Journal of Applied Sciences

ISSN 1812-5654

science alert

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Journal of Applied Sciences 12 (17): 1839-1845, 2012
ISSN 1812-5654 / DOI: 10.3923/jas.2012.1839.1845

Economic Valuation of Integrated Solid Waste Management in Kota Bharu, Kelantan

[4]Nik Nor Rahimah Nik Ab Rahim, [1]Mad Nasir Shamsudin, [2]Awang Noor Abd. Ghani,
[3]Alias Radam, [4]Latifah Abd. Manaf, [4]Sara Kaffashi and [4]Norfashah Mohamed
[1]Faculty of Agriculture,
[2]Faculty of Forestry,
[3]Faculty of Economics and Management,
[4]Faculty of Environmental Studies, Universiti Putra Malaysia, Selangor, Malaysia

Abstract: Solid Waste Management (SWM) is a critical issue in Kota Bharu, a compacted city in east coast of West Malaysia. The amalgamation of dwindling financial resources and population growth results in incompetency in controlling and handling excessive solid waste generation, giving rise to adverse effects on environment and public health. This study was attempted to evaluate acceptance of the communities towards introducing Integrated Solid Waste Management (ISWM) to alleviate the drawbacks of current solid waste management. Single-bounded Dichotomous Contingent Valuation Method (DC-CVM) was conducted to estimate communities' Willingness to Pay (WTP). Primary data obtained through personal interview were analyzed using a logit model. The model estimation shows age, income and occupation are significantly influential in determining the communities' willingness to pay. The monetary figure derived from the model shows the willingness to pay value of RM 13.91 (USD 4.40) per month. The consciousness of environmental degradation due to current solid waste management drives the communities to yearn for improvement initiatives. The study suggests that intervention by authority to introduce integrated solid waste management is required.

Key words: Solid waste management, integrated solid waste management, willingness to pay, Kota Bharu, contingent valuation method

INTRODUCTION

In developing countries, generally, the unbefitting solid waste management was mainly due to insufficient land resources for waste disposal and the identification of an appropriate solid waste management program (Jin *et al*., 2006). In Malaysia, specifically, the downside of excessively generated solid waste was the results of incompetency of solid waste management services due to weaknesses in the institutional, financial and technical aspects (Othman, 2002).

Expanding economic activities and growing population are generating excessive solid waste. This issue is common in the main cities of Malaysia, including Kota Bharu, the capital city of Kelantan state. Kota Bharu is the most crowded area among the main cities in east coast of West Malaysia with a population density of 1,264 km^{-2} due to urbanization rate of 2.4% in a decade (Department of Statistics Malaysia, 2010). It is estimated that the solid waste generation was about 320 tonnes per day in 2010 and increased of 119% from 146 tonnes per day in 2006 (Periathamby *et al*., 2009).

The Federal government of Malaysia has introduced privatization policy of SWM in 1998 to reassign the responsibility of SWM from local authorities to concessionaires. However, the state government of Kelantan declined the privatization policy, repudiating SWM services by the concessionaires. Thus, service of SWM in Kelantan state is maintained by local authorities. Kota Bharu Municipal Council (KBMC) is responsible for handling of SWM in Kota Bharu which oversees 115.64 km^2 square of the vicinities around Kota Bharu. SWM in Kota Bharu is enforced according to Local Government Act 1976 and also is legislated by By-laws for Waste Collection and Disposal. The acts serve as rules and enforcement to KBMC in implementation of SWM (Manaf *et al*., 2009).

Conventional SWM is practiced in Kota Bharu encompassing almost all the functional elements in a typical SWM starting from waste generation, waste storage, collection, transportation until disposal (Tchobanoglous *et al*., 1993). KBMC has customary routines to manage controlled solid waste (definition as stipulated in part 1, Section 2, Act 672), including

Corresponding Author: Nik Nor Rahimah Nik Ab Rahim, Department of Environmental Management, Faculty of Environmental Studies, Universiti Putra Malaysia 43400 Serdang, Selangor, Malaysia
Tel: (+06) 0192684655

household waste, commercial waste, institution waste, industrial waste and construction waste. The responsibility of KBMC in SWM comprised of providing stationary waste storage container at waste collection site, collecting the solid waste approximately 3 times a week and waste transportation to the dumpsite for waste disposal. Compactor vehicles are used to collect the waste. Solid waste is immediately transported to a dumpsite which it is located in Beris Lalang at Bachok (Idris *et al*., 2004).

Similar to other developing countries, the aspects of ineffectiveness of SWM in Kota Bharu are very much identical. The flaws in current SWM like placement of solid waste on the ground, leachate and emission dust and gases cause drawbacks to the environment, health and dumpsite's lifespan (Kumar *et al*., 2009; Agamuthu *et al*., 2007; Rushton, 2003). These flaws are the catalysts of environmental hazards, leading to environmental and health effects.

Kota Bharu is gradually facing peril impacts due to SWM, causing communities' discontentment. Piles of uncollected solid waste and insanitary waste disposal promote breeding of pests. As a result, cases of vector borne diseases (e.g., Malaria, Dengue and Leptospirosis) are escalating. The contamination of ground and surface water is also intensifying, particularly in the dumpsite due to indiscriminate waste disposal. Excessive solid waste generation and unsystematic use of dumpsite shortens its life span, causing tight spot to KBMC to find for the substitute at given inadequate funds. Subsequently, financial issue becomes the barrier of improvement intended in SWM (Isa *et al*., 2005).

ISWM is a new established policy in SWM that practices 3R's (reduce, reuse, recycle) together with landfilling and incineration as waste disposal method. The 3R's practices are employed prior to waste disposal as a means of waste reduction strategy. Hence, the volume of solid waste disposed is reduced amplifying positive environmental impacts (Bagchi, 2004). Since ISWM is a new approach for most developing countries, hence China, India and Lesotho were chosen for pilot tests. Positive responses were shown indicating acceptances of ISWM by localities (UNEP, 2009). With respect to that, implementation of ISWM in Kota Bharu, Kelantan is an apt option as to face uphill challenges to properly manage the solid waste. The efforts to reduce the final solid waste volume will literally solve the environmental problems that arise due to excessive waste generation. Alternatively, the concept of 3R's aids to generate sufficient funds for SWM as the recovered solid waste could be utilized to generate revenue to fund SWM (UNEP, 2009). This study therefore was attempted to evaluate acceptance of the communities towards introducing Integrated Solid Waste Management (ISWM) to alleviate the drawbacks of current SWM.

MATERIALS AND METHODS

The contingent valuation of introducing ISWM: Dichotomous choice contingent valuation method (DC-CVM) was employed in this study to estimate the communities' WTP towards introducing ISWM in Kota Bharu, Kelantan. The study was carried out covering five vicinities under management of KBMC. These areas include Kota Bharu city, Kubang Kerian, Pengkalan Chepa, Wakaf Che Yeh and Pantai Cahaya Bulan. The employment of DC-CVM in this study required data collection process through questionnaire survey in duration of August 2011 to October 2011. The initial development of the DC-CVM method in this study commenced with the focus group discussion among the officials from Department of Municipal and Health Services and local community representatives to assist in explaining the problem setting of SWM in Kota Bharu. The outcome from the focus group was utilized in questionnaire design. A good contingent valuation scenario is crucial in CVM study as it helps the respondents to make an informed decision. However, the information in the scenario should not overwhelm the decisions made by the respondents (Carson and Hanemann, 2005). The aspects included in the CVM scenario were the problems in current SWM practices and their implications towards the environment and also pertinent aspects of improvement in ISWM. In this study, the payment vehicle was defined as annual assessment payment which is a payment obliged to the communities to cover the costs of services provided by KBMC, including SWM. Therefore, increment in the assessment rate is necessary to provide services of ISWM. In this study, the payment was calculated for monthly basis.

The elicitation method selected for this CVM study was single bounded, dichotomous choice. In this format, each respondent was presented with contingent valuation scenario that offers future government policy. The respondent was told that the government will impose the stated cost for the policy execution. A random assigned price was offered and response regarding WTP for this amount was recorded (Cameron and Huppert, 1991). Therefore, in this study the respondents were asked about their WTP for the given price to implement ISWM in Kota Bharu. They have to choose either "Yes" or "No" answer.

Questionnaire design: The questionnaire was designed into four sections. The first section of the questionnaire covered the general questions regarding the respondents' awareness about environmental problems in Malaysia and their general knowledge about SWM. The second section was the most vital part covering contingent valuation scenario and dichotomous choice question regarding the respondents' WTP. The scenario signified problems encountered in current SWM in Kota Bharu which it was related to excessive waste generation and inability of local authority to provide sufficient funds to accommodate satisfactory services for SWM. The implications of these problems were elaborated as the escalation of environmental and health problems in Kota Bharu.

The need for new policy in SWM was signified with the introduction of ISWM which the communities' WTP need to be assessed. This scenario was followed by the dichotomous choice question. In this question, bid offer was stated as "If the assessment is increased with the aim to introduce integrated solid waste management in RM X. Are you willing to pay for it?". Two answer choices were offered, either "Yes" or "No". From the pretest results, four bidding prices were selected for RM X, including RM 5 (USD 1.58), RM 10 (USD 3.16), RM 15 (USD 4.75) and RM 20 (USD 6.33). Each bid price was randomly assigned in 75 set of questionnaires prior administration. Section three covered questions on attitude and perception towards introducing ISWM, current SWM problems associated in current SWM in multiple choices and Likert scale format. The last section of questionnaire was designed to attain information regarding the respondents' socioeconomic background.

The registered number of households in Kota Bharu was 64,515 in 2010. Hence, 300 households were selected as respondents to represent the population. The five vicinities in sampling area were given equal number of respondents which 60 respondents each giving the total amount of 300 respondents. The sampling of the households in vicinity was conducted via stratified random sampling. The households were stratified according to the key of stratification variable "types of residential area" that represent their standard of living-high income residential area, medium income residential area and low income residential area. Prior to the selection of the household for survey purpose, the residential areas that receive services of SWM by KBMC were inspected to determine the characteristics of the residents. Proportionate number of households was used for each stratum in order to ensure its representativeness to the whole population.

Willingness to pay estimation: There are three approaches developed to estimate WTP from DC-CV data, initiated by Bishop and Heberlein (1979), followed by Hanemann (1984) and the latter was Cameron (1988) (cited in Santos, 1998, pp 83-91). Most of the literatures employed the Cameron's approach due to its feasibility compared to former approaches. Cameron's approach directly specified a valuation function by proposition of censored logistic regression. This regression is advantageous in a way that it enables estimation of regression equation straightforward from DC-CV data and it's tolerance towards unavailability of continuous information regarding the dependant variable (Santos, 1998; Kaffashi *et al*., 2011).

The censored regression in Cameron's approach is relying on three assumptions that: (1) binary response variable I_{ij} is related to the independent variable WTP_{ij}, (2) WTP_{ij} is generated by a model $WTP_{ij} = X_{ij}'\beta + \mu_{ij}$, where, μ_{ij} are iid logistic random variables with zero mean and k dispersion parameter and (3) availability of observations on offered bid t_{ij}, plus all explanatory variables X_{ij}. When these assumptions are satisfied, the probability of a "yes" answer is:

$$\begin{aligned} \Pr(I_{ij} = 1) = \Pr(WTP_{ij} = t_{ij}) &= \Pr(X_{ij}'\beta + \mu_{ij} = t_{ij}) \\ &= \Pr(\mu_{ij} = t_{ij} - X_{ij}'\beta) \\ &= \Pr\{\mu_{ij}/k = (t_{ij} - X_{ij}'\beta)/k\} \\ &= \Pr\{Z_{ij} = (t_{ij} - X_{ij}'\beta)/k\} \quad (1) \end{aligned}$$

where, Z_{ij} is a standard logistic random variable with zero mean value and dispersion parameter equals to one. Hence, the log-likelihood function for the observed data is:

$$\log L = \Sigma\{-I_{ij} \log \{1+\exp[(t_{ij} - X_{ij}'\beta)/k]\} + (1-I_{ij}) \log \{\exp[(t_{ij} - X_{ij}'\beta)/k] / (1+\exp[(t_{ij} - X_{ij}'\beta)/k] \quad (2)$$

Then, WTP can be calculated by utilizing this formula according to Cameron's approach:

$$WTP = (\beta_0/\beta_1) + (\beta_2/\beta_1) X_1 + (\beta_3/\beta_1) X_2 \quad (3)$$

where, β_0 is the constant, β_1 is the coefficient for the bid price variable, β_2 is the coefficient for independent variable X_1 and β_3 is the coefficient for independent variable X_2 (Santos, 1998; Kaffashi *et al*., 2011). The interpretation of the formula for calculation of WTP is:

$$\text{Mean WTP} = [\beta\text{constant} + \beta\text{age} \times \text{AGE} + \beta\text{occupation} \times \text{OCCUPATION} + \beta\text{income} \times \text{INCOME}] / \beta\text{bid} \quad (4)$$

Statistical analysis: The collected data from questionnaire survey were scrutinized for incorporated analyses in which to include descriptive and economic valuation analyses. The descriptive analysis summarized socioeconomic profiles of the respondents and also their responses for perception, attitude and WTP. The results from the analysis were in terms of frequency, mean and standard deviation. Economic valuation analysis was imperative for WTP estimation. The responses for ISWM bid offers were analyzed into LIMDEP 4.0 for WTP estimation and determination of associated socioeconomic factors affecting WTP.

RESULTS

Respondents' socioeconomic profile: The background of the respondents is presented in Table 1. The average age was 36.28 years old and male respondents comprised 50%. Majority (43.7%) was university graduates and the rest were college graduates (17%), held certificates from secondary school (33.7%), primary school (3.7%) and also never been to school (2%). In terms of the household size, the average number of household was 5 persons. The average household income was about RM 3133.87. Occupation of the respondents varied from government servants (30%), private sector employees (25%), retired (4.3%) to self-employed (22%). Meanwhile 11% of them were housewives and 7.7% were unemployed. About 74.3% of the respondents live in urban areas.

Respondents' perceptions: The respondents' perceptions results is presented in Table 2. Majority of the respondents (66.7%) disagreed that the current SWM is efficiently managed. It is followed with their agreement that SWM in Kota Bharu does not practice solid waste recycling and reusing with the percentage of 72 and 73.3 subsequently. The respondents agreed that current SWM are causing environmental problems (70.4%) and health problems (72%). Majority of the respondents (84%) also perceived that the quality of SWM is not par with other state and 79.7% are not satisfied with overall SWM.

Estimation of mean willingness to pay: Out of 300 respondents surveyed, 55% of them gave positive responds to show their conformity to pay for ISWM. The frequency of responses to bidding prices is shown in Table 3. The responses indicated that the percentage who said "yes" declined as the bid price increased.

The estimation of mean Willingness-to-pay (WTP) was initiated with regression of bivariate logit model. The logit model included probability of "YES" responses for WTP as dependant variable and the offered bid amounts and selected demographic variables as explanatory variables (Table 4). The bid price offered (X_1) for ISWM implementation showed an inverse relationship with "YES" responses for WTP. This relationship was statistically significant at 1% level. The second variable, age (X_2) showed negative coefficient value with 10% significant level. The third explanatory variable, occupation (X_3) was categorized into dummy variables where employed = 1 and unemployed = 0. Positive sign on the coefficient indicated that it has positive relationship

Table 1: Socioeconomic profile of the respondents

	Frequency			
Variable	No.	%	Mean	SD
Age (year)			36.28	12.389
Gender				0.501
Male	150	50.0		
Female	150	50.0		
Educational level			3.97	1.050
Never been to school	6	2.0		
Primary school	11	3.7		
Secondary school	101	33.7		
College/matriculation	51	17.0		
University	131	43.7		
Household size			5.42	2.203
Household income (RM)			3133.87	2322.146
Below RM 1000	23	7.7		
RM 1000-RM 2999	142	47.3		
RM 3000-RM 4999	85	28.3		
RM 5000-RM 6999	23	7.7		
Above RM 7000	27	9		
Occupation				1.666
Government servant	90	30.0		
Private sector	75	25.0		
Retired	13	4.3		
Self-employed	66	22.0		
Housewife	33	11.0		
Unemployed	23	7.7		
Residential area				
Urban	223	74.3		
Rural	77	25.7		

Table 2: Results of respondents' perceptions

	Percentage		
Perceptions	Agree	Not agree	Total
SWM is handled efficiently	33.3	66.7	100
SWM practices recycling	28.0	72.0	100
SWM promotes reusing of solid waste	26.7	73.3	100
SWM does not cause environmental problems	29.6	70.4	100
SWM does not cause health problems	28.0	72.0	100
Quality of SWM is equivalent to SWM in other states in Malaysia	16.0	84.0	100
Satisfaction with overall SWM	20.3	79.7	100

Table 3: The frequency of responses towards bidding prices

	WTP		
BID (RM)	Yes	No	Total
5	67	8	75
10	54	21	75
15	31	44	75
20	13	62	75
Total	165	135	300

Table 4: Willingness to pay model

Variable	B	Sig
Constant (X_0)	2.544	0.000***
Bid (X_1)	-0.298	0.000***
Age (X_2)	-0.025	0.061*
Occupation (X_3) (1: employed; 0: otherwise)	0.854	0.009***
INCOME (X_4)	0.00065	0.000***
-2 Log likelihood	:	251.141
Cox and Snell R Square	:	0.417
Nagelkerke R Square	:	0.558
Mean WTP	:	RM 13.91

***Significant at 1, **5 and *10% level

with "YES" responses to WTP and was highly significant with 1% level. Income (X_4) showed positive relationship with WTP with 1% significant level. From the regressed model, the value for mean WTP was computed based on Cameron's approach as showed in (4). From the model, mean WTP calculated for ISWM was RM 13.91 (USD 4.40) per household for monthly assessment payment.

DISCUSSION

In general, current SWM in Kota Bharu is inadequate to accommodate the communities' needs for efficient service. The core of this predicament is due to lack of parallel between SWM and augmentation of solid waste generation. When waste reduction practice is crucial nowadays, unavailability of reuse and recycle initiatives aggravate quality of SWM. This situation in Kota Bharu represents recycling dilemma in developing countries. Recycling initiatives are commonly hindered to succeed in developing countries due to inadequate infrastructure, poor management and lack of public education by government (Agamuthu *et al*., 2007). Hence, unavailability of waste reduction initiatives cannot circumvent the occurrence of environmental and health effects as well as the chances of landfill life-span prolongation.

The results from CVM study show the respondents' acceptances towards ISWM implementation. Estimation of the logit model with socioeconomic explanatory variables shows comparable results with previous studies. Firstly, the result shows an indication of decrement in WTP due to inclination of bid offers. This result is supported by similar outcomes in CVM studies by Abou-Ali (2003) and Nuva *et al.* (2009). The reluctance for WTP is due to reduction in the respondents' utility for the requirement to pay higher prices. Second, the finding of inverse relationship between age and WTP in this study is supported well by CVM study for SWM in Nigeria (Rahji and Oloruntoba, 2009). The results concur to show that the tendency to pay was higher in younger people. The greater WTP in younger people may be subjected to the influence of environmental and health awareness, that are extensively exposed in academic institutions rather than in old days. Third, positive coefficient of income suggests that higher income influences the tendency for WTP. Sufficient income leads one to have inclination to pay due to ample financial resources. This result is supported by WTP literatures which have stated that income has a positive effect on WTP (Afroz and Masud, 2010; Jin *et al*., 2006; Basli *et al*., 2006). In economic theory, income is fundamental in leading one's WTP which the consistency between the theory and average income of the communities can be seen. Income of ≥RM 3000 (≥USD 949.29) is considered of middle income where it represents the communities in Kota Bharu. Scarce financial resource can be a hindrance to those with middle income. However, without splurging in other expenses; it gives them higher WTP for more convenient ISWM services. Fourth, employment status is influential in determining WTP. The respondents with occupation have tendencies to pay for ISWM due to stable earning; hence it leads to higher WTP.

Individual's WTP amount of RM 13.91 per month (USD 4.40 per month) is rather costly when it is compared to the average income at RM 3133.87 (USD 985.49). At given amount, annual WTP for ISWM would be RM 166.92 (USD 52.49). High WTP gives an indication that the communities are willing to make trade off in spending their income for ISWM implementation. Nonetheless, this result is still in the range of WTP values obtained in previous CVM studies in Malaysia. Murad *et al*. (2007) employed CVM in studying WTP of the poor for improved solid waste collection and disposal services. The results from the study showed the respondents are willing to pay RM 13 (USD 4.11) per household. The research by Afroz and Masud, (2010) showed RM 22 (USD 6.96) per month for WTP for improved solid waste collection system in Kuala Lumpur. Meanwhile, CVM study by Othman (2002) for improvement in SWM in Kajang and Seremban municipalities showed the WTP amount of RM 30 (USD 9.49) per month.

From the estimated mean WTP value, it gives WTP cumulative value of RM 897,403 (USD 284,010.77) by multiplying the mean WTP (with number of households in Kota Bharu at 64,515. WTP cumulative value represents increment in monthly assessment payment. Hence, for an annual basis, the assessment increment paid by the communities would be at RM 10, 768, 834 (USD 3,408,905.31) a year. When it is compared to current assessment payment which it is amounted up to RM

18 million (USD 5,696,912.88) a year, approximately the WTP cumulative value adds 60% to assessment payment. Here in therefore, in a year KBMC is generating almost RM 29 million (USD 9,177,958.07) for assessment collection. The benefits from accruing earning by KBMC are not limited for ISWM purpose but also for enhancement in providing public services to the communities.

Stated by Kumar *et al.* (2009), akin to other developing regions, KBMC is spending half of the assessment collection for SWM operation. Therefore, it gives the amount of RM 14.5 million (USD 4,588,972.34) available for SWM operation. The increment in assessment collection offers adequate fund for ISWM implementation. Additional costs are necessary for initial development in ISWM. The requirements of recovering the solid waste and sanitary disposal in ISWM need ample of funding. Adequate funding are crucial for provision of facilities like waste segregation bin, sufficient congregated solid waste container and construction of sanitary landfill. Although the initial implementation is rather costly, however for long term benefit, the recovered solid waste could be utilized to generate revenue to fund ISWM.

CONCLUSION

SWM is a critical issue in most developing countries due to the dwindling financial resources and population growth. The parts that are affected most by this issue are the environment and public health. Here in therefore, this study attempts to determine an efficient SWM alternative to alleviate the drawbacks of inefficient SWM in Kota Bharu, Kelantan. The results from this study are attached to the employment of CVM to estimate the WTP among the communities to introduce ISWM in Kota Bharu. ISWM is an integrated approach in SWM that promotes stability between waste reduction and cost-effectiveness. On average the communities in Kota Bharu are willing to pay RM 13.91 (USD 4.40) per month for implementation of ISWM. Encouraging results from CVM study can be recognized as a benchmark for KBMC in introducing new policy in SWM. In aspect of the communities' point of view, their acceptances and affordability have been assessed. The policy makers need to initiate strategies for ISWM establishment which the collaboration with the communities is required. Proposal for SWM policy needs to be comprehensive, integrated and incentive-compatible to stimulate the communities' co-operations in 3R's initiatives. Efforts for ISWM establishment can be scrutinized by referring to successful SWM policies in Asian countries such as Japan and Singapore.

REFERENCES

Abou-Ali, H., 2003. Using stated preference methods to evaluate the impact of water on health: The case of metropolitan Cairo. Goteborg University, Sweden. http://gupea.ub.gu.se/bitstream/2077/2823/1/gunwpe0113.pdf

Afroz, R. and M.M. Masud, 2010. Using a contingent valuation approach for improved solid waste management facility: Evidence from Kuala Lumpur, Malaysia. Waste Manag., 31: 800-808.

Agamuthu, P., S.H. Fauziah, K.M. Khidzir and A.N. Aiza, 2007. Sustainable waste management-Asian perspectives. Proceedings of the International Conference on Sustainable Solid Waste Management, September 5-7, 2007, Chennai, India, pp: 15-26.

Bagchi, A., 2004. Design of Landfills and Integrated Solid Waste Management: Landfill Design. 3rd Edn., Wiley and Sons, USA., pp: 237-352.

Basli, M., M.D. Matteo and S. Ferrini, 2006. Analyzing demand for environmental quality: A willingness to pay/accept study in the province of Siena (Italy). Waste Manage., 26: 209-219.

Bishop, R.C. and T.A. Heberlein, 1979. Measuring values of extramarket goods: Are indirect measures biased? Am. J. Agric. Econ., 61: 926-930.

Cameron, T.A. and D.D. Huppert, 1991. Referendum contingent valuation estimates: Sensitivity to the assignment of offered values. J. Am. Stat. Assoc., 86: 910-918.

Cameron, T.A., 1988. A new paradigm for valuing non-market goods using referendum data: maximum likelihood estimation by censored logistic regression. J. Environ. Econ. Manage., 15: 355-379.

Carson, R.T. and W.M. Hanemann, 2005. Contingent valuation. Handb. Environ. Econo., 2: 821-936.

Department of Statistics Malaysia, 2010. Basic population characteristics by administrative districts. http://www.statistics.gov.my/portal/index.php?option=com_content&view=article&id=916&lang=en

Hanemann, W.M., 1984. Discrete/continuous models of consumer demand. Econ. Soc., 52: 541-561.

Idris, A., B. Inanc and M.N. Hassan, 2004. Overview of waste disposal and landfills/dumps in Asian countries. J. Mater. Cycl. Waste Manage., 6: 104-110.

Isa, M.H., F.A.H. Asaari, N.A. Ramli, S. Ahmad and T.S. Siew, 2005. Solid waste collection and recycling in Nibong Tebal, Penang, Malaysia: A case study. Waste Manage. Res., 23: 565-570.

Jin, J., Z. Wang and S. Ran, 2006. Comparison of contingent valuation and choice experiment in solid waste management programs in Macao. Ecol. Econ., 57: 340-441.

Kaffashi, S., M.N. Shamsudin, A. Radam, K. Abdul Rahim, M.R. Yacob, A. Muda and M. Yazid, 2011. Economic valuation of Shadegan international wetland, Iran: Notes for conservation. Reg. Environ. Change, 11: 925-934.

Kumar, S., J.K. Bhattacharyya, A.N. Vaidya, T. Chakrabarti, S. Devotta and A.B. Akolkar, 2009. Assessment of the status of municipal solid waste management in metro cities, state capitals, class I cities and class II towns in India: An insight. Waste Manage., 29: 883-895.

Manaf, L.A., M.A. Abu Samah and N.I.M. Zukki, 2009. Municipal solid waste management in Malaysia: Practices and challenges. Waste Manage., 29: 2902-2906.

Murad, M.W., M.A. Raquib and C. Siwar, 2007. Willingness of the poor to pay for improved access to solid waste collection and disposal services. J. Environ. Dev., 16: 84-101.

Nuva, R., M.N. Shamsudin, R. Alias and A. Shuib, 2009. Willingness to pay towards the conservation of ecotourism resources at gunung gede pangrango National Park, West Java, Indonesia. J. Sustainable Dev., Vol. 2

Othman, J., 2002. Household Preferences for Solid Waste Management in Malaysia. Economy and Environment Program for Southeast Asia, Malaysia, ISBN-13: 9781552500323, Pages: 43.

Periathamby, A., F.S. Hamid and K. Khidzir, 2009. Evolution of solid waste management in Malaysia: Impacts and implications of the solid waste bill, 2007. J. Mater. Cycles Waste Manage., 11: 96-103.

Rahji, M.A.Y. and E.O. Oloruntoba, 2009. Determinants of households willingness to pay for private solid waste management services in Ibadan, Nigeria. Waste Manage. Res., 27: 961-965.

Rushton, L., 2003. Health hazards and waste management. Br. Med. Bull., 68: 183-197.

Santos, J.M.L., 1998. The economic valuation of landscape change: Theory and policies for land use and conservation.. Edward Elgar Publishing Inc., Northampton.

Tchobanoglous, G., H. Theisen and S.A. Vigil, 1993. Integrated Solid Waste Management: Engineering Principles and Management Issues. 2nd Edn., McGraw-Hill International, New York, USA., ISBN-13: 9780070632370, Pages: 978.

UNEP, 2009. Developing integrated solid waste management plan training manual volume 2: Assessment of current waste management system and gaps therein. United Nations Environmental Programme, Division of Technology, Industry and Economics, International Environmental Technology Centre, Osaka/Shiga, Japan. http://www.unep.or.jp/ietc/Publications/spc/ISWMPlan_Vol2.pdf