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An Economic Study of Household Solid Waste Management in Mayiladuthurai Taluk

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Abstract

The situation of environment is a deciding factor that determines the quality of life. The quality of life depends upon the conditions of the surroundings of houses, the pollution level of environment and also the availability of essential facilities to maintain proper and efficient solid waste management. In recent times due to the rapid urbanization and the increase in the per capita income the quality of life has improved. Even though unsanitary conditions and inadequate facilities have made living conditions more miserable especially in the urban regions. The environmental health is affected by population growth, economic development, social attitudes, lavish lifestyles and rapid industrialization. The study has used the primary data from 210 households on the basis of Random Sampling technique and the secondary data are collected from various reports of central and state pollution control board. By analyzing the data, it was found that factors such as household income, expenditure, employment and ownership of house affect the household's willingness to pay. To an extent, this study identifies the problems related to the current solid waste management and suggests some policy implications for efficient and effective solid waste management.

Keywords: Population Growth, Solid Waste, Generation, WTP, Management

Introduction

Industrialization and population growth are the two major factors that results in the degradation of environment. Over the last decades the rapid increase in urbanization and consumption rate of people had led to an increase in the solid waste generation in developing nations (Minghua et.al. 2009). Collection and disposal of solid waste, unregulated management and unscientific disposal increases the level of mortality and morbidity (Medina, 2002). During the pre-industrial era waste was recognized as a major issue only in the major cities but due to modern industrial practices the industrial waste is generated in large quantities. The solid waste can be also categorized from other sources such as domestic, commercial, construction and demolition. Efficient Solid waste management tends to eradicate the adverse impacts of solid waste on environment and human health. Whereas inefficient solid waste management often leads in the contamination of water bodies, greenhouse gas emissions and also health hazards (Ejaz, 2010). Over the last decade, India's solid waste management practices have evolved significantly as traditionally, waste disposal involved the practices of open dumping, burning and improper disposal of solid waste which has led to contamination of environment and resulted in health hazards. Factors such as improper disposal of waste and inefficient waste treatment contributes to pollution of water, air and soil which directly affects the ecosystems and human health (Mohan and Joseph, 2021). The collected waste from different sources is dumped in landfills and dumping sites this leads to the accumulation of waste which emits greenhouse gases, contaminates groundwater, degrades surface soil and reduces soil fertility. Additionally, improper solid waste also contributes to the spread of diseases mainly vector-borne since the accumulated waste

can serve as a breeding ground for the pests (Mainul 2019). The end consequences are not only affecting the environment but also the social and economic thus affecting the quality of life and health.

Statement Of The Problem

Solid waste is created by human activities, the generated waste are handled, collected, stored, treated and disposed of which reduces the risk to the environment and public health. If the process lacks in any way resulting in inadequate waste disposal it creates serious environmental issues that affect both the health of humans and animals resulting in serious economic and welfare losses. It is found that many urban and rural areas still have improper solid waste management, insufficient collection system, poorly controlled open dumps, unscientific landfills and illegal dumping of waste in roadside. The study was carried out in Mayiladuthurai Taluk of Mayiladuthurai District. During the past years, the household solid waste problem in Mayiladuthurai also continues to grow exponentially. Solid waste management has evolved into a major problem that has reached its alarming state and requires drastic efforts to regularize it. Due to lavish lifestyles and increased consumptions, volume of waste generated is increased and these increased waste generations are seen as a potential source of pollution and on the other hand also a loss of resources, in the form of energy and materials. In Mayiladuthurai according to the data the accumulation of solid waste increases every year and it was also suggested that measures should be taken to address it. One way to implement an efficient solid waste system is by increasing public awareness via campaigns enlightening the impact of solid waste on environment and human health. Handling solid waste has become one of the intractable environmental issues in Mayiladuthurai Taluk. If not properly taken care of, solid waste can cause severe health hazards, environmental issues thus solid waste management requires special attention. Hence the study on the generation of solid waste and its management has become an important concern in recent times.

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Yousuf et al., (2007) mentioned the determinants of the willingness to pay for improved households solid waste management as the study shows education level, age, service price, household size and monthly expenses are the major variables that influence thewillingness to pay for solid waste management. **Selamawit Mulat et al., (2019),** studied that globally, cities generate about 1.3 billion tons of solid waste per year, amounting to a total rate of 1.2 kg per person per day. Solid waste management is proven to be one of the important challenges for both developing and developed countries and the study has aimed to assess the willingness to pay for enhanced solid waste management and the factors among the households in Injobara town, Ethiopia. **Wang et al., (2021)** have noted the improvised waste planning, management, anddisposal of the categorized waste which play a pivotal role in the maintenance of sanitation standards and achieving an sustainable development within a country. Waste to Energy is animportant method in which unusable wastes are converted into energy that can be used for other activities. **Widad Fadhullah (2022)** have found that poor waste disposal practices hamper progress towards achieving integrated solid waste management in households. Knowledge of the current practices and also the perception of waste management is necessary for makingaccurate decision with a more sustainable approach. The study also investigates major household waste practices and perceptions about the solid waste management in Kota Bharu, Kelantan, Malaysia.

Objectives Of The Study

1. To study the Socio-Economic status of the Households in Study Area.

2. To estimate Household Willingness to Pay to improve Solid Waste Management in the study area.
3. To know the quantity of Solid Waste Generated and Disposal practices of the Household in study area.
4. To suggest sustainable measures to improve the efficiency of Solid Waste Management in study area.

Methodology Of The Study

The primary data have been collected from 210 respondents from the Mayiladuthurai Town. The data was collected from the respondents regarding Household Solid Waste Management by interview method. With the help of personal interview with the respondents, the data was collected with the help of well-prepared schedule. A total of 210 samples were collected and analyzed in the study. The secondary sources were collected from Magazines, Manuscripts, Books, National and International Journals, Ministry of Environment, Forest and climate change, Environment report from the state of Tamil Nadu and annual report. For the purpose of analysis simple percentage analysis is used. For interpretation of data and analysis Chi-square analysis has been applied.

Hypotheses Of The Study

Based on these objectives the hypothesis, "There is a significant relationship between the Age, Educational qualification and Monthly income of the Respondents and their Willingness to Pay for Solid Waste Management" was framed.

Table: 1-Socio-Economic Characteristics of the Households

Socio Economic Status	N= 210	Percent (%)
Age		
Less than 25	25	11.90
26to30	30	14.28
31to35	27	12.85
36to40	29	13.80
41to45	33	15.71
46to50	31	14.76
Above50	20	9.52
Gender		
Male	92	43.80
Female	118	56.19
Educational Status		
Illiterate	13	6.19
Primary School	20	9.52

Middle School	15	7.14
High School	26	12.38
Higher Sec. School	39	18.57
Degree	30	14.28
Post Graduate	27	12.85
Professional	22	10.47
Technical	18	8.57
Households Monthly Income		
Below 5000	56	26.66
Rs. 5001 to Rs. 10000	40	19.04
Rs. 10001 to Rs. 15000	42	20
Rs. 15001 to Rs. 20000	35	16.66
Rs. 20001 to Rs. 25000	19	9.04
Rs. 25001 to Rs. 30000	11	5.23
Above Rs. 35000	7	3.33
Family Size		
2 Members	12	5.71
3 Members	78	37.14
4 Members	56	26.66
5 Members	40	19
6 Members and above	24	11.42
Nature of Employment		
Government	10	4.76
Private	98	46.66
Self	102	48.57

Source: Primary Data

From table 1 it is denoted that about 25(11.90%) of the respondents are less than 25 years of age, about 30(14.28%) are between age of 26 and 30, 27(12.85%) are between age of 31 and 35, 29(13.80%) are between age of 36 and 40, about 33(15.71%) are between the age of 41 and 45,about 31(14.76%) are between age of 46 and 50 and about 20(9.52%) are above 50 years. Out of the 210 respondents about 92(43.80%) are male and the remaining 118(56.19%) are female. Out of the total respondents, 13(6.19%) are illiterate, 20(9.52%) attended primary school, 15 (7.14%) attended middle school, 26(12.38%) attended high school, 39 (18.57%) completed higher secondary school, 30 (14.28%) are graduates, about 30 (14.28%) are graduates, 27 (12.85%) are post

graduates, 22 (10.47%) are professional and about 18 (8.57%) of the respondents are technical. Out of the 210 respondents monthly income about 56(26.66%) have income below Rs 5000, 40 (19.04%) have income ranging between Rs 5001to Rs 10000, 42 (20%) have income ranging between Rs 10001to Rs 15000, 35 (16.66%) have income ranging between Rs 15001to Rs 20000, 19(9.04%) have income ranging between Rs 20001to Rs 25000, 11(5.23%) have income ranging between Rs 25001to Rs 30000 and about 7 (3.33%) of the respondents have income above Rs 35000. Out of the total respondents about 12(5.71%) have a family of 2 members, 78 (37.14%) have a family of 3 members, 56 (26.66%) have a family of 4 members, 40 (19%) have a family of 5 members and about 24 (11.42%) have a family of more than 6 members. Out of the total respondents about 10(4.76%) are government employees, 98 (46.66%) are private employees and about 102(48.57%) are self employed.

Table: 2 – Solid Waste Management Practices of Households

Source: Primary Data

Solid Waste Management Practices	N= 210	Percent (%)
Types of Waste		
Food Waste	96	45.71
Plastic Waste	81	38.57
Paper Waste	33	15.71
Places of Waste Disposal		
Nearby Container	129	61.42
Open Dump	52	24.76
Burnt	29	13.09
Quantity of Waste Generated		
Lessthan5kg	98	46.66
5.1kgto10kg	46	21.90
10.1kgto15kg	35	16.66
Above15kg	31	14.76
Agency involved in Collection		
Municipality	104	49.52
Private	39	18.57
Both	67	31.9
Frequency of Collection		
Once in a week	125	59.52
Twice in a week	85	40.47
Satisfaction about the Service		
Yes	132	62.85
No	78	37.14

The table 2 indicates the solid waste management practices and about 96 (45.71%) generates food waste, 81(38.57%) generates plastic waste and about 33(15.71%) generated paper waste. Out of the 210 respondents about 129(61.42%) disposes waste in nearby container, 52(24.76%) disposes waste in open dump and about 29(13.09%) burns the generated waste. About 98(46.66%) generated less than 5 kg of solid waste, 46(21.90%) generates solid waste between than 5.1 kg to 10 kg, 35(16.66%) generates solid waste between than 10.1 kg to 15 kg and about 31(14.76%) generates more than 15 kg of solid waste. The generated solid waste are collected by the agency and about 104(49.52%) of the respondent's waste are collected by municipality, 39(18.57%) of the

respondent's waste are collected by private agencies and about 67(31.9%) of the respondent's waste are collected by both municipality and private agencies. About 125(59.52%) says the generated waste are collected once in a week and the rest of the respondents 85(40.47%) says that the generated waste are collected twice in a week and about 132(62.85%) of the respondents are satisfied about the service while the rest of the respondents about 78(37.14%) are not satisfied with the current service.

Table: 3-Households willingness to Pay (WTP) for Improved Solid Waste Management Services

Willingness to Pay (WTP)	**N= 210**	**Percent (%)**
Yes	94	44.76
No	116	55.23
Total	**210**	**100**

Source: Primary Data

The table 3 indicates that out of the 210 respondents about 94(44.76%) are willing to pay for improved solid waste management services while about 116(55.23%) are not willing to pay for it.

Result And Discussion

Hypotheses-1

H_0 = There is no significant relationship between the Age of the respondents and their Willingness to Pay for Solid Waste Management.

H_1 = There is a significant relationship between the Age of the respondents and their Willingness to Pay for Solid Waste Management.

Relationship between Age of the Respondents and Willingness to Pay for Solid Waste Management

Age of the Household	**Willingness to Pay for Solid waste Management**		**Total**
	Willing	**Not Willing**	
Up to 25 Years	17 (68.0)	8 (32.0)	25 (100.0)
26-30	18 (60.0)	12 (40.0)	30 (100.0)
31-35	14 (51.9)	13 (48.1)	27 (100.0)
36-40	12 (41.4)	17 (58.6)	29 (100.0)
41-45	11	22	33

	(33.3)	(66.7)	(100.0)
46-50	12 (38.7)	19 (61.3)	31 (100.0)
51-55	5 (25.0)	15 (75.0)	20 (100.0)
Above 55 Years	5 (33.3)	10 (66.7)	15 (100.0)
Total	94 (44.8)	116 (55.2)	210 (100.0)

Source: Primary Data

Note: Figures in the parenthesis indicate percentage, D. f: 7, $\chi^2 = 15.114$, Tab. Value= 14.067.

It is interpreted from the above table that the calculated Chi-Square value is greater than the table value and the result is significant at 5% level. Hence the hypothesis "Age and Willingness to Pay" are associated. From the analysis, it is concluded that there is a significant relationship between the variables, age of respondent and their willingness to pay for solid waste management.

Hypotheses -2

H_0 = There is no significant relationship between the education of the respondents and their Willingness to Pay for Solid Waste Management.

H_1 = There is a significant relationship between the education of the respondents and their Willingness to Pay for Solid Waste Management.

Relationship between Education of the Respondents and Willingness to Pay for Solid Waste Management

Education of the Household	Willingness to Pay for Solid waste Management		Total
	Willing	Not Willing	
Illiterate	5 (38.5)	8 (61.5)	13 (100.0)
Primary School	7 (35.0)	13 (65.0)	20 (100.0)
Middle School	6 (40.0)	9 (60.0)	15 (100.0)
High School	12 (46.2)	14 (53.8)	26 (100.0)
Hr Sec School	18 (46.2)	21 (53.8)	39 (100.0)

Degree	13 (43.3)	17 (56.7)	30 (100.0)
PG	13 (48.1)	14 (51.9)	27 (100.0)
Professional	10 (45.5)	12 (54.5)	22 (100.0)
Technical	10 (55.6)	8 (44.4)	18 (100.0)
Total	94 (44.8)	116 (55.2)	210 (100.0)

Source: Primary Data

Note: Figures in the parenthesis indicate percentage, D. f: 8, $\chi^2 = 2.170$, Tab. Value= 15.507

It is identified from the above table that the calculated Chi-Square value is less than the table value and the result is significant at 5% level. Hence the hypothesis "Education and Willingness to Pay" are not associated. From the analysis, it is concluded that there is no significant relationship between the variables, education of the respondent and their willingness to pay for solid waste management.

Hypotheses -3

H_0 = There is no significant relationship between the monthly income of the respondents and their Willingness to Pay for Solid Waste Management.

H_1 = There is a significant relationship between the monthly income of the respondents and their Willingness to Pay for Solid Waste Management.

Relationship between Monthly Income of the Respondents and Willingness to Pay for Solid Waste Management

Monthly Income of the Household	Willingness to Pay for Solid waste Management		Total
	Willing	Not Willing	
Up to Rs. 5000	15 (26.8)	41 (73.2)	56 (100.0)
Rs. 5001 to Rs. 10000	12 (30.0)	28 (70.0)	40 (100.0)
Rs. 10001 to Rs. 15000	20 (47.6)	22 (52.4)	42 (100.0)
Rs. 15001 to Rs. 20000	21	14	35

	(60.0)	(40.0)	(100.0)
Rs. 20001 to Rs. 25000	14 (73.7)	5 (26.3)	19 (100.0)
Rs. 25001 to Rs. 30000	6 (54.5)	5 (45.5)	11 (100.0)
Above Rs. 35000	6 (85.7)	1 (14.3)	7 (100.0)
Total	94 (44.8)	116 (55.2)	210 (100.0)

Source: Primary Data

Note: Figures in the parenthesis indicate percentage, D.f: 6, $\chi^2 = 25.871$, Tab. Value= 12.592

It is identified from the above table that the calculated Chi-Square value is greater than the table value and the result is significant at 5% level. Hence the hypothesis "Monthly Income and Willingness to Pay" are associated. From the analysis, it is concluded that there is a significant relationship between the variables such as monthly income of the respondent and their willingness to pay for solid waste management.

Findings of the Study

The present study entitled "An Economic Study of Household Solid Waste Management in Mayiladuthurai district of Tamil Nadu" is an attempt to assess the knowledge, practices, attitude, solid waste generation and methods of disposal in the Mayiladuthurai district. In the selected study key factors such as Socio-Economic factors, Solid waste management practices and willingness to pay among the respondents were found and analyzed.

Socio-Economic status of the Respondents

- The result revealed that the majority of the respondents about 33(15.71%) belongs to the age group of 41-45 while 20(9.52%) of the respondents are above 50 years old. Here the majority of the respondents were females about 118(56.19%). The majority of the respondents about 39(18.57%) have completed higher secondary school meanwhile about 13(6.19%) are illiterate. Regarding the household income the majority of the respondents 56(26.66%) earns below Rs 5000 whereas about 7(3.33%) earns above Rs 35000. Out of the total respondents the majority 78(37.14%) belongs to a family size with 3 members. The result reveals that the majority of the respondents 102(48.57%) are self employed.

Solid Waste Management Practices

- From the result it is found that the food waste 96(45.71%) is the most generated waste according to the respondents, about 129(61.42%) disposes waste in nearby containers and regarding the quantity of solid waste generated the majority of the respondents about 98(46.66%) generates less than 5kg of waste. The majority of the waste of the respondents 104(49.52%) are collected by the municipality. The majority of the respondents 125(59.52%) says

frequency of collection is about once in a week. About 132(62.85%) the majority among the respondents are satisfied about the solid waste service.

Willingness to Pay

- The result indicates that the majority of the respondents about 116(55.23%) are not willing to pay for improved solid waste management services and the remaining 94(44.76%) respondents are willing to pay for the improved solid waste management services

Policy Suggestions

The empirical study suggests improving awareness about the impact of solid waste for the general public, campaigns and awareness programs should be conducted. Proper guidelines for waste disposal should be set and authorities should monitor whether the guidelines are followed or not. Respective municipal authorities should create awareness and encourage the citizens to segregate household waste into biodegradable and non-biodegradable so it can be easily collected by municipalities. Community bins should be classified on basis of dry and wet waste. Waste dumping sites should be located far away from residential areas to avoid the adverse health effects from the accumulation of solid waste. More treatment plants should be set up in major cities and proper facilities for dumping waste should be constructed. A strict penalty system should be introduced that would reduce the ill practices and illegal dumping of waste in public areas.

Conclusion

In developing countries like India, the major issues that rise in parallel with the rapid urbanization, population growth, improper waste dumping and inadequate facilities are evident in Tamil Nadu. To improve the existing solid waste management in Mayiladuthurai district the local authorities should create awareness through campaigns and awareness programs to change the perception of the people to positive regarding the solid waste management practices. Authorities can also implement strict guidelines for people to practice and impose penalties if not followed. On the other hand, the authorities of central and state should concentrate on the challenges associated with solid waste management such as the selection of waste technology, availability of trained staff in waste management, awareness campaigns and better solid waste management policies for achieving a sustainable solid waste management system.

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