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Community attitude, perception and willingness towards solid waste management in Bangalore city, Karnataka, India

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ABSTRACT

Community participation has a direct bearing on effective solid waste management. Investigation on community attitude, perception and willingness towards solid waste management was carried out in Bangalore city. Households data was collected randomly based on their socioeconomic status using focus group discussion and structured interviews. On an average 63% of the households are willing to participate for the better management, 97.8% households are preferred daily collection and 82.5% of the households are preferred to segregate the waste into different bins; once the bins are provided by Government /Non-Government Organizations. The majority of the households about 71% are willing to use the recyclable products which they were using to carry vegetables, grains etc. from whole shops/markets, as they have aware about reduce, recycle and reuse (R3). Greater level of community engagement in reduction of waste at the source through campaigns in a scientific manner is needed.

Keywords: attitude, awareness, bangalore, community, management, perception, solid waste

1. Introduction

Today the most important subject that affects and worries mankind is the issues concerned with waste management. Waste management practices especially the municipal solid waste can differ for developed and developing nations, for urban and rural areas, and for residential, commercial and industrial producers. Waste collection methods vary widely among different countries and regions. Domestic waste collection services are often provided by local government authorities, or by private companies in the urban cities. Countries and experts alike spend lot of time and resources to come out with a solution to the problem of environmental degradation and climate change. A problem created by mankind due to thoughtless act of consumerism (Sebastian, 2010). A few decades back disposable things were only known to developed countries in the west. People of the third world countries used pens which were refilled with ink or a ball point pen was used years together by changing the tube. This is not the case now. Everything or most of the things used are disposable or ready-made, which cause a lot of wastage of our resources.

Community participation has a direct bearing on efficient Solid Waste Management. Yet, the municipal authorities have failed to mobilize the community and educate citizens on the rudiments of handling waste and proper practices of storing it in their own bins at the household, shop and establishment level (Asnani, 2006). In the absence of a basic facility of collection of waste from source, citizens are prone to dumping waste on the streets, open spaces, drains, and water bodies in the vicinity creating insanitary conditions. Citizens

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assume that waste thrown on the streets would be picked up by the municipality through street sweeping.

For the general public, which is quite indifferent towards garbage disposal protocol, the responsibility of keeping the city clean is entirely on the Urban Local Bodies (ULBs). This mind set is primarily responsible for the unscientific systems of waste management in the country. The relevance of the study has direct relation to the present environmental issues. There is a global awakening on the issue by the world leaders. Most often the present efforts are disproportionate because all the stakeholders want others to control the contamination. Willingness to pay for waste management services or facilities is very important to the success of the Private Sectors' Participation (PSP) in Solid Waste Management program. The willingness to or not to pay could have direct impact positively or negatively on the reliability and success of any solid waste management strategy (Epp and Mauger, 1989; Rahman *et al.*, 2005).

The perception of one's capability is said to set a limit to what to do and ultimately what can be achieved (Holland and Rosenberg, 1996). The influence of perception which describes how a person views himself and the world around him and how it tends to govern behavior is explained by Anomie theory (Merton, 1968). A situation that may result is greater incidence of divergent behavior's towards Solid Waste Management services as perceived or a total breakdown of waste control system. In this wise, individual's perception will influence the cultural values, responses, and success of the solid waste management system. Hence, people's perception on waste disposal and on waste collection services is primordial for its willingness to pay.

Unwillingness to pay could lead to illicit burning and dumping, hence, in their model, Fullerton and Thomas (1995) were of the opinion that household collection should be subsidized in order to prevent such external environmental costs resulting from illegal dumping. The present research work was aimed at investigating the perception and willingness of household solid waste management system in Bangalore Urban city as a case study.

2. Materials and methods

2.1 Study area

Bangalore is one of the fastest growing cities in India and is branded as 'Silicon Valley of India' for heralding and spearheading the growth of Information Technology (IT) based industries in the country. With the advent and growth of IT industry, as well as numerous industries in other sectors and the onset of economic liberalisation since the early 1990s, Bangalore has taken lead in service-based industries fuelling substantial growth of the city both economically and spatially. Bangalore has become a cosmopolitan city attracting people and business alike, within and across nations (Sudhira *et al.*, 2007).

Owing to the large growth in population as well as a significant influx of migrants from the countryside, Bangalore today faces serious problems of solid traffic congestion, inadequate infrastructure and an increased demand on resources. This, in turn, has affected the quantity and composition of municipal solid waste, which is further straining the city's resources. In 2011, Bangalore had population of 9,588,910 of which male and female were 5,025,498 and 4,563,412 respectively. There was change of 46.68 percent in the population compared to population as per 2001. In the previous census of India 2001, Bangalore District recorded

increase of 35.09 percent to its population compared to 1991. The initial provisional data suggest a density of 4,378 in 2011 compared to 2,985 of 2001. Total area under Bangalore district is of about 2,190 sq.km.

Average literacy rate of Bangalore in 2011 were 88.48 compared to 82.96 of 2001. If things are looked out at gender wise, male and female literacy were 91.82 and 84.80 respectively. For 2001 census, same figures stood at 87.92 and 77.48 in Bangalore District. Total literate in Bangalore District were 7,609,962 of which male and female were 4,146,709 and 3,463,253 respectively. In 2001, Bangalore District had 4,782,565 in its total region.

2.2 Methodology

One of the important stages in the research process is data collection the researcher used both primary and secondary methods of data collection. In order to accomplish the research's objectives, information on existing household solid waste management practices and public perception on the effectiveness of the current system were gathered. In assessing the general perception and willingness of respondents on the household waste management system, sample size of 400 households among the community was selected randomly. The respondents were divided into three socio-economic strata: High, middle and low-income groups based on the State's socio-economic status index. To achieve this, a classification questionnaire with items bothering on respondent bio data and availability of social amenities was used to generate their socio-economic status. Collection of data was based on direct questionnaire administration, personal interviews of the members of the focus group in order to obtain information on respondent's general opinion on attitude and perception on household waste handling and management, waste management services, patronage and willingness to pay for such waste management services.

3. Results and discussion

3.1 Status of solid waste management in Bangalore city

With an estimated population of 9.4 million, Bangalore is among the largest five cities of India. The solid waste management practice in Bangalore is very interesting. Waste generated per person per day is about 0.5 - 1kg. It generates more than 4,500 tonnes of Urban Solid Waste a day, which the Bhruhat Bangalore Mahanagara Palike (BBMP) is clear approximately about 60%. The primary and secondary collection, and transportation have been reasonably satisfactory to enable the city to remain clean. Consequently, there is a huge backlog of un-cleared waste cluttering the city are properties that are under dispute, lake beds, storm water drains, street corners etc., (Environmental Status Report, 2008).

The existing solid waste treatment system in the city is not very effective. Between the 1970s and 1990s a significant fraction of the fermentable wastes was composted or used directly in the fields. In spite of rapid growth in Urban Solid Waste production over the years, the capacity of compost plants has not increased. Various forms of waste recycling processes are currently functioning in Bangalore (reaching an estimated 67% of total recyclable content). This level is inadequate and it results in the production of non-fermentable wastes to be land-filled. A significant fraction of the total Urban Solid Waste is also dumped in about 60 shifting open dump sites and poses environmental problems. The total Municipal Solid Waste generated in Bangalore city has increased from 650 tons per day (1988) to 1450 tons per day (2000) and today it has become 4500 tons per day (Rajabapaiah, 1988). From 1988 to 2000 there is reasonable change in waste composition: fermentable, paper and plastic has increased

by 7%, 3% and 0.2%, respectively (Chanakya and Sharatchandra, 2005). Generation rate has also increased from 0.16 (1988) to 0.58 kg/capita/day (2009) attributable to development and lifestyle changes.

3.2 Socio-economic characteristics of households

Socio-economic characteristics (gender, age, education and number of persons in the household, employment status and income of respondents were investigated to analyzed respondents attitude, perception and their willingness to participate in solid waste management.

Table 1: Table showing the Socio-economic characteristics of Households

Variables	Respondents	Percentage %
Gender		
Male	130	32.5
Female	270	67.5
Age		
15 – 21	87	21.8
22 – 60	252	63.0
Older than 60	61	15.2
Education		
Illiterate	17	4.2
Primary School	112	28.0
Secondary School	153	38.3
Diploma	38	9.5
Degree	80	20.0
Household size		
Individual	35	8.8
1 - 2 people	128	32.0
3 - 4 people	196	49.0
5 - 7 people	31	7.7
8 - 10 people	8	2.0
More than 11 people	2	0.5
Residential Area		
Central Residential Area	68	17.0
South Residential Area	124	31.0
East Residential Area	108	27.0
North Residential Area	100	25.0
Employment Status		
Government employ	28	7.0
Private employed	191	47.8
Self employed	88	22.0
Student	76	19.0
Unemployed	17	4.2
Income		
Low Level Income	136	34.0

Medium Level Income	168	42.0
High Level Income	96	24.0

3.3 Community attitude of households towards solid waste management

Attitude is a hypothetical construct that represents an individual's like or dislike for an item. Attitudes are positive, negative or neutral views of an 'Attitude Object'. People can also be 'Ambivalent Towards' a target, meaning that they simultaneously possess a positive and a negative bias towards the attitude in question.

Table 2: Table showing the Attitude of households on solid waste management

Attitude	Respondents	Percentage %
Awareness about solid waste generation		
Yes	57	14.2
No	343	85.8
Recycling the waste		
Yes	22	5.5
No	378	94.5
Sources of waste management information		
Municipality	13	3.2
Friends and Neighbor	4	1.0
Media	18	4.5
NGO's	23	5.8
No information	342	85.5
Methods of recycling and disposal		
Composting	3	0.7
Separating the recyclable waste	5	1.3
Disposing the waste into different bins	17	4.2
Self-deposit in community bins	375	93.8
Collection Frequency		
Daily	296	74.0
Once in a week	6	1.5
Thrice in a week	98	24.5
Paying charges for removal of household solid waste		
Yes	39	9.7
No	361	90.3
Waste as a resource		
Yes	12	3.0
No	388	97.0

As waste management is a concerted effort of all stakeholders – civic agencies, municipalities, NGO's government and the rag pickers, each one has to play an active role in making it a success. About 14.2% of the households are aware about the generation of solid waste and the majority of the households (85.2%) are not aware about the solid waste generation and their disposal. Due to their busy schedule in the daily life, they just want to

dispose their waste out the house. When asked about the recycling of the waste only 5.5% of the households are motivated and are involved in recycling and remaining 94.5% of the households are not recycling their waste due to lack of awareness, responsiveness and time. Majority of households (85.5%) have no information on waste management are disposing their waste as it is into the nearby open spaces and 5.8%, 4.5%, 3.2% and 1% of the households are aware about the waste management information through NGO's, Media, Municipality and friends and neighbor respectively.

At the household level, segregation is vital. It does not take any time for an individual to put biodegradable and non-biodegradable waste in two separate bins. This exercise saves a lot of effort at the dump site. About 93.8% of the households are not recycling the waste and are directly disposing into the community bins without segregation.

About 74% of the households are preferred to dispose the waste on daily because of the location of their house is near to the community bin. About 24.5% of the households are preferred to dispose the waste thrice in a week because the household size is medium and the generation of waste is comparatively low. About 1.5% of the households preferred to dispose the waste once in a week because they are in 1 – 2 in numbers and waste generation is very low. However, very few households know where the collected waste is disposed.

About 9.7% of the households are paying charges for removal of household solid waste with interest and remaining 90.3% are not paying any charges for the removal of solid waste because just they are dumping their waste either in the community bins or nearby open spaces; from their the government bodies like municipalities, corporation are collecting the waste from the community bins or open spaces using pourakarmikas.

About 3% of the households are making their waste as a resource through mini-composting and the produced manure is using for their horticulture in their gardens. The households are involved in waste management NGO's and are gained knowledge on "Waste from Wealth". The remaining 97% of the households are not bothered about the waste management and their disposal due to lack of knowledge and understanding the concept of "Waste from Wealth". As non-biodegradable wastes like plastics, polythene, glass and paper do fetch a price, the pourakarmikas unload the waste on the dump sites and ragpickers are carry out sorting for resale and without any safety measure in the stinking place. It once again spread the waste, leading to unhygienic conditions. Once enforcement of segregation is achieved, biodegradable waste can be collectively taken to the composting area and most of the non-biodegradable waste sold by the ragpicker as recyclable. This would reduce manpower and transportation costs for the municipality/corporation and ensure that only less percent of waste goes to the so-called dump sites.

4. Perception and willingness of households towards solid waste management

Perception and willingness of households are very much needed for any management activities. Without households involvement in solid waste management; "Waste from Wealth" cannot be achieved. The perception and willingness of the residents for the management of waste was found that majority of them do not care on the final disposal of the waste. On an average 63% of the households are willing to participate for the better management of waste. About 97.8 % households are preferred daily collection of waste and 94% households preferred to self-disposal of waste to community bins. About 82.5% of the households are preferred to segregate the waste into different bins; once the bins are provided by Government / Non-Government Organizations.

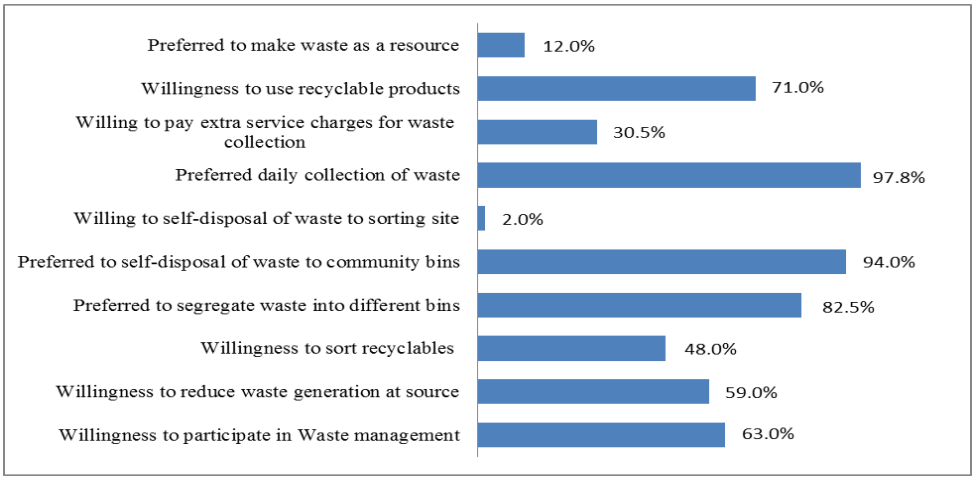

Figure 1: Image showing the Perception and Willingness of households in SWM

The majority of the households about 71% are willing to use the recyclable products which they were using to carry vegetables, grains etc. from whole shops/markets, as they have aware about reduce, recycle and reuse (R3). About 12% of the households are preferred to make waste as a resource and about 59% of the households are willing to reduce waste generation at source, as they have aware about it and known the future consequences and impact on both human beings and environment.

About 48% of the households are willing to sort recyclables at the source, as the environmental awareness of the households seems to be low and due to this they are completely disposing the waste into the same bins and are carried to dump site. However, they simply want the waste to be out from their house. About 30.5% of the households are ready to pay extra service fees for the collection of waste, as they did not find any problem once the waste is out of there house. Thus, the average willingness to pay seems to be lower than that of the cost required for the management of the waste. The Willingness to pay is also positively related to the household income and household size. Interestingly, about 2% of the households are willing to self-disposal of their waste to the sorting site, as they have knowledge about the reduce, recycle and reuse

The households have given more than one reason for not willing for the management of the waste. About 37% of the households were not willing, as their waste was collected and they do not feel the problem from the waste since they have sufficient space to throw the waste either on the road, lake bed, open spaces, etc. and few households feel that it is the duty of the municipality and the government and so they are not willing to pay. Another reason is that, as their waste generation is very low and even the income were also very low. About 34% of the households are comes under lower level income and they feel that their priority is hand to mouth survival and not the waste.

5. Conclusion

As the wastes gradually becomes enriched easily decomposable material, it also becomes easily amenable to anaerobic fermentation processes that convert the carbon to carbon dioxide and Methane, the latter being a greenhouse gas of interest. Open dumping is conducive to the generation and release of Greenhouse Gases (GHGs), such as methane – having 21 times more GHG potential than carbon dioxide. As we head into a climate conscious society, it is imperative that we plan to reduce the potential GHG emissions from

waste management. Our study concludes that most of the households feel that the lack of stiff penalty and non-execution of law is the basic problem for the effective management of waste. Thus, provision of strong penalties and effective execution of the law will be the major tool to reduce the problem of solid waste management in Bangalore. It is found that environmental awareness is low among the residents of Bangalore. Thus, strict regulations with environmental awareness programs for household sorting and composting can reduce the volume and quantity of waste for dump site. It could be suggested that a fee be charged as per the electricity or water bill to the households to cover the costs, since the willingness to pay is positively related to the level of income. Otherwise there will be the possibility of illegal dumping.

Thus overall, awareness, concern, and support for significant action to deal with waste management appears to be gaining momentum among the public, although there are many obstacles remaining, including our limited understanding of the current status of waste generation, public opinion and willingness to pay, it is hoped that results of this survey will be helpful in designing the first signs of a community tipping point, leading to greater levels of public engagement in reduction of waste at the source through campaigns in a scientific manner to create awareness among the individuals is very much needed for making our cities clean.

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