issues, 56.

Steuer, B., Ramusch, R., Part, F. and Salhofer, S. (2017). Analysis of the value chain and network structure of informal waste recycling in Beijing, China. Resources, Conservation and Recycling, 117, pp.137-150.

Straub, D. W., 1989. Validating instruments in MIS research. MIS Quarterly, pp. 147-169.

Sun, L. and Wang, P. 2005. state of the art in reverse logistic researches. China Mechanical Engineering, 16 (10), pp. 928-934.

Sun, G., 2016. China Energy. Available at: http://www.cnenergy.org/hb/201608/t20160829_368926.html

Shen, Y., 2011.
The garbage classification situatiao and suggestion in China. North Environmental Magazine, 8 pp. 13-14.

Steg, L., Bolderdijk, J. W., Keizer, K. and Perlaviciute, G. 2014. An integrated framework for encouraging pro-environmental behaviour: The role of values, situational factors and goals. Journal of Environmental Psychology, 38 pp. 104-115.

Stern, P. C., 2000. New environmental theories: toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 56 (3), pp. 407-424.

Tai, J., Zhang, W., Che, Y. and Feng, D. (2011). Municipal solid waste source-separated collection in China: A comparative analysis. Waste Management, 31(8), pp.1673-1682.

Tang, j., 2000. Analyzing the environment attitude and behavior of Beijing residents in sociological angle Urban Problems, 5 pp. 23-26.

Tonglet,M., Pillips,P.S.and Read,A.D.2004.Using the Theory of Planned Behavior to investigate the determinants of recycling behavior: a case study from Brixworth,UK. Resources,Conservation and Recycling,41(3),pp.191-214. Available at: http:// swww.sciencedirecct.com/science/article/pii/S0921344903001629[Accessed 5/10/2016 4:26:58 PM]

The central people's government of the people's republic of China, 2017. The central people's government of the people's republic of China. [Online] Available at: http://www.gov.cn/flfg/index.htm

Tyson, K. S., Rymes, M. and Hammond, E. 1996. Future potential for MSW energy development. Biomass and Bioenergy, 10 (2-3), pp. 111-124.

Tai, J., Zhang, W., Che, Y. and Feng, D. 2011. Municipal solid waste source-separated collection in China: A comparative analysis. Waste Management, 31 (8), pp. 1673-1682.

Truelove, H. B., Carrico, A. R., Weber, E. U., Raimi, K. T., et al., 2014. Positive and negative spillover of pro-environmental behavior: An integrative review and theoretical framework. Global Environmental Change, 29 pp. 127-138.

U.S. Environmental Protection Agency, 2016. Municipal Solid Waste. Available at: https://archive.epa.gov/epawaste/nonhaz/municipal/web/html/

Vining, J. and Ebreo, A. 1990. What makes a recycler? A comparison of recyclers and nonrecyclers. Environment and Behavior, 22 (1), pp. 55-73.

Wang, H. and Wang, C. (2013). Municipal solid waste management in Beijing: characteristics and challenges. Waste Management & Research, 31(1), pp.67-72.

Wang, m., 1999. Analyzing the stucture of environment awareness. Journal of Beijing Normal University (Natural Science), 35 (3), pp. 423-426.

Wellar, B. S., 1981. National and Regional Economic Development Strategies: Perspectives on Canada's Problems and Prospects: Colloquium Proceedings. University of Ottawa Press.

Wen, X., Luo, Q., Hu, H. (2013). Comparison research on waste classification between China and the EU, Japan, and the USA. Journal of Material Cycles and Waste Management, 16(2), pp.321-334.

Webster, F. E., 1975. Determining the characteristics of the socially conscious consumer. Journal of Consumer Research, 2 (3), pp. 188-196.

Xu, j. and Huang, X. 2005. Analysing the recycling Utilization of MSW in Shanghai. Energy Research and Information, 21 (3), pp. 125-131.

Ying, J., 2003. Comparing and Analyzing the MSW classification between China and Japan. Journal of Lishui Teachers College, 25 (5), pp. 73-76.

Zhang, H., Wen, Z., 2014. The consumption and recycling collection system of PET bottles: a case study of Beijing, China. Waste Manage. Res. 34 (6), 687–698

Zhao, Y., Guo, Q. and Yi, t. 2008. Analysing the MSW classification and the development of cycle economy. Social Scientist, (4), pp. 52-55.

Zhou Y, Xiong H. Estimation of economic value of recyclables collected by waste pickers and collectors and suggestions for their management in Beijing [C] // Proceedings of the International Conference on E-Business and E-Government, Guangzhou, China. 2010: 761-764.

Zsóka, Á., Szerényi, Z. M., Széchy, A. and Kocsis, T. 2013. Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. Journal of Cleaner Production, 48 pp. 126-138.

Annex: Questionnaire

I am a student of the Erasmus University, Rotterdam. I am currently conducting an academic research related to MSW classification behavior in Beijing. Beijing has been conducting MSW classification policy for over20 years, the key of which is residents' active participation. Therefore, we need your opinion regarding the MSW classification in Beijing. Data and information that we collect will be kept confidential and only be used for academic purposes. Thank you for your help and time given to complete this questionnaire.

A: Social demographic:

Q1.1 Sex：（1）Male （2）Female

Q1.2 Age：（1）（2）18-30 （3）31-50 （4）50-65 （5）Above 65 years old

Q1.3 Educational level：（1）Below high school (2) technical secondary school（3）junior college (4)Bachelor degree（5）Above bachelor degree

Q1.4 Monthly income：（1）Below 5000¥（2）5000-8000¥（3）8000-12000¥ （4）Above 12000¥

Q1.5 Profession：（1）Housewife （2）Retiree （3）Normal worker （4）Administrative staff (5)Technical staff (6) Government stuff （7）Entrepreneur （8）Government officer （9）Student (10) The other

Q1.6 Living status: （1）Living alone (2) Living with others (3) Dormitory

B: Behavioral intention

Please ✓in the answer which is suitable for your behavior intention：1. Strongly Unwilling to do 2. Unwilling to do it 3. Stand in the middle 4. Willing to do 5. Strongly willing to do

Q2.1 Separately collecting plastic products	1	2	3	4	5
Q2.2 Separately collecting paper products	1	2	3	4	5
Q2.3 Separately collecting metal products	1	2	3	4	5
Q2.4 Taking time to do MSW classification	1	2	3	4	5
Q2.5 Taking energy to do MSW classification	1	2	3	4	5
Q2.6 Separating the MSW as kitchen waste/ the other	1	2	3	4	5

Q2.7 If you classify, since when? 1 year ago, 2years, 3, 4, 5 or more

C: Psychological variables：

Public education and awareness campaign

Please ✓in the answer which is suitable：1. Not agree at all 2. Not agree 3. Stand in the middle 4. Agree 5. Strongly agree

Q2.8 The public education and propaganda could make individual concern about MSW problem

1 2 3 4 5

Q2.9 The public education and propaganda could make individual know how to classify the MSW

1 2 3 4 5

Q2.10 The continuous public education and propaganda could make individual keep classifying the MSW.

1 2 3 4 5

Q2.11 Please choose your favorite way to accept public education and propaganda

（1） TV（2）Newspaper（3）Radio（4）Poster（5）Booklet（6）Leaflet（7）Community notice board（8）Propaganda organized by work unit（9）Internet（10）The other（noted）

Q2.12 Has there been any education/awareness campaign that really made you understand the problem and classify your garbage

yes no What is the name, and why? _____

Perceived Behavior control

Q2.13 The corresponding reward could encourage individual conducting classification

1 2 3 4 5

A. The type of award you would like to get: (1) Honorary citizen; (2) Environmental citizen; (3)Economic return; (4) the other (please note) 1 2 3 4

【 _____ 】

Q2.14 If you do not classify which is the main factor for not doing this?

a) Classification is too difficult to do
b) Classification takes too much time
c) Classification takes too much energy
d) Classification takes too much space
e) All of the above

Q2.15 Please rank the barriers that stand in the classification process based on the difficulties. What

is the most important barriers, give a order. One is the most important barrier, and five is the least important barrier.

A Too difficult to do B. Take too much time C. Take too much energy D. Take too much space E All of the above

Subjective Norm

Q2.16 My family would think I should classify my waste at home 1 2 3 4 5

Q2.17 My neighbors would think I should participate in MSW classification at home.

1 2 3 4 5

C．Situational factors：

Please ✓in the answer which is suitable：1. Not agree at all 2. Not agree 3. Stand in the middle 4. Agree 5. Strongly agree

Q3.1 The distance between the waste bin and your home is important for individual to decide whether to classify the waste or not 1 2 3 4 5

Q3.2 The clean surrounding of the waste bin is important for individual to decide whether to classify the waste or not 1 2 3 4 5

Q3.3 The regular (weekly/ biweekly) frequent waste classified collection and transport is important for individual to decide whether to classify the waste or not 1 2 3 4 5

Q3.4 The clear mark of the waste bin is important for individual to decide whether to classify the waste or not 1 2 3 4 5

D. Environmental factors:

Environment value：

Please ✓in the answer which is suitable：1. Not agree at all 2. Not agree 3. Stand in the middle 4. Agree 5. Strongly agree

Q4.1 The nature and environment has the same value as human being, we need to protect and respect the nature and environment. 1 2 3 4 5

Q4.2 The environment problem is the main concern in the future development of city

1 2 3 4 5

Q4.3 MSW problem is the problem that residents should concern and help to solve

1 2 3 4 5

Q4.4 MSW problem is the problem that is only for the government to solve 1 2 3 4 5

Q4.5 Please give the reason why you think that way

【_____ 】

Environmental knowledge：

Please ✓in the answer which is suitable： 1. Yes 2. No

Q4.6 Do you think plastic should be classified	1	2
Q4.7 Do you think paper should be classified	1	2
Q4.8 Do you think mental should be classified	1	2
Q4.9 Do you think bottles should be classified	1	2
Q4.10 Do you think MSW classification is an important precondition of the whole MSW disposal system	1	2