

“Little Drops of Water...” The Decentralized Path to Urban Renewal

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Most of today's cities produce enormous quantities of wastes that can pollute air, water and land within and outside their boundaries. Since the very beginning of its work in the area of waste management, that is in 1991, the Centre for Environment Education 's strategy has been to promote decentralized methods for implementation, which involves education of all urban householders and establishments to carry out source segregation of garbage into wet, dry, solid, toxic and construction waste components.

In this effort, it has been noticed that residents in different parts of the country have been able to understand the importance of all these five categories but in practice are able to segregate only bio-degradables and recyclables among the wastes. They find it difficult to understand and categorize hazardous and solid waste because the quantity generated per day in each household/establishment is small and their perception of what is hazardous is also poor. However, in a scenario when toxic components are making inroads into our lives and ultimately entering our food chain through the environment and the spread of infectious diseases is also on the rise because of improper treatment of solid waste, it becomes imperative to sensitize the public about the significance of identifying and segregating toxic and solid waste components. A significant component of the solution lies in improving the motivation and training aspects of the residents and sustaining their interest.

A viable alternative is possible even with such segregation and is economical if done in a decentralized manner. For instance in a pilot project for segregation of household wastes undertaken in three geographical and economically different areas of Delhi, the aim was to develop an effective system of household waste generation and segregation characteristics and to analyze it to facilitate better household waste segregation, collection and treatment. It was also envisaged to examine the viability and feasibility for replication in other areas of the city. The findings of this study have been highlighted and discussed in this paper.

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Introduction

One of the major problems associated with urbanization is the disposal of large amounts of solid wastes generated by residential as well as commercial establishments in any city, town etc.

Since the very beginning of its work in the area of waste management i.e. 1991, CEE's strategy has been to promote decentralized methods of implementation which involves education of all urban householders, educational and commercial establishments to carry out source segregation of garbage into wet, dry, soiled, toxic and construction waste components. In this effort, we have seen that residents in different parts of the country have been able to understand the importance of all these five categories but in practice are able to segregate mostly biodegradables and recyclables among the wastes. They find it difficult to understand and categorize hazardous and soiled waste because the quantity generated per day in each household/establishment is small and their perception of what is hazardous is also poor. However, in a scenario when toxic components are getting into our lives and ultimately entering our food chain through the environment and infections are increasing because of improper treatment of soiled waste, it becomes imperative to sensitize the public about the significance of identifying and segregating toxic and soiled waste components too. A significant component of the solution lies in improving the motivation and training aspects of the residents towards segregation of wastes and sustaining their interests in doing so.

A door- to-door collection mechanism, conversion of wet waste to compost, sale of dry waste for recycling, separate collection of toxic waste and provision of sanitary/secured landfills for their safe disposal besides collection and treatment of soiled waste connected to the healthcare waste common facility operator is the main aim of CEE's education programme in the cities and towns of India. This programme has been appropriately named SWACHH – Solid Waste Awareness in Community and House Holds and is operative in many States in the country today.

This and other studies done by CEE have helped in establishing unequivocally that along with cultivating better waste habits such as reducing wastage, encouraging reuse and reducing per capita waste generation, it is also possible for a city/town to run and sustain economically viable decentralized systems in groups of 500 to 800 households, commercial and healthcare establishments.

In addition to conducting studies, CEE has also been lobbying and working with Municipal bodies, City, State and Central governments on the matter of urban policies, formulation of rules, implementation methods and standards for monitoring waste and has made path-breaking contributions in the field of environmental education for the entire gamut of people involved in urban renewal from decision makers to field employees.

Pilot project in Delhi

Municipal Corporation of Delhi (MCD) in association with Japanese International Corporation Agency (JICA) started a project on segregation of household waste in three geographical and economically different areas of Delhi. MCD and JICA selected the consortium consisting of Centre for Environment Education (CEE) and Infrastructure Professionals Enterprise (P) Ltd. (IPE) for the execution of this project. The aim was to develop an effective system of household waste segregation, collection and transportation. The specific objectives of the project were to conduct household waste segregation and collection, collect and collate data to record household waste generation and segregation characteristics and to analyze it to facilitate better household waste segregation, collection and treatment. It was also envisaged to examine the viability and feasibility of the project for replication in other areas of the city.

This project was initiated in the following three different socio-economic and geographic settlements of Delhi. In each settlement, we selected 500 to 800 households to actively participate in the project.

- Vasant Kunj High Income Colony
- Krishan Kunj Unauthorized Colony
- Jahangirpuri Resettlement Colony

Methodology

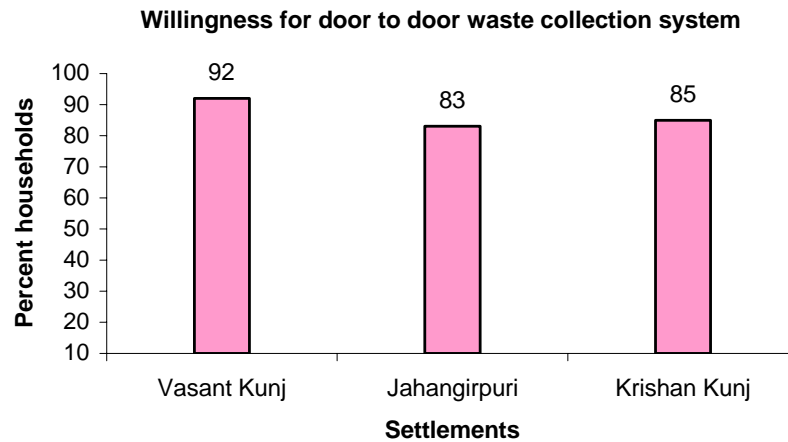
- **Community contacts** - In the initial phase of the project, which began in September 2003, residents were briefed about the project and motivated about the segregation of waste at the household level through a house-to-house contact programme.
- **Distribution of material** – In this project we distributed bins and bags for segregation of wastes in four different categories i.e. biodegradable, recyclable, hazardous and soiled waste, identifiable by their unique colour codes. We also distributed educational material such as posters, stickers, pamphlets, etc. to each household and screened short films and video spots to educate the residents about the importance of segregation of waste.
- **Collection of waste** - Waste is collected through a door-to-door collection system from each house everyday. A system was worked out to accommodate the existing system for workers in each of the colonies and motivate them to improve their method of collection and management. In the mornings, waste is collected from each house. The waste collectors are given four different containers for four categories of waste and are trained to collect segregated waste separately. In this project we have built intermediate transfer stations (ITS) in a common location where all the waste collected is brought or transferred, quantified and then disposed as per the nature and category of the waste. Dry waste is sold to *kabariwalas* by private collectors themselves and wet waste taken for composting. The other two categories are picked up by MCD everyday.

- **Data Collection** - In this project, we collected qualitative and quantitative data on household waste. We collected six readings from each house over a week's time. This way quantification was done in all 500 to 700 houses in each area. Simultaneously we also conducted household surveys to collect socio-economic data and information related to knowledge, attitude and practices (KAP) of garbage handling and management in households.
- **Capacity Building of MCD staff and RWA members** - As this project was to be handed over to MCD and RWA in all areas, they were involved in the entire process of the project and they have been oriented and trained to continue the project in their areas once the consultants move out of the project.
- **Sustainability of the project** - Sustainability issues were addressed through meetings with residents, RWA members and the MCD staff. They were motivated and explained as to how they could sustain the project. The entire economics and logistics were worked out and explained to all stakeholders. Residents were motivated to subscribe to waste collection services at the doorstep.
- **Monitoring** - As the experimental phase of the project is over, with the cooperation from MCD, waste collection and transportation is now supervised by RWA in all areas.
- **Analysis, Interpretation and Reporting** – All the data collected is being analyzed and interpreted and a comprehensive report is being prepared. Recommendations will be put forward to MCD for implementation of segregation of household waste in Delhi and to make the methods operational. The entire process is also documented on video and a film has been prepared.

Results and Discussion

- The residents more often than not perceive local environmental problems as their biggest environmental challenges. That is the reason why a maximum number of people in Vasant Kunj feel that water scarcity is the biggest problem whereas according to residents of Krishan Kunj water pollution is the major concern and the Jahangirpuri inhabitants feel that insanitation and garbage problems are more severe than other problems.
- Respondents in all the areas consider garbage as one of the biggest environmental problems in Delhi and feel that it is resulting in other environmental consequences such as ground water contamination, river pollution as well as air pollution. Residents in all the three areas are aware that garbage is leading to contamination of the Yamuna River.
- Although residents said that more dustbins, garbage cleaners and composting/incineration like technologies may solve the problem of garbage management in Delhi, most residents accepted the fact that garbage problem in their area as well as in Delhi can only be solved by spreading awareness, adopting responsible lifestyles and joint management at the local level .

- Although in all the three areas MCD has been considered responsible for not removing garbage but people admit that it is the high waste generation, which is ultimately responsible for the backlog of garbage in Delhi.

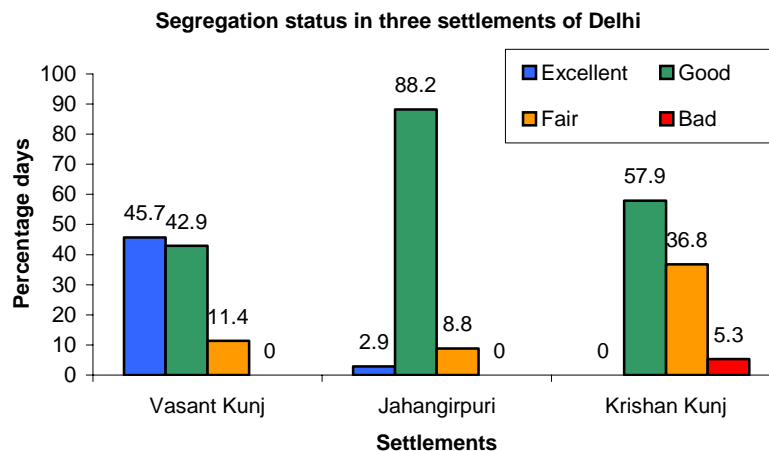


Motivation

- Nearly 92% of the people are ready to continue the supporting waste management plan in D-3 and 4 pocket of Vasant Kunj area. Some 22% more houses are ready to subscribe to already existing door-to-door collection system. They find it comfortable to do the segregation of the waste at their houses and some have even agreed to support it by carrying out local composting, taking on the responsibilities as office bearers as well as through voluntary work. About 85% of the surveyed houses in Jahangirpuri promised that they are willing to support and sustain the waste management programme if it is continued in their area. This was an encouraging factor and helped us in working out a viable method for the project. The RWA was willing to take over and continue the garbage collection system after the withdrawal of the project in the area. In Krishan Kunj also, residents were willing to support the project with extra subscription fee as well by segregating the waste at their households. Nearly 83% of the surveyed houses have promised that they are willing to support the waste management programme if it is continued in their area.
- This is an encouraging factor and helped us in sustaining the project. The RWAs have taken over and are continuing the garbage collection system ever after the withdrawal of the formal support from the project in all the areas.
- Illness is directly related to poor water quality and garbage management in the area especially in lower and middle economic areas such as Jahangirpuri, KrishnaKunj, etc.

Garbage generation and segregation

- Per capita waste generation is highest in Vasant Kunj, lowest in Jahangirpuri and Krishan Kunj is in the medium generation category.
- Segregation in the middle of the week is good and even the third and fourth categories namely hazardous and soiled waste are segregated properly. The quantity of waste again increases and peaks during the weekend. This shows that consistent motivation and education plays a significant role in improving segregation. Since there is no quantification on Sundays, there could be a slight lag in the segregation pattern just after the weekend.
- Although all the areas showed good overall segregation, some houses showed reluctance to change and either did not cooperate during the experimental phase or responded only slightly to motivational and educational activities. Lack of understanding of the implications of not segregating these hazardous categories is the main reason that can be attributed for the above behaviour.



Whereas

- **Excellent** - Segregated in all four categories and good segregation
 - **Good** - Segregated in three or two categories and good segregation
 - **Fair** - Giving waste in segregated categories but segregation is poor
 - **Bad** - Segregation not attempted, giving all the waste together
- Quantity of hazardous and soiled waste during quantification at households was less because most of it was still given as mixed with other two categories separated well and sometimes the entire waste was given as mixed.
 - High quantities of recyclable waste category reflect an affluent society and a throw away culture. On other hand the high quantities of recyclable waste may be considered as one of the key factors responsible for the interest waste pickers have in door-to-door garbage collection since it adds to the revenue of the waste collectors.

- Segregation has improved from the first to the second month especially with regard to segregating the biodegradable and recyclable waste among the household waste. This can mean that motivation and education can improve categorization and segregation beyond the usual two categories, although some households' behaviours need to be analyzed and responded to more acutely. The quantity of waste again increases and peaks during the weekends. This shows that consistent motivation and education plays a significant role in improving segregation. Since there is no quantification on Sundays, there could be a slight lag in the segregation pattern just after the weekend. Segregation in the middle of the week is good and even the third and fourth categories namely hazardous and soiled waste are segregated properly.
- Quantity of waste does seem to be related to the economic class residing in a particular area and peer pressure (cultural similarities)
- The garbage generation by any household is directly related to the size of the family, increasing with increase in family members. However, there is a minimum quantity of waste that any house generates irrespective of the number of people in the house, increases with the number of the family members and reaches a steady stage after a certain family size (5 to 6 members) and again increases in very large families. What we also observed was that the increase in garbage with increase in family size was not proportional to the per capita generation of garbage since increase in family size also leads to better utilization of material and lesser wastage.

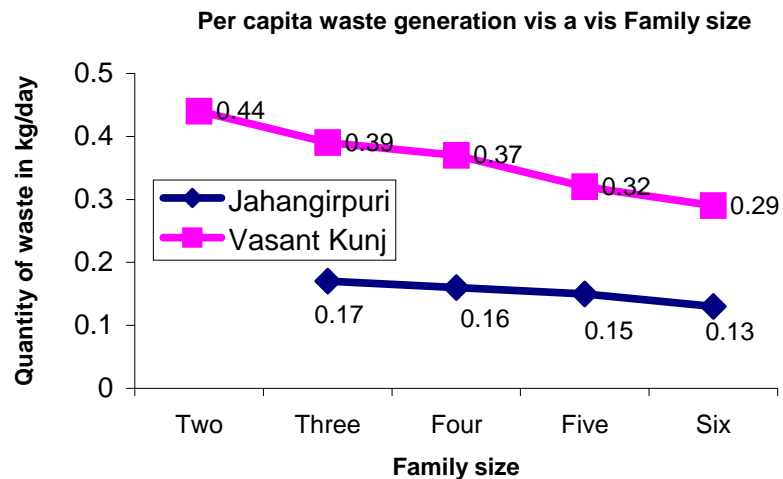
Quantity of waste/households during initial and later stage of the project and percentage change in composition of waste

Waste Category	Vasant Kunj			Jahangirpuri			Krishan Kunj		
	Initial (in kg)	Later (in kg)	% Change in Composition	Initial (in kg)	Later (in kg)	% Change in Composition	Initial (in kg)	Later (in kg)	% Change in Composition
BW	0.804	0.781	+6.0%	0.480	424	+5.0%	0.796	0.983	+6.8
RW	0.390	0.296	-5.0%	0.180	0.119	-4.0%	0.476	0.447	-4.3
HW	0.007	0.002	-0.37	0.001	0.002	+0.18%	0.024	0.017	-0.6
SW	0.025	0.013	-0.8%	0.000	0.001	+0.15%	0.026	0.020	-0.5
MW	0.081	0.076	+0.3%	0.153	0.116	-1.0%	0.056	0.020	-1.2
Total	1.307	1.168	10.6% Reduction	0.814	0.661	18.8% Reduction	1.378	1.480	16.7% Increase

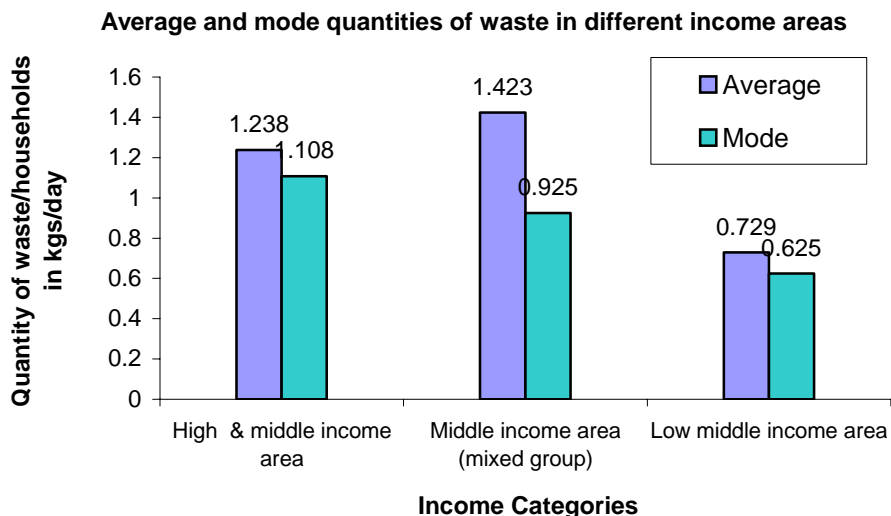
- In Vasant Kunj and Jahangirpuri, there has been a reduction in the quantity of waste/households as people started realizing the importance of minimization of waste and lesser usage of disposables, etc.
- There has been an increase in percentage of biodegradable waste in all the three areas showing better perception and understanding of categories of waste.
- Krishan Kunj showed an increase in the total quantity of waste/household because the experiment period was shorter than the other two areas and cooperation from the households started only at a later stage.

Conclusion

1. The households in all the three areas of the projects have accepted the concept of segregation especially into biodegradable and recyclable categories. Although some of the residents practice segregation but still more motivational and educational efforts are required for sustaining segregation in all four categories.



2. Waste generation increases with family size but per capita waste generation decreases even in high-income areas.



Here

High middle income area	= Rs. 15000 and above/month
Middle income area	= Rs. 5000 to 15000/month
Lower middle income area	= Less than Rs. 5000/-month

3. High and middle-income areas generate greater quantities of waste as compared to low-income areas although the amount of dry recyclables may vary according to the cultural habits of the people.

We are extremely thankful to Japanese International Cooperation Agency (JICA) for sponsoring the project and MCD & RWAs in all the three areas for providing their wholehearted support to make this project worthwhile in every way.