



# Antecedents of urban residents' separate collection intentions for household solid waste and their willingness to pay: Evidence from China



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## ABSTRACT

Rapid mass migration into cities and economic growth have created various problems of sustainability. The increasing household solid waste, bringing about environmental pollution and land occupation, is among the concerns and separate collection is recognised as a sound way to dispose it. However, separate collection behaviours are not common in China, and the research into the dynamics of urban residents' separate collection intentions for household solid waste is scarce. For filling this gap, we extend the theory of planned behaviour to explore the antecedents of separate collection intentions for household solid waste and identify their effects on residents' willingness to pay for separate collection by other organisations. The results show that separate collection intentions towards household solid waste are significantly influenced by the behaviours of others, facility conditions, and moral obligations, while their willingness to pay for separate collection is also affected by age, perceptions of results and government policies. In conclusion, urban residents' willingness to pay is more sensitive to perceptions of results and policy implications than separate collection intentions in China. Accordingly, the government should provide a pro-environmental climate, convenient facilities, detailed cases, cultivate environmental moral obligations and propose appropriate promotional and incentive policies for different recycling modes.

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## 1. Introduction

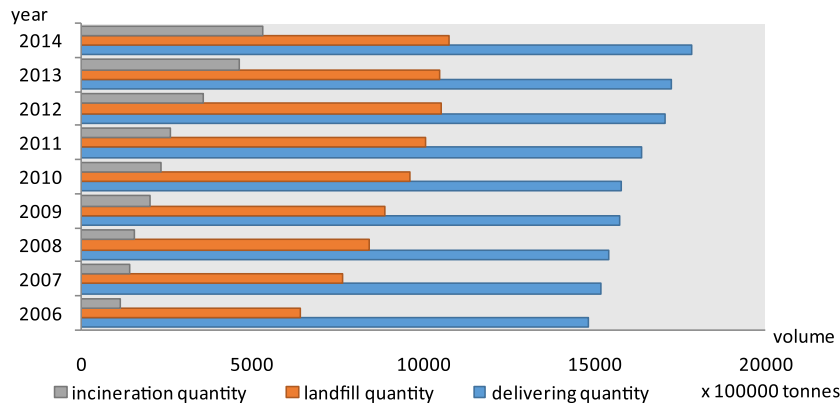
Accompanying the rapid economic growth and urbanization process, massive municipal sustainable development issues have arisen, among which urban waste management is a great concern (Chong et al., 2016). Over 1.3 billion tonnes of municipal solid waste are produced worldwide each year, bringing enormous challenges for urban waste disposal (Welivita et al., 2015). Household solid waste occupies a significant part of urban waste (Hering, 2012; Swami et al., 2011). As for China, problems of urban household waste are likewise impeding socio-economic development. The delivered quantity of household solid waste is rising year-by-year, most of which is handled by way of landfill and incineration

(Fig. 1). By 2014, there were 604 national landfill sites in China (Ministry of Housing and Urban-Rural Development, 2014), occupying a lot of land and polluting both land and the surrounding groundwater systems. In addition, in 2014, there were 188 incineration plants (Ministry of Housing and Urban-Rural Development, 2014). These plants produce poisonous gases such as dioxins (LAN, 2010) and cause a serious waste of resources and environmental pollution problems (Gu et al., 2014; Zabaleta and Rodic, 2015).

An economic system circular economy is promoted worldwide to increase resource use efficiency and achieve a better balance of economy, environment and society. The residents' separation collection of household solid waste embodies circular economy in reduce, reuse and recycle from consumers' responsibility perspective, improving the entire living and economic model (Ghisellini et al., 2016). Household solid waste includes food waste, recyclable waste such as paper, glass, metal, hazardous waste including batteries, pesticide containers, and other solid waste (Liu et al.,

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**Fig. 1.** China's household solid waste treatment capacity.  
Source: China Urban Construction Statistical Yearbook, 2014.

2015), among which the recyclable component can reach 89.3% (Gu et al., 2015). Separate waste collection facilitates the reduction of greenhouse gas emissions and waste volumes (Calabrò, 2009; Geng et al., 2009). Meanwhile, conventional resources can be conserved and heat can be generated through waste-to-energy process (Agovino et al., 2016; Cucchiella et al., 2014). In the context of circular economy, waste separate collection not only lays the foundation for waste reuse but also works as a sustainability indicator (Chong et al., 2016; Rigamonti et al., 2016). Total weight of waste by type and disposal, weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, and VIII, and percentage of transported waste shipped internationally are indicator measures of *Global Reporting Initiative Sustainability Reporting Guidelines* (GRI<sup>1</sup> G4 Guidelines); toxic emission and waste, along with packaging material and waste are Environmental Social and Governance (ESG) key issues of Morgan Stanley Capital International (MSCI) ESG research; some other standards like ISO 14001 and ISO 14031 consider waste management as important ratings (GRI, 2014; MSCI, 2015; Rahdari and Anvary Rostamy, 2015). Consequently, organisations and cities attach great importance to waste recycling, aimed at achieving business goals and gaining competitive advantages through improved reputations, efficiencies of organisations and improved confidence of stakeholders (ISO, 2015). For example, Ben's & Jerry's plant applies Chunkinator to digesting all the ice cream waste from the plant, satisfying roughly 20% of its energy needs and Unilever are increasingly using post-consumer recycled materials in their plastic bottles. In short, waste recycling can make a better world economy and environment, and separate collection of household solid waste is the fundamental and meaningful responsibility from the consumer aspect.

To promote and standardise the classification, collection, transportation, and disposal of urban waste, the Chinese Government introduced a series of policies and regulations, such as: *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste*, *Regulations on the Administration of Municipal Appearance and Environmental Sanitation*, *Administrative Measures for Urban Living Garbage*, and so on. Besides, China released *The General Planning for National Municipal Solid Waste Disposal Facilities Construction During the 12th Five-Year Plan Period* in 2012. It requires that domestic waste classification pilots should be promoted nationwide in 2015, and China should

establish a near-perfect supervision system for municipal solid waste disposal. However, Chinese residents' awareness of household solid waste separation and collection is still weak (Gu et al., 2015), the recovery rate of the municipal solid waste is less than 2% in China (Zhang et al., 2016), and waste classification pilots run with difficulty. In addition, low recovery rates of household solid waste are common elsewhere: for example, the recovery rates of Germany and Austria are 60%–70%, Australia, Belgium, Holland, and Sweden manage about 50%, the United States, Britain, France, and Italy are at 30%–40%, and Iran and Turkey reach less than 10% (Environmental Protection Agency, 2012; European Environment Agency, 2013; Hyder Consulting, 2011; Pakpour et al., 2014).

In face of the negative current situation of household solid waste separation and collection, some scholars come to focus on the formation mechanism of recycling behaviours with regard to household solid waste. Wan et al. (2014) combined the theory of planned behaviour with norm-activation theory, concluding that recycling intentions were influenced by perceived policy effectiveness in Hong Kong. Pakpour et al. (2014) applied the extended theory of planned behaviour and found that attitudes, subjective norms, perceived behavioural control, moral obligations, self-identify, intention, action planning, and past behaviour significantly predicted household waste collection behaviours in Iran. Crociata et al. (2015) used a probit model and identified that culture, and participation dimensions influenced recycling behaviours. Alpizar and Gsottbauer (2015) identified that reputational concerns played a role in shaping pro-environmental behaviours through experiments.

Questionnaires or experiments are used to study the factors influencing residents' recycling behaviours; however, researchers seldom talk about influences of government policies, surrounding facilities, and demographic variables on the separate collection intentions for household solid waste, especially with regard to the intentions of Chinese urban households. Meanwhile, residents pay the government for its waste handling and separate collection behaviours, which is a potential measure for use in promoting separate collection of household solid waste while few scholars have researched this field. This research aims to improve the situations in these aspects.

We take Chinese urban households as an example, and propose two kinds of household solid waste recycling scenarios: the first involves urban residents themselves classifying and recycling household solid waste; the second involves urban residents paying other organisations to implement separate collection of household solid waste. In this research, we extend the theory of planned behaviour with government policies, facility conditions, and

<sup>1</sup> All the abbreviations in this paper and their full names are summarized in Appendix C.

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