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# Small Step towards Sustainable Solid Waste Management: An Investigation of household participation in solid waste management with respect to Alappuzha municipality

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**Abstract**

The aim of this paper is to assess the practices of solid waste management in Alappuzha. The research is based on quantitative research design and descriptive survey of the households at Alappuzha using the stratified sampling method for a sample of 200. The primary data was collected using a structured questionnaire that covered two basic principles; a) solid waste management knowledge; b) willingness to pay for waste management practices. Data was analyzed using the SPSS to carry out statistical analysis. The finding shows households‟ knowledge towards the solid waste management is good and positive. However, finding also shows that 55% of the households were willing to pay for safe disposal. Most of the households agreed to participate in the activities of the segregation of waste if the facility will be made available at their backyard. Also for a developing country like India, it is not possible for the government alone to tackle the issues of solid waste management. Rather the active support of public is essential. Therefore, it is recommended that the citizen should be provided with more in-depth knowledge by intensifying the awareness of the households and facilities to them in the solid waste management programs. In term of urban planning and management, the location of aerobic unit facility can be analyzing by using GIS.

Key words: Sustainable development, Solid Waste Management, WTP, Household Participation.

## Introduction

Solid waste management is an essential service provided by the municipal and local government authorities. Alappuzha is one of the tourists place in Kerala that face problems in solid waste management such as insufficient facilities and lack of technology. The factors affecting solid waste management are population growth, economic growth, law enforcement inadequate waste, infrastructure and public attitudes among others encountered. It remains a major challenge for municipalities to collect, recycle, treat and dispose of increasing quantities of solid waste, especially in a water logging areas. Recycling, Willingness to pay and public

participation have been identified as the significant factors towards sustainable waste management.

**Review of literature**

Sustainable household solid waste management is a challenging task. It requires a change in the behaviour of the public behaviour to reduce the volume of their waste and increase the recycling rate. According to (U.S.E.P.A) (2012), Active people participation makes the recycling program particularly sorting a great success. The behaviour of an individual changed when he or she is aware of the problem or the particular need that boosts an individual to take initiative for a particular course of action.

Tonglet et. Al (2004) identified that the Theory of Planned Behaviour provided valuable insights into the factors which motivate participation. Attitudes are the major contributor to recycling behaviour such as having appropriate opportunities, facilities and knowledge to recycle. According to Vining and Ebero 1990, Oskamp et al, 1991 and Vining, 2001, various studies have been undertaken on recycling behaviours and its effect on socio-economic conditions, demographics and the knowledge and attitude of public on recycling.

The quantity of waste generated by a household also influences Willingness to Pay for waste management. The higher the waste generation, an individual faces greater waste disposal problems and the willingness to pay. (Aggrey and Douglason, 2010).

According to Aggrey and Douglason (2010), age affects Willingness to pay negatively. The age old people could be less willing to pay for the solid waste management because they consider that the waste collection is the responsibility of the government bodies. While the younger generation might by more familiar with cost sharing and could be willing to pay.

According to United Nations Environment Programme report, 2017, the Alappuzha municipality is recognised as one among the five cities in the world which has sustainable solid waste management practises.

The Centre for Science and Environment's report—Not in my backyard which was a result of a survey of cities and their waste management practices—was released in New Delhi in 2016. The Centre for Science and Environment's Clean City Awards conferred by Mr, Venkaiya Naid the three of the cleanest cities in India: Alappuzha (Kerala), Panaji (Goa) and Mysuru (Karnataka).

Alappuzha, generates 58 tonnes of solid waste per day which has a population of 0.174 million. Since November 2012 the city has promoted 100% segregation in all the 23 wards through decentralised waste management. 80% of the households recycle the biodegradable waste by using biogas and composting system in Alappuzha.

30 aerobic plants are set up in the municipality for disposing waste at the community level. These are used by families who do not have the space to compost bio-degradable waste in their backyard. More than 1500 household use biogas plants and 10,000 use bio composters, the segregation of waste into biodegradable and non-biodegradable. Aerobic composting is used to decompose the biodegradable waste into manure through the process of microorganisms and oxygen in the air.

The municipality has offered bio bins and pipe composed at a subsidised rate for the households. 30 aerobic units with 294 bins with each bin have the capacity up to two tonnes are installed in the municipality area to promote solid waste management at the community level. Public can dispose the waste in the aerobic plant from 6am to 11 am in the morning

and from 6pm to 10 pm in the evening. Also material collection facility is provided in the public spots for treating non-biodegradable waste. Separate collection facility for E-Waste, hard plastic and carry bags are provided for the people to dispose the non bio-degradable waste. Also the door to door collection of non biodegradable waste by Green Action Force and volunteers group are promoted in the city.

In spite of a number of studies, mostly at the international level, those in Indian context, particularly with reference to Kerala state are virtually nil. This paper on a small step towards sustainable solid waste management paves the way for successful solid waste management system in Alappuzha municipality in Kerala

**Objectives of the study**

- To study the existing solid waste management system in Alappuzha municipality.
- To analyse the willingness to pay and public participation in waste recycling
- To propose aerobic treatment plant location

**Methodology**

The study was conducted in the Alappuzha municipality consisting of the area that covered by the local authorities of Nirmala Bhavanam Nirmala Nagaram project and local self government respectively. It is located in Alappuzha District of Kerala State. A total of 200 household were sampled. The survey was conducted using a structured questionnaire. Statistical tools like SPSS and correlation had been used to analyse the data. In addition simple statistical tools such as means, ranges and frequency distributions chi-square test had been computed for all variables and selected variables had been used in multivariate analysis. The ordinary least squares method had been used to estimate the parameters in the multiple linear regression models. The F statistics had been used to test the significance of the R2 statistics in the multiple linear regression models. Cartographic techniques using GIS had been used for pictorial representation of proposed site for aerobic units.

**Findings**

**Socio demographics and characteristic of households**

This study found that71.8% of the respondents were male and 28.2% female. 37.23% the respondent were over 50 years old. The middle age group (40 to 50 years old) is 33.33% and the age group (30 to 40 years old) is 25.64% and 3.8% were in the age group of less than

30 years old. In this survey the highest percentage of the respondents had high school level (38.48%) followed by degree (38.46%), middle school (11.53%), only 6.41% had middle school. Majority of the respondents were employed (29.04%), and about 24.35% were self-employed. The percentage for the unemployed was about 12%, and most of them were housewives and they were the people who categorized as older group (50 years old and above). On average, monthly income of respondents was more than Rs.10000. Majority (29.04%) of the respondent had income range Rs.20000 and above. While 24.35% of the respondents had income range Rs.10000 up to Rs.20000 and only minority, had income below Rs.5000.

**Public Perception on Solid Waste Management**

Currently households are required to bring their segregated biodegradable waste bags in to the collection centre in front of the aerobic plants. The collectors collect the wastes twice a day. Households are required to pay collection fee set by the local authorities with the service provider. This study found that most households (66.66%) were reasonable satisfied with the existing solid waste management system. Only 21.34% were very satisfied. However, very few households (12%) were not satisfied to the current system. This was due to the failure of systematic collection and transportation.

the awareness of households on existing solid waste management system in the municipality. The study found that most of the respondents were aware of garbage collection schedule (83.5%) followed by deficiency on existing solid waste management system (33.34%). The result indicated that the respondents had adequate awareness on the existing waste management scenario. Only 56.41% of respondents knew about the location of the aerobic plant site. This showed that the respondents did not have a clear and in depth awareness as information on the aerobic plant site location.

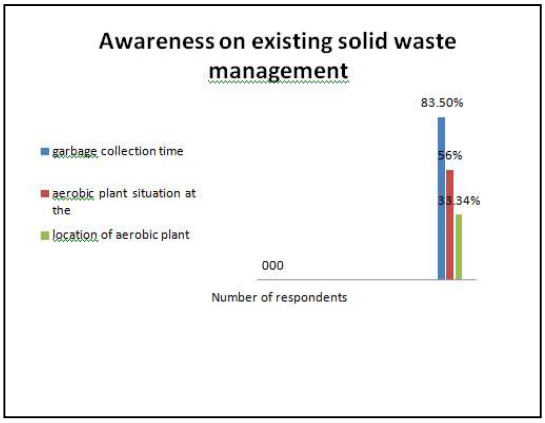


**Figure 1.** Awareness of existing solid waste management system.

Figure 1 shows the awareness of households on existing solid waste management system in the municipality. The study found that most of the respondents were aware of garbage collection schedule (83.5%) followed by deficiency on existing solid waste management system (33.34%). The result indicated that the respondents had adequate awareness on the existing waste management scenario. Only 56.41% of respondents knew about the location of the aerobic plant site. This showed that the respondents did not have a clear and in depth awareness as information on the aerobic plant site location

**Knowledge Towards Sustainable Solid Waste Management**

Knowledge is important to predict recycling behaviour. Knowledge of household recycling is about where, what, when and how to practice in a real life. A majority (85%) of the respondents claimed that they knew how to segregate their household waste.

**Willingness to participate and willingness to pay**

The results of regression model show that the willingness is likely to be their level of satisfaction with the present service from municipality particularly with the aerobic plant. The independent factor that have a positive influence on householders willingness to pay and participate in recycling activities are monthly income of the head of the households, education, number of members in the households and quantity of waste generations. Based on the observations, it may be predicted that for high income group with the household size of 4 shows higher frequency to willingness to pay as the waste generated by them is high when compared to other groups. The respondents' willingness to participate in household waste recycling was the highest (66.66%) that received in Alappuzha municipality.

Correlation was used to find out the relation between education and willingness to pay and participate in recycling activities. The mean of education (3.57) is higher than willingness to pay and participate (1.14) and the standard deviation for education is 1.24 which is greater than 0.34. This means that the education has a strong impact on Willingness to pay and participate in recycling. The problem of waste collection and nuisance occurred from other forms of waste collection are pretty serious in the commercial regions of the study area,

The result showed positive feedback by respondent. However, the result shows in the older age group (above 50 years old) are more likely and less than 30 years old are not willing to pay and to participate in recycling activities.

Out of the 200 households taken for the study, 32.07% of the households preferred door to door collection and 52.23% in disposal in aerobic plant while the rest were interested in dumping the waste in the yard. And the respondents were willing to dump the waste by them if the aerobic plant is 50m- 100m distant from their houses. The amount they were willing to pay ranges from Rs.30 to Rs.100 and there is perfect relationship between variables and the model is a good fit. 56.41% of the respondents were disposing the waste daily. Most of the respondents (66.66%) of this study have indicated that local solid waste management could be improved through municipal waste collection and disposal services. The study result shows that Municipality is the most preferred service provider.

**Conclusion**

This study demonstrated that Alappuzha municipality households have awareness on recycling management. The local self Government, Suchitwa mission and NGOs will be implementing the requisite segregation of solid waste at source as early as 2015. Therefore, it is recommended that the citizen should be educated in effective segregation at source through regular sensitization programme. Also citizens should be strengthened on willingness to pay and participate for the service delivery thereby the households, maximize their utility from

improved services. The system is also, useful to analyze the suitable location for that particular service.

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