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FACTORS THAT AFFECT THE WILLINGNESS OF RESIDENTS TO PAY FOR SOLID WASTE MANAGEMENT IN BHUBANESWAR

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Abstract

The sheer volume of solid waste has become a growing concern of local authorities regarding its adverse impact on the environment and human health. Therefore, the need for developing policies and regulations towards the environmentally sound management of solid waste is becoming crucial. Although the municipalities play an important role in solid waste recycling program, there does not appear to be any study involving residents' perceptions on solid waste management in Bhubaneswar city. This paper aims to examine the influencing factors of end users' willingness to pay and their payment preferences toward solid waste management. The logistic regression model was employed to analyze a qualified data set collected through a personal interview survey in Bhubaneswar city. All analyses were conducted using Statistical Package for Social Sciences (SPSS) software (version 20.0). The results revealed that the households are willing to pay for efficient management of solid waste. These results suggest that strong and rigorous promotional and educational programs are needed to improve the knowledge and positive attitude of residents towards recycling methods and the three policies. However, subsidy should be provided to low-income groups who cannot afford to pay the waste charge.

Introduction

Disposal and management of solid waste indeed a major challenge in both urban and rural areas. Any human can be a potential waste producer and therefore a contributor to this problem. One aspect is to produce waste, the kind of the waste produced is another aspect, but somehow the manner in which the waste is treated or disposed of is also a completely distinct concept. Quite often, it has been seen that the scale with which waste material is produced is much greater than the actual capacity to handle the same. Waste is created by and from various sectors; residential, commercial, industrial and other sectors, and in many cases, the responsibility for waste management has been left to the government or administrative authorities.

In developed countries, the rapid increase in the volume of solid waste has been emerging as a major cause of environmental pollution. In most developed countries, the existing method of solid waste management is unsustainable and unsuccessful (Turner and Pearce, 1994). The problems of air pollution in the form of greenhouse effects, ozone depletion, water and soil pollution and acid rain are caused by this inefficient solid waste management (Visvanathan & Glawe, 2006). According to the World Population Prospects: The 2017 Revision, India is the second most populated nation in the globe, with having a population of 134 crores, which accounts for almost 18 percent of world's human population, however it doesn't have sufficient resources and adequate systems in proper place to treat the solid wastes. India's urban population has increased at the degree of 31.8 percent throughout the last decade to 377 million that is greater than the population of United States, the third largest country within the world per population. From several years, India is facing a pointy distinction between its increasing urban population and accessible resources and services. There is a culture of strong waste administration that must be placed in legitimate place from the miniaturized scale level of family to the large-scale levels of country, state and city (Srinivas & Nakagawa, 2008).

India, one of the fastest growing economies in the world, faces a challenge of MSW Management. To address the issue, the Indian Government enacted MSW Rules in the year 2000 with a view to improve the present scenario. All Urban Local Bodies (ULBs) were supposed to have MSW management systems by end of year 2003. Being engrossed in their day-to-day activities and due to typical nature of Indian MSW, no single ULBs could achieve the targets. The Courts of Law in India are now issuing summons to ULBs for non-compliance with the law of the land. Urban India generates about 1.0 lakh MT/day of Municipal Solid Waste and it requires more than 1500 Acres of land/year for land fill. This is a very imposing land demand, in a land- scarce India. Land filling is the ultimate disposal technology which is relevant even when other advanced options are being used for recycling and/or volume reduction. It is the method of choice in developing nations because it is the lowest cost disposal



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option. Indeed, most industrial nations, including many European Union countries and the USA, still rely on land filling as an integral part of solid waste management infrastructure (Agamuthu, 2013).

Despite the fact that the urban local bodies utilize major part of its staff and resources for collection and disposal of MSW, nearly half of MSW generated remains unattended in many cities. Out of the funds spent on MSW management, ULBs typically spend about 65% funds on collection, 30% on transportation and a mere 5% on waste disposal. There is thus an urgent need to address the problem with a more scientific approach than the commonly adopted; crude dumping of MSW. Proper management of MSW can play significant role in national progress. Not many Municipalities have been able to take desired steps in this direction. This can be attributed to low capacity of local government and municipal authorities to manage increase in solid waste generation due to population growth (Kassim, 2009). Households which are the primary producers of solid waste and suffer from the effects of uncollected solid waste should be able to participate in improving SWM. Accordingly, the contribution of urban dwellers on SWM service plays a great role for better improvement of SWM at the community. However, there is limited evidence on the willingness to pay (WTP) for improved solid waste management (ISWM) and associated factors in the study area. Therefore, this study aimed to assess the WTP for ISWM and associated factors among households in Bhubaneswar town, Odisha, India.

Literature Review

In Malaysia, contingent valuation was used to estimate the benefits of improved solid waste management in Kuala Lumpur: households were willing to pay slightly more for the system involving voluntary source separation than for the system where it was mandatory, though the difference was insignificant (Afroz and Masud, 2011). In Malawi, dichotomous contingent valuation was used to determine the willingness to pay for solid waste collection in Lilongwe, and was found to be K92 per household per month (Maganga, 2016). A contingent valuation method is also frequently applied to estimate citizens' willingness to pay (WTP) for waste management (Afroz and Masud, 2011; Ezebilo, 2013; Pek and Jamal, 2011; Song et al., 2016). Many scholars conducted research on identifying the factors that affect the WTP of an individual for solid waste management. Socio-economic factors, such as gender, age, education, income, occupation, dwelling type, and family size (Ma and Hipel, 2016; Purcell and Magette, 2010; Song et al., 2016); attitudes, knowledge, awareness, and amount of waste (Afroz et al., 2017; Ezebilo, 2013) were considered.

In order to identify the willingness to pay (WTP) for certain goods or services, especially when the goods being transacted are not being traded in the market, the contingent valuation (CV) method can be used. The CV method is a widely used and accepted technique to study WTP for both marketable and non-marketable goods such as travel cost, reduction in the risk of death, improvement in air quality, sanitation, water supply and other environmental services. Because such conditions are non-existent in the targeted location, WTP cannot be extrapolated from the existing conditions. In such a scenario, a "stated preference" approach such as CV is used, which is a direct assessment technique that measures the expected amount of the project in monetary terms by directly asking those who will be benefited by the services under hypothetical circumstances through a questionnaire survey with the assumption that it will be implemented in the near future. Thus, with this intent, this study tries to evaluate WTP by households for improved SWM service of waste collection and the factors influencing it. The findings from this study will help the local government and concerned stakeholders to understand the relevant characteristics of households and come up with a suitable fee for waste collection service, which shall help to improve the current overall SWM scenario. This study can also be a guiding tool to conduct WTP studies in other municipalities of developing countries where there is no waste collection fee imposed.

Material and Methods

In order to uncover the end users' willingness to participate, WTP (binary "yes or no" questions were used) and their recycling preferences (favorite payment methods, and reasons for respondents' rejection to pay for recycling). The last section gathered socio-demographic information including gender, age, education level, family size, monthly household income, and residential area. Before asking the respondents to answer all the questions, the trained interviewers informed respondents about the purposes of study and explained clearly all the specific terms used in the content of questionnaire, with the aim to make sure the respondents understood. The data of this study was collected through face-to-face interviews. After removing unqualified questionnaires, a set of 398 qualified ones was used for further examination. A purposive sampling technique was used to select respondents/ households living in the three zones of Bhubaneswar Municipal Corporation (BMC). The questionnaire was pretested and had minor changes before conducting the actual survey. In this study, we used



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the Contingent Valuation method, which is a stated preference valuation method to elicit WTP by the households in Bhubaneswar Municipal for improved waste collection service.

Study Area: Bhubaneswar Municipal Corporation (BMC)

Bhubaneswar is located in Khorda District of Coastal Orissa, about 40 km west of north Bay of Bengal between Latitude 20° 12' to 20° 25' North and Longitude 85° 44' to 85° 55' East on the western fringe of the coastal plain across the main axis of the Eastern Ghats. The city lies on the Mahanadi Delta. It lies on the west bank of River Kuakhai, which is a tributary of River Mahanadi, 30 km southeast of Cuttack. The River Daya branches off at Kathajodi and flows along the south eastern part of the city. The Bhubaneswar urban development area consists of the Bhubaneswar Municipal Corporation area, 173 revenue villages and two other municipalities spread over 1,110 km² (430 sq mi). The area under the jurisdiction of the Bhubaneswar Municipal Corporation covers 186 square kilometres (72 sq mi). The city is somewhat dumbbell-shaped with most of the growth taking place to the north, northeast and southwest. The north-south axis of the city is widest, at roughly 22.5 kilometres (14.0 mi). Growth in the east is restricted due to the presence of Kuakhai River and by the wildlife sanctuary in the northwestern part. The city can be broadly divided into the old town, planned city (or state capital), added areas and outer peripheral areas. It is subdivided into Units and Colonies.

Table 1: Key Socio-Economic Features (2011 census)

Particulars	Bhubaneswar
Urban Sex Ratio (Female per 1000 Male)	890
Literacy Rate (Percent)	93.15 %
Total population of Scheduled Tribe (Urban)	7,054
Total population of Scheduled Caste (Urban)	1,642
Child Sex ratio	904
Total workers (Main + Marginal)	2,16,033
Male workers	1,86,121
Female Workers	29,912
No. of wards	60
No. of Revenue villages	46
No. of slums	436
Slum Population	301611

WARD MAP
Bhubaneswar Municipal Corporation

Reference

- W-1 Ward number
- Municipal boundary
- Ward boundary
- Railways
- National Highway
- Road
- Drain
- River / Waterbodies

The Bhubaneswar Municipal Corporation was established in 1994. The city is divided into 67 administrative wards and 46 Revenue Villages. Each ward elects a councilor to the BMC. BMC has undertaken pioneering work in various fields and perceives its role as principal provider of services as detailed below to provide a better quality of life to the citizens of Bhubaneswar. The functions of the BMC include water supply, drainage and sewerage, sanitation, solid waste management, street lighting and building regulation. The Population becomes more than 8



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lakhs and the new revenue villages were included in the City. The tourist spots attract people from all over the world and being a Capital City of Odisha, it became Municipality to Municipal Corporation vide Housing & Urban Development Department Notification No. 24148/dated. 28/07/1994.

Data Analysis and Discussion

Socio-economic characteristics of study participants

Table 2 shows the socio-economic characteristics like gender, age, education, household size, income, and residential area of respondents in the sample data set.

Table 2: Socio-economic Profile

Variable	Categories	Frequency	Percent
Gender	Male	209	52.5
	Female	189	47.5
Age	Below 30 Years	212	53.3
	30-45 Years	139	34.9
	Above 45 Years	47	11.8
Education	10 th	44	11.1
	10+2 or equivalent	83	20.9
	UG	135	33.9
	PG or above	136	34.2
Occupation	Service	152	38.2
	Students	55	13.8
	Business	143	35.9
	Others	48	12.1
Family size	Less Than 3 Members	45	11.3
	3-5 Members	269	67.6
	More Than 5 Members	84	21.1
Family Income	Less than INR. 20000	92	23.1
	INR. 20000-40000	74	18.6
	INR. 40000-60000	88	22.1
	INR. 60000-80000	15	3.8
	Above INR. 80000	129	32.4
Resident Type	Apartments	147	36.9
	Unorganized residential area	121	30.4
	Organized Residential Area	82	20.6
	Slums	48	12.1

Source: primary data

A total of 398 household heads participated in the study. The study revealed that, among the study participants, 52% were males, 53.3% were between the age group of below 30 years, 34.2% were having an educational qualification of post graduation or above and 36.9% were dwellers of apartments. Most of the people who participated in this study have family members between 3-5 persons (67.28%), and 32.4% of the respondents were having a monthly family income of above Rs. 80000/- per month.

Willingness to Pay for Improved Solid waste management

The primary concern of this study is to see whether the visitors are willing to pay any amount for the better management of solid waste, then to find out how many of them are willing to pay and how much those who are willing to pay are prepared to pay. The first part answered the question – would the dwellers of BMC be willing to pay any amount for the better management of solid waste in their locality. The dependent variable was a simple binary categorical variable with two possible values – Yes or No.

Accordingly, a binary logistic regression analysis was done to empirically determine the relationships between the independent variables and the dependent variable. The second part answered the question – how much are dwellers willing to pay on monthly basis for the better management of solid waste? The responses were obtained



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on ratio scale with open ended questions. The average monthly monetary amounts the people are willing to pay were analysed.

Table 3: Residence type and willingness to pay cross tabulation

Residence type	WTP		Total	Chi-Square Tests	d.f.	p-value
	Yes	No				
Apartment	142	5	147	207.3	3	0.000
Unorganized residential area	106	15	121			
Organized Residential Area	63	19	82			
Slums	5	43	48			
Total	316	82	398			

Out of 398 respondents 311 respondents are willing to pay whereas 87 respondents are not willing to pay. The maximum respondents who are not willing to pay are basically from the slum areas as they are least concerned about the solid waste management issues and have a strong opinion that it is government's responsibility. While, the rest respondents stated that they cannot afford the payment because of their limited income. The chi-square test concluded that there is an association between type of residence dwellers live and their willingness to pay for improved solid waste management.

Table 4 presents the factors that determine the willingness to pay for improved solid waste management service in the study area. The results showed that three variables i.e education, income and residence type are significant at 1 per cent level. Whereas, the gender is the only variable that is significant at 5 per cent level.

Table 4: Binomial Logistic Regression results of the factors influencing willingness to pay for improved solid waste management service

Variables	B	S.E.	Sig.
Age	-0.148	0.24	0.538
Education	0.644	0.18	0.000
Family size	-0.323	0.329	0.327
Occupation	0.097	0.167	0.562
Residence type	1.685	0.21	0.000
Household Income	1.299	0.532	0.000
House Size	0.101	0.525	0.847
Constant	-2.126	1.419	0.034
a. Variable(s) entered on step 1: Gender, Age, Education, Family_size, Occupation, Residence_type, House_Size, Household_Income.			
Note: Nagelkerke R Square = 0.612			

The result indicates that educational level is positively related to the willingness to pay for improved solid waste management service. This means that as the household education increases, the willingness to pay for improved solid waste management service also increases. This result is similar to the work of Danso-Abbeam et al. (2014). The educated people are aware of the issues of environmental degradation. In this connection, the households wish to participate in the activities which give the better environment.

Household income and willingness to pay have a positive relationship and significant at 1 per cent. This implies that as household income increases, the household is willing to contribute to the improved solid waste management service. It shows that if household income increased by 1 RWF, the willingness to pay also increases by 1.299 points in the study area. This positive relationship between income and willingness to pay is in conformity with the work of Nguyen et al. (2019). The residence type has a positive effect on the willingness to pay. This shows that willingness to pay for improved solid waste management among those who are at slum areas is lower compared to others.

The factors that significantly influence households' WTP are monthly household income, education of household head, residence type, family size and occupation of the family head. The significant factors that influence the maximum amount of money households are willing to pay for improved waste collection service are monthly household income, environmental awareness and waste collection service. Concerned stakeholders and policy



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makers should consider these traits before enforcing a waste collection fee. For instance, since households' awareness of the environmental impact is positively significantly related to both WTP and the maximum amount of waste collection fee they are willing to pay, the government and concerned stakeholders should educate the households about adverse effects of indiscriminate disposal of waste on the environment in order to generate more funding for SWM.

Estimation of Average monthly WTP for improved solid waste management

The present research gathered the exact information about the maximum monthly WTP for improved solid waste management in their locality by asking open-ended questions. The estimation of the average WTP by households for improved solid waste management service was done by calculating simple average for the responses collected from the respondents. In this study the estimated mean of maximum monthly WTP was found to be is Rs. 90 per month (approx). The average monthly contribution from people staying in four type of residences i.e. apartment, organised residential area, unorganised residential area and slums are discussed below.

Table 5: Mean comparison across residence type for willing to pay

Residence Type	Mean (in Rupees)
Apartment	185.43
Unorganized residential area	59.30
Organized Residential Area	113.72
Slums	4.17

It can be evident that most of the persons who are staying apartments or organized residential areas are generally willing to pay more for improved solid waste management in their locality. The reasons for this could be higher level of education, income and standard of living the person are generally common among these people. Therefore, attainment of environmental protection and enjoying its benefits is something luxury item for the people from high society. While, dwellers from unorganised are moderately willing to contribute toward for improved solid waste management in their locality and the average monthly contribution is around INR.60 per month. But, the people staying at slum areas are least concerned about the issues related to solid waste and are not willing to pay any significant amount for improved solid waste management in their locality.

Conclusion

The findings of the study revealed that Bhubaneswar residents have willingness to pay for improved residential waste management. To improve waste management strategy, one could provide facilities that increase access to information regarding the future benefits of involving more private firms in the provision of residential waste management. On the other hand, the recycling fee, when being imposed, should be considered carefully and appropriately. If the fee is too high, a large number of poor people cannot afford recycling fee, leading to several bad consequences, even they are more likely to have illegal disposal of solid waste to avoid paying the fees. In contrast, if the recycling fee is too low, it raises a concern that such fee is lower than the actual cost invested in recycling activities. In summary, besides the voluntary engagement of end users and the power of laws and regulations, activating end users' WTP for recycling solid waste strongly depends on not only the readiness of solid waste recycling facilities but also their solid waste recycling habits.

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