Assessment of opportunities and challenges in raising awareness for efficient community participation and role in source segregation based solid waste recycling project

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Waste generation with its growing rate is one of the major global concerns. It leads to human health deterioration and degradation of the environment and the ecosystem (Saeed et al., 2009). In future, other than poor planning and development, few of the reasons that will accelerate such impacts are: increase in population, growth in urban density and changes in lifestyle and consumption patterns (Masood et al., 2014). It has been observed that community does not only play a significant role in waste generation but also source segregation, recycling and disposal practices (Babaei et al., 2015). Hence, it is vital to involve the producers and most important stakeholders of waste in the management process to create a sense of belonging and willingness to find an effective solution. Consequently, factors associated with community can be turned in favor for the management when we consider community participation as an essential element of an integrated solid waste management plan. In developing countries, existing waste management systems need to be updated to incorporate the concept of resource recovery as an essential aspect for sustainability. For this purpose, awareness based community participation plays a key role in the success of resource recovery systems relying on source segregation. Therefore a need arises to study the factors associated with the producers of waste that may influence their performance in waste management

The objective of this research was to conduct a baseline study for the quantification and characterization of the generated waste to produce reliable and comparable database. This data is intended to be updated and used for predicting future growth trends and changes in composition for designing a long term management plan. Moreover, relation of waste generation rates and composition with the socio-economic factors of the community are to be established (Dyson and Chang, 2005; Bandara et al, 2007). The study is also focused on quantifying the influence of awareness on the performance of community in waste management.

The research has been conducted in Gujrat city in Punjab province of Pakistan where samples from 9 colonies, having different income levels, were collected. Each participating household filled out a structured questionnaire and were given awareness brochures. The households were also provided with three colored shopping bags in which they were to sort their one-day waste when prompted through a telephone call. Parameters to assess community participation were response to survey filling, response to call and sorting efficiency. After calculating the sorting efficiency, samples were further separated manually into identifiable fractions and sub-fractions for weighing. Samples of each fraction were taken for dry mass experiment.

Assuming that this data is representative of the whole city, it has been estimated that in Gujrat city the average kg/capita/day waste generation is 0.31 on wet mass (WM) basis and 0.15 on dry mass (DM) basis. Extrapolating these values for the city of 390533 people, the waste generation per day comes out to be 122 tons WM and 57 tons DM.

Table 1: Waste quantification and characterization of Gujrat city, Pakistan

Waste Fraction	Mohalla Nizamabad	Saleemi	Al Nabi 1	Al Nabi 2	Qamar Sialvi	Shadman	Marghazar	Model Town	Residential UoG	Average Waste Generation
	g/capita/day									kg/capita/day
Decomposable Organic	163.76	92.35	115.08	272.92	247.92	346.15	76.22	154.33	188.89	0.185
Recyclables	61.07	21.43	40.48	52.08	117.71	100.00	46.95	95.28	57.04	0.067
Plastic	24.16	9.69	12.70	11.46	25.00	21.37	17.68	27.56	18.52	0.020
Paper	26.17	8.16	5.56	21.88	16.67	41.88	7.93	22.83	14.81	0.019
Metal	6.71	2.04	0.00	8.33	12.50	15.38	1.83	9.45	7.41	0.007
Glass	4.70	1.02	12.70	11.46	21.88	21.37	17.68	13.39	11.11	0.013
Ceramic	-	0.00	0.79	-	33.33	-	1.22	4.72	2.96	0.004
Tetrapak	-	1.02	8.73	-	8.33	-	1.22	18.11	0.74	0.004
Trash	52.35	31.12	38.89	62.50	129.17	101.71	26.83	77.17	42.96	0.067
Medicine	5.37	0.00	3.17	-	13.54	10.26	0.61	9.45	6.67	0.062
Diapers	28.19	6.12	18.25	-	27.08	30.77	10.37	31.50	11.11	0.005
Polythene	12.75	2.55	18.25	-	47.92	41.03	10.37	18.11	18.52	0.019
Wrappers	5.37	22.45	2.38	-	34.38	20.51	2.44	18.11	5.93	0.019
Others	0.00	0.00	0.00	-	7.29	0.00	3.66	0.00	0.00	0.013
Average (kg) WM	0.28	0.15	0.19	0.39	0.49	0.55	0.15	0.33	0.28	0.313
Average (kg) DM	0.13	0.07	0.09	0.18	0.23	0.26	0.07	0.15	0.13	0.147

While characterizing the fractions of waste we observed that the quantity of waste fractions in kg/capita/day were as follows: decomposable organic 0.19(59%), recyclables 0.067(21%) and trash 0.062(20%).

Figure 1: Percentage generation of various waste fractions.
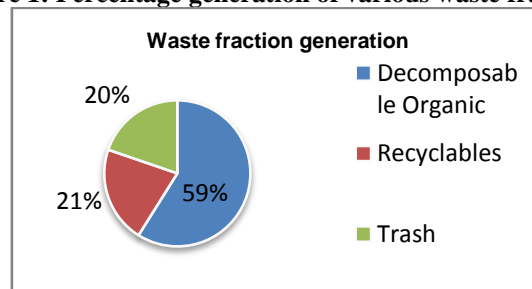
Factors such as income play a vital role in waste generation where a positive relation was observed. However as opposed to the literature review, in some colonies with higher education level, worst sorting efficiency was witnessed. This finding has been attributed to the management of waste by maids in such areas.

The communities have shown remarkable overall response and participation as a result of multi-dimensional awareness related to waste, associated problems and proper ways & benefits of segregation. 84.6% people responded well to the survey and 85.2% showed eager participation on call and collection. 72.9% of the waste was properly segregated by all the 9 colonies indicating comprehensive understanding of the concept of waste segregation.

Figure 2: Assessment of various factors gauging community participation and role.
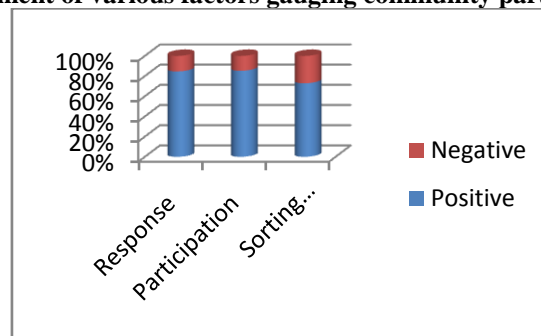
Therefore, it is concluded that recycling projects can be a success with the help of consistent and frequent multi-dimensional awareness campaigns.

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