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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of *MSc Sustainable Urbanism* at University College London:

I declare that this dissertation is entirely my own work and that ideas, data, and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

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Declaration

The reason why this dissertation has a high similarity rate in the Introduction and Literature Review parts lies in the reuse of sentences from the dissertation proposal or the dissertation draft I submitted before, which has been approved by Dr. Moore, Susan and Dr. Son, Jung Won.

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Abstract

Recent decades have witnessed a sharp increase in the amount of household waste generation worldwide, which inevitably brings about serious environmental problems and exposes sustainable urbanism to overwhelming challenges. China, as the most rapidly industrialised and populous country, is undeniably the largest household waste producer, generating about 200 million tonnes of household waste per year. Since the 21st century, China has been promoting to separate and collect household waste at source, however, household waste source-separated collection programmes in China are still in the initial stage and there is little literature on household waste management in the research context of China. To fill this gap in literature and to provide pragmatic implications for policymakers in Nanjing, a 20-person pilot interview and a self-report questionnaire survey with a sample size of 449 are conducted in Gulou District, Nanjing, adopting the TPB+ model I construct. The results of data analysis show that the 10 policy-related factors in the TPB+ model all have significant impacts on Nanjing residents' household waste source-separated collection behaviour. Among them, environmental knowledge and awareness towards environmental problems, social/community atmosphere, publicity, policy clarity, accessibility to facilities serve as the five best predictors, suggesting that attitudes, subjective norms, perceived behavioural control and moral norms are significant determinants of Nanjing residents' household waste source-separated collection behaviour. By contrast, the predictive validity of situational factors is relatively mild. Based on the findings, this dissertation further provides several relevant policy implications for the Nanjing government.

Keywords: Theory of Planned Behaviour (TPB), municipal solid waste (MSW), household waste, source-separated collection

1. Introduction

With rapid development of economy, continuous growth in population and acceleration of urbanisation process, recent decades have witnessed a sharp increase in the amount of municipal solid waste (MSW) generation worldwide. In accordance with a forecast based on global data, there is a projected trend of annual global MSW generation increasing by 70 percent from 2 billion tonnes to 3.4 billion tonnes spanning from 2016 to 2050 (Word Band, 2018). China accounts for 15% of this total amount, ranking 1st among countries around the world (Tiseo, 2020).

Household waste makes up a large proportion (over 60%) of MSW, however, approximately 90% of household waste that could have been recycled is mixed and further misplaced as waste for incineration or landfill (Gu et al., 2015; Mancini et al., 2007); over two billion people have little access to collect and separate household waste whereas over three billion people are incapable of disposing of household waste (UN-Habitat, 2020). That is to say, the vast majority of recyclable natural resources used for residents' daily consumption are discarded without any form of recycling. This one-way linear pattern of production and consumption will inevitably result in not only a loss of resources and energy but also soil, air and water pollution (Lee et al., 2018; Regadio et al., 2015; Shapiro-Bengtson et al., 2020).

Household waste management has also been exposed to new challenges by the COVID-19 pandemic. On the one hand, the panic brought about by the COVID-19 virus, together with sudden lockdown, led to the intensification of fear-buying behaviour (Sarkodie and Owusu, 2020), which put pressure on the disposal of perishable household waste such as food leftovers and unwanted goods, millions of tonnes of extra household waste being generated. On the other hand, the amount of medical household waste such as masks, sanitizers, gloves and so on has soared due to the stay-at-home policy and COVID-19 prevention measures, with global sales of masks alone increasing by 166 billion dollars (UN, 2020). Therefore, how to properly dispose

of household medical waste to both curb the secondary transmission of COVID-19 and have recyclable components recycled as much as possible should be put on the agenda by all countries across the world (UNEP, 2020; WHO, 2020).

China, the most populous and rapidly industrialised country in the world, indisputably serves as the largest household waste generator, with approximately 200 million tonnes of household waste produced annually (China Association of Urban Environmental sanitation, 2021). In the meanwhile, China also possesses the most stringent policies for the COVID-19 pandemic prevention and control among all countries in the world. These two factors face China's household waste management system with unprecedented challenges jointly.

Despite the fact that China has developed a range of techniques (e.g., soil replacement, washing strategies, catalytic decomposition of waste gas) to remediate environmental pollution from landfill and incineration, these techniques are after all merely post-pollution mitigation methods that cannot thoroughly eliminate the negative influences caused by improper disposal of household waste. In contrast, by implementing household waste source-separated collection, urban planners can reduce the amount of household waste for the final disposal to a great extent, thus effectively saving money and natural resources, alleviating environmental pollution at source and realising circular economy (Gundupalli et al., 2017).

Since the 1970s, many industrialised countries (e.g., Japan, Sweden, Germany, Singapore) have started to put household waste source-separated collection into practice and achieved success in sustainable household waste management (Knickmeyer, 2020). Starting from the 21st century, China has been promoting to separate and collect household waste at source, but still in its initial stage, lagging far behind those developed countries mentioned above. In 2000, Beijing, Nanjing, Shanghai, Hangzhou, Guangzhou, Shenzhen, Xiamen and Guilin were chosen as first

cities to initiate pilot projects on household waste source-separated collection (Ministry of Housing and Urban-Rural Development, 2000). In 2017, the *Household Waste Separation System Implementation Plan* was issued, requiring household waste to be separated and collected at source in 46 cities, Nanjing included (General Office of the State Council, 2017).

Successful implementation of household waste source-separated collection requires joint efforts of all stakeholders: national governments are responsible for developing national household waste management strategies; municipalities are obliged to facilitate household waste collection and disposal; manufacturers need to maximise the proportion of recyclable materials used in manufacturing processes and make them easier to sort; and residents are required to separate the household waste they produced. However, public engagement is not as much as expected in the previous projects carried out in China (Tai et al., 2011), which undoubtedly affected the efficiency of household waste management. How to enhance public participation when implementing household waste source-separated collection projects at the local level in China comes to be a critical problem to be solved for policymakers.

Taking Nanjing residents who live in Gulou District as research sample, this paper introduces the Theory of Planned Behaviour (TPB) (Ajzen, 1991), a social psychological theory widely applied by scholars to explain various environmentally friendly behaviour of individuals, to understand policy-related factors (factors determined by policy formulation) which have significant impacts on Nanjing residents' household waste source-separated collection behaviour, and to further provide pragmatic implications for policymakers. This study answers the following questions:

- (1) How do Nanjing residents separate household waste under the current policy environment?
- (2) What policy-related factors have significant impacts on Nanjing residents'

household waste source-separated collection behaviour?

(3) In which aspects should Nanjing's household waste source-separated collection policies be improved?

This dissertation begins by defining municipal solid waste and household waste. Then I make a brief introduction to household waste management system and household waste source-separated collection, drawing parallel between the household waste source-separated collection policies of Kalmar, Sweden, where household waste management system tends to be mature, and those of Nanjing, China, where household waste source-separated collection is still in its initial stage. Next, I review the TPB model along with literature that applies this model to study residents' household waste source-separated collection behaviour, and construct a TPB+ model based on previous research, proposing a series of policy-related factors that may influence residents' household waste source-separated collection intention and behaviour. In regards of methodology, semi-structured interviews with 20 people and a 449-person questionnaire survey are conducted in Gulou District to support my TPB+ model and to identify policy-related factors which Nanjing's household waste source-separated collection policies are currently deficient in. After that, I make concrete suggestions for Nanjing's household waste source-separated collection policies. In the final section, future research directions, contributions and limitations of this dissertation are discussed.

2. Literature Review

2.1 Municipal solid waste and household waste

Municipal solid waste (MSW) refers to solid waste generated in the daily life of urban residents or in the activities that provide services for them, including household, commercial, institutional, construction and demolition waste (Hoorweg et al., 2015). Figure 1 shows the amount of MSW generation in China from 2011 to 2020, along with its year-on-year growth rate. Spanning from 2011 to 2020, the amount of MSW generation in China grows steadily from 163.95 million tonnes to 235.12 million tonnes, with an average year-on-year growth rate of 5%, much higher than the average global growth rate of 2% (World Bank, 2018). Despite the fact that 2020 witnessed a temporary decline because of the consumption downgrading brought about by the COVID-19 pandemic, the amount of MSW generation in China takes on an overall upward trend. Within ten years, China's annual amount of MSW generation has almost doubled.

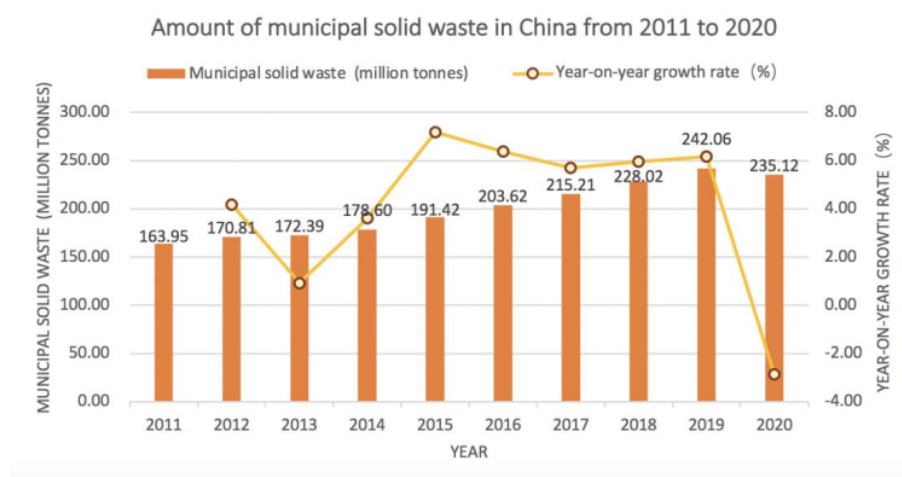


Figure 1. Amount of municipal solid waste in China from 2011 to 2020 (Source: Ministry of Housing and Urban-Rural Development of the People's Republic of China, 2021)

Household waste, also known as residential or domestic waste, accounts for over 60%

of MSW, and is defined as any type of MSW generated under household environment (Glossary of Environment Statistics, 1997). Although the classification standards vary from country to country, household waste generally consists of recyclable, food waste (wet waste), residual waste (dry waste) and hazardous waste. The definition and components of each category are shown in Table 1.

Table 1. The definition and components of each household waste category (Source: Nanjing City Administration Bureau, 2020a)

Category	Definition	Components
Recyclable	Household waste suitable for reusing or recycling	Waste paper, plastic, glass, metal, fabric, etc.
Food waste	Perishable household waste, also known as wet waste	Vegetable leaves, melon skins and cores, leftovers, animal offal, etc.
Residual waste	Household waste with little harm and recycle value, also known as dry waste	Tile ceramics, muck, toilet waste paper, porcelain fragments, animal excrement, disposable articles, etc.
Hazardous waste	Household waste that may cause direct or potential harm to human health or environment	Rechargeable batteries, button batteries, lamps, discarded drugs, pesticides (containers), mercury products, etc.

Household waste produced in China by type in 2020

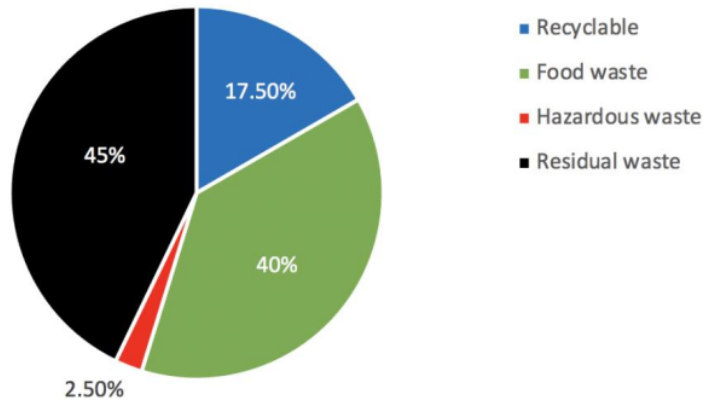


Figure 2. Household waste produced in China by type in 2020 (Source: FORWARD Business Information Co., Ltd., 2022)

As shown in Figure 2, residual waste accounts for the biggest share (45%) of household waste produced in China in 2020, followed by food waste and recyclable which represent 40% and 17.5% respectively. The proportion of hazardous waste is the least, merely 2.5%.

Same as the amount of MSW generation, household waste production in China has also risen steadily in recent years. It is noted that even in 2020, when the amount of MSW generation in China shows a declining trend, household waste production in China is still increasing as a result of the stay-at-home policy and COVID-19 prevention measures (FORWARD Business Information Co., Ltd., 2022; Sarkodie and Owusu, 2020). However, approximately 90% of household waste that could have been recycled is mixed and further misplaced as waste for incineration or landfill (Gu et al., 2015; Mancini et al., 2007). Considering the growing trend of the huge amount of annual household waste generation in China and its extremely low recycling rate, how to separate and collect household waste at source in China is an issue worthy of study.

2.2 Household waste management and household waste source-separated collection

Household waste management is a process involving manufacturers, residents, environmental protection departments and other stakeholders, with an overall goal of reutilising recyclable household waste and alleviating environmental pollution caused by residues (Tolaymat et al., 2015). A preferred household waste management system requires an integrated consideration of environmental impacts, human health, urban development and stakeholders (Manfredi et al., 2011). In other words, being guided by an environmentally friendly vision, being beneficial to human health, being in coordination with urban development, along with active participation of all stakeholders, are the four key elements of an efficient and sustainable household waste

management system.

The skyrocketing amount of household waste generated annually and the increasing variety of materials in the waste stream make household waste management overwhelmingly challenging for countries around the world. To cope with the increasing trend in the amount of household waste and in the types of materials contained, and to set norms for household waste management, the waste management hierarchy has been developed by the Environmental Protection Agency, ranking household waste treatment activities in terms of their environmental impacts (Gharfalkar et al., 2015). Figure 3 shows the waste management hierarchy. Following this household waste management philosophy, countries around the world are encouraged to set priorities for household waste management in a descending order of reuse, composting or recycling, energy recovery, with landfill and incineration being the least favourable options.

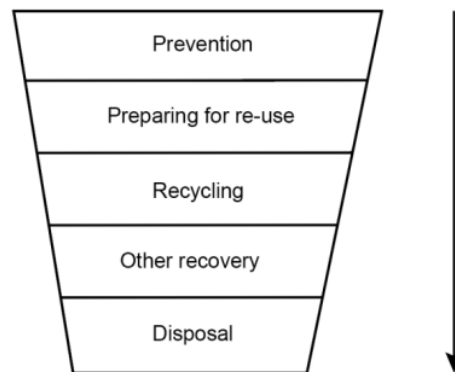


Figure 3. The waste management hierarchy (Source: European Waste Framework Directive, 2008)

In line with the waste management hierarchy, a qualified household waste management system should include at least five steps: source-separated collection, storage, transport and transfer, processing and conversion, disposal (Tchobanoglous

and Kreith, 2002), and each of these steps requires active participation of stakeholders involved to ensure its successful implementation. The explanation and stakeholders of each step are shown in Table 2, in addition to the stakeholders mentioned in the table, planning agencies, research institutions, financial institutions, NGOs and environmental regulators also have a supportive role to play throughout the whole process from design to final implementation of household waste management systems (Joseph, 2006).

Table 2. The explanation and stakeholders of each household waste management step (Source: Tchobanoglous and Kreith, 2002; Zhuang et al., 2008)

Step	Explanation	Stakeholders
Source-separated collection	Separate various components in the household waste stream, put them into storage containers and move containers loaded to collection points	Residents Communities Recyclers/Collectors Storage container providers (e.g., municipalities, real estate companies)
Storage	Store different types of components in the household waste stream separately both under household environment and at collection points	Residents Communities Storage container provider (e.g., municipalities, real estate companies)
Transfer and transport	This step involves two main processes, the first is to transfer separated household waste from collection points to transport equipment, while the second is to transport it to processing or disposal sites	Waste management departments Waste transport companies
Processing and conversion	Process household waste for recycling, composting or energy recovery at treatment plants, combustion facilities, material recovery facilities and so on	Waste management departments Waste processing companies
Disposal	Conduct biosafety treatment to residual household waste, such as incineration and landfill	Waste management departments Waste disposal companies

Household waste source-separated collection, the first step of household waste management system, determines the quantity and quality of household waste that flows into subsequent processes, as well as the efficiency of the entire management chain. Compared with mixed collection of household waste, which takes household waste separation as the responsibility of downstream stakeholders, household waste source-separated collection can effectively improve the efficiency of subsequent processes and reduce the possibility of secondary pollution by asking residents to separate and preliminarily dispose of household waste at source.

Residents, as the key stakeholders and practitioners of household waste source-separated collection, play a crucial role in separating and preliminarily disposing of household waste at source. Without active participation of residents in household waste source-separated collection, the efficiency of household waste management system will be greatly influenced, resulting in serious ecological, urban and health problems (Antanasijević et al., 2013). And hence, how to increase residents' participation rate and thus improve the efficiency of the whole management chain becomes a big challenge for policymakers of all nations.

Generally, residents' household waste source-separated collection behaviour can be motivated by four types of measures: economic measures (e.g., fines, earnings, taxes), administrative measures (e.g., legislation, supervision, policies), informational measures (e.g., awareness training, publicity, prompts) and physical measures (e.g., placement of recycling facilities) (Lindén and Carlsson-Kanyama, 2003). In practice, a combination of these measures should be applied by policymakers to enhance residents' participation rate in household waste source-separated collection (Bernstad, 2014; Martin et al., 2006).

For previous household waste source-separated collection projects carried out in

China, residents' participation is not as much as expected. In contrast, a self-reported survey conducted by the European Commission shows that household waste source-separated collection programmes in Sweden possess a relatively high residents' participation rate of 86% (EC, 2014). To set benchmark for policymakers in Nanjing, I am now going to draw parallel between the household waste source-separated collection policies of Kalmar, Sweden, where household waste management system tends to be mature, and those of Nanjing, China, where household waste source-separated collection is still in its initial stage.

2.3 A comparative discussion of household waste source-separated collection programmes in Kalmar, Sweden and Nanjing, China

Starting from the 21st century, China has been promoting to separate and collect household waste at source. Nanjing was selected as one of the first 8 cities in China to pilot household waste source-separated collection in 2000, however, the results were poor because of the low residents' participation rate (Ministry of Housing and Urban-Rural Development, 2000). In 2011, the Nanjing government started to promote household waste source-separated collection again and issued the *Measures for the Management of Household Waste Separation in Nanjing*, encouraging Nanjing residents to separate household waste into three categories: recyclable, hazardous waste and residual waste (Nanjing Government, 2013). In 2017, Nanjing was listed as one of the 46 cities nationwide to implement mandatory household waste source-separated collection according to the *Household Waste Separation System Implementation Plan* (General Office of the State Council, 2017). In response to national policy, the *Nanjing Household Waste Management Regulations* was established in November 2020, requiring household waste to be more adequately separated into four categories (recyclable, food waste, residual waste and hazardous waste) instead of three (Nanjing City Administration Bureau, 2020b).

The *Nanjing Household Waste Management Regulations* stipulates the responsibilities

of stakeholders at all levels: the Nanjing City Administration Bureau and district governments are responsible for household waste management in their jurisdictions, including household waste collection, transportation, processing and disposal; sub-district offices are obliged to handle daily affairs and mobilise residents to participate in household waste source-separated collection; and residents are required to separate household waste and deliver it to designated collection points. Those residents who do not abide by the regulations will be warned and imposed a fine of 200 CNY (Nanjing City Administration Bureau, 2020b).

Committed to the construction of household waste collection system, the *Nanjing Household Waste Management Regulations* makes the following provisions: indoor places such as residential areas, restaurants and hotels shall be equipped with storage containers for recyclable, food waste, residual waste and hazardous waste, while outdoor public places such as pavements, parks and public squares shall be set up with storage containers for recyclable and other waste (Nanjing City Administration Bureau, 2020b).

In addition to stipulating the responsibilities of stakeholders at all levels and constructing household waste collection system, the Nanjing government has also formulated a range of supporting policies in the *Nanjing Household Waste Management Regulations* to ensure the smooth implementation of household waste source-separated collection: incorporating household waste separation knowledge into students' daily education; publicising policies on household waste source-separated collection through newspapers, radio, television and internet; promoting the development and application of new technologies to realise intellectualised management of household waste; and establishing information disclosure system to regularly disclose environmental information and outcomes of household waste source-separated collection to the public (Nanjing City Administration Bureau, 2020b).

By drawing parallel between the household waste source-separated collection policies of Kalmar, Sweden (see Appendix C) and those of Nanjing, China, it can be found that there are still some deficiencies in Nanjing's household waste management system. To begin with, compared with Kalmar's separation of household waste into eight categories, Nanjing's household waste separation is not detailed enough, which makes it necessary to further separate household waste in subsequent processes, thus influencing the efficiency of the whole management chain. Moreover, consisting merely of indoor and outdoor storage containers in certain places, Nanjing's household waste collection system is not as complete as that of Kalmar, which is made up of recycle bins around the residences, kerbside collection, drop-off stations and groceries with buyback machines. This makes it inconvenient for Nanjing residents to deliver separated household waste fractions to collection points. Besides, the responsibilities of manufacturers are not stipulated in the *Nanjing Household Waste Management Regulations*, leading to a lack of manufacturers' participation. Last but not least, with little application of economic measures, the Nanjing government may not be able to incentivise residents' household waste source-separated collection behaviour in an all-round way.

2.4 Theory of Planned Behaviour

Despite adopting similar household waste source-separated collection policies, waste management departments from different countries or even different regions perform dissimilarly due to the variance in local residents' behaviour patterns brought about by social, economic and cultural differences. Therefore, behaviour patterns of local residents must be fully considered when formulating household waste source-separated collection policies at the local level (Ordoñez et al., 2015). Instead of imitating Kalmar's policies or adopting the four types of measures mentioned above mechanically, policymakers in Nanjing should formulate household waste source-separated collection policies based on in-depth analysis of policy-related factors that have significant impacts on Nanjing residents' household waste source-separated

collection behaviour.

In recent years, scholars in the field of waste management have introduced two types of theoretical frameworks (value-norm-based models and intention-based models) from the field of social psychology to understand and predict residents' household waste source-separated collection behaviour, such as the Norm-Activation-Theory (NAT) model, the Value-Belief-Norm (VBN) model, the Theory of Planned Behaviour (TPB) model and so on. Among them, the TPB model is the most widely applied one in the field of waste management for the reason that it has been proved effective in many other domains (Nisbet and Gick, 2008). By introducing the TPB model into the field of waste management, scholars have opened up a brand-new research direction at the intersection of these two fields and found fruitful outcomes.

The TPB model provides a theoretical framework for researchers to methodically identify factors that have influences on the behaviour being studied (Ajzen, 1991). It evolves from the Theory of Reasoned Action (TRA) developed earlier by Ajzen and Fishbein (1980), which assumes individuals' behaviour is mostly under volitional control, that is, individuals can decide whether to perform certain behaviour and give reasons for their choices. According to the TRA, behavioural intention, which directly leads to the performance of behaviour, is influenced both by attitudes towards behaviour and subjective norms. Liska (1984) argues that the performance of behaviour can also be constrained by the lack of resources, skills and opportunities, extending the TRA to the TPB by including a third variable, perceived behavioural control.

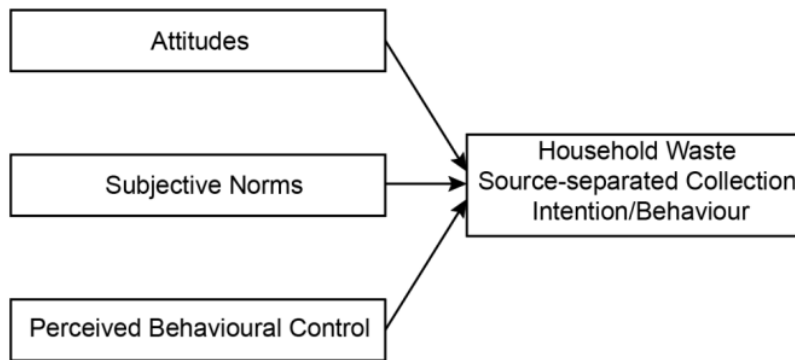


Figure 4. The conventional TPB framework (Source: Ajzen, 1991)

As illustrated by Figure 4, attitudes, subjective norms and perceived behavioural control jointly shape individuals' behavioural intention and behaviour. Attitudes towards behaviour describe the degree to which individuals' perception and evaluation of the behaviour in question are favourable or unfavourable (Ajzen and Fishbein, 1980). It has been consistently found by scholars that attitudes can significantly predict residents' household waste source-separated collection intention and behaviour, those who believe separating and collecting household waste at source is beneficial to environmental protection tend to participate more actively in household waste source-separated collection programmes (Hu et al., 2021; Ma et al., 2018; Zhang et al., 2015). Subjective norms refer to perceived pressure stemming from society and surrounding groups or persons (e.g., colleagues, neighbours, friends, family members, communities) that determines whether certain behaviour will be practiced by individuals or not (Ajzen and Fishbein, 1980). People prefer to draw inferences by observing referent others' behaviour when unsure of whether to perform certain behaviour, as a result of which, individuals' household waste source-separated collection intention and behaviour are largely influenced by subjective norms. To be more specific, residents will be more encouraged to separate and preliminarily dispose of household waste at source when witnessing family members doing so. Perceived behavioural control reflects individuals' perception of behavioural resources in

possession (e.g., skills, time, convenience) and the simplicity or complexity in performing certain behaviour (Ajzen, 1991). For example, providing residents with accessible recycling facilities will make them feel convenient to perform household waste source-separated collection behaviour, thus increasing residents' participation rate.

Despite the fact that the conventional TPB framework has achieved great success in identifying factors influencing various kinds of behaviour, investment decisions (East, 1993), dishonest actions (Beck and Ajzen, 1991), leisure choices (Ajzen and Driver, 1992) included, it is considered insufficient to explain more complex behaviour patterns of individuals such as household waste source-separated collection behaviour. Therefore, extra variables (e.g., moral norms, situational factors) should be incorporated into the framework (Ajzen, 1991; Boldero, 1995; Davies et al., 2002). Figure 5 shows the extended TPB framework.

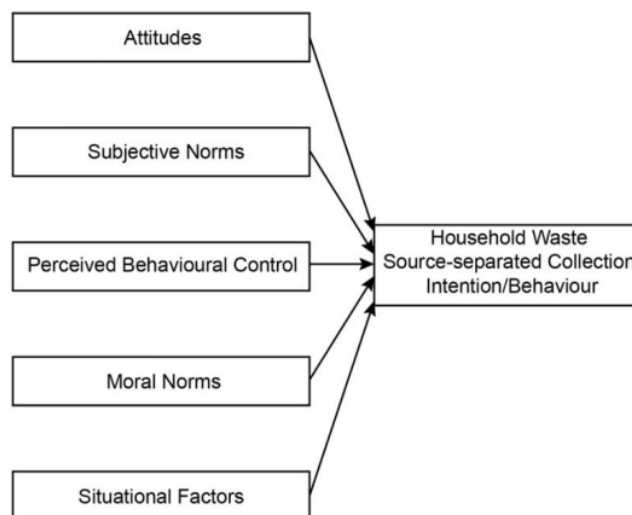


Figure 5. The extended TPB framework (Source: Ajzen, 1991; Boldero, 1995; Davies et al., 2002)

Subjective norms have been proved to be the weakest predictor of individuals' behavioural intention and behaviour in the conventional TPB framework (Armitage and Cornner, 2001). Ajzen (1991) affirms this issue and suggests adding moral norms, which refer to perceived moral correctness or incorrectness of performing certain behaviour, as a supplement to subjective norms to improve the predictive validity of the conventional TPB framework. Given the fact that household waste source-separated collection behaviour contains elements of social responsibility and personal morality, it is appropriate for scholars to introduce this variable into the framework (Tonglet et al., 2004). A number of studies have provided empirical support for this argument. Largo-Wight et al. (2012) found that moral norms serve as a crucial predictor of household waste source-separated collection intention and behaviour among American undergraduate students. In another study carried out in an Iranian community, moral norms are found to largely influence residents' household waste source-separated collection intention and behaviour, those who think everyone should take on the responsibility for separating and preliminarily disposing of household waste at source are more inclined to perform household waste source-separated collection behaviour (Pakpour, 2014).

The conventional TPB framework has long been criticised for ignoring the influences of external factors on individuals' behavioural intention and behaviour, as a result of which, Boldero (1995) and Davies et al. (2002) suggest that "situational factors should be incorporated into the conventional TPB framework" to make up for this deficiency. Situational factors (e.g., punishments and rewards, supervision) refer to external factors that motivate or inhibit certain behaviour. The significance of situational factors in predicting individuals' behavioural intention and behaviour has been acknowledged by Ma et al. (2018) in a study on household waste source-separated collection behaviour of residents living in Guilin, China. In another study, both government incentives and market incentives are found to have significant influences on Hangzhou

residents' household waste source-separated collection intention and behaviour (Xu et al, 2017).

2.5 TPB+ model

Based on the extended TPB framework and literature that applies this framework to study residents' household waste source-separated collection behaviour, I construct my TPB+ model, aiming to identify policy-related factors that have significant impacts on Nanjing residents' household waste source-separated collection intention and behaviour. In accordance with the TPB+ model, individuals' household waste source-separated collection intention and behaviour are determined by five main factors: attitudes, subjective norms, perceived behavioural control, moral norms and situational factors. These, in turn, are influenced by certain policy-related factors which are summarised in Figure 6 and further discussed in more detail below.

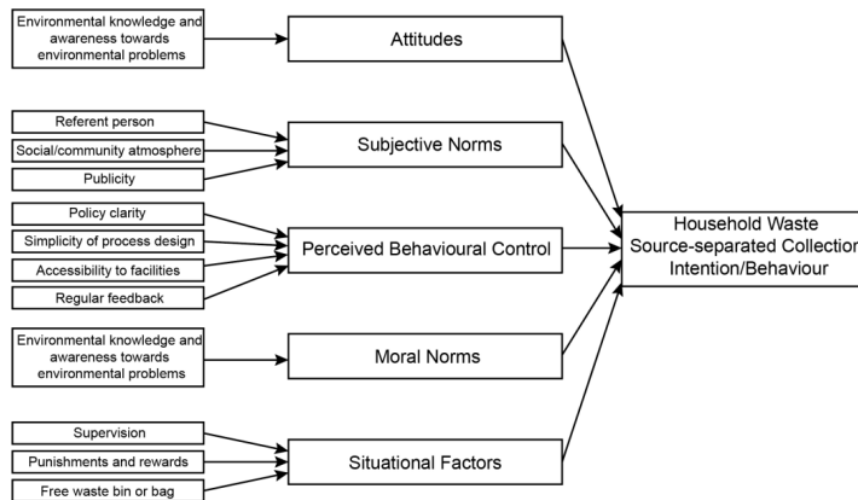


Figure 6. The TPB+ model

Environmental knowledge and awareness towards environmental problems influence attitudes and moral norms. With sufficient environmental knowledge and awareness towards environmental problems, residents are more likely to understand

the value of household waste source-separated collection and the adverse consequences of disposing of household waste without any form of recycling, thus developing positive attitudes towards household waste source-separated collection policies and realising it is every resident's responsibility to separate and preliminarily dispose of household waste at source, which will lead to the performance of household waste source-separated collection behaviour. It has been proved by previous research that environmental knowledge and consciousness can influence individuals' pro-environmental behaviour such as household waste source-separated collection behaviour indirectly through the mediation of attitudes and values (Ajzen and Fishbein, 1980; Fietkau and Kessel, 1981; Kitzmuller, 2013). Pakpour et al. (2014) and Fan et al. (2019) also point out in their studies that the reason why household waste separation rates in the United States, Britain and France are significantly higher than those in Iran and Turkey lies in that residents in developed countries possess more environmental knowledge and consciousness. Hence, I propose that *“environmental knowledge and awareness towards environmental problems have indirect impacts on individuals' household waste source-separated collection behaviour by influencing both attitudes and moral norms” (Proposition 1).*

Referent person, social/community atmosphere and publicity influence subjective norms. By definition, subjective norms are mainly influenced by perceived pressure stemming from society and referent groups or persons (e.g., colleagues, neighbours, friends, family members, communities) (Ajzen, 1991; Ajzen and Fishbein, 1980). Lou (2020) finds that publicity of policies has a significant impact on urban residents' household waste source-separated collection behaviour, which indicates that large-scale publicity campaigns can effectively raise the intrinsic motivation level of residents and create favourable social atmosphere for separating household waste at source. Hence, I propose that *“referent person, social/community atmosphere and publicity have indirect impacts on individuals' household waste source-separated collection behaviour by influencing subjective norms” (Proposition 2).*

Policy clarity, simplicity of process design, accessibility to facilities, as well as regular feedback influence perceived behavioural control. According to the scales developed by Tonglet et al. (2004), perceived behavioural control can be measured from the following three dimensions: “I know how to carry out household waste source-separated collection”, “Household waste source-separated collection is not complicated and inconvenient”, and “There are sufficient facilities for household waste source-separated collection”. Drawing on the scales, I propose that *“policy clarity, simplicity of process design and accessibility to facilities have indirect impacts on individuals’ household waste source-separated collection behaviour by influencing perceived behavioural control” (Proposition 3)*. Moreover, regular feedback on the outcomes of household waste source-separated collection policies can enhance residents’ perceived efficacy of their behaviour. In an interview conducted by Lou (2020) about the motivating factors of residents’ household waste source-separated collection behaviour, the word “feedback” was mentioned repetitively. Although the result is not significant, the researcher believes that this may be because effective feedback measures were not taken by policymakers, and the significance of feedback requires further exploration in future studies. Hence, I propose that *“regular feedback have indirect impacts on individuals’ household waste source-separated collection behaviour by influencing perceived behavioural control” (Proposition 4)*.

Supervision, punishments and rewards, free waste bin or bag influence situational factors. This is consistent with the famous “carrot and stick” approach, which means administrative measures and economic measures should be applied jointly when formulating policies (Vedung, 1998). The influence of supervision on individuals’ household waste source-separated collection behaviour has been confirmed in studies carried out in Iran (Pakpour et al., 2014), mainland China (Zhang et al., 2015) and Hong Kong (Wan et al., 2014). In the meanwhile, the predictive validity of free waste bin or bag and punishments and rewards has been supported by the work of Lou (2020)

in rural groups. Hence, I propose that *“supervision, punishments and rewards, free waste bin or bag have indirect impacts on individuals' household waste source-separated collection behaviour by influencing situational factors” (Proposition 5).*

3. Methodology

3.1 Study area

As shown in Figure 7, Nanjing is located in southeast of China. Being the capital of Jiangsu Province, Nanjing's GDP is around 1635.53 billion CNY (ranked 2nd over the 13 cities in Jiangsu Province) in 2021 (National Bureau of Statistics of China, 2022). It consists of 11 districts, covering an area of 6587.02 km² and having a population of 9.31 million. In response to the increasing amount of MSW generation, by the end of 2021, Nanjing had carried out household waste source-separated collection programmes in 5148 residential communities and established 10,202 household waste collection points, with more than 10,000 sub-district office staff providing on-site guidance of household waste separation, collection and transportation (Nanjing government, 2021).



Figure 7. Location of Nanjing

Gulou District is selected as the study area for the following reasons. To begin with, as shown in Figure 8, located in the heart of Nanjing, Gulou District has the highest population density among the 11 districts in Nanjing, with 17,349.58 ppl/km² (see Table 3 for the population density of each district), which makes Gulou District the largest

household waste producer. Furthermore, Gulou District has achieved some success in implementing household waste source-separated collection policies. Residents in Gulou District are familiar with the concept of household waste separation, which provides convenience for the conduction of the interview and the questionnaire survey. By the end of 2021, Gulou District had completed the construction of 1480 collection points in 1147 residential communities within its jurisdiction, and set up 30 special lines for household waste transportation (Nanjing government, 2021). According to the ranking of household waste separation score (a comprehensive evaluation of household waste management system from the dimensions of recycling facilities, publicity, daily management and outcomes, etc.) released by Nanjing City Administration Bureau in 2020, Gulou District ranked 1st over the 11 districts in Nanjing with a score of 91.97. Last but not least, it is representative to choose Gulou District as the study area for the reason that its economic development level, economic scale and population size are all at the average level of Nanjing (Nanjing Statistics Bureau, 2020).

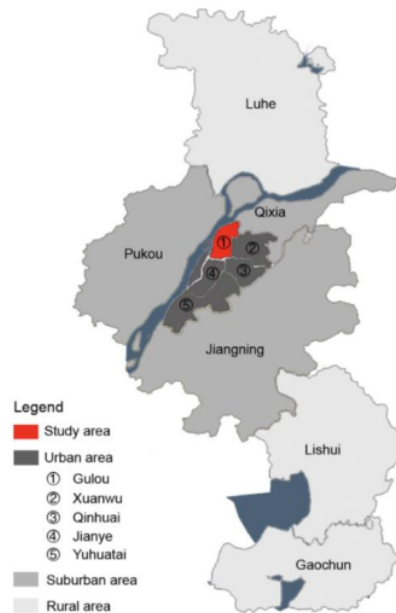


Figure 8. Location of Gulou District

Table 3. The population density and household waste separation score of each district in Nanjing (Source: Nanjing City Administration Bureau, 2020c; Nanjing Statistics Bureau, 2020)

District	Population (million)	Area (km ²)	Population density (ppl/km ²)	Household waste separation score
Gulou	0.94	54.18	17349.58	91.97
Xuanwu	0.54	75.46	7156.11	90.32
Gaochun	0.43	790.23	544.15	89.43
Lishui	0.49	1067.00	459.23	88.53
Qinhuai	0.74	49.11	15068.21	87.47
Qixia	0.99	395.44	2503.54	83.58
Jiangning	1.93	1561.00	1236.39	82.97
Pukou	1.17	913.75	1280.44	82.70
Yuhuatai	0.61	132.39	4607.60	82.63
Jianye	0.53	80.87	6553.73	79.29
Luhe	0.94	1471.00	639.02	76.84

3.2 Semi-structured interview

Considering that the influencing factors of household waste source-separated collection intention and behaviour vary with groups and environment, pilot interviews should be conducted in the study area before the distribution of questionnaires to ensure that no policy-related factors are omitted in the constructed TPB+ model. As a rule of thumb, a pilot study adopting the TPB model requires a sample of 20 to 30 participants drawn randomly from the general study population (Ajzen, 1991). On July 15, 2022, I posted a recruitment notice for participants online, and within ten days, 36 Nanjing residents who live in Gulou District filled in the application form. Based on the principle that participants need to be demographically diverse in regards of age, gender, occupation, education level and income level, I eventually selected 20 of them as the interviewees of semi-structured interviews. Table 4 provides the demographic characteristics of the interviewees.

Table 4. Demographics of the interviewees

Interviewee	Age	Occupation	Education level	Monthly income level
Ms. Jiang	73	Retired	Junior high school	2280-5499 CNY
Mr. Li	60	Senior manager	Bachelor or above	Over 25,000 CNY
Ms. Lin	56	Kindergarten principle	Senior high school	12,000-25,000 CNY
Mr. Zhang	55	Entrepreneur	Junior high school	Over 25,000 CNY
Mr. Xu	54	Civil servant	Bachelor or above	12,000-25,000 CNY
Ms. Huang	52	Financial manager	Bachelor or above	12,000-25,000 CNY
Ms. Xia	51	Office director	Bachelor or above	12,000-25,000 CNY
Mr. Gao	49	Technician	Bachelor or above	12,000-25,000 CNY
Ms. Ge	47	Engineer	Bachelor or above	12,000-25,000 CNY
Mr. Pan	45	School doctor	Senior high school	5500-11,999 CNY
Mr. Wang	42	Human resource manager	Bachelor or above	5500-11,999 CNY
Ms. Mao	39	Dancer	Bachelor or above	12,000-25,000 CNY
Mr. He	36	Flight attendant	Bachelor or above	12,000-25,000 CNY
Mr. Zhao	35	College counselor	Bachelor or above	12,000-25,000 CNY
Mr. Geng	31	Programmer	Bachelor or above	Over 25,000 CNY
Ms. Chen	29	English teacher	Bachelor or above	12,000-25,000 CNY
Ms. Cao	27	Decoration designer	Bachelor or above	12,000-25,000 CNY
Ms. Zhu	25	Administration clerk	Bachelor or above	5500-11,999 CNY
Ms. Bian	21	Undergraduate	Senior high school	Below 2280 CNY
Mr. Shi	18	High school student	Junior high school	Below 2280 CNY

After a brief introduction to household waste source-separated collection and research ethics (see Section 3.4 for statement on research ethics), every interviewee was asked about the following two questions:

1. "What policy-related factors may facilitate or inhibit your household waste source-separated collection behaviour?"
2. "Among the policy-related factors mentioned above, in which aspects should the Nanjing government improve?"

In addition to the structured part (see above) which allows for standardised comparisons across the interviewees, during the interviews, whenever the interviewees made interesting answers or mentioned points that had not been

mentioned by other interviewees, I would ask some follow-up questions in order to make the points elaborated as thoroughly as possible. The semi-structured interviews lasted between 11-24 minutes, with an average of 15 minutes.

Due to the COVID-19 pandemic, all interviews were conducted either online or by telephone, recorded and further transcribed into text, generating about 36,000 words of textual data. After encoding, I made content analysis of the interviews, extracting high-frequency words appeared in the textual data respectively based on the five main factors in the TPB+ model and summarising them in Table 5. By comparing the high-frequency words in Table 5 with the policy-related factors in the TPB+ model, it can be found that there are no policy-related factors omitted in the TPB+ model I constructed.

Table 5. High-frequency words appeared in the textual data by type

Main factor	High-frequency words
Attitudes	Environmental education
Subjective norms	Family members or neighbours' behaviour, community atmosphere, publicity
Perceived behavioural control	Simplicity of process design, sufficient recycling facilities, regular feedback
Moral norms	Environmental education
Situational factors	Supervision, punishments and rewards, free biodegradable waste bags

3.3 Questionnaire survey

Since the results of pilot interviews had already proved that no policy-related factors are omitted in the TPB+ model I constructed, a self-report questionnaire was further adopted by this study. It was designed according to the guidelines for constructing a TPB questionnaire (Ajzen, 2006; Ajzen, 2009) and consisted of four parts: demographic information, intention and behaviour, policy-related factors, additional questions. To ensure the validity and reliability in the measurements of latent variables, all questions were adapted from prior studies and further modified for the research context of this dissertation in an appropriate way. Before finalised, the questionnaire had been revised three times in terms of content, language clarity and wording. With

an aim of avoiding inductivity and reducing adjoining perceptions on interrelated questions, all questions were presented to respondents in a random order. It was expected to take them 5-10 minutes to fill in the questionnaire. The structure of the questionnaire is shown in Table 6.

Table 6. Structure of the questionnaire

Part	Research Question answered	Adapted from	Analytical method
Demographic information	None	Ma et al., 2018	Frequency distribution
Intention and behaviour	Research Question 1	Hu et al., 2021 Pakpour et al., 2014	Frequency distribution Descriptive statistics
Policy-related factors	Research Question 2&3	Hu et al., 2021 Lou et al., 2020 Ma et al., 2018	Descriptive statistics
Additional questions	None	None	Text mining

Referring to the study of Ma et al. (2018), Part 1 (Question 1-6) collects respondents' demographic information in terms of age, gender, education level, monthly income level, household size and length of residence. All options are set to match China's census categories. A frequency distribution table will be applied to summarise and present the demographic data collected.

Part 2 (Question 7-13) is designed to answer Research Question 1. Question 9-13 are developed on the basis of the works of Hu et al. (2021) and Pakpour et al. (2014), measuring respondents' household waste source-separated collection intention and behaviour from five dimensions (willingness, willingness to motivate surrounding others, frequency, how detailed, time devoted) with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The first two variables measure intention while the other three measure behaviour. As a supplement to Question 9-13, Questions 7&8 further ask respondents about the way they separate household waste and the amount of time they spend on household waste separation each week. Both frequency

distribution and descriptive statistics will be applied to analyse the data obtained, using EXCEL and STATA 16.0 for Windows.

Drawing on the works of previous studies (Hu et al., 2021; Lou et al., 2020; Ma et al., 2018), Part 3 (Question 14-33) is made up of 10 groups of questions, corresponding to the 10 policy-related factors in the TPB+ model. All questions in this part are declarative statements, and respondents are required to rate the extent to which they agree with the given statement on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The first question of each group measures the perceived influence of each policy-related factor on Nanjing residents' household waste source-separated collection behaviour, answering Research Question 2. While the second one measures the performance of Nanjing's household waste source-separated collection policies in terms of corresponding policy-related factors. Those policy-related factors that score high on the first question but low on the second are the aspects that need to be improved by the Nanjing government, thus answering Research Question 3. The data obtained in this part will be compiled into EXCEL spreadsheets, calculated for mean value as a score and further analysed, with STATA 16.0 for Windows applied for descriptive statistics.

Extra questions are added in Part 4 to gain additional insights into Nanjing residents' household waste source-separated collection behaviour. Part 4 (Question 34&35) consists of the following two questions:

1. "Is there any surrounding person who has a positive impact on your household waste source-separated collection behaviour?"
2. "Is there any other policy-related factor that may influence your household waste source-separated collection behaviour?"

The answer to the questions in Part 4 will be organised in a Word document and manual text mining will be performed to summarise the main points in the textual data.

3.4 Statement on research ethics

In strict compliance with UCL Data Protection Policy and the research ethics norms established by UCL Research Ethics Committee, this dissertation was conducted under the highest research ethical standards. For interviewees of semi-structured interviews, before the interview, each of them was briefed on the research objectives of this dissertation and signed an Informed Consent Sheet (Appendix B) detailing research ethics. For survey respondents, there was a statement at the beginning of the questionnaire (Appendix A) informing them that the information collected in this survey would only be used for academic purposes and would never be shared with any third party. All participants were not required to provide their real or full names, and all original notes or recordings will be permanently deleted after the submission of this dissertation to protect their privacy. In addition, rights were given to all participants to retract the information they had shared at any time, should they wish to withdraw from the interview or the survey.

4. Data Analysis and Results

4.1 Demographic characteristics of the respondents

Questionnaires were officially distributed on July 27, 2022, targeting Nanjing residents who live in Gulou District. Due to the impact of the COVID-19 pandemic, all questionnaires were distributed and collected online through the WJX platform. From July 27 to August 7, 2022, a total of 502 residents in Gulou District participated in the questionnaire survey. In order to ensure the quality of questionnaires, I spent two days screening the 502 questionnaires collected, sieving out invalid ones with the presence of significant problems and excluding them from the research sample. The final sample size is 449 (valid response rate = 89.4%). Of the 53 invalid questionnaires, 13 were discarded due to consistent selection of the same option, while 3 were eliminated because of the presence of abnormal values (e.g., ages under 18 but has been awarded a bachelor's degree or above). The remaining 37 invalid questionnaires were excluded for the reason that they were completed by respondents in less than 3 minutes. Given that the time taken to complete the questionnaire was estimated to be 5-10 minutes, it was reasonable to assume that these respondents had filled out the questionnaires without careful reading or due consideration. The respondents' demographic profile is shown in Table 7.

Table 7. Demographic profile of respondents

Demographics	Category	Frequency	Percentage (%)
Gender	Male	249	55.5
	Female	200	44.5
Age	Under 18	20	4.4
	19-22	13	2.9
	23-35	67	14.9
	36-60	320	71.3
	Over 60	29	6.5
Education level	Primary school or below	1	0.2
	Junior high school	16	3.6
	Senior high school	49	10.9
	Bachelor or above	383	85.3
Monthly income level	Below 2280 CNY	30	6.7
	2280-5499 CNY	35	7.8

	5500-11,999 CNY	147	32.7
	12,000-25,000 CNY	191	42.5
	Over 25,000 CNY	46	10.3
Household size	1	48	10.7
	2	178	39.6
	3	145	32.3
	4	46	10.3
	Over 4	32	7.1
Length of residence	Less than 6 months	63	14.0
	6 months-1 year	20	4.5
	1-5 years	49	10.9
	More than 5 years	317	70.6

As shown in Table 7, the age of respondents ranges between 14 and 79 years old, with the middle-aged group (36-60 years old) accounting for the largest proportion, reaching 71.3%. The male-to-female ratio is approximately 5.5 to 4.5. Most of the respondents (70.6%) have lived in Gulou District for more than five years, being fully familiar with the household waste source separated-collection policies in Gulou District. Moreover, most of them live in families of two or three, with the respondents living in families of two and those who live in families of three representing 39.6% and 32.3% of the sample size respectively. In terms of education level, up to 85.3% of the respondents hold a bachelor's degree or above, which indicates that residents at high education level may pay more attention to household waste source separated-collection. As to monthly income level, 75.2% of the respondents belong to the middle class with a monthly income between 5500 and 25,000 CNY. The demographic characteristics of the respondents, with the exception of education level, are almost identical to the latest census data released by the Nanjing government, suggesting that the research sample selected is representative (Nanjing Statistics Bureau, 2021).

4.2 How do Nanjing residents separate household waste?

Question 9-13 answer the Research Question of "How do Nanjing residents separate household waste under the current policy environment?" by adopting a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to measure respondents'

household waste source-separated collection intention and behaviour from five dimensions: willingness, willingness to motivate surrounding others, frequency, how detailed, time devoted. The first two variables measure intention while the other three measure behaviour. Table 8 shows the descriptive statistical analyses for these variables.

Table 8. Descriptive statistical analyses for variables measuring intention and behaviour

	Willingness	Willingness to motivate surrounding others	Frequency	How detailed	Time devoted
Mean	4.354	4.347	4.080	4.067	2.960
Standard error	0.042	0.039	0.044	0.043	0.054
Coefficient of variation	0.010	0.009	0.011	0.011	0.018
Median	5	5	4	4	3
Mode	5	5	5	4	3
Variance	0.787	0.687	0.864	0.848	1.289
Skewness	-1.661	-1.196	-0.847	-0.856	0.070
Kurtosis	6.089	4.248	3.265	3.362	2.290
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Count	449	449	449	449	449

As can be seen from Table 8, the standard errors of all variables are small, indicating that the sample means can reflect corresponding population means to a large extent. The mean values of the first four variables (willingness, willingness to motivate surrounding others, frequency, how detailed) are relatively high. With variances less than 1 and kurtosis values greater than 3 (kurtosis value of normal distribution), all these four variables are relatively concentrated around their mean values. Besides, their negative skewness values indicate a left-skewed asymmetric distribution, that is, the dataset is clustered on the higher side of the scale and less distributed on the lower side. Based on the above data-based analyses, it can be concluded that the vast majority of Nanjing residents have made positive responses to Nanjing's household

waste source-separated collection policies. They have a strong intention for household waste separation and separate household waste in a detailed and frequent way. By contrast, through an integrated evaluation of kurtosis, skewness and variance, it is found that the data on time devoted takes on a relatively flat symmetric distribution with a mean value of 3, suggesting that there are still a considerable number of Nanjing residents who have not invested enough time in separating household waste.

As a supplement to Question 9-13, Questions 7&8 further ask respondents about the way they separate household waste and the amount of time they spend on household waste separation each week.

The way Nanjing residents separate household waste

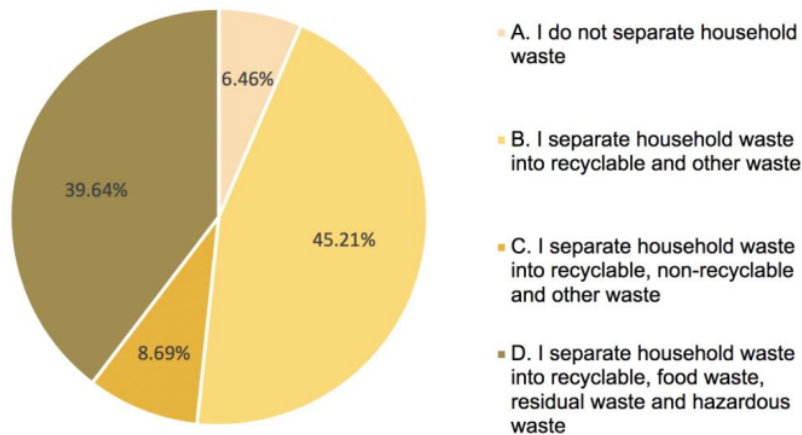


Figure 9. The way Nanjing residents separate household waste

As shown in Figure 9, Nanjing residents who separate household waste into two categories (recyclable and other waste) and those who separate household waste into four categories (recyclable, food waste, residual waste and hazardous waste) account for 45.21% and 39.64% of the sample size respectively. This is consistent with Nanjing's household waste source-separated collection policy of setting up four types

of containers for household waste in indoor places and two types of containers for household waste in outdoor places. Nanjing residents who do not separate household waste at all being the least, represents merely 6.46%, indicating that the Nanjing government has made some achievements in promoting household waste source-separated collection.

The amount of time Nanjing residents spend on household waste separation per week

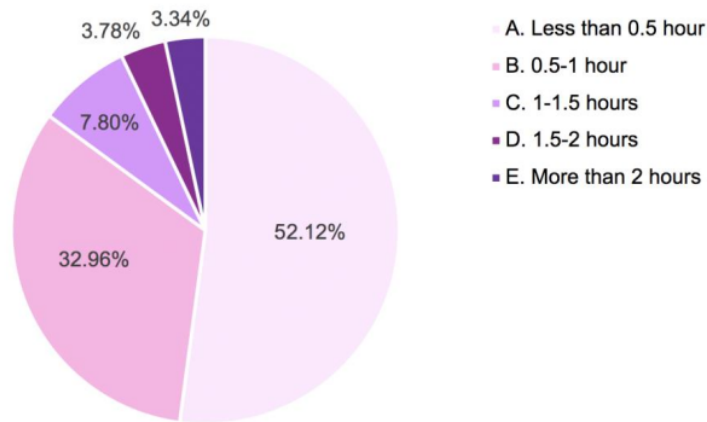


Figure 10. The amount of time Nanjing residents spend on household waste separation per week

As shown in Table 10, up to 52.12% of Nanjing residents spend less than half an hour on household waste separation per week, suggesting that, consistent with the conclusion drawn above, there are still a considerable number of Nanjing residents who have not invested enough time in separating household waste. In the meanwhile, it takes 3.34% of Nanjing residents more than two hours per week to separate household waste, which indicates that the Nanjing government may fail to provide them with accessible recycling facilities and adequate instructions on household waste separation.

4.3 What policy-related factors have significant impacts on Nanjing

residents' household waste source-separated collection behaviour?

The influence of each policy-related factor on Nanjing residents' household waste source-separated collection behaviour is measured with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The data obtained is further calculated for mean value as an indicator of influence degree. The descriptive statistical analyses for policy-related factors are shown in Table 9.

Table 9. Descriptive statistical analyses for policy-related factors

	Knowledge and awareness	Atmosphere	Publicity	Policy clarity	Simplicity
Mean	4.258	4.238	4.004	4.140	3.987
Standard error	0.041	0.040	0.042	0.037	0.042
Coefficient of variation	0.010	0.009	0.011	0.009	0.010
Median	4	4	4	4	4
Mode	5	5	4	4	4
Variance	0.772	0.709	0.808	0.625	0.786
Skewness	-1.341	-1.308	-1.046	-0.989	-0.998
Kurtosis	5.057	5.282	4.415	4.597	4.332
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Count	449	449	449	449	449
	Accessibility to facilities	Supervision	Regular feedback	Punishments and rewards	Free waste bin or bag
Mean	4.082	3.737	3.806	3.675	3.788
Standard error	0.043	0.046	0.042	0.048	0.047
Coefficient of variation	0.011	0.012	0.011	0.013	0.012
Median	4	4	4	4	4
Mode	4	4	4	4	4
Variance	0.835	0.953	0.786	1.055	0.993
Skewness	-1.169	-0.784	-0.634	-0.608	-0.613
Kurtosis	4.580	3.588	3.599	3.106	2.971
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Count	449	449	449	449	449

As shown in Table 9, the mean values of all policy-related factors are high, suggesting that they all have significant impacts on Nanjing residents' household waste source-separated collection behaviour, thus proving Proposition 1-5. By ranking the mean values in a descending order, it is found that among the 10 policy-related factors, environmental knowledge and awareness towards environmental problems, social/community atmosphere, publicity, policy clarity, accessibility to facilities serve as the five best predictors of Nanjing residents' household waste source-separated collection behaviour. By contrast, the predictive validity of supervision, punishments and rewards, free waste bin or bag is relatively weak. The standard errors of all policy-related factors are small, indicating that the sample means are fairly close to the actual population means. The negative skewness values of all policy-related factors indicate a left-skewed asymmetric distribution, with the dataset clustered on the higher side of the scale and less distributed on the lower side. Besides, with variances greater than 1 or kurtosis values less than 3 (kurtosis value of normal distribution), the two variables, free waste bin or bag and punishments and rewards are relatively less concentrated around their mean values, suggesting that Nanjing residents do not reach a consensus on their predictive validity. In other words, for quite a number of Nanjing residents, these two policy-related factors may not be able to motivate them to conduct household waste source-separated collection behaviour.

4.4 In which aspects should Nanjing's household waste source-separated collection policies be improved?

A 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) is also applied to measure the performance of Nanjing's household waste source-separated collection policies in terms of the 10 policy-related factors. The mean values of the data obtained are calculated and further compared with corresponding mean values in Table 9, those policy-related factors that score high in Table 9 but low in Table 10 are the aspects that need to be improved by the Nanjing government. The descriptive statistical analyses for variables measuring the performance of Nanjing's household

waste source-separated collection policies are shown in Table 9.

Table 10. Descriptive statistical analyses for variables measuring the performance of policies

	Knowledge and awareness	Atmosphere	Publicity	Policy clarity	Simplicity
Mean	3.497	3.512	3.526	3.477	3.385
Standard error	0.049	0.052	0.051	0.049	0.049
Coefficient of variation	0.014	0.015	0.014	0.014	0.014
Median	4	4	4	4	3
Mode	4	4	4	4	4
Variance	1.085	1.197	1.147	1.094	1.081
Skewness	-0.509	-0.514	-0.510	-0.473	-0.368
Kurtosis	2.837	2.668	2.791	2.727	2.694
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Count	449	449	449	449	449
	Accessibility to facilities	Supervision	Regular feedback	Punishments and rewards	Free waste bin or bag
Mean	3.401	3.298	3.094	3.020	2.973
Standard error	0.052	0.052	0.050	0.050	0.053
Coefficient of variation	0.015	0.016	0.016	0.017	0.018
Median	4	3	3	3	3
Mode	4	3	3	3	3
Variance	1.205	1.219	1.134	1.131	1.263
Skewness	-0.458	-0.271	-0.065	-0.018	-0.080
Kurtosis	2.611	2.436	2.524	2.530	2.338
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Count	449	449	449	449	449

As can be seen from Table 10, compared with corresponding mean values in Table 9, the mean values of all variables in Table 10 are relatively low, with about 0.5 lower respectively, indicating that Nanjing's household waste source-separated collection policies need to be improved in all these ten aspects, especially those five with high predictive validity. The standard errors of all variables are small, indicating that the

sample means are fairly close to the actual population means. The skewness values of all variables are close to zero, which indicates a symmetrical distribution. Besides, with variances greater than 1 or kurtosis values less than 3 (kurtosis value of normal distribution), the distributions of all variables are relatively scattered, suggesting that Nanjing's household waste source-separated collection policies have received mixed evaluations from Nanjing residents.

5. Discussion and Policy Implications

The results of the data analysis answer the three research questions raised at the beginning of this dissertation. In terms of Research Question 1, it is found that the vast majority of Nanjing residents have made positive responses to Nanjing's household waste source-separated collection policies. Consistent with Nanjing's household waste source-separated collection policy of setting up four types of containers for household waste in indoor places and two types of containers for household waste in outdoor places, 45.21% of Nanjing residents separate household waste into two categories (recyclable and other waste) while 39.64% of Nanjing residents separate household waste into four categories (recyclable, food waste, residual waste and hazardous waste). They have a strong intention for household waste separation and separate household waste in a detailed and frequent way. However, there are still a considerable number of Nanjing residents who have not invested enough time in separating household waste, with up to 52.12% of them spending less than half an hour on household waste separation per week. In response to Research Question 2, the 10 policy-related factors in the TPB+ model all have significant impacts on Nanjing residents' household waste source-separated collection behaviour. Among them, environmental knowledge and awareness towards environmental problems, social/community atmosphere, publicity, policy clarity, accessibility to facilities serve as the five best predictors, suggesting that attitudes, subjective norms, perceived behavioural control and moral norms are significant determinants of Nanjing residents' household waste source-separated collection behaviour and reconfirming the necessity of including moral norms in the conventional TPB framework. This is incongruent with the findings of prior studies wherein subjective norms are proved to be the weakest predictor of individuals' behavioural intention and behaviour in the conventional TPB framework (Armitage and Cornner, 2001). This kind of incongruence can be attributed to collectivism which is predominant in most of the eastern countries, China especially. According to the Hofstede's cultural dimensions theory (Hofstede, 1980), cultural differences across countries can be summarised into the following “six

basic dimensions of cultural values: power distance, uncertainty avoidance, individualism versus collectivism, masculinity versus femininity, long-term orientation versus short-term orientation, indulgence versus restraint". Among them, the individualism versus collectivism dimension measures the degree to which individuals are integrated into groups, as well as their perceived dependence and obligations on groups. In a country with high collectivism index such as China, great importance is attached to the well-being and goals of the group, as a result of which, Nanjing residents' household waste source-separated collection behaviour can be largely motivated by perceived pressure from surrounding environment and referent others, thus making subjective norms a significant determinant in the research context of China. By contrast, the predictive validity of supervision, punishments and rewards, free waste bin or bag is relatively weak, indicating that, compared with the other four main factors (attitudes, subjective norms, perceived behavioural control and moral norms) in the TPB+ model, the influence of situational factors is relatively mild. This finding is consistent with the results of previous studies conducted by Ma et al. (2018) and Tonglet et al. (2004). As to Research Question 3, the results of data analysis show that Nanjing's household waste source-separated collection policies need to be improved in all the ten aspects corresponding to the 10 policy-related factors, especially in those five with high predictive validity.

Based on the findings discussed above, this dissertation provides several relevant policy implications for the Nanjing government. Firstly, in order to help Nanjing residents to develop positive attitudes towards household waste source-separated collection and realise it is every resident's responsibility to separate and preliminarily dispose of household waste at source, measures should be taken to enrich their environmental knowledge and cultivate their awareness towards environmental problems. Formal environmental education should be carried out by schools and universities, while informal education about easy-to-understand environmental knowledge (e.g., campaigns, oral doctrines, knowledge contests) should be

popularised in residential communities as a supplement. Secondly, considering the high predictive validity of subjective norms, measures should be taken to create favourable social/community atmosphere for household waste source-separated collection, for example, the Nanjing government can invite celebrities and public figures to shoot promotional videos and disseminate them through radio, television, internet and other communication channels. Public forums can be set up for Nanjing residents to discuss the topics concerning household waste separation. Catchy slogans such as "Household waste separation is to protect our only planet" can also be put forward. Thirdly, given the significant influence of perceived behavioural control on Nanjing residents' household waste source-separated collection behaviour, measures should be taken to enhance their perceived behavioural control. On the one hand, manuals introducing the process of household waste separation can be developed and distributed freely to Nanjing residents. On the other hand, accessible recycling facilities and regular feedback on the outcomes of household waste source-separated collection policies should be provided by the Nanjing government.

During the study, some directions that require further exploration in future studies emerge. In the first place, the results of data analysis show that Nanjing residents do not reach a consensus on the predictive validity of free waste bin or bag and punishments and rewards, suggesting that economic and administrative measures may only work for some certain groups and moderating variables such as income level should be included in future studies to gain more insights. Moreover, when asked about surrounding person who has a positive impact on their household waste source-separated collection behaviour, quite a number of respondents (56 out of 145 respondents with children) mentioned their children. This has overlaps with the concept of cultural feedback in sociology, which refers to values inheritance from the younger to the elder generation. Future research could explore the impact of cultural feedback on individuals' household waste source-separated collection behaviour (e.g., whether families with children perform better on household waste separation than

those without). Finally, in the questionnaire survey, some Nanjing residents believe that the cleanliness of recycling facilities and the transparency of policy implementation also have impacts on their household waste source-separated collection behaviour. These two variables should be included in the TPB model and further examined in future studies.

By introducing the TPB model into the field of waste management, this study opens up a brand-new research direction at the intersection of these two fields and finds fruitful outcomes. The contributions of this dissertation are as follows. To begin with, a TPB+ model integrating five main factors and a range of policy-related factors is constructed in this study, thus providing a conceptual framework for future research. Furthermore, adopting the TPB+ model, I identify policy-related factors that have significant impacts on Nanjing residents' household waste source-separated collection intention and behaviour, filling the gap in the literature on household waste management in China. Last but not least, based on the findings, concrete suggestions are put forward on Nanjing's household waste source-separated collection policies.

Despite the contributions, this dissertation still has some limitations. On the one hand, self-report behaviour is used as a proxy for actual behaviour in this study, which may result in an overestimation of Nanjing residents' performance in household waste source-separated collection, as there is always a gap existing between the declared behaviour and the actual behaviour. On the other hand, due to the impact of the COVID-19 pandemic, all questionnaires were distributed and collected online through the WJX platform, which may lead to a lack of randomness in sample selection. Infrequent internet users, such as the elderly and the children, accounts for a small proportion of the sample size. While residents with high education level pay more attention to household waste source-separated collection, and hence participate more in the questionnaire survey.

6. Conclusion

Taking Gulou District as the study area, this dissertation constructs a TPB+ framework consisting of five main factors (attitudes, subjective norms, perceived behavioural control, moral norms, situational factors) and a series of policy-related factors to identify policy-related factors that have significant influences on the household waste source-separated collection behaviour of Nanjing residents. A 20-person pilot interview and a self-report questionnaire survey with a sample size of 449 are conducted in Gulou District, Nanjing. The results of data analysis show that the 10 policy-related factors in the TPB+ model all have significant impacts on Nanjing residents' household waste source-separated collection behaviour. Among them, environmental knowledge and awareness towards environmental problems, social/community atmosphere, publicity, policy clarity, accessibility to facilities serve as the five best predictors, suggesting that attitudes, subjective norms, perceived behavioural control and moral norms are significant determinants of Nanjing residents' household waste source-separated collection behaviour. By contrast, the predictive validity of supervision, punishments and rewards, free waste bin or bag is relatively weak, indicating that the influence of situational factors is relatively mild. Based on the findings, this dissertation further provides several relevant policy implications for the Nanjing government.

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Appendix A

Questionnaire

Hello to all participants of this online questionnaire survey! This questionnaire is designed by a student majoring in Sustainable Urbanism at the Bartlett School of Planning, University College London (UCL) and will take you 5-10 minutes to complete. Thank you for your participation.

This survey focuses on Nanjing's household waste separation policies. I hope to identify policy-related factors (factors determined by policy formulation) that have significant impacts on Nanjing residents' household waste source-separated collection behaviour, so as to put forward concrete suggestions for policymakers in Nanjing. I believe this will be conducive to the improvement of Nanjing's household waste management system.

Statement on research ethics:

1) This survey strictly follows UCL Data Protection Policy and the research ethics norms established by UCL Research Ethics Committee, confidentiality of collected

A. Below 2280 CNY B. 2280-5499 CNY C. 5500-11,999 CNY D. 12,000-25,000 CNY
E. Over 25,000 CNY

6) What is your household size?

A. 1 B. 2 C. 3 D. 4 E. Over 4

Household waste source-separated collection intention and behaviour

7) How do you separate household waste?

A. I do not separate household waste B. I separate household waste into recyclable and other waste

C. I separate household waste into recyclable, non-recyclable and other waste

D. I separate household waste into recyclable, food waste, residual waste and hazardous waste

8) How much time do you spend on separating household waste per week?

A. Less than 0.5 hour B. 0.5-1 hour C. 1-1.5 hours D. 1.5-2 hours E. More than 2 hours

9) I am willing to separate household waste.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

10) I am willing to encourage surrounding others to separate household waste.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

11) I separate household waste frequently.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

12) I separate household waste in detail.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

13) I spend much time on separating household waste.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

Attitudes and moral norms

14) I think having sufficient environmental knowledge and awareness towards environmental problems has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

15) I think the Nanjing government has done a good job in popularising environmental knowledge and awareness towards environmental problems among residents.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

Subjective norms

16) I think favourable social/community atmosphere for household waste separation has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

17) I think the Nanjing government has done a good job in creating favourable social/community atmosphere for household waste separation.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

18) I think publicity of household waste separation policies has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

19) I think the Nanjing government has done a good job in publicising household waste separation policies.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

Situational factors

20) I think government supervision has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

21) I think the Nanjing government has done a good job in executing supervision on household waste separation.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

22) I think punishments and rewards (e.g., fines, earnings, awards) have influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

23) I think the Nanjing government has done a good job in setting up punishments and

rewards.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

24) I think availability of free waste bin or bag has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

25) I think the Nanjing government has done a good job in providing free waste bin or bag.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

Perceived behavioural control

26) I think policy clarity has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

27) I think the Nanjing government has done a good job in making household waste separation policies clear and understandable.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

28) I think simplicity of process design has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

29) I think the Nanjing government has done a good job in simplifying household waste separation process.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

30) I think accessibility to sufficient recycling facilities has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

31) I think the Nanjing government has done a good job in providing sufficient recycling facilities.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

32) I think regular feedback on household waste separation outcomes has influences on my household waste source-separated collection behaviour.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

33) I think the Nanjing government has done a good job in providing regular feedback on household waste separation outcomes.

A. Strongly disagree B. Disagree C. Neither agree nor disagree D. Agree E. Strongly agree

Additional questions

34) Is there any surrounding person who has a positive impact on your household waste source-separated collection behaviour? If so, please point out his/her relationship with you (e.g., colleagues, neighbours, friends, family members, classmates).

35) Is there any other policy-related factor that may influence your household waste source-separated collection behaviour?

Appendix B

Informed Consent Sheet

How do Nanjing residents separate waste?

If you are happy to participate, please complete this consent form by ticking the boxes to acknowledge the following statements and signing your name at the bottom of the page.

Please give the signed form to the researcher conducting your interview at the interview. They will also be able to explain this consent form further with you, if required.

1.	I have read and understood the information sheet.	<input type="checkbox"/>
2.	I agree to participate in the above research by attending a face-to-face interview as described on the Information Sheet.	<input type="checkbox"/>
3.	I understand that my participation is entirely voluntary.	<input type="checkbox"/>
4.	I understand that I may withdraw at any time without giving a reason and with no consequences.	<input type="checkbox"/>
5.	I agree for the interview to be audio recorded.	<input type="checkbox"/>
6.	I understand that I may see a copy of the interview transcript after it has been transcribed and agree any amendments with the researcher.	<input type="checkbox"/>
7.	I understand that the intention is that interviews are anonymised and that if any of my words are used in a research output that they will not be directly attributed to me unless otherwise agreed by all parties.	<input type="checkbox"/>
8.	I understand the data from this project will be considered for repository in the UCL Open Access repository as described on the Information Sheet but that this will be anonymised data only.	<input type="checkbox"/>
9.	I understand that I can contact the student who interviewed me at any time using the email address they contacted me on to arrange the interview, or the dissertation supervisor using the contact details provided on page X of the information sheet.	<input type="checkbox"/>

Participant name: **Signature:** **Date:**

Researcher name: **Signature:** **Date:**

Appendix C

Household waste source-separated collection programmes in Kalmar

About 4.66 million tonnes of household waste were generated in Sweden in 2018, 467 kilograms per person. However, due to Sweden's developed household waste management system and high residents' participation rate, more than 99% of this amount can be recycled or used as energy after processing, with valueless household waste for the final disposal accounting for only 0.7% (Avfall Sverige, 2018).

In 1993, Pollute Pays Principle (PPP) was introduced by the Sweden government, clearly stipulating the responsibilities of the three main stakeholders of household waste source-separated collection: municipalities, manufacturers and residents.

The municipalities take on the responsibility for the collection of household waste by providing administrative guidance and purchasing services. They have rights to enact their own household waste management regulations and financial measures according to specific local conditions under the general guidelines of the Swedish Government (Stoeva and Alriksson, 2017).

Manufacturers are obliged to specify recycling methods on the package of products they produced, instructing residents in separating and preliminarily disposing of household waste at source. In particular, manufacturers of packaging, paper, batteries, electrical and electronic equipment should further have their products recycled after consumption. They are required to pay a deposit in advance to the environmental protection department, which will be refunded when the recycling rate reaches a certain percentage. As a result of this, a series of recycling organisations such as Packaging Recovery Organisations (PRO) are formed after industrial sectors in Sweden (SWMA, 2013).

Residents are responsible for separating household waste into eight fractions (food waste, paper and glass, newspapers, packaging of metal, plastic, tires, batteries, electronics) after consumption of products based on instructions on the package, sending them to designated collection points, paying household waste collection and disposal fee to municipalities. As ruled by the *Swedish Environmental Code*, residents who intentionally or negligently litter in public places will be fined and imprisoned for not more than one year (Sweden Government, 1998). Apart from administrative measures, economic measures are also widely adopted by the Sweden government to incentivise residents' household waste source-separated collection behaviour. For example, in addition to the cost of drink, residents also have to pay a deposit of 0.5-2 SEK on the bottle, which will be returned when the discarded bottle is put into recycle bin.

Kalmar is located in the southeast of Sweden, with about 65000 inhabitants. It possesses a complete household waste collection system, consisting of recycle bins around the residences, kerbside collection, drop-off stations and groceries with buyback machines, with a household waste collection coverage rate of 100% (EC, 2012). In terms of recycle bins around the residences, single-family houses are equipped with recycle bins both for food waste and general household waste while apartment blocks have waste rooms placed either in separated houses or in the basements. Kerbside collection is also a common household waste collection service in Kalmar, with approximately 30% of residents pay for this service. Those who do not subscribe kerbside collection service are required to bring household waste to drop-off stations operated by KSRR or FTI, private companies in charge of household waste recycling in Kalmar. In addition, aluminum cans and plastic bottles can also be collected in groceries with buyback machines (Stoeva and Alriksson, 2017).

Ethical Clearance Forms and Risk Assessment Forms

Supervisor sign-off for Ethical Clearance Forms and Risk Assessment Forms

(For supervisor completion only BEFORE submission via Moodle)

Are you satisfied with the ethical clearance form (yes/no)?

Please provide any additional comments about the form that may help the student.

(If the form is missing, the proposal must be given a mark of 0, and the student will have 48hours to resubmit the complete proposal. If the form is unsatisfactory, the student must amend their ethical questionnaire to your satisfaction before they can proceed with their research)

YES

Are you satisfied with the risk assessment form (yes/no)?

Please provide any additional comments about the form that may help the student.

(If the form is missing, the proposal must be given a mark of 0, and the student will have 48hours to resubmit the complete proposal. If the form is unsatisfactory, the student must amend their ethical questionnaire to your satisfaction before they can proceed with their research)

YES

Ethical Clearance Pro Forma

It is important for you to include all relevant information about your research in this form, so that your supervisor can give you the best advice on how to proceed with your research.

You are advised to read though the relevant sections of [UCL's Research Integrity guidance](#) to learn more about your ethical obligations.

Submission Details

1. **Name of programme of study:**
MSc Sustainable Urbanism
2. **Please indicate the type of research work you are doing (Delete that which do not apply):**
 - o Dissertation in Planning (MSc)
3. **Please provide the current working title of your research:**
How do Nanjing residents separate waste?
4. **Please indicate your supervisor's name:**
Dr. Catalina Turcu

Research Details

5. **Please indicate here which data collection methods you expect to use. (Tick all that apply/or delete those which do not apply.)**

- o Interviews ✓
- o Questionnaires (including oral questions) ✓

6. Please indicate where your research will take place (delete that which does not apply):

- o UK and overseas

7. Does your project involve the recruitment of participants?

'Participants' means human participants and their data (including sensor/locational data and observational notes/images.)

Yes

Appropriate Safeguard, Data Storage and Security

8. Will your research involve the collection and/or use of personal data?

Personal data is data which relates to a living individual who can be identified from that data or from the data and other information that is either currently held, or will be held by the data controller (you, as the researcher).

This includes:

- Any expression of opinion about the individual and any intentions of the data controller or any other person toward the individual.
- Sensor, location or visual data which may reveal information that enables the identification of a face, address etc. (some post codes cover only one property).
- Combinations of data which may reveal identifiable data, such as names, email/postal addresses, date of birth, ethnicity, descriptions of health diagnosis or conditions, computer IP address (of relating to a device with a single user).

No

9. Is your research using or collecting:

- special category data as defined by the General Data Protection Regulation*, and/or
- data which might be considered sensitive in some countries, cultures or contexts?

*Examples of special category data are data:

- which reveals racial or ethnic origin, political opinions, religious or philosophical beliefs, trade union membership;
- concerning health (the physical or mental health of a person, including the provision of health care services);
- concerning sex life or sexual orientation;
- genetic or biometric data processed to uniquely identify a natural person.

No

10. Do you confirm that all personal data will be stored and processed in compliance with the General Data Protection Regulation (GDPR 2018)? (Choose one only, delete that which does not apply)

- I will not be working with any personal data

11. I confirm that:

- The information in this form is accurate to the best of my knowledge.
- I will continue to reflect on and update these ethical considerations in consultation with my supervisor.

Yes

RISK ASSESSMENT FORM FIELD / LOCATION WORK



DEPARTMENT/SECTION: BARTLETT SCHOOL OF PLANNING

LOCATION(S): LONDON, UK AND NANJING, CHINA

PERSONS COVERED BY THE RISK ASSESSMENT: Ziyu Gaon

BRIEF DESCRIPTION OF FIELDWORK (including geographic location): In Nanjing Gulou district, I am going to conduct a survey relating to the waste management policy for residents and do some further interviews with government officers, members of neighbourhood committees as well as community workers.

COVID-19 RELATED GENERIC RISK ASSESSMENT STATEMENT:

Coronavirus disease (COVID-19) is an infectious disease caused by coronavirus SARS-CoV-2. The virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Droplets fall on people in the vicinity and can be directly inhaled or picked up on the hands and transferred when someone touches their face. This risk assessment documents key risks associated fieldwork during a pandemic, but it is not exhaustive and will not be able to cover all known risks, globally. This assessment outlines principles adopted by UCL at an institutional level and it is necessarily general. Please use the open text box 'Other' to indicate any contingent risk factors and control measures you might encounter during the course of your dissertation research and writing.

Please refer to the Dissertation in Planning Guidance Document (available on Moodle) to help you complete this form.

Hazard 1: Risk of Covid -19 infection during research related travel and research related interactions with others (when face-to-face is possible and/or unavoidable)

Risk Level - Medium /Moderate

Existing Advisable Control Measures: Do not travel if you are unwell, particularly if you have COVID-19 symptoms. Self-isolate in line with NHS (or country-specific) guidance.

Avoid travelling and face-to-face interactions; if you need to travel and meet with others:

- If possible, avoid using public transport and cycle or walk instead.
- If you need to use public transport travel in off-peak times and follow transport provider's and governmental guidelines.
- Maintain (2 metre) social distancing where possible and where 2 metre social distancing is not achievable, wear face covering.
- Wear face covering at all times in enclosed or indoor spaces.
- Use hand sanitiser prior to and after journey.
- Avoid consuming food or drinks, if possible, during journey.
- Avoid, if possible, interchanges when travelling - choose direct route.
- Face away from other persons. If you have to face a person ensure that the duration is as short as possible.
- Do not share any items i.e. stationary, tablets, laptops etc. If items need to be shared use disinfectant wipes to disinfect items prior to and after sharing.

- If meeting in a group for research purposes ensure you are following current country specific guidance on face-to-face meetings (i.e rule of 6 etc.)
- If and when possible meet outside and when not possible meet in venues with good ventilation (e.g. open a window)
- If you feel unwell during or after a meeting with others, inform others you have interacted with, self-isolate and get tested for Covid-19
- Avoid high noise areas as this mean the need to shout which increases risk of aerosol transmission of the virus.
- Follow one way circulation systems, if in place. Make sure to check before you visit a building.
- Always read and follow the visitors policy for the organisation you will be visiting.
- Flush toilets with toilet lid closed.
- 'Other' Control Measures you will take (specify):

NOTE: The hazards and existing control measures above pertain to Covid-19 infection risks only. More generalised health and safety risk may exist due to remote field work activities and these are outlined in your Dissertation in Planning Guidance document. Please consider these as possible 'risk' factors in completing the remainder of this standard form. For more information also see: [Guidance Framework for Fieldwork in Taught and MRes Programmes, 2021-22](#)

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.

If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.

Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT

The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard

e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.

N/A

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- N/A work abroad incorporates Foreign Office advice
- N/A only accredited centres are used for rural field work
- N/A participants will wear appropriate clothing and footwear for the specified environment
- N/A refuge is available
- N/A work in outside organisations is subject to their having satisfactory H&S procedures in place
- N/A OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

EMERGENCIES Where emergencies may arise use space below to identify and assess any risks

e.g. fire, accidents N/a

CONTROL MEASURES Indicate which procedures are in place to control the identified risk

- N/A participants have registered with LOCATE at <http://www.fco.gov.uk/en/travel-and-living-abroad/>
- Yes contact numbers for emergency services are known to all participants
- Yes participants have means of contacting emergency services
- N/A a plan for rescue has been formulated, all parties understand the procedure
- N/A the plan for rescue /emergency has a reciprocal element
- N/A OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK 1

May 2010

EQUIPMENT Is equipment used? NO If 'No' move to next hazard
If 'Yes' use space below to identify and assess any risks

e.g. clothing, outboard motors. Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?

CONTROL MEASURES Indicate which procedures are in place to control the identified risk

- the departmental written Arrangement for equipment is followed
- participants have been provided with any necessary equipment appropriate for the work
- all equipment has been inspected, before issue, by a competent person
- all users have been advised of correct use
- special equipment is only issued to persons trained in its use by a competent person
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING Is lone working If 'No' move to next hazard

	a possibility?	YES	If 'Yes' use space below to identify and assess any risks
<i>e.g. alone or in isolation lone interviews.</i>	Examples of risk: difficult to summon help. Is the risk high / medium / low?		
Low – an emergency number will be always left with a trusted person who could check on me.			
I will occasionally be travelling and collecting data/ conducting interviews by myself.			
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		
N/A	the departmental written Arrangement for lone/out of hours working for field work is followed		
N/A	lone or isolated working is not allowed		
N/A	location, route and expected time of return of lone workers is logged daily before work commences		
N/A	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle		
YES	all workers are fully familiar with emergency procedures		
N/A	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:		
FIELDWORK 2		May 2010	

ILL HEALTH	The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.		
<i>e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.</i>	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low?		
LOW			
I do not have any pre-existing health conditions, but covid-19 spreading may be a risk.			
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		
YES	all participants have had the necessary inoculations/ carry appropriate prophylactics		
N/A	participants have been advised of the physical demands of the research and are deemed to be physically suited		
N/A	participants have been adequate advice on harmful plants, animals and substances they may encounter		
N/A	participants who require medication should carry sufficient medication for their needs		

N/A OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT	Will transport be required	NO	Move to next hazard
		YES <input checked="" type="checkbox"/>	Use space below to identify and assess any risks
<i>e.g. hired vehicles</i>	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low? Low		

CONTROL MEASURES Indicate which procedures are in place to control the identified risk

- N/A only public transport will be used
- N/A the vehicle will be hired from a reputable supplier
- N/A transport must be properly maintained in compliance with relevant national regulations
- N/A drivers comply with UCL Policy on Drivers
http://www.ucl.ac.uk/hr/docs/college_drivers.php
- YES drivers have been trained and hold the appropriate licence
- N/A there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
- N/A sufficient spare parts carried to meet foreseeable emergencies
- N/A OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	YES	If 'No' move to next hazard
		<input type="checkbox"/>	If 'Yes' use space below to identify and assess any risks
<i>e.g. interviews, observing</i>	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? Low		

CONTROL MEASURES Indicate which procedures are in place to control the identified risk

- YES all participants are trained in interviewing techniques
- N/A advice and support from local groups has been sought
- N/A participants do not wear clothes that might cause offence or attract unwanted attention
- N/A interviews are conducted at neutral locations or where neither party could be at risk
- N/A OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

WORKING ON OR NEAR WATER	Will people work on or near water?	<input type="checkbox"/> NO	If 'No' move to next hazard
		<input type="checkbox"/>	If 'Yes' use space below to identify and assess any risks
<i>e.g. rivers, marshland, sea.</i>	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		
CONTROL MEASURES Indicate which procedures are in place to control the identified risk			
<input type="checkbox"/>	lone working on or near water will not be allowed		
<input type="checkbox"/>	coastguard information is understood; all work takes place outside those times when tides could prove a threat		
<input type="checkbox"/>	all participants are competent swimmers		
<input type="checkbox"/>	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons		
<input type="checkbox"/>	boat is operated by a competent person		
<input type="checkbox"/>	all boats are equipped with an alternative means of propulsion e.g. oars		
<input type="checkbox"/>	participants have received any appropriate inoculations		
<input type="checkbox"/>	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:		
MANUAL HANDLING (MH)	Do MH activities take place?	<input type="checkbox"/> NO	If 'No' move to next hazard
		<input type="checkbox"/>	If 'Yes' use space below to identify and assess any risks
<i>e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.</i>	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		
CONTROL MEASURES Indicate which procedures are in place to control the identified risk			
<input type="checkbox"/>	the departmental written Arrangement for MH is followed		
<input type="checkbox"/>	the supervisor has attended a MH risk assessment course		
<input type="checkbox"/>	all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities		

- all persons performing MH tasks are adequately trained
- equipment components will be assembled on site
- any MH task outside the competence of staff will be done by contractors
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK 4

May 2010

SUBSTANCES	Will participants work with substances	NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
<i>e.g. plants, chemical, biohazard, waste</i>	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		
<input type="checkbox"/>	the departmental written Arrangements for dealing with hazardous substances and waste are followed		
<input type="checkbox"/>	all participants are given information, training and protective equipment for hazardous substances they may encounter		
<input type="checkbox"/>	participants who have allergies have advised the leader of this and carry sufficient medication for their needs		
<input type="checkbox"/>	waste is disposed of in a responsible manner		
<input type="checkbox"/>	suitable containers are provided for hazardous waste		
<input type="checkbox"/>	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:		
OTHER HAZARDS	Have you identified any other hazards?	NO	If 'No' move to next section If 'Yes' use space below to identify and assess any risks
<i>i.e. any other hazards must be noted and assessed here.</i>	Hazard: <input type="text"/>		
	Risk: is the risk <input type="text"/>		
CONTROL MEASURES	Give details of control measures in place to control the identified risks		
	N/A		
Have you identified any risks that are not adequately controlled?	NO	<input checked="" type="checkbox"/>	Move to Declaration
	YES	<input type="checkbox"/>	Use space below to identify the risk and what action was taken

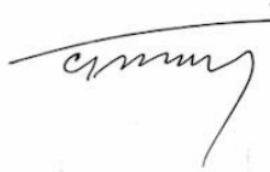
N/A

DECLARATION

The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

- I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
- I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above



NAME OF SUPERVISOR
Catalina Turcu 21.03.2022
FIELDWORK 5

May 2010

FINAL GRADE

GENERAL COMMENTS

/100

Instructor

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