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Wishing to finance a recycling program? Willingness-to-pay study for enhancing municipal solid waste recycling in urban settlements in Thailand

Amornchai Challcharoenwattana [a, b], Chanathip Pharino [b, c, *]

[a] International Postgraduate Programs in Environmental Management, Graduate School, Chulalongkorn University, Bangkok 10330, Thailand
[b] Center of Excellence on Hazardous Substance Management (HSM), Chulalongkorn University, Bangkok 10330, Thailand
[c] Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand

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ABSTRACT

This study measured willingness to pay (WTP) for the addition of recycling services into existing municipal solid waste management in different types of settlements in Thailand. Questionnaire surveys were distributed in person to gather recycling-related socio-economic factors. The mean WTP was identified by the payment card method and analysed by interval regression. Analysis of results revealed that mean monthly WTPs increase, although not linearly, in the least urbanized areas (~0.73 USD), the urbanized areas (~1.96 USD), and the most urbanized areas (~1.65 USD). Common factors that influenced WTP were (a) higher level education and (b) a habit of separating recyclables. However, other socio-economic and recycling behaviour factors affected willingness to pay in each settlement differently. The mean WTP from each study site is consistently higher than the current rate for waste disposal, which signifies that average respondents from all study sites favoured recycling.

1. Introduction

Despite drawbacks in the form of pollution and depreciation of land values, landfilling remains a prevalent method of disposal for municipal solid waste (MSW) (AIT & UNEP, 2010; Hoornweg & Bhada-Tata, 2012). The Municipal Solid Waste Management Authority is now struggling to commence new landfill projects and must even suspend existing landfill operations due to public demonstrations. Schemes to change MSW management (MSWM) to alternative disposal technologies, such as incineration, are often too costly and create significant budgetary burdens. The city of Harrisburg provides a good example of a city bankrupted by its incinerator project (Varghese, Bathon, & Sandler, 2011).

To expand the operating life of landfills and minimize environmental burdens on stakeholders, MSW separation prior to landfilling has been recommended under the principle of the "3Rs"—Reduce, Reuse, and Recycle. However, many towns' administrations struggle to incorporate a recycling system into their MSW management systems, citing a deficit of investment, lack of participation, and insufficient technical support as their primary reasons (Ezebilo, 2013). Alternatively, pricing the disposal of MSW using a "Pay as You Throw" (PAYT) scheme is often employed to incentivize a reduction of disposed MSW and to promote separations of recyclables in many towns with good track records (Gellynck & Verhelst, 2007; Hong, 1999; Reschovsky & Stone, 1994).

Despite clear benefits of PAYT for reducing the overall burden of public finance, many cities still opt to maintain the status quo by absorbing the cost of MSW services using the justification that households may turn to illegal dumping and create adverse health and sanitation situations. Another potential cause of slow adoption of system improvements is the fear of political backlash from increasing MSWM fees despite the city managers' awareness of the long-term benefits. Contrary to popular belief, outcomes from many contingent valuation surveys have indicated that

Abbreviations: LAUs, Local Administrative Units; MS, Metropolis Settlement; MSW, Municipal Solid Waste; MSWM, MSW management; MSWR, Municipal Solid Waste Management through recycling services; PAYT, Pay as You Throw; PC, Payment Card Method; PCD, Pollution Control Department; PHA, Public Health Act; PS, Peri-Urban Settlement; US, Urban Settlement; WTA, Willingness to Accept; WTP, Willingness to Pay.

* Corresponding author. Department of Environmental Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand.
E-mail address: Chanathip.p@chula.ac.th (C. Pharino).

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respondents often understand and express additional willingness to pay if MSW services are improved (Blaine, Lichtkoppler, Jones, & Zondag, 2005; Palatnik, Ayalon, & Shechter, 2005).

Nevertheless, MSWM fees must be set at an appropriate level. When the fees are too high, residents are more likely to engage in illegal dumping or refuse to subscribe to the MSWM system (US EPA, 2004). If the fee is too low, recycling rates may decrease because MSW generators may opt to pay the fees to continue their existing practice of not recycle, and they may view the fee as a "reparation fee for not recycling." Uri Gneezy and Aldo Rustichini (2000) indicated that penalties that are too lenient can encourage behaviour that they were intended to curb.

1.1. Background of MSWM in Thailand and Thai MSWM financing problems

In 2012, Thailand's annual generated MSW was 24.73 million tons but only 44.92% was properly managed or recycled, according to Thailand's Pollution Control Department (PCD, 2012). According to Statistics of MSWM Methods in Thailand, 97.63% of the 2,490 MSWM sites in Thailand use land-burying methods, i.e., landfilling and open dumping (ThaiPublica, 2014). The average daily MSW generation rates in urban settlements are also increasing. The smallest settlement type (unchartered townships with registered populations less than 5,000) is estimated to produce MSW at a rate of 0.91 kg/capita. The most basic type of municipality is called Thumbon municipality, defined by numbers of registered population higher than 5,000 and approved by Ministry of Interior, is estimated to produce MSW at a rate of 1.02 kg/capita. The more urbanized type of municipality is called Muang municipality, defined by number of registered population higher than 10,000 and approved by Ministry of Interior, is estimated to produce MSW at a rate of 1.15 kg/capita. The most urbanized type of municipality is called Nakorn municipality, defined by number of registered population higher than 50,000 and approved by Ministry of Interior, is estimated to produce MSW at a rate of 1.89 kg/capita (PCD, 2013).

Complex and ambiguous regulations in Thailand are a burden on financing MSWM. Under the Public Health Act B.E. 2535 (1992) (PHA), the responsibility to collect and dispose MSW is delegated to Local Administrative Units (LAUs) such as municipal governments. However, the PHA only authorizes LAUs to bill the collection cost to MSW generators. Disposal costs are to be recovered by the guideline in the Enhancement and Conservation of the National Environmental Quality Act B.E. 2535 (1992). Consequentially, most LAUs, which are more familiar with the PHA, only enforce and collect MSW collection fees and use the fees to cover both collection and disposal costs. As indicated in Table 1, collected MSWM fees cover only approximately 10–37% of the full cost of MSWM in sampled small municipalities and less than 10% for sampled larger municipalities. In addition, MSWM expenses per resident rise substantially due to increasing complexity in collection and disposal as the town size increases. Given the disparity of collected fees to the full costs of MSWM, it is understandable that the low upfront and operation costs of landfilling and open dumping continue to make them a popular option.

1.2. Contingent valuation and underlying econometric analysis

Contingent valuation (CV) is a technique used for gauging how a population of interest values goods and services in terms of willingness to pay (WTP) or willingness to accept (WTA) (Arrow et al., 1993; Cawley, 2008). Of the two, WTP has become more popular because values as reported tend to be more conservative than those of WTA (He & Asami, 2014; Horowitz & McConnell, 2002). The CV technique gained acceptance when the National Oceanic and Atmospheric Administration (NOAA) used the technique to evaluate the public's willingness to pay to prevent environmental and ecological damages similar to the Exxon Valdez oil spill case (Carson et al., 2003). CV is also used in other non-market valuations to gauge the public's WTP for improvement or introduction of public services, i.e., river management (Loomis, Kent, Strange, Fausch, & Covich, 2000), air quality improvement (Wang & Whittington, 2003), climate change mitigation (Choi, 2014), and improvement of MSWM (Aadland & Caplan, 1999; Dunn, 2012; Kinnaman, 2000).

Relationships between WTP, incomes, socio-economic factors, and recycling behaviours can be demonstrated using the random utility theory. As adapted from Wang and Whittington (2003), in a situation where no MSWM service (V_0) exists, the utility can be explained as:

$$V_0 = V(Y, P, E_0, Z, \varepsilon_1) \quad (1)$$

where Y is incomes, P is a price vector, E_0 is an environmental status of lacking MSWM services, Z is the observed socio-economic, perception, knowledge toward the issue and ε_1 is a group of factors that are not reflected in Y, P, E_0, Z.

If a MSWM service is offered, an individual is willing to pay up to the amount of X monetary unit (WTP_x) for the service and the environmental status changes from E_0 to E_1. The utility for this situation (V_1) can be expressed as:

$$V_1 = V(Y-(WTP_x), P, E_1, Z, \varepsilon_1) \quad (2)$$

Solving for WTP results in:

$$V_0 \rightarrow V_1 \text{ and } WTP = WTP\,(Y, P, E_0, E_1, Z, \varepsilon_1) = E[WTP] + \varepsilon_2 \quad (3)$$

where E [ ] is an expectation transformation, and ε_2 is the random term of the individual's WTP for MSW service in which ε_2 values are unique for each individual.

Among popular methods of soliciting WTP (i.e., dichotomous choice, open-ended estimation, etc.), this study employed the payment card (PC) method because PC tends to provide more

Table 1
Selected 2014 municipal budget reports in Thailand.

Parameters	Least urbanized municipalities		Urbanized municipalities		Most urbanized municipalities	
	Thumbon Lamthough municipality, Nakorn Rajsrima	Thumbon Krui Buri Municipality, Prachub Khirikhan	Muang Nong pre municipality, Chonburi	Muang municipality, Prachub Khirikhan	Nakorn Nakorn Rajsrima, Nakorn Rajsrima	Nakorn Chieng Rai, Chieng Rai
Registered populations	5,950	9.830	61,198	17,901	136,153	69,612
% MSW's related expense from overall expenses	0.57%	3.48%	13.88%	10.41%	9.78%	14.54%
% fee covered in MSWM expense	36.36%	10.47%	11.48%	3.47%	0.05%	6.37%
Expense for MSWM per head (USD)	0.91	5.69	18.06	26.16	23.23	27.17