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Knowledge, attitude and practice on solid waste management in selected areas of Puducherry

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Abstract
Segregation is one of the most important activities that we need to promote and enforce for effective waste management in urban area and to make landfills reduce in size gradually. Segregation of waste components should be encouraged at source, the new MSW rules 2016 insist that. This study was carried out with the objective of studying the knowledge, attitude, practice of solid waste management (SWM) with special emphasis on segregation at source. The location of the study was an urban ward with number 14 of Rainbow Nagar, Puducherry. Hundred households were taken for the study on random basis. This area comprises of educated and proactive and participative family members from whose response reliable and holistic information can be sought. The results obtained are discussed with percentage s as comparable measure. Around 71-91% exhibited positive attitude over SWM which reflected their commitment towards the community. The response was overwhelmingly positive with 96% to abide by the government if sorting of solid waste was made compulsory.

Keywords: Solid waste management, KAP, Segregation at source

Introduction
Solid waste management is one of the major problems faced by different cities all over the world. The problem is mainly due to urbanization, industrialization, poor urban planning and lack of adequate resources which contribute to the enormous amount of solid waste generation. This problem has resulted in serious environmental, social and economic complications in the developing countries like India. Level of urbanization increased from 27.81% in 2001 Census to 31.16% in 2011 Census (Census of India, 2011). It is projected that in coming years the total increase in population will take place only in urban locations and by 2030, around 50% of total population will be residing in urban areas of India. Modern urban living brings on the problem of waste because of everything in packaging and fast food products which increases the quantity of waste and changes its composition with each passing day. Therefore, Solid Waste Management (SWM) which is already a mammoth task in India is going to be more complicated with the increase in urbanization, changing lifestyles and increase in consumerism (Dimpal Vij, 2012) [2].

Statement of the problem: Puducherry Urban Agglomeration Area (PUAA) generates about 495 tons/day of waste. Out of this, currently about 350-360 tons per day of waste is collected and transported to the dumping site at Kurumbapet. Segregation of waste at source can be an ideal option to redress the issue to certain extent. Therefore a KAP study was undertaken for better understanding of the households over the issue.

Methodology: The study was carried out in an urban ward of Puducherry *viz*. Rainbow Nagar. Hundred households were taken for the study on random basis. This area comprises of educated, proactive and participative family members from whose response reliable and holistic information can be sought. Statements related to knowledge, attitude and practices on solid waste management were culled, tested for consistency and administered to the households. A Knowledge, Attitude and Practices (KAP) survey is a quantitative method (predefined questions formatted in standardized schedule that provides access to quantitative

and qualitative information. A KAP survey essentially records an "opinion" and is based on the "declarative" (i.e., statements). In other words, the KAP survey reveals what was said, but there may be considerable gaps between what is said and what is done. One segment of the interview schedule was designed to explore the knowledge, attitude, & practice of the respondents. This type of questioning helps in ascertaining if there is coherence and consistency in transforming the knowledge into practice. The results would direct the way for further interventions to the target community by the academicians and policy makers. The results are discussed with percentages as mean comparable measure.

Results and Discussion: The results obtained are tabled below. The responses from the respondent were marked as right or wrong while interviewing. No options or choices were given.

Table 1: Knowledge on SWM issues

Sl. No.	Awareness/knowledge about SWM	Correct/Aware (%)	Wrong/Unaware (%)
01	What is solid waste Management?	24	76
02	From whom are you getting services of solid waste collection or disposal?	57	43
03	Knowledge on waste management	93	7
04	Health hazards of accumulated solid waste	92	8
05	What are the advantages of segregating waste	56	44
06	Recycling reduced the amount of waste that goes to land filling	79	21
07	Using less of disposal items in houses reduces the waste generation	82	18
08	We should not mix solid and liquid waste	60	40
09	Have you heard of Swachch Bharat Mission	60	40
10	Are you aware that segregation of waste does more good to the environment	91	9
11	Are you aware of mixing the waste will lead to soil pollution	80	20

From the above table it can be taken to notice that knowledge on waste management, health hazards of accumulated solid waste, need for segregating waste was remarkably good with only a meagre number unaware of it. Those who were aware of the need for segregating did not know the advantages of segregating waste and the score was very low. Knowledge on Swachch Bharat Mission, ill effects of mixing liquid and solid waste, providers of door to door cleaning service was less.

Table 2: Knowledge on biodegradable and non-biodegradable waste

Which of the following are biodegradable/non-biodegradable	Bio-degradable (%)	Non-biode gradable (%)	Don't know (%)
Kitchen Waste	100	-	-
Glass bottles	4	93	3
Wood	70	28	2
Sanitary napkins	23	73	4
Electrical bulb	2	95	3

From the table above it can be inferred that uncertainty prevails on wood and sanitary napkins. Disposal of sanitary napkins or alternate methods of using compostable napkins should be taught to the masses through educational institutions.

Table 3: Sources of information on Solid Waste Management

Sources of information on SWM*	Frequency
Internet	24
Mass Media	85
Family members	23
Relatives	16
Friends	10
Neighbours	8
Municipality officials	20
Social welfare organisations/RWA	15
Seminars/conferences/other academic events	6
Others	9

*Multiple responses

From the table 3 the power of mass media namely TV, Radio, Press is evident with 85% response. This follows the internet, municipal personnel, relatives, friends, RWA, and academic events. Therefore, Audio-Video medium has an impacting effect on the masses. Attitude refers to a state of mind towards an issue or event or person. In the present context it refers to the notion of the households on SWM in the selected wards. The results are projected in Table 4 below003A

Table 4: Attitude on SWM

Sl. No.	Waste Management Attitude Statements	Agree (%)	Neutral (%)	Dis-agree (%)
01	Everyone in the community is responsible for proper disposal of waste	98	1	1
02	Keeping my living/working surroundings clean is my responsibility.	96	4	0
03	No difference is going to make if I reduce the volume of my house hold waste at my house itself	39	28	33
04	I give more importance to the issues like, unemployment, and cost of living than a solid waste free community	37	43	20
05	The purchase decisions of a person can increase or decrease the amount of solid waste that a household generates.	71	21	8
06	Burning solid waste can affect my health and the health of others.	81	9	10
07	People throw solid waste on the streets and in the drains and gullies because they have no other means of disposing their solid waste.	35	19	46
08	The Local Government is doing enough to solve the solid waste related problems.	51	32	17
09	Environmental education should be imparted in schools and colleges.	86	11	3
10	Public education about proper disposal of solid waste is one way to solve the solid waste problem.	81	11	8
11	Regular and daily collection of solid waste is the only solution to the solid waste problem.	90	8	2
12	It is very important that the Local Government should enforce segregation of waste and recycling laws and	74	19	7

	programs strictly.			
13	Using plastic bags should be banned	85	13	2
14	Males in the family should not be allowed to dispose the waste	26	17	57
15	Recycled products are equally harmful as waste	40	39	21

Simple and easily understandable statements happening in our day-to-day lives related to SWM targeting their attitude were posed to the respondents asking them to respond in the given 3 point scale. The results were highly encouraging. Out of the 15 statements, for nine statements that were direct (Nos.1, 2, 5, 6, 9, 10, 11, 12, & 13) around 71-91% exhibited positive attitude which reflected their commitment towards the community. Statement No.14 "Males in the family should not be allowed to dispose the waste" that was designed to study the level of gender bias, showed a positive trend with 57% expressing their disagreement towards the issue. However, this is not a expression of 'gender equality' as 43% either did not agree to include males in SWM initiatives or were neutral. These are fundamental constraints that hinder the performance of civic duties. Statement No.8 "The Local Government is doing enough to solve the solid waste related problems" did not fetch overwhelming response. About 51% expressed satisfaction, 32% neutral and 17% dissatisfaction over the issue. To mention the sidelining issues, most of the households clubbed all the civic problems into SWM for eg. drainage problem, problem of misuse in empty plots, building debris blocking the road, were expressed by the households. They were not aware which department was responsible to redress the particular nature of the problem. Their only expression of grievance was to accuse the government when such interviewers were available. Statement No. 4, "I give more importance to the issues like, unemployment, and cost of living than a solid waste free community" was slated to know if SWM prioritised compared to other economic problems. The response was neutral with 43% unable to take side. However, 37% agreed that economic issues like unemployment and cost of living mattered more than SWM. This calls for the attention to project that solid waste management can be made an economic activity. The concept of 3Rs needs to be emphasised more in awareness camps.

Practice, in KAP studies refers to the ways in which they demonstrate their knowledge and attitude through their action. In the present context the practice of minimising, disposal, reusing, recycling and similar such practices are elicited, tabulated and discussed in the following psages.

Table 5: Frequency of solid waste generated in a normal day

Types of waste	Daily	Sometimes	Never
Kitchen/food wastes	97	3	0
Papers	15	57	28
Thin Polythene covers	23	61	16
Thicker Polythene covers	5	52	43
Milk covers	75	16	9
Sanitary napkins/diapers	2	56	16
Plastic	6	66	28
Expired medicines/chemical	10	45	45
Pricks/needles	2	13	85
Metals	0	32	68
Glasses	0	30	70
Textiles/cotton wastes	1	45	54
Others	4	0	96

The type and frequency of waste is indirectly related to one's life style. From the table 5 it is evident that kitchen waste and milk covers dominated the list with 97% and 75% respectively, descended by thin polythene covers, papers, expired medicines, etc. This result calls for the attention of home makers to make effective use of kitchen waste by composting, inculcate the habit of raising a garden in the available space. Mukherjee, Abira; Bose, G.K; *et al*. (2016) [4], have abstracted their findings "with the rapid urbanization managing of the kitchen waste generated by the large population has become a big problem. Kitchen wastes comprises of vegetables peels, fruit peels, smashed fibre of fruits, spare uneaten food items, food grains etc. These are loaded with nutrients and organic material, and can be easily recycled.

Table 6: Quantity of waste generated in a normal day

Quantity of waste	Number	Percent
Less than 0.5 kg	78	78
1 kg to 1.5 kg	20	20
More than 1.5 kg	2	2
Total	100	100

From the table above it is evident that a good number of them (78%) revealed that the waste generated in a day was less than 500gms. The waste generation can be linked to size of the family and the age group of the family members. The per capita solid waste generation is computed to be around 100-150 grams/day. Annepu, R.K (2012) [1] in the report on Municipal Solid Waste (MSW) Generation in India documents. "Waste generation rate in Indian cities ranges between 200 - 870 grams/day, depending upon the region's lifestyle and the size of the city. The per capita waste generation is increasing by about 1.3% per year in India".The average per capita waste generation in India is 370 grams/day as compared to 2,200 grams in Denmark, 2,000 grams in US and 700 grams in China. The per capita waste generation in

Puducherry a class C state, is 0.608 gms in 2011 which is alarmingly higher than the national average of 0.498 kgs./ year. This could be due to the floating population with tourists and the soaring food service establishments. (Annepu, R.K,2012) [1].

The respondents were asked about storage and disposal of waste which indirectly reflects on the best practices followed and health consciousness. The response is tabulated in the following table and substantiated with a figure.

Table 7: Practices of storing, disposing and minimizing waste

Storage and disposing practices						Percentage
Type of wastes	containers	used	for	holding	Closed plastic dust bin	36
					Open plastic dust bin	53
					Polythene bags	9
					Others	2
Number of waste bins do you use in your house					One	64
					Two	25
					Three	3
					More than 3	8
Where do you place the waste bin to collect and store your household waste*					Balcony	17
					Kitchen	48
					Backyard	24
					Garden	1
					Terrace	3
					Outside the gate	14
					Inside the gate	14
					Others	4
How often do you dispose waste from your home					Daily	88
					Twice a day	2
					Once in two days	4
					Twice in a week	6
					Total	100
When do you dispose your household waste					Morning	94
					Afternoon	1
					Evening	3
					Night	2
					Anytime	2
Who is responsible for disposing waste from your home*					Myself	68
					Spouse	14
					Children	2
					Maid	9
					Others	12
Do you insist on an environment friendly and reusable packaging material while shopping					Yes	67
					No	33
Have you taken any steps to minimize waste					Yes	48
					No	52

From the table 7 it can be inferred that nearly 64% did not adhere to right method of using closed bin and the remaining 36% used closed bins. In 64% of households one bin was used to collect the entire household waste which implies for sure that segregation is not done. About 48% of them placed the waste bin in the kitchen which was the highest response when compared to other alternatives. About 14% said that they left the dust bin outside the gate which is not a safe option. About 88% of the households disposed the waste almost daily which is an ideal practice. Nearly 94% disposed the waste in the morning hours. Around 83% of the household said either of the spouse was responsible to dispose the waste from home, 2% children and remaining 8% said servant maids cleared the waste from home. About 12% said other family members like in-law took the responsibility of disposing the waste. Nearly 67% revealed that they wait for the waste collectors whistle and then dispose the waste. About 67% insisted on environmental friendly packs or reusable package material while shopping. Shockingly, 52% of them did not take any step to minimise waste. Though, less in number 48% took efforts to minimize waste. When questioned on sorting of waste it was negative response from 67% and the remaining 33% sorted Food/Kitchen waste; plastics and milk covers. The same is tabulated below in Table 8.

Table 8: Issues related to sorting of waste

Sorting and segregation practices		Percentage
Do you sort your household waste before disposal	Yes	33
	No	67
	Total	100
If Yes, what are the items you sort? *	No	66
	Kitchen/food waste	32
	Plastics	21
	Milk covers	13
if No, reasons for not sorting *	No	38

	I am aware of it	18
	Consumes time & space	25
	Sorting of waste does not benefit me	2
	Waste is too dirty to handle	5
	Even if I sort waste, I do not know to compost, recycle or reuse	3
	I am not bothered	7
	I don't want to	5
	Others	1
If Govt. makes it compulsory will you abide by it	Yes	96
	No	4
In your opinion what steps can be taken to inculcate the habit of sorting at source*	No	5
	Providing coloured bags for segregation	71
	Reward Programmes	23
	Regular supervision by municipal authorities	27
	Conduct awareness programmes	31
	Monetary incentive	4
	Distribution of pamphlets	42
	TV/Radio advertisement	44
	Others	3
In your opinion what steps can be taken for those who do not abide by the waste management rules*	Levy fine	52
	Deprive of Government service benefits	15
	Red marking before the house for not abiding the SWM rules	14
	Others	21
What do you do with your recyclable waste*	Sell it to the recyclable dealers/centres	48
	Give free of cost to the recyclable dealers/centres	15
	Sell it to scrap collectors	28
	Others	17
What do you do with your reusable waste? *	Own use	51
	Give free of cost to others who will reuse	25
	Sell it to scrap collectors	21
	Others	9
How did you get to know about the importance of segregating waste *	TV/Radio	57
	Awareness class	13
	Friends & relatives	4
	Others	34
Do you manage solid waste by burning	Often	1
	Sometimes	7
	Never	92

*Multiple responses

When the reasons for not sorting the waste was culled the highest among the negative responders of 38%, nearly 25% felt sorting consumed more of time and space and the rest were quite indifferent towards the waste that it is dirty and sorting was not their botheration. However, the response was overwhelmingly positive with 96% to abide by the government if sorting of solid waste was made compulsory.

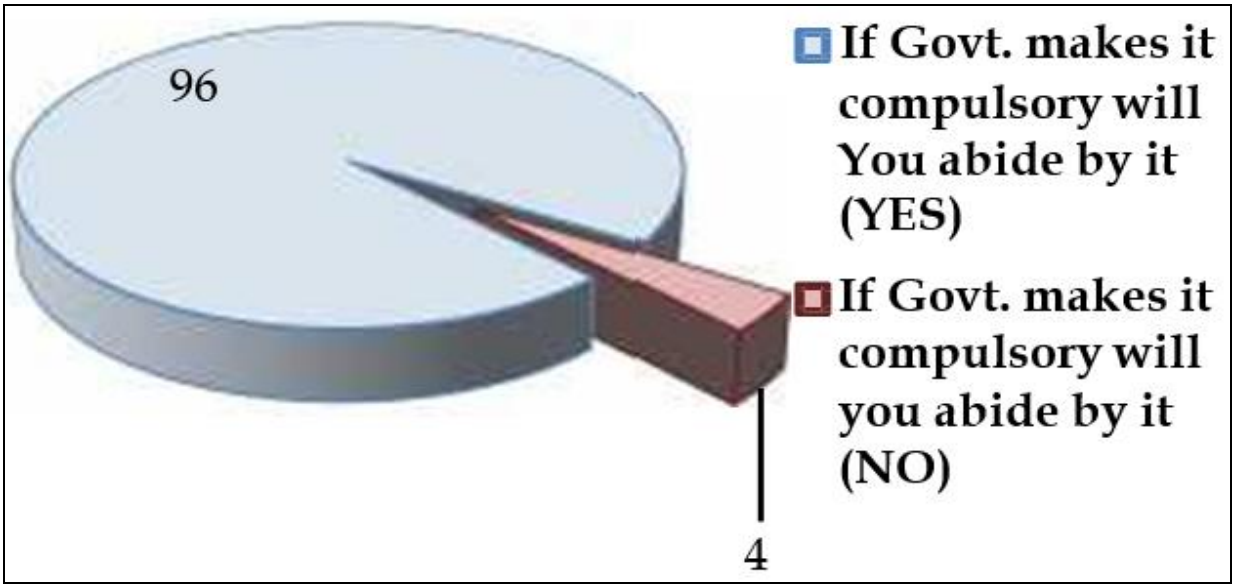

Fig 1: Response to Government initiative in future

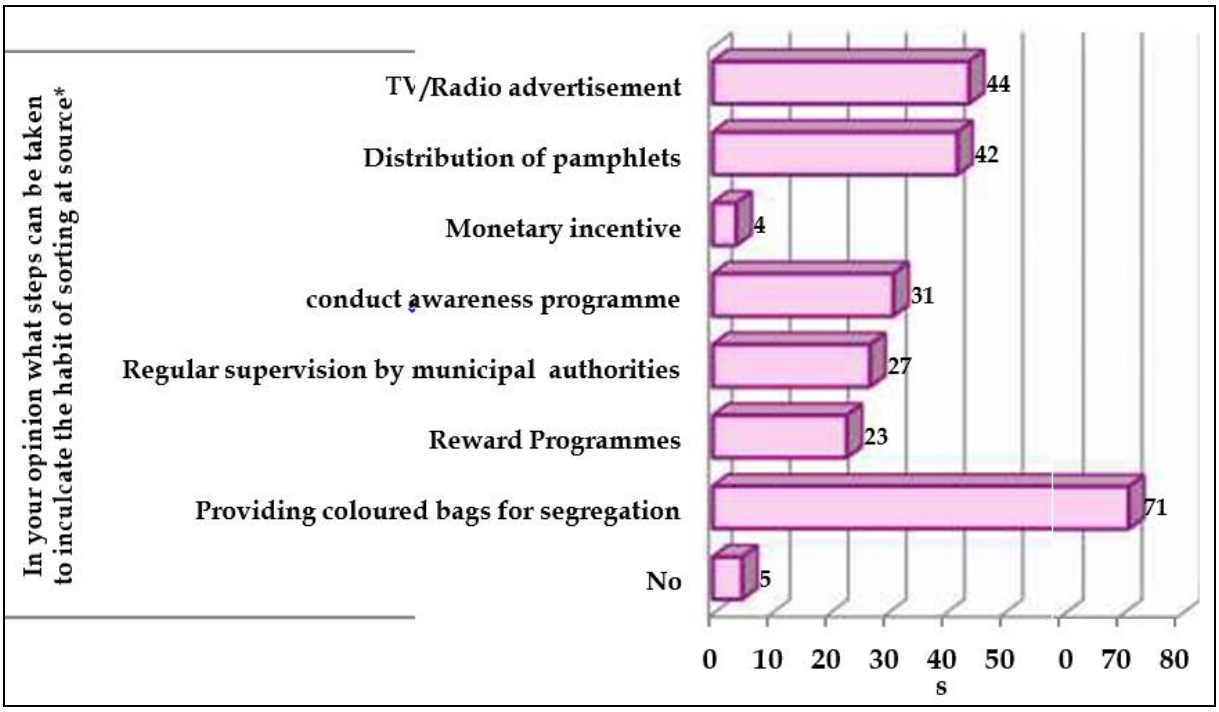

Fig 2: Steps that can be taken to inculcate the habit of sorting at source

About 52% of them voiced out that fine can be levied to those who do not adhere to waste management rules, 15% of them opted for deprivation of government benefits, 14% for labelling with red on the walls of houses that did not go by SWM rules and 21% opted for more democratic way of dealing with the issue. The same is illustrated in Figure3 below.

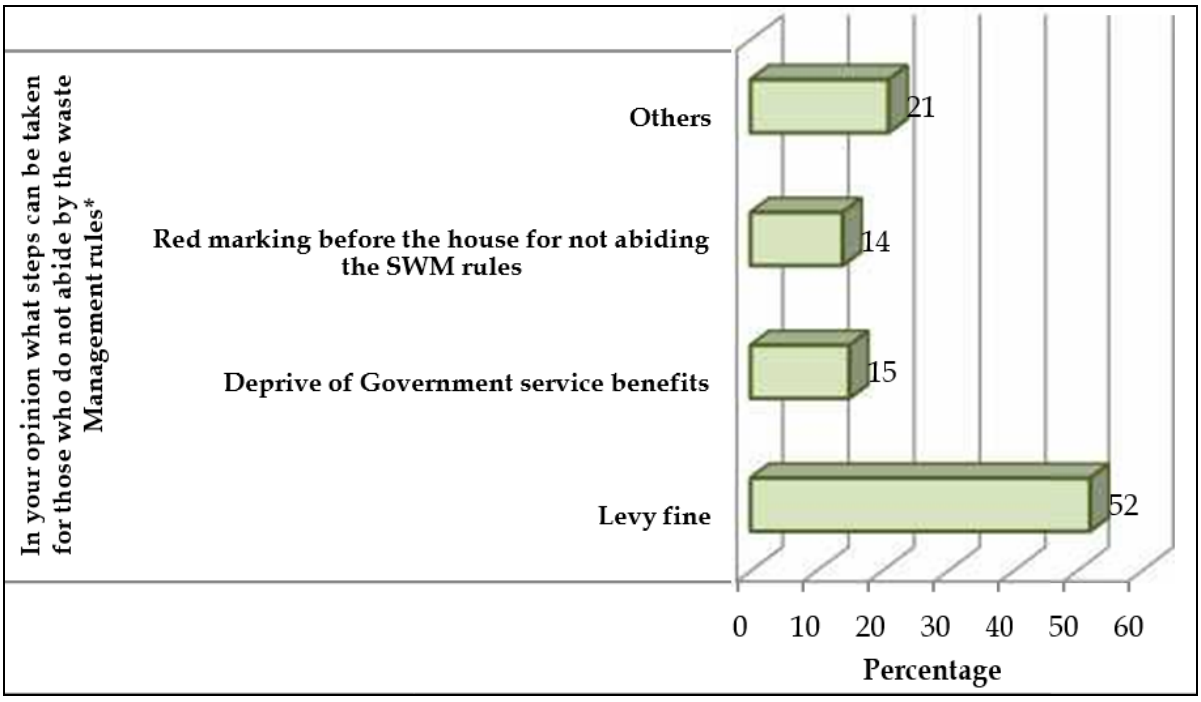

Fig 3: Measures to deal with households that do not abide by SWM rules

Annepu, R.K. (2011) [1] has documented as" Indian cities are still struggling to achieve the collection of all MSW generated. Metros and other big cities in India collect between 70- 90% of MSW. Smaller cities and towns collect less than 50% (Kumar,S. 2010) [3]. The benchmark for collection is 100%, which is one of the most important targets for ULBs at present. This is a reason why source separated collection is not yet in the radar.

When the respondents were asked on the usage of reusable and recyclable waste most of them (76%) made economic gains by selling them to recyclable waste dealers and the reusable waste was used by the households itself or distributed free to housemaids.

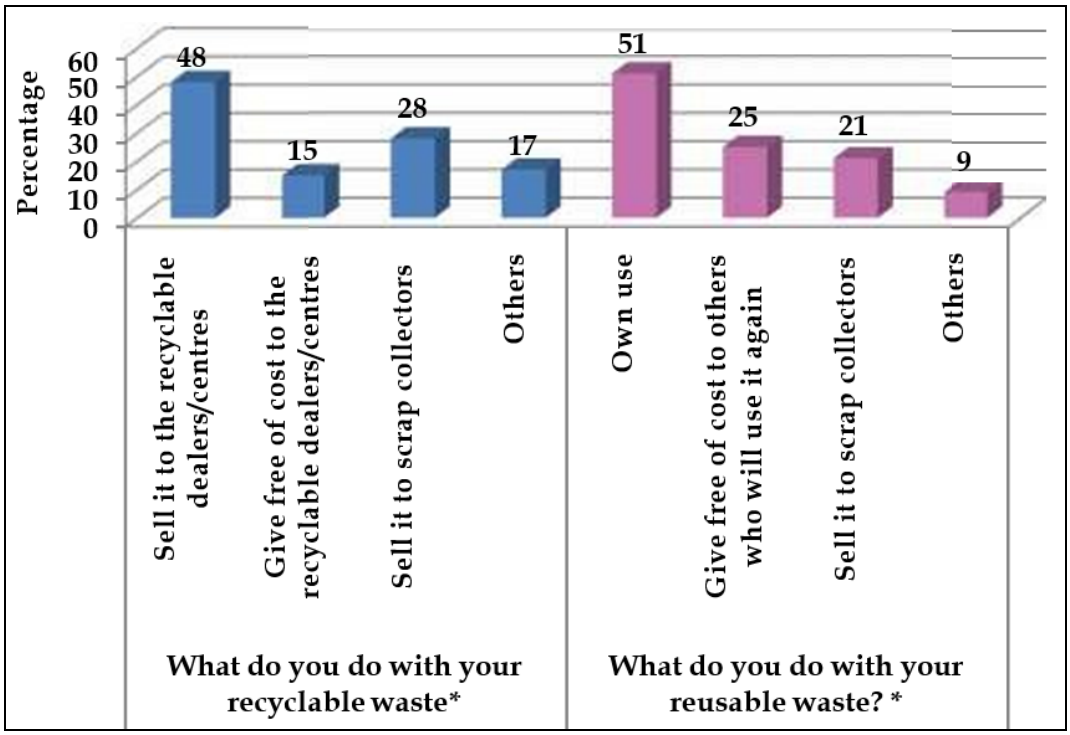

Fig 4: Usage of recyclable & reusable waste

The level of practice is found to be better. But on comparing the 3 components namely knowledge, attitude &practice, knowledge level was good but the attitude was not as high as knowledge. While observing if knowledge and attitude were put into action the results were appreciable with good practices. However, 10-15% indifference was noticed. It was obvious that all the civic issues were expected to be redressed by the government without voluntary participation from the residents.

The Resident Welfare Association (RWA) of Rainbow Nagar was well established and were ready to implement innovative ideas into action. The RWA has published a booklet with all the addresses in the locality but have not included those who are residing on rental basis. For a holistic and inclusive growth all the residents should be included into mainstream development.

Table 9: Willingness for voluntary participation in SWM initiatives by the households

Sl. No.	Statements to elicit voluntary participation	Yes (%)	No (%)
1	Would you be willing to participate in any intervention program regarding solid waste?	60	40
2	Would you like to know more information about how and what types of solid waste you can compost, reuse, and recycle in order to reduce the amount of solid waste that you need to get rid of?	58	42
3	Would you be willing to compost your food and yard waste?	44	56
4	Would you be willing to reuse the solid waste in your house?	49	51
5	Would you be willing to separate the recyclable waste into separate bags for collection purposes?	62	38
6	Would you be willing to contribute to the safe disposal of the solid waste in your neighborhood?	64	36
7	Would you be willing to participate in any community clean-up program?	64	36

Around 44-64% of the respondents were willing to be participative in SWM plans. The same is projected below for better understanding. More of motivation and sensitization meets needs to be convened for better results. The non-participant observation by the interviewers revealed that spill overs in community bins were seen and the streets were not so good and drainage problem was visibly felt.

Conclusion: The results revealed that majority of them did not segregate the waste and sought assistance from the government or providing coloured bags for segregation. Sensitizing the households on these issues should be made aggressive in an activist mode for which the co-operation of resident welfare associations (RWAs) need to be solicited.

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