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Sustainable Urban Waste Management in Silchar Municipal Area: An Application of Contingent Valuation Method in Cachar District of Assam.

Ashish Taru Roy[1], Uttam Deb[2] and Dr. Ritwik Mazumder[3]

[1]*Research Scholar, Department of Economics, Assam University, Silchar-11, Assam*
[2]*Research Scholar, Department of Economics, Assam University, Silchar-11, Assam*
[3]*Assistant Professor, Department of Economics, Assam University, Silchar -11, Assam*

ABSTRACT*: This research paper studied the willingness to pay (WTP) for sustainable solid waste management scheme in Silchar municipal area. A systematic random sampling technique was employed to select three hundred seventy eight households from the twenty eight wards in the study area. A dichotomous choice contingent valuation technique was used to elicit households' WTP for improvement in their solid waste management. We used probabilistic regression model to establish the determinants of WTP for solid waste management. Relevant socioeconomic variables and attributes are hypothized to influence WTP. The binary probit regression estimates revealed that monthly average household expenditure, household size, average education, environmental awareness and number of working woman presented in family positively associated with the WTP for solid waste management scheme. Informal waste disposal arrangement was not significantly associated with the WTP. The results of this study suggest that there is a chance of success if solid waste management scheme is introduced.*

Keywords—*Contingent valuation, Dichotomous choice, Probabilistic regression model, Solid waste management, Willingness to pay.*

I. INTRODUCTION

Sustainable waste management implies less reliance on landfill and greater amounts of recycling and composting. Sustainability of waste management is a key to providing an effective service that satisfies the needs of the end users. One pillar of sustainable solid waste management is strategic planning and another pillar is cost analysis of solid waste options. For financing, private sector involvement is a growing trend in solid waste management. For successful development of any solid waste project, community participation in collection, community consultation on cost recovery, and public participation in collection, community consultation on cost recovery, and public participation in sitting and design of facilities is inherently essential to sustainability.

This paper studies the willingness to pay for sustainable solid waste management scheme in Silchar town. The management of solid waste management involves storage at the source, collection, transportation and final disposal of the refuse. With increased urbanization, there is a growing interest in solid waste management in urban areas among researchers and policy makers. With the increasing urbanization, rising standards of living and rapid development associated with population growth, solid and liquid waste generation by commercial and domestic activities has increased in Silchar town.

Poor solid waste handling is threatening the lives of Silchar residents. To improve this pressing problem the government and other stake holders have to put maximum effort. The problem is usually inadequate budget compared to solid waste generation in Silchar town. In line with this, it is very important and timely to look for the possibility of cost sharing by households, and for this we need to analyze the demand side for improved solid waste management. This study is designed to generate demand side information, which is vital for the planning process. The study therefore examines the willingness to pay of households for sustainable solid waste management scheme in Silchar municipal area.

The paper is organized as follows: Section 2 presents a brief acquaintance of Silchar town; Section 3 summarizes the present waste management scenario in Silchar; Section 4 highlights contingent valuation method; Section 5 provides an overview of previous studies. Methodological procedures are discussed in Section 6. Empirical findings and analysis of data are presented in Section 7, while concluding remarks are given in the last section.

II. A BRIEF ACQUAINTANCE OF SILCHAR TOWN

Silchar is the district headquarters of Cachar district in the state of Assam in India. It is the economic gateway to the state of Mizoram and part of Manipur. It is 343 kilometers (213 miles) south east of Guwahati and on the left bank of river Barak in 24.82`N and 92.8`E. The city of Silchar is the second largest city of Assam after Guwahati in terms of population and municipal area. The town of Silchar has tremendous commercial importance. It consequently witnesses the settlement of a sizeable population of traders from distant parts of India. The city has an airport and lies on both a rail head and national highways connecting Guwahati, Assam; Agartala, Tripura; Imphal, Manipur; and Aizawl in Mizoram state.

Silchar is the most thickly populated town of South Assam in the Barak Valley. The total population of this town was merely 34 thousands in the year 1951 which increased to 1.15 lakhs in 1991 thereby showing an annual average growth rate of 6 percent over a period of 40 years. The population of the town increased to 1.42 lakhs and 1.72 lakhs in the year 2001 and 2011 showing an average growth rate of 2.3% and 2.1% respectively. An unprecedented annual growth rate of 10.5 percent was noticed only during the decade 1941-1951 mainly due to partition of the country. Even after 1951, immigration continued at varying rates. Added to the problem of refugee influx from the erstwhile East Pakistan (now Bangladesh) was the problem of migration from other parts of the North Eastern Region owing to social unrest. These factors together contributed rapid demographic change of Silchar.

The area under Silchar Municipal Board (SMB) was only 10 sq. km. in 1971 with a density of 5260 per sq. km. in 1991 the area was increased to 15.75 sq. km. with the increased density of 7301 per sq. km. (Dey and Nayak, 1998) [1]. The number of holdings assessed to tax rose from 5137 in 1971-72 to 13,358 in 1994-95 and it is increased to 19563 till the year 2010 (Silchar Municipal Board, 2010).

III. PRESENT WASTE MANAGEMENT SCENARIO IN SILCHAR

Presently more than 90 tones of municipal solid waste are generated in Silchar town. As a group, households are the single largest generators of municipal solid waste. A substantial part of household waste in Silchar is disposed off through the municipal service. In the existing system, the Silchar Municipal Board (SMB) disposes the collected waste by means of open dumping in crude landfills near 'Meherpur', 2.5 km. away from the town. As there is no provision for collection of pre-sorted waste, the disposed off waste mostly consists of kitchen waste along with household toxic waste. However households separate items like plastic, paper, metal glass etc. from their regular garbage because these can be re-used or sold in an informal market. The buyers of these items are itinerant vendors who pay households for the items.

Given the fact that per capita waste generation per day in the city is over .5 kg and there is a shortage of adequate dumping space, management of this huge quantum of waste is a serious problem for the local body. Moreover, the possibilities of ground water contamination and adverse health consequences have made open dumping an almost non-viable mode of disposal. However, the adoption of alternative disposal methods such as composting runs into a problem: the waste is not properly segregated. This is because a household's source separation activity is limited to items that can either be re-used or have an exchange value in the market.

In designing efficient strategies of waste management for Silchar, one important feature of the city should be kept in mind. Due to unplanned growth in most wards of SMB, both commercial and residential units co-exist. The composition of waste increases the difficulty involved in its management. The commercial waste is mostly non-biodegradable. To handle such waste, installation of effluent treatment plants, incineration etc. may be useful. On the other hand, domestic waste is mostly biodegradable and composting remains an alternative mode of waste disposal. The major difficulty faced in its widespread use, as indicated already, is the absence of source-separation at the point of garbage production. A substantial amount of recyclable items such as plastic, glass and metal along with household appliances (which may include toxic waste) are also disposed off along with the regular garbage. The collection system of residential waste is not designed to collect pre-sorted waste. In some parts of the town, households simply dispose off their garbage in concrete vats or into metal bins and containers. These are then loaded into tipper trucks and carried to the dumping ground. House to house collection of residential waste has not been started although it is clearly mentioned in the Municipal Solid Wastes (Management and Handling) Rules 2000. Informal waste disposal arrangement is carried on in some wards where lane committee hires a 'thelawala' -a person who collects the waste of a lane by hand-driven uncovered containerized cart or other small vehicle in lieu of payment. While there remains no provision for collection of source-separated waste, households also do not face economic incentives for practicing source-separation. Finally, it is common for households in Silchar to litter or indiscriminately dump some waste items. This results in clogging of sewage drains and water logging in the town area during the monsoon. Any satisfactory method of waste disposal must prevent or dramatically reduce the probability of all these threats. This necessitates the improvement of current waste management system in the city.

IV. CONTINGENT VALUATION METHOD (CVM)

This is one measures of direct valuation method. Since mid-1970s, the method is most widely used for economic value of environmental resources and services. Economic Valuation is about "measuring the preferences" of people for an environmental good or against an environmental bad. Direct methods are based upon expressed preferences elicited through questionnaire surveys. These methods seek to infer individuals' preferences for environmental quality directly, by asking them to state their preferences for the change in environmental quality. Carson (1991) [2] describes six main components to a successful CVM study:

4.1. Define the hypothetical market scenario

In the first stage, a hypothetical or contingent market is set up in which individuals are simply asked how much they are either willing to pay or willing to accept in respect of the proposed change in provision of the good under investigation. The market scenario is the information to be conveyed to a respondent, to place the respondent in the right frame of mind to give meaningful responses to questions.

4.2. Choosing elicitation method

After properly defining the market scenario, the next step is to decide how best to obtain the valuation response. This is obviously a very important part of the survey and one of the most difficult to administer effectively. There are four primary ways eliciting value: (i) open-ended(OE), in which the respondent is asked 'how much you are willing to pay?' for preservation or conservation of environmental resources; (ii) dichotomous choice (DC), where respondents are asked 'are willing to pay Rs. X?'; (iii) iterative bidding (IB), in which a series of DC-type questions are followed by a final OE question; (iv) payment card (PC), in which respondents select their maximum willingness to pay (WTP) amount from a list of possible sums presented on a card to them.

4.3. Design market administration

Having design the survey, it must be administered, i.e., complete the survey and respondents' responses are assembled. There are three basic approaches to survey administration: mail, telephone and in-person survey.

4.4. Sample design

There are two issues in choosing the people to answer the CV questionnaire. The first is to choose the group or population from which the sample is to be drawn and second is to draw the random sample.

4.5. Experimental design

The goal of a CV survey is to develop statistically significant estimates of willingness to pay for a particular environmental good or to test a hypothesis about the willingness to pay for the hypothetical good. Considering the cost of data collection, it is important to construct a survey carefully so that appropriate information is collected in an efficient manner without unintentional biases.

4.6. Estimation of WTP function

The last step is to take the survey results and correctly estimate the WTP function. This is obviously an important step. Sometimes this step is neglected until after the survey has been conducted, only to find that some vital piece of information is needed but was not collected on the survey. This outcome would suggest a defective experimental design.

In short CV study needs three basic things. First, the respondent should be given detailed information about the service to be valued and the hypothetical scenario under which it is made available. For example, the structure under which the service is provided, the range of available substitutes and the method of payment. Second, a method which elicits respondent's willingness to pay (WTP) is required. The respondents are asked for their maximum WTP (e.g., per month). Third, demographic information (such as age, gender, income, education) is needed to estimate the valuation function for the environmental service. The data obtained are used in regression analysis to estimate how the values are related to the respective demographic variables based on theory.

The CVM technique however suffers from one major drawback despite its ability to measure total economic values. The hypothetical nature of the questions used in CVM surveys may pose problems since respondents may have little incentive to provide information on their true willingness to pay.

V. REVIEW OF LITERATURE

There is an extensive literature on the willingness to pay for solid waste management. The CVM technique is superior to other valuation methods because it is able to capture use and non-use values. As Freeman (1993) [3] noted non-use values could be larger in some cases, and as such, the use of measurement techniques that capture only use values underestimates the total derived values. The other reason for using CVM is its ease of data collection and requirement compared to other valuation methods. Sansa and Kasake (2004) [4] stated that benefits from Solid Waste Management (SWM) include reduced contact of the vulnerable populations with garbage in streets, reckless dumping and improved management of designated dumpsites. In

addition, reduced treatment for illness such as diarrhea and cholera, avert health costs and enhance productivity of the population. Fonta et al. (2008) [5] found that CVM can be fruitfully used to support the design and implementation of new solid waste management facilities and that analysis of the valuation function can give qualitative information that is difficult to identify using baseline surveys or most conventional economic valuation techniques.

VI. METHODOLOGY

6.1 Data collection and sampling strategy

In this section we focus on data collection, methodological procedures and sampling strategy. Silchar Municipal Area, an area with a high concentration of the working population was purposively selected. It was thought that Contingent Valuation would be appropriate to apply in this area, as the population is relatively more educated. This is mainly because Contingent Valuation works effectively if it is applied to a more educated and informed population. For the present study the source of data is entirely primary in nature. Silchar municipal area has 28 wards under it. The ward wise household list is first collected from the Silchar Municipality Office and a total of 19563 households were estimated. Of the total number of households, 2 percent of households from each ward was selected the total of which is approximately 378 households for an interview using systematic sampling. The systematic sampling technique was used whereby every 10^{th} building in the area was sampled. Vacant households were replaced by next one in the list. The structured questionnaire, pretested in a pilot study was used. The questions were designed to get the most precise data for econometric analysis of willingness of pay. Interviews were conducted with the head of the household. The interviews lasted 15-30 minutes. The study would have benefitted from higher sample size but due to inadequate funding the sample size could not be increased.

6.2 Model Specification

In this analysis, there are two groups of respondents: one group willing to pay for proposed scheme and the other group does not. Respondents express their decisions regarding willingness to pay in 'yes' or 'no' responses. So the dependent variable in this analysis is a qualitative one and to analyze this type of models generally Logit or Probit regression models are used because of their ability to deal with a dichotomous dependent variable and a well established theoretical background which allows for estimating the probability that an event will occur or not through prediction of a binary dependent outcome from a set of independent variables. Out of these two models, distribution of the error term determines which model gives better results. If error term of the regression model follows logistic distribution then Logit model is used and when error term follows normal distribution then probit model is carried out. In the present study, it is assumed that the error term follows normal distribution and probit model is used to determine how various socio economic characteristics affect the decision regarding willingness to pay for proposed waste management scheme.

The specification of the equation below was primarily motivated by theory and relevant literature. In the model, WTP for proposed scheme of waste management of households in Silchar municipal area is endogenously determined and is a function of the following independent variables: monthly average household expenditure, household size, average education, environmental awareness, number of working woman and informal waste disposal arrangement. The dependent variable is binary in nature – those willing to pay are given a score of 1, others being given 0.

Thus: $WTP = \beta 0 + \beta 1MAHE + \beta 2HSZ + \beta 3AE + \beta 4AW + \beta 5NWW + \beta 6IWDA + \varepsilon$ (1)

Where; $\beta 1>0$, $\beta 2< 0$, $\beta 3>0$, $\beta 4> 0$, $\beta 5> 0$, $\beta 6 < 0$

Where,

WTP: Willingness to pay for proposed scheme of waste management, households that are willing to pay is given a score of 1; others are given 0 in the binary model.

$\beta 0$: Constant

βi: Coefficients where i= 1 to 6

MAHE: Monthly average household expenditure

HSZ: Household size

AE: Average education of the family which is total years of schooling of the family members divided by the total member of family.

AW: Environmental awareness which is total number of desirable responses divided by total number of awareness questions multiplied by 100.

NWW: Number of working woman present in the family.

IWDA: Informal waste disposal arrangement where IWDA= 1 for having the arrangement and IWDA= 0 for not having the arrangement.

ε: Error Term.

6.2.1 Priori Expectations

MAHE; Expenditure is expected to be positively related to WTP. Monthly average household expenditure enters the model as a proxy of income. Environmental economic theory assumes that the demand

for an improved environmental quality increases with income. Consequently, those with a higher income are expected to be willing to pay for an improved waste management.

HSZ; Household size is expected to be inversely related to WTP. It is assumed that big households will not willing to pay due to the associated high running costs (i.e. budgetary constraints). Thus, the study expects the sign of its coefficient to be negative.

AE; WTP for improved waste is expected to be positively related to education. The longer time in formal schooling (years), the more people understand better the consequences of using unsafe waste collection and disposal method. Therefore, the educated will be willing to pay than the illiterate.

AW; It is hypothesized that the higher the level of environmental awareness the more the respondent would appreciate the consequence of mishandling solid waste and more value the individual would give in order to avoid the risk of being a victim of unclean environment.

NWW; Number of working woman is supposed to affect WTP. A positive relationship between WTP and NWW might exist because working women are the ones who take care of domestic household everyday jobs and travelling to other places, and also have to handle the household waste mostly. Hence their presence will influence willing to pay for a smooth waste management.

IWDA; Informal waste disposal arrangement refers to undertaking personal waste treatment measures such as hiring the 'thelawala', giving him the charge of disposing waste. The study expects a negative relationship between the variable WTP. Households will not willing to pay since they are already incurring some payment regarding waste.

The hypothetical market scenario or the proposed scheme for sustainable urban waste management in Silchar Municipal Area of the present study is constructed according to the recommendations of the U.S National Oceanic and Atmospheric Administration (NOAA). The willingness to pay question is presented as this:

The present system of waste collection and disposal and expenditure incurred by the Municipality needs to be understood before planning for an effective and efficient alternative. During the financial year 2010–11, the total establishment cost of Silchar Municipal Board (SMB) was approximately Rs. 70 lakhs (SMB, 2010). The running cost and depreciation of all vehicles used by the Municipality during the same period for the purpose of waste collection and disposal was around Rs. 26 lakhs (SMB, 2010). The wages and salaries of all waste collection and disposal workers including that of drivers stood approximately at Rs. 1.56 Crores (SMB, 2010). The sum total of these annual expenses (costs) was around Rs. 2.52 Crores during the last financial year. This is the running expense or cost incurred by the municipality per annum. This is actually the recurring cost per annum. Consequently if this sum is divided by the number of houses (number of households will be higher) in Silchar Municipal Area, which is 19,563, then the average cost of waste collection and disposal per house per year comes to around Rs. 1288**/-.** This figure divided by 12 gives the monthly average cost per household, which is around Rs. 107/-.

At present there are 116 casual laborers (SMB, 2010) for the purpose of waste collection and disposal. These workers are assigned with the task of collecting solid waste from all parts of the city with the assistance of the garbage collection vehicles. At present the municipal authorities use 8 vehicles in all for the entire area covered by the municipality. Presently there are 2 excavators, 2 robots, 1 lifter, tipper, truck, and tractor (SMB, 2010). However it is worth mentioning that this physical machinery strength may be insufficient to effectively manage and organize the household waste collection and disposal problem of Silchar.

The present system of waste disposal in Silchar Municipal area is largely inefficient, ineffective and environmentally unsafe and health wise unhygienic. The study presents an alternative proposal for environmentally safe and hygienic household solid waste disposal system that aims to collect and dispose the daily household solid waste.

(i) Separation of waste at the household level: 3 separate closed containers to be provided (by municipality) to each household for separate disposal of food related waste, paper, plastic and polythene etc. and metal and glass etc.

(ii) The waste disposal containers are to be collected by waste collection workers every morning during a fixed hour (say 6.30 AM), emptied and returned to the household. This process is to be repeated every day.

(iii) Each ward is to have a medium sized vehicle (provided by municipality) fitted with a closed waste dumping containers/chambers dedicated for the purpose of waste collection of that ward only. The collected waste is to be transported to 'Meherpur' dumping ground every day. Large open trucks would not be used at all.

(iv) There are 28 wards. So 30 such vehicles (taking big wards into consideration) would be required. Around 30 drivers (permanent staff) would be required for all the ward vehicles taken together. Estimated cost of petroleum for all vehicles (assuming 5 liters of petrol would be required by each vehicle on an average per day) is Rs. 315000/-. If assuming Rs. 2000 is the depreciation per vehicle

per month, then monthly depreciation for all vehicles comes to around Rs. 60000/-. Total running cost of all vehicles per month comes to around Rs. 375000/-.

(v) Daily waste is to be collected from homes. For this purpose waste collection workers are required. For efficient collection and disposal around 10 workers are required per 500 households. That is a Ward having 1000 households would require around 20 workers and so on. Around 422 workers would be required for the entire town. These workers are mostly casual staff getting a salary of Rs. 4500/- per month.

(vi) The casual workers would be carrying the waste to the ward vehicle by means of rickshaw van. One rickshaw van (provided by municipality) per 100 houses would be minimum necessity. Two casual workers would be required per van. .

(vii) The total monthly salary bill of all workers comes to around Rs. 2259000/-. The total monthly cost (running cost) of waste collection and disposal including all running costs comes to around Rs. 2634000 per month**.** Per house cost (there are 19563 houses under Silchar Municipality) per month comes to around Rs. 134 (around rupees 4.50 per day) which is just rupees 27 more than the current per house cost.

Suppose at this time Municipal Authority comes forward to provide the service efficiently. It is also mentioned that these amounts will be collected in the next month from the households. Remembering that you have limited income and you have to do many personal works with this income:

a. Are you willing to join such an environmentally safe waste management scheme? Yes…… no…….

b. Are you willing to pay a sum of rupees 134 for this proposed waste management scheme? Yes…… No……..

VII. EMPIRICAL FINDINGS AND ANALYSIS OF DATA

The findings of this study are based on the sample data collected from 28 wards in Silchar. Three hundred and seventy eight (378) households were covered out of a total of 19563 (Silchar Municipal Board, 2010) households in 28 wards. This means that the survey covered only 2 percent of the households in each ward. The results of this study show that on average, 63 percent of the households in Silchar are willing to pay for improved waste management scheme. Despite the smallest of the sample relative to population size and for the sake of argument, assuming that the sample is nevertheless representative, it means that 12324 households in Silchar are willing to pay for improved waste management scheme.

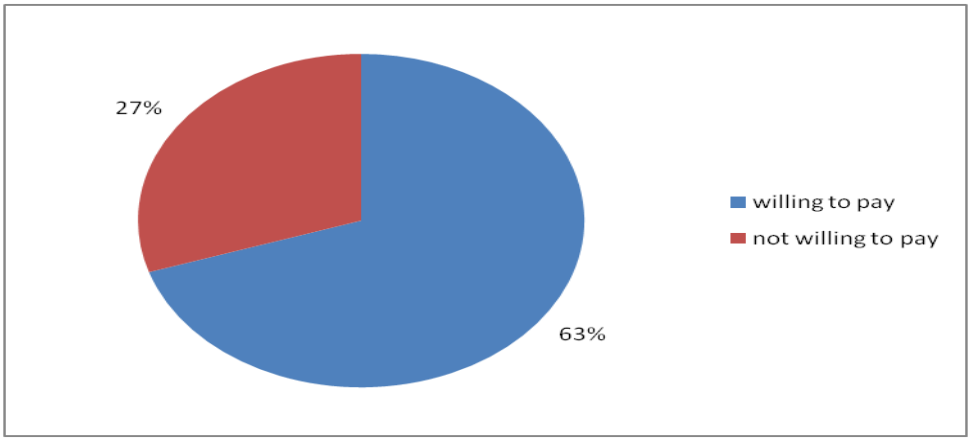

Figure1. willingness to pay for sustainable waste management scheme.

Source: authors' calculation based on selected sample of households in Silchar municipal area.

7.1 Results regarding willingness to pay for proposed sustainable waste management scheme

The analysis is carried out to show how the decision of respondents regarding willingness to pay for the proposed scheme or probability of payment is affected by their various socio-economic characteristics. It is found that 63% of total sample households are willing for the payment.

7.1.1 Correlation Analysis

Before carrying out regression analysis Pearson's correlation coefficient is estimated to show the nature and degree of relationship between willingness to pay for the proposed scheme and various socio economic characteristics of the households, as well as among these socio demographic variables. Pearson's correlation coefficient matrix is depicted in Table I and findings of this Table are as follows:

1. WTP for the proposed scheme is positively correlated with all the variables.

2. Monthly average household expenditure is positively correlated with education (0.191), awareness (0.153) and number of working woman (0.189), household size is negatively correlated education (-0.138) and education is positively correlated awareness (0.190) and number of working woman (0.188). From all these correlation coefficient estimates it can be concluded that these variables are not highly correlated and so there is no mulcollinearity problem in the data set.

Table I. Pearson's Correlation Matrix

		WTP	*Monthly average household expenditure*	*Family Size*	*Average Family Education*	*Awareness*	*Number of working woman*
WTP	***Pearson Correlation***	**1**					
	Sig. (2-tailed)						
Monthly average household expenditure	***Pearson Correlation***	**0.150****	**1**				
	Sig. (2-tailed)	**0.004**					
Household Size	***Pearson Correlation***	**0.087**	**0.362****	**1**			
	Sig. (2-tailed)	**0.092**	**0.000**				
Average Education	***Pearson Correlation***	**0.191****	**0.275****	**0.138****	**1**		
	Sig. (2-tailed)	**0.000**	**0.000**	**0.007**			
Awareness	***Pearson Correlation***	**0.153****	**0.117***	**0.064**	**0.190****	**1**	
	Sig. (2-tailed)	**0.003**	**0.023**	**0.216**	**0.000**		
Number of working woman	***Pearson Correlation***	**0.189****	**0.001**	**0.097**	**0.188****	**-0.036**	**1**
	Sig. (2-tailed)	**0.000**	**0.993**	**0.059**	**0.000**	**0.485**	

**** and *Correlation is significant at the 0.01 level and 0.05 level (2-tailed).**

Source: Authors' calculation based on selected sample in Silchar.

7.1.2 Estimation of willingness to pay for proposed scheme

The estimates of probit model are depicted in Table 2. The model takes the following form:

WTP = -2.56962 + 0.0000842**MAHE** + 0.1394618**HSZ** + 0.743482A**E** + 0.0113484**AW** + 0.4505774**NWW** + 0.1570519**IWDA**

Table II. Estimates of Probit Model

WTP	*Coefficients*	*Standard error*	*Z*	*P|z|*
MAHE	**0.0000842**	**0.0000301**	**2.80*****	**0.005**
HSZ	**0.13946618**	**0.0506162**	**2.76*****	**0.006**
AE	**0.743482**	**0.6357665**	**2.08****	**0.038**
AW	**0.0113484**	**0.0058965**	**1.92***	**0.054**
NWW	**0.4505775**	**0.1435271**	**3.14*****	**0.002**
IWDA	**0.1570519**	**0.1463038**	**1.07**	**0.283**
Constant	**-2.56962**	**0.605908**	**-4.24**	**0.000**
***Number of observations* = 378**		***LR chi^2(6)* = 43.71**		
***Log likelihood* = -230.28674**		***Prob.>chi^2* = 0.0000**		
***Pseudo R^2*= 0.2867**		**-**		

*****, ** and * denotes significant at 1%, 5% and 10% level of significance.**

Source: Author's calculation based on selected sample in Silchar municipal area.

The results showed that all the variables except IWDA have significant affect on the decision regarding payment for the proposed scheme. Households having informal waste disposal arrangement are more reluctant to pay for such scheme. The household having higher monthly average expenditure and have numbers of

educated persons have a greater possibility of willing to pay. Households, having more number of working woman in the family, also raise the possibility of paying. HSZ is significant at 1 percent but does not have the expected negative sign. This suggests that the bigger the family size, more will be the volume of waste and the more difficulties encountered in terms of waste disposal in the urban area hence encourage willing to pay.

Considering the importance of improved waste management, the relatively weak values of pseudo R^2 is at variance with reality. This result might be due to low level of awareness among households on the global trend in waste management financing which promotes community participation in a bid to achieving sustainability of improved solid waste management. The low pseudo R^2 might also be a result of poverty among households especially among the urban poor who may rail against apparently additional responsibility.

VIII. CONCLUSION

This paper used primary data to analyze the willingness to pay for sustainable solid waste management scheme in Silchar. Despite the limitations of the CVM, which we acknowledge as a limitation of our study, we can conclude that there is a chance of success if solid waste management schemes are introduced. Attempts must be made to improve WTP for waste management services in the town. To achieve this, the municipal authority should concentrate first on awareness campaigns about the consequences of waste mishandling and benefits of payment for proper waste management before building up the commercialization plan for solid waste management in Silchar town.

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APPENDIX A

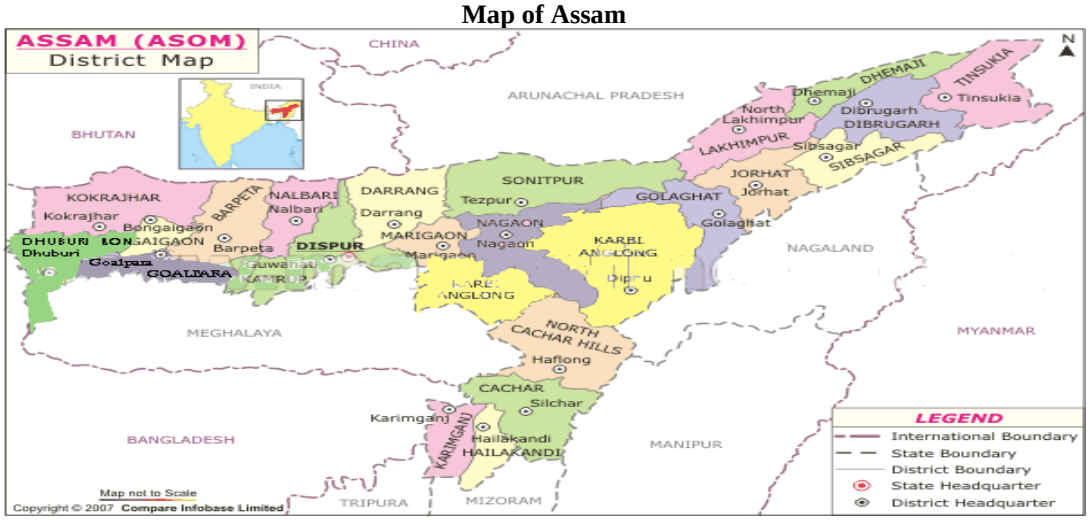
Table 3. Descriptive Statistics of the Probit Model

	Observation	*Minimum*	*Maximum*	*Mean*	*Std.Dev.*
WTP	**378**	**0**	**1**	**0.614**	**0.486**
MAHE	**378**	**375**	**25000**	**4348.43**	**2767.96**
HSZ	**378**	**1**	**11**	**4.01**	**1.54**
AE	**378**	**7**	**19**	**13.07**	**2.05**
AW	**378**	**30**	**100**	**69.11**	**12.09**
NWW	**378**	**0**	**4**	**0.34**	**0.543**
IWDA	**378**	**0**	**1**	**0.380**	**0.477**

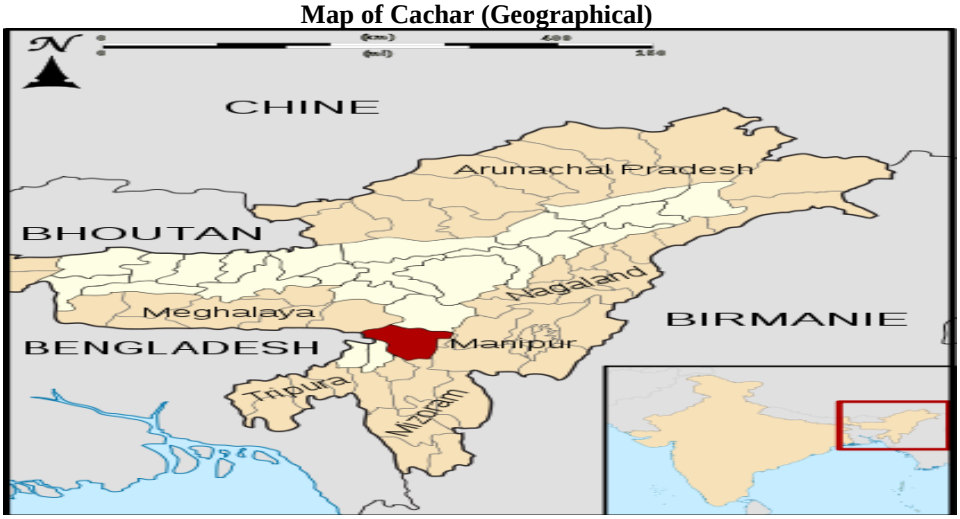
Source: Author's calculations based on sample survey in Silchar.

APPENDIX B

Map of Assam



APPENDIX C
Map of Cachar (Geographical)



APPENDIX D
Location of Silchar Town in Cachar District

APPENDIX E
Map of Silchar Municipal Area