



# External influences on forming residents' waste separation behaviour: Evidence from households in Hangzhou, China



Lin Xu <sup>a</sup>, Maoliang Ling <sup>a</sup>, Yujie Lu <sup>b,\*</sup>, Meng Shen <sup>b</sup>

<sup>a</sup> School of Public Affairs, Zhejiang University, Hangzhou, Zhejiang Province, China

<sup>b</sup> Department of Building, School of Design and Environment, National University of Singapore, Singapore

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## ABSTRACT

Due to the increasing amount of global waste generated over the years, most countries have the urgency to implement effective household waste recycling to solve this problem. In order to develop the policy that regulates waste recycling behaviour, it is important to investigate on the external factors that may influence an individual's waste sorting behaviour and participation rate. In this paper, we examined how four possible external factors—namely market incentives, market facilitators such as informal recycling market, government incentive and government facilitators—influence waste separation behaviour of Hangzhou's residents in China. The survey questionnaire was designed based on the extension of an extant theoretical framework and literature review, and then disseminated to the households through systematic sampling in JB Street of Hangzhou, resulting in a sample size of 631 valid responses. The partial least squares structural equation modelling (PLS-SEM) was conducted to evaluate the effectiveness of each construct. Our results revealed a significant and positive correlation between all the constructs to waste separation intention except the path from market incentive to intention. We further discussed on the moderating effect of the social-demographic variables such as social influence, gender and income on recycling intention and waste separation behaviour. This study expands the understanding on perceived effectiveness of external factors that influence residents' waste separation behaviour. The findings can be extrapolated to other countries to implement effective household waste management policies.

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## 1. Introduction

Household solid waste management has been a challenge for every countries due to the increasing amount of waste produced, the high cost of waste management and most importantly the lack of understanding of the factors affecting waste management (Guerrero, Maas, & Hogland, 2013). In particular, the increasing amount of household waste production has been due to several reasons namely, rapid increase in population, pushing for economic growth, moving toward urbanization of rural parts of the country (Minghua et al., 2009). Besides, landfill spaces are getting limited in many countries (Bartelings & Sterner, 1999), and the increase in food consumption has also resulted in an increase in the amount of

waste produced in homes (Adeoye, Sadeeq, Musa, & Adebayo, 2016). Therefore, the urge to build an efficient waste management mechanism is the top priority of the government. Yet even though recycling activities are well known by individuals, the rates of recycling by residents are still on the lower scale due to reasons such as lack of convenience for recycling and their perceived benefits from recycling (Mavropoulos & Sa, 2009). For instance, in the Dhaka City Corporation (DCC), Bangladesh, there were only half of the solid waste produced be collected and classified (Matter, Dietschi, & Zurbrugg, 2013). Thus, to identify the gap for the lack of participation in recycling during their daily life, understanding what and how the factors drive people's recycling behaviour is important to lead their behaviour to a favourable movement.

There are some existing studies about how the internal factors influence recycling behaviour (Nguyen, Zhu, & Le, 2015). For instance, motivations, perceived consumer effectiveness and environmental knowledge were proved to have a direct effect on students' recycling behaviour in Spain and the U.S (Izagirre-Olaizola, Fernández-Sainz, & Vicente-Molina, 2015). However, to the best

\* Corresponding author. Department of Building, 4 Architecture Drive, 117566, Singapore.

E-mail addresses: [xulin0707@zju.edu.cn](mailto:xulin0707@zju.edu.cn) (L. Xu), [lingmaoliang@zju.edu.cn](mailto:lingmaoliang@zju.edu.cn) (M. Ling), [luy@nus.edu.sg](mailto:luy@nus.edu.sg) (Y. Lu), [mengshen@nus.edu.sg](mailto:mengshen@nus.edu.sg) (M. Shen).

of our knowledge, there are seldom conclusive results that discussed the linkage between external factors and household waste separation behaviours. Hence, this paper aims to investigate how the external factors impact household waste separation behaviour based on a questionnaire survey conducted in the city of Hangzhou, China. The result can provide lessons for policy makers to implement appropriate waste management policy with possible extrapolation to other cities of China, or even to other countries in a different context in terms of policy making by their government.

## 2. Literature review

Previous studies on individual pro-environmental behaviour and resource consumption are based on a few theoretical foundations, rigorously reviewed as follows.

### 2.1. Theory of planned behaviour (TPB) model and relevant psychological models

There are two main types of theoretical framework that explains psychological factors of environmental behaviour, namely Intention-based models and value-norm-based models. According to Nisbet and Gick (2008), TPB is the most commonly used intention-based model, which has largely been tested in the domain of recycling behaviour. TPB is a theory that has been applied to studies of the relations among beliefs, attitudes, behavioural intentions and behaviours (Ari & Yilmaz, 2016; Babaei et al., 2015; Chu & Chiu, 2003; Nguyen et al., 2015; Pakpour, Zeidi, Emamjomeh, Asefzadeh, & Pearson, 2014; Tonglet, Phillips, & Bates, 2004). TPB theory maintains that attitude, subjective norms, and perceived behavioural control, which are resulted from various beliefs, can shape an individual's behavioural intentions leading to the change of behaviour together, and the perceived behavioural control can also directly predict the behaviour. Meanwhile, there emerged many TPB-extended models which incorporate perceived moral obligation, knowledge, skill, past behaviour and other factors. Undoubtedly, TPB is the most popular theory applied to explain the variance of performance of recycling, while the key determinants it elucidates are almost the internal incentives and facilitators, which ignores the various external factors especially the market factor to a large extent.

Extant studies have also applied the Norm-Activation-Theory (NAT) and Value-Belief-Norm (VBN) model to examine the influence of values, beliefs and norms on pro-environmental behaviours. The NAT model assumes that the personal norms are a potent contributor to behaviours that carry a reference to morality (Ofstad, Tobolova, Nayum, & Klöckner, 2017; Schwartz and Howard, 1981; Thøgersen, 2006). And there are three main predictors of personal norms namely awareness of needs (AN), awareness of consequences (AC) and ascription of responsibility (AR). NAT theory mainly focuses on internal determinants rather than the direct discussion on external situational factors. The VBN model is developed to explore the forming mechanism of support of social movement, which can be divided into four categories namely private-sphere behaviours such as recycling and electricity saving, policy support, environmental citizenship and environmental activism (Ofstad et al., 2017). Based on values and norm-activation processes, this theory claims that if individuals equipped with basic values of movements believe that valued objects are threatened and their own actions are beneficial for restoring those values, they would experience an obligation (personal norm) for pro-movement action which creates a predisposition to support for social movements, the specific type of which are dependent on individual capabilities and constraints (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). Briefly, trait-like values about the self, others and earth

influence one's personal beliefs and norms for pro-environmental actions (Seacat & Northrup, 2010). Conclusively, this theory explains the effects of intrinsic factors especially incentives on the support behaviours and logic relations among these factors.

Apart from the intention and value-norm-based models based on the environmental psychological principles, Seacat and Northrup (2010) also applied an Information–Motivation–Behavioural Skills (IMB) model traditionally used to predict personal health behaviour to explore the factors of information, motivation, and behavioural skills and the predictive validity of these components and their interrelationships to recycling behaviour. According to IMB model, any deficiency in information, motivation, and/or skills may lead to the less chance of behavioural change. The findings also suggest that the levels of information and motivation served as the exogenous variables would predict the endogenous mediating variable—recycling skills—and influence recycling behaviour indirectly.

### 2.2. Social marketing theory and other relevant theories

Social marketing theory, proposed by Kotler and Roberto (1989), provides a comprehensive method for planning and effectively changing public behaviour. The effective influence on beliefs, attitudes, and actions of individuals relies on communicating the right kinds and mix of offers, facilities, information, and promotion. The social marketing theory has then been explored and expanded by Hornik et al. (1995) in studying the deterrents of recycling behaviour based on a meta-analysis of 67 empirical studies. The key determinants of consumer recycling behaviour were classified into four theoretical groups: intrinsic incentives, extrinsic incentives, internal facilitators, and external facilitators. Both external incentives and facilitators fitting into the scope of this study were selected to group external factors in this study.

Scholars also used other theories, such as governance theory and institutional theory, to explore the consumer recycling behaviour and management. For instance, governance theory focusing on the interactions between government, market and society could be applied to the recycling mechanism design and policy discussion. Institutional theory emphasizes the processes by the structures, including schemes, rules, norms, and routines, as established as authoritative guidelines for social behaviour. However, they are more suitable for the macro-level analysis to evaluate multiple waste recycling programs and therefore haven't been selected in this study which is more focused on the individual-level psychological factors and behaviour.

After the synthesis of relevant theories, the framework of this paper was mainly built upon a mix of abovementioned theories including both TPB and social marketing theory, to investigate the influence of external factors on an individual recycling behaviour. Specifically, this paper established the construct of “external factors—intention—behaviour” based on the adaption of TPB model, where the extrinsic factors were grouped into two dimensions: government/market and incentives/facilitators. The moderating effects of the social and demographic factors were also considered to complement the theoretical basis of this proposed construct.

### 2.3. Factors to form residents' waste separation behaviour

The TPB, as aforementioned, is one of the most popular theoretical frameworks applied to explore the interrelationships between inherent psychological factors and waste separation behaviour. Chu and Chiu's (2003) survey of a sample of community residents in Kaohsiung, Taiwan, for example, tested an integrated model provided by TPB model, which manifests that the intention and behaviour of waste recycling could be predicted by the intrinsic

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