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An application of the theory of planned behaviour to study the influencing factors of participation in source separation of food waste

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ABSTRACT

Tremendous increases in biodegradable (food waste) generation significantly impact the local authorities, who are responsible to manage, treat and dispose of this waste. The process of separation of food waste at its generation source is identified as effective means in reducing the amount food waste sent to landfill and can be reused as feedstock to downstream treatment processes namely composting or anaerobic digestion. However, these efforts will only succeed with positive attitudes and highly participations rate by the public towards the scheme. Thus, the social survey (using questionnaires) to analyse public's view and influencing factors towards participation in source separation of food waste in households based on the theory of planned behaviour technique (TPB) was performed in June and July 2011 among selected staff in Universiti Putra Malaysia, Serdang, Selangor. The survey demonstrates that the public has positive intention in participating provided the opportunities, facilities and knowledge on waste separation at source are adequately prepared by the respective local authorities. Furthermore, good moral values and situational factors such as storage convenience and collection times are also encouraged public's involvement and consequently, the participations rate. The findings from this study may provide useful indicator to the waste management authorities in Malaysia in identifying mechanisms for future development and implementation of food waste source separation activities in household programmes and communication campaign which advocate the use of these programmes.

1. Introduction

The development of Malaysia with total population of approximately 29.2 million currently, along with the economic growth, business activities and consumption rate, will accelerate the daily generation and volume rate of municipal solid waste (MSW). With total MSW waste generation of 19,100 tons in 2005, the amount is expected to be 31,000 tonnes/day with assumptions of 3.6% growth with an average generation rates ranges from 0.5–0.8 kg/person/day to 1.7 kg/person/day in major cities in 2020 (Latifah et al., 2009; Kathirvale et al., 2003). The Malaysian MSW composition is summarised in Table 1 and generally has characterised significantly high moisture content which ranging from 52.6% to 66.2% (Hassan et al., 2001) due to its tropical climate with heavy rainfall. Obviously, Malaysian solid waste contains a significantly high amount of food waste, and the amount has been recently reported to reach 63.1% in 2008 (Siwar, 2008) and 74% specifically in Kuala Lumpur (capital city of Malaysia) which are mainly being disposed at the landfills. This figure may escalate further after other recyclable materials are recovered from the waste stream which mainly disposed at the landfills.

The food waste includes uneaten food and food preparation leftovers from residences, commercial establishments such as restaurants, institutional sources like school cafeteria and industrial sources like factory lunch-rooms. These organic residues generated by the handling, storage, sales, preparation, cooking and serving of food, are among the many wastes that could be separated and recycled. Unlike other recyclable waste such as paper and glass, food waste separation and minimisation programs has not been extensively implemented in Malaysia due to various constraints which include low awareness among waste generators and low demand of products from food waste such as compost (Agamuthu et al., 2007). Since a significant portion of Malaysian's municipal solid waste comprises of food waste, this matter could cause significant environmental impacts to the country in the long run as most of these food wastes are sent to landfills, in which would degrade in anaerobic conditions to release methane, a potent greenhouse gas. Land-filled food waste can produce methane gas that results in 21 times greater impact on global warming than carbon dioxide. Besides this, the humid nature of food waste is also a main contributor to leachate formation at the landfill site, and their existence in the waste stream may contaminate and complicate the recovery process of other recyclables. To overcome this issue, the separation

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Table 1
The composition of municipal solid waste (Chuah, 2011).

Components	2002	2003	2004	2005	2006	2007	2010
Food waste	32	56.3	37.4	49.3	45	42	43.5
Mixed plastic	16	13.1	18.9	9.7	24	24.7	25.2
Mix paper	29.5	8.2	16.7	17.1	7	12.9	22.7
Textiles	3.4	1.3	3.4	–	–	2.5	0.9
Rubber and leather	2	0.4	1.3	–	–	2.5	–
Wood	7	1.8	3.7	–	–	5.7	–
Yard wastes	–	6.9	3.2	–	–	–	–
Ferrous	3.7	2.1	2.7	2	6	5.3	2.1
Glass	5.5	1.5	2.6	3.7	3	1.8	2.6
Others	1.9	8.4	10.4	18.2	15	25.74	1.8
Total	100	100	100	100	100	100	100

and recycling of these food wastes is one way of success, in the road to divert these wastes from entering disposal sites. In 1979, Environment Protection Society Malaysia (EPSM) has recommended separation of waste at its point of generation where the separated waste must be placed in separate containers and organic waste should be used in biogas plant or composting and or for energy generation (Mohamed et al., 2009). Later, the provision under Solid Waste and Public Cleansing Act 2007 had mandatorized residents to separate recyclables and recycle which the guidelines for source separation of municipal solid waste has been introduced to local authorities in 2006. Three pilot projects for National Waste Minimisation (2004–2006) were performed which involved three model local authorities namely Majlis Perbandaran Pulau Pinang (MPPP), Majlis Perbandaran Subang Jaya (MPSJ) and Majlis Perbandaran Miri (MBM). Based on this guideline, the selected local authorities should identify the waste flow and characteristics for formulating the source separation plan. Commercially, modernised technologies namely anaerobic digestion and vermicomposting has capability to transform food waste into more valuable products such as biogas and organic fertilizers, respectively. the quality of end products from these food waste conversions depends largely on the quantity and quality of food waste sent into the system. Hence, the successful management and marketing of any domestic waste recycling scheme will require both national and local governments to encourage high levels public participation to ensure the planned technology to be implemented successfully. This will require strategies that encourage and persuade the publics to significantly change its current recycling behaviour (William and Kelly, 2002).

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) is a theoretical framework to aid understanding of the perceived effectiveness and public attitudes towards the studied schemes. The use of a psychological models in this theory is important to understand householders' reaction towards food waste separation programs which require underpin these choices (Tonglet et al., 2004). The theory, which was developed from the earlier Theory of Reasoned Action (TRA), assumes that people behave rationally, and they take into consideration the implications of their actions. The TPB hypothesizes that the immediate determinant of behaviour is the individual's intention to perform, or not to perform the behaviour. Intentions are in turn influenced by two factors namely attitude (the individual's positive or negative evaluation of performing behaviour) and subjective norms (the individual's perception of social pressure to perform or not perform the behaviour). However, Liska (2004) argues that the performance of much behaviour will be constrained by the lack of appropriate opportunities, skills and resource. Thus, the TPB extends the TRA to include a third variable, perceived behavioural, a measure of individual's perception of their ability to perform the behaviour in questions. To date, the TPB has been used successfully to understand a range of environmentally responsible behaviours which includes recycling (e.g., William and Kelly, 2002; Davis et al., 2006; Omran et al., 2009).

According to the theory as illustrated in Fig. 1, human behaviour is guided by three kinds of considerations: beliefs about the likely outcomes of the behaviour and the evaluations of these outcomes (attitude), beliefs about the normative expectations of others and motivation to comply with these expectations (subjective), and beliefs about the presence of factors that may facilitate or impede performance of the behaviour and the perceived power of these factors (perceived behavioural control). In their respective aggregates, behavioural beliefs produce a favourable or unfavourable attitude toward the behaviour; normative beliefs result in perceived social pressure or subjective norm; and control beliefs give rise to perceived behavioural control. In combination, attitude toward the behaviour, subjective norm, and perception of behavioural control lead to the formation of a behavioural intention. As a general rule, the more favourable the attitude and subjective norm, and the greater the perceived control, the stronger should be the person's intention to perform the behaviour in question. Finally, given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions when the opportunity arises.

Waste separation is a behaviour which requires considerable efforts on the part of individual as household waste must be sorted, prepared and stored. Consequently the separation decision is likely to be complex and several factors to be taken into consideration. The TPB provides theoretical framework for systematically identifying the factors which influence the separation decision. TPB also allowed individuals who have positive attitudes, and think that there is adequate normative support, and perceive that they can easily engage in the activity, should have strong intentions to perform the behaviour (Fielding et al., 2008). Meanwhile, the stronger these intentions are, the higher will be the likeliness for people to behave according to these intentions. Despite a considerable support of TPB, several authors have suggested that additional variables such as situational factors should be included within the

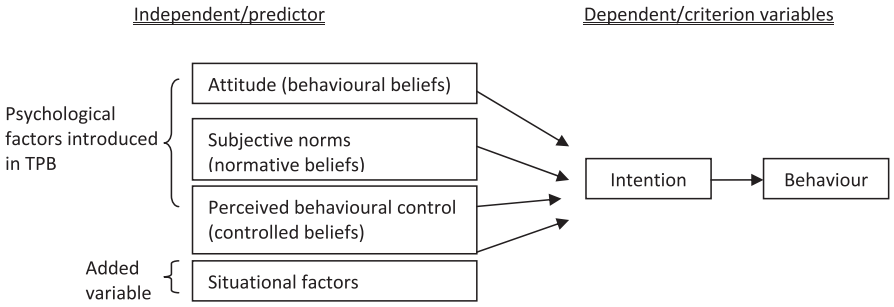

Fig. 1. Utilizing factors introduced by TPB and an added variable to predict intention and behaviour to perform food waste separation at home.