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Factors influencing waste separation intention of residential households in a developing country: Evidence from Hanoi, Vietnam

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ABSTRACT

Although various programs of waste separation at source have been deployed over the last decades in developing countries, they have stopped at the level of pilot-programs and have generally not been replicable. This empirical study aims to investigate the factors influencing the intentions in separating waste of residential households in Vietnam's capital city, Hanoi. The waste separation intentions of respondents were judged by the amount of the cash fine that each household was willing to pay as a commitment to participation. An econometric analysis was employed to demonstrate that trust, personal moral norms, perceived difficulties and reciprocity are important factors explaining the residents' behavioral intentions in waste separation. These findings suggest that apart from the improvement of institutional capacity and guarantee of satisfactory facilities and vehicles, communication campaigns to consolidate trust and inspire moral obligations of residents also have an essential role to play in overcoming the common dilemmas of solid waste management in a typical city of a developing country such as Hanoi, Vietnam.

1. Introduction

The separation of waste at source has been considered as a fundamental condition in *closing the loop of materials*, which is expected to reverse the negative impacts of solid waste on the environment and the scarcity of natural resources (Zhu, 2004). However, in cities of developing countries, waste separation at source is currently one of the biggest challenges for sustainable waste management programs. The various programs of waste separation at source deployed over several decades have only existed in the form of pilot-programs and have generally not been replicable on large scales. Examples of this situation can be found in various studies (Charuvichaipong & Sajor, 2006; Tadesse, 2009; Zhang, Che, Yang, Ren, & Tai, 2012).

In Hanoi, the capital of Vietnam, the combined effects of changes in lifestyle, burgeoning population and rapid urbanization have led to a rise in the generation of municipal solid waste (MSW). The city produces more than 6500 tons of solid waste per day, and the average amount of MSW generated daily per capita is 0.9 kg. It is estimated that this figure will reach 1.4 kg/day by 2020 (Ministry of Natural Resource and Environment – MONRE, 2011). Although pilot programs of waste separation at source have been deployed since the early 2000s, they have not been scaled up, and currently, solid waste is not segregated at the source. Most of the solid waste generated is disposed of in landfill sites, causing severe pollution and overload of waste (Thanh & Matsui, 2011). Amidst this situation, the National Strategy for Integrated Management of Solid Waste Until 2025 and Vision Towards 2050 was issued in December 2009. The National Strategy stipulates that waste separation at source is one of the most important tasks of the strategy in Vietnam, especially for major cities such as Hanoi. However, for the strategy to materialize at local level, it is essential to understand what factors influence individual behavior patterns.

As is the case in many other environmental situations, one of the possible barriers to waste separation is social dilemmas, which, by definition, refer to a choice situation in which short-term rationality impels people to act for their own benefit (Dawes, 1980; Hardin, 1968). However, many people are also ready to care more

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about pro-environmental behaviors than their personal immediate gains (Ostrom, 2010). According to Dietz (1994), the choices people make are informed by rules other than self-interest or personal gains, and different rules will be applied in different contexts, making it hard to foresee the actual individual decisions.

Fundamental questions concerning how individual decisions are made and how defection problems are resolved have been addressed in various studies on common dilemmas. Some studies rely on the development of the Theory of Planned Behavior (TPB) (Ajzen, 1991) to suggest that attitude is the main predictor regarding waste separation intentions, and based on this positive intention, it is possible to predict the actual waste separation behavior of the respondent (Barr & Gilg, 2005; Karim Ghani, Rusli, Biak, & Idris, 2013; Tonglet, Phillips, & Read, 2004). Although TPB provides a logical outline of environmental behavior, a number of variables other than attitudes, subjective norms and perceived behavioral control also play a role in shaping behavioral intention (Barr & Gilg, 2005). In certain contexts, personal feelings of moral judgment, obligation to perform or refusal to perform a certain behavior must be taken into account (Ajzen, 1991). Moral judgment and felt obligations are also identified as key variables in the Value-Belief-Norm theory developed by Stern, Dietz, Abel, Guagnano, and Kalof (1999). Empirical evidence has been found in several studies regarding waste management behavior (Chu and Chiu, 2003; Kanbar, 2005).

A number of recent studies have shed light on the behaviors in common dilemmas by accounting for other economic and social mechanisms such as economic incentives, sanctions, communication, altruism, reciprocity, social norms and trust (Mulder, Van Dijk, De Cremer, & Wilke, 2006; Thøgersen, 2008; Yau, 2010; Ostrom, 2000). Dietz, Dolsak, Ostrom, and Stern (2002, p.12) argued that: "Hardin's predictions hold under a one-shot condition with no communication, but not necessarily in a world where the game is played repeatedly, or where communication is possible". Other studies have suggested that trust plays a key role in facilitating cooperation (De Cremer, Dewitte, & Snyder, 2001; Van Lange, Joireman, Parks, & Van Dijk, 2013).

Moreover, many previous studies indicate that recycling behavior can be facilitated by convenience (Ando & Gosselin, 2005; Sidique, Lupi, & Joshi, 2010; Timlett & Williams, 2008). This argument was supported recently by Bernstad (2014), who emphasized the importance of convenience and the existence of necessary infrastructure to participate in waste recycling. Additionally, a convenient location of waste drop-off facilities was found to be a motivator (Lange, Bruckner, Kroger, Beller, & Eggert, 2014). However, Yau (2012) suggested that the convenience of a floor-based system of waste separation facilities is by itself no guarantee of effective domestic waste recycling in residential high-rises. A noteworthy recent study in Malaysia by Karim Ghani et al. (2013) found that convenience was not a significant reason for not participating in waste recycling.

Only by knowing what drives people to participate in separation of waste at source and whether they are ready to cooperate or not can we find conditions and interventions that effectively maximize cooperation for the implementation of waste separation programs. Given the paucity of such studies related to Vietnam, we conducted an empirical study in Hanoi to investigate the factors influencing the intention of residential households in separating waste at source.

2. Methodology

2.1. Study site

Hanoi has an area of 3328.89 km^2 and a population of 6,870,200 people (Hanoi Statistical Office, 2012). The majority of citizens live in detached houses and others in pre-fabricated buildings typical of the pre-1990 period. High-rise buildings, regarded by local authorities as the future accommodation style, now account for approximately 18% of the city's total residential area (Minh, 2012). Increasing at a rate of 10% per year, solid waste is a growing problem for Hanoi, with organic waste accounting for as much as 60% of MSW. This presents great potential for composting applications (MONRE, 2011).

Between 2006 and 2009, in the framework of the 3R (Reduce, Reuse, Recycle) program financially and technically supported by the Japan International Cooperation Agency (JICA), the solid waste management authority, Hanoi City Urban Environmental Company, implemented a project of waste separation at source and recycling of biodegradable waste in the four most central wards, namely Lang Ha, Thanh Cong, Nguyen Du, Phan Chu Trinh.

At the beginning of the program, each household was given two types of waste bins for free, an orange-colored bin for non-compostable waste and a green-colored bin for compostable waste. To accommodate the differences in the residential places of the city dwellers, a new source-separated waste collection system was introduced. (i) For houses located along and close to major streets, people have to place biodegradable waste in the green-colored container and other wastes in an orange-colored container at designated sites along the streets. (ii) For houses located far away from major streets, separated waste is collected by two hand-carts and carried to collecting points on larger streets before being picked up by two waste trucks.

The project was evaluated as successful in raising the awareness of citizens and significantly improving the rate of organic waste composted, from 7% to 30% (Taniguchi & Yoshida, 2011). In addition, some other pilot programs of waste separation in smaller communities have been organized in suburban districts of the city. However, these programs are generally unsustainable. Although theoretically they remain in operation, only a small number of households have continued to separate their waste since funding from the project ran out (MONRE, 2011).

2.2. Sampling

Two types of households, those who have experience of waste separation (pilot households – Thanh Cong and Nguyen Du wards) and those who have no experience of waste separation (non-pilot households – Nhan Chinh and Nghia Tan wards), were selected for the household survey. The location, population and area of these wards are presented in Fig. 1.

Although the study was designed to randomly survey 45 households in each ward, a larger sample of 60 households was randomly chosen from the list of households provided by each ward official. This was done to make sure that the researcher had a spare but random sample in case some of the households were either unavailable or unwilling to respond to the questions. A total of 180 households were surveyed, and a pretest was given to 15 respondents to avoid possible misinterpretation.

2.3. The questionnaire

The development of the four-section questionnaire was grounded on various literature about recycling (see for example Ajzen, 1991; Tonglet et al., 2004; Kanbar, 2005). The first section was a set of items to collect the general information of households in terms of socio-demographic information, income, and number of years of living in the community. The second section included a set of items to collect data relating to waste generation and habits in the waste management of households. The third section presents items that are used to measure the predictor variables of the model. For each item, the respondents were asked to demonstrate their