

SCOPE OF RECYCLING MUNICIPAL SOLID WASTE IN DELHI AND NATIONAL CAPITAL REGION (NCR)

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Abstract

Ecosystem is affected by uneducated, unplanned and ineffective waste management. The cycle of garbage generation and recycling is effective to make the cities environment more pollution free, clean, green and habitable for healthy living.

In an effort to understand the dynamics of waste management and scope in Delhi & NCR the paper looked at the systems in place for collection and recycling of municipal waste, the role of the government & private partnership projects. The researcher has studied the Indian waste management and analyzed its scope for improvement with an objective was to understand the consumer behavior with respect to the services available in market for waste management.

Keywords : *Waste management, Informal recycling industry, Public private partnership, Recycling, Reprocessing, Urbanization*

1. Introduction:

Whatever we consume generates a lot of garbage and waste. Discarding of products adds to the clutter of the dustbins. But what happens with this garbage is a thought less pondered upon.

Cities worldwide are dying off under the aching load on them with tons of garbage. Indian cities are no better. Before dumping the garbage in a landfill it should be treated for safe disposal and recycled for various use. The municipalities are inefficient and unsuccessful in managing the garbage menace in cities.

The garbage generated from various sources consists of different types of waste. The process of recycling is different for different type of material found in the waste pile. A typical system of solid waste management includes segregation, reuse, and recycling at the household level, waste collection and transport to a transfer station or community bin, street sweeping and cleansing of public places, management of the transfer station or community bin, secondary collection and transport to the waste disposal site & waste disposal in landfills. Disposal methods include incineration, plasma gasification, landfill and recycling. Recycled garbage is used in composting, producing energy like refuse derived fuel, making animal food, reusing the material in art and craft, same industry, as a raw material in another industry.

The 23 metro cities in India generates about 30,000 tonnes of such wastes per day while about 50,000 tonnes are generated daily from the Class I cities. Municipalities adopt labour intensive technique of door to door or collection from community Dust Bins and spend about 5-25% of their budget on SWM. Municipalities are facing challenges in collection and segregation

of waste at sources. Lack of administration by municipalities coupled with scarcity of land & lack of awareness among people makes the task difficult.

In India informal recyclers are important players for the whole recycling structure. Informal sector comprises of unorganized and unrecognized establishments which work within the industry. It is not monitored by the government and does not contribute to the economy, this makes it very difficult to control the informal collection, segregation and recycling of MSW & improper waste handling.

2. Literature Review:

In Municipal Solid Waste Management (MSWM) of developing countries typical problem areas can be identified. These can be described as (**Zurbrugg, 2003**): 1) inadequate service coverage and operational inefficiencies of services, 2) limited utilization of recycling activities, 3) inadequate landfill disposal, and 4) inadequate management of hazardous and healthcare waste. The need to understand community participation and community-based environmental management initiatives have been addressed by researchers and concerned institutions for the several years now (**Richardson, 2003, Omran et al., 2006, Omran & Gavrilescu, 2008**).

A review of existing literature reveals that a great number of studies on SWM have been undertaken, even prior to 1970 (**van Beukering et al., 1999**). Earlier studies show that the prime consideration management of the public officials was the quick waste removal and destruction (**Melosi, 2005**). During the 1970s the debate shifted to issues of waste utilization, focusing on the technical and economic issues surrounding the allocation and utilization of available resources. Also, the existing state-of-the-art of resource recovery for managing municipal waste was examined (**Bever, 1976; von Heidenstam, 1977**). The early studies reveal that recycling in the past was mostly industrial and based on financial considerations to reduce production cost, unlike the current emphasis on recycling as a way of reducing waste in the environment and preserve dwindling resources (**Cointreau et al., 1984; Diwekar, 2005**). During time, systems approaches have also been attempted at by authors dealing with one or few aspects of MSWM (**Imam et al., 2008; Omran and Read, 2008; Zurbrugg, 2003; van Beukering et al., 1999**). **Tsiliyannis (1999)** discussed the main environmental problems related to MSWM and in particular those concerning pollutant releases. The analysis was based on the solid waste composition of Athens, Greece, and the facilities were assumed to meet EU Directives and to include the proper disposal of residues. It was found that landfilling with energy recovery produces slightly higher air pollution and greenhouse gas releases, mainly owing to the emission of uncollected biogas. **Chang and Wang (1997)** proposed a fuzzy goal programming approach for optimal planning of SWM systems, in which they consider four objectives: economic costs, noise control, air pollution, and traffic congestion limitations. Another possible approach is based on life-cycle assessment, which is a tool can provide the data needed for choosing the best combination from an environmental standpoint (Finnveden, 1996).

However, life-cycle assessment does not predict actual impact; assess risk, safety or whether a threshold may be exceeded by choosing an option (**Bagchi**, 2004). With regards to the development of a solid waste management system, **Zia and Devadas** (2007) attempted to introduce a SWM system in Kanpur City and by analyzing the major problems pertaining to SWM faced in the City. Because some of Indian cities are often characterized by poorly rendered services including waste management, the most ignored of all basic services on account of various reasons. They have observed that the existing solid waste management system in the city is found to be highly inefficient. Consequently, **Jin et al.** (2006) presented an overview on the current solid waste management practices and situation in Macao during the last decade. However, they drew conclusions that due to Macao's geographic area and high cost of land, landfilling has the lowest priority for waste disposal and solid waste incineration has been given a top priority over the other waste disposal methods although it is much more expensive. One of their suggestions was that for an effective and efficient solid waste management in Macao, waste minimization needs to be implemented strictly in order to reduce the amount of solid waste. The establishment of new regulations for more effective and efficient integrated solid waste management system is also necessary. The regulations should indicate the appropriate authority to define and implement waste management regulations (**Jin et al., 2006**). Elsewhere, **Turan et al.**, (2008) presented an overview on of solid waste management in Turkey. However, they drew conclusions that MSW management is a major problem facing municipalities. The annual generation increases in proportion to the rise in the population and urbanization, and issues related to disposal have become challenging as more land is needed for the ultimate disposal of solid waste. They commented that open dumps can be detrimental to the urban environment. In spite of efforts to change open dumps into sanitary landfills and to build new modern recycling and composting facilities, Turkey still has over 2000 dumps because of insufficient financing. **Turan et al.**, (2008) stated that composting is an excellent method of recycling bridgeable waste. However, many composting plants have failed because not enough attention was given to the quality of the product and to marketing activities. To conclude, determining methods of final disposal requires an understanding of the make-up of the MSW stream. A MSW decision support system based on integrated solid waste management should be developed for cities in Turkey (**Turan et al., 2008**). A recent study conducted by **Hazra & Goel** (2008) presented an overview on of current solid waste management practices in Kolkata, India and suggested solution to some of the problems. They argued that the collection process is deficient in terms of manpower and vehicle availability. Bin capacity provided is adequate but locations were found to be inappropriate, thus contributing to the inefficiency. Further, **Hazra & Goel** (2008) proved that there is no treatment is provided to the waste and waste is dumped on land after collecting it. However, in order to

improve these problems, authors provided some solutions for these problems. For instance, to improve collection and transportation at Kolkata city, public-private partnerships can be successful solution, with private agencies providing waste collection service at lower cost and grater efficiency (**Hazra & Goel, 2008**). Another study conducted in Sir Lanka by **Vidanaarachchi et al. (2006)** described the problems, issues and challenges of solid waste faced in the country's Southern Providence. However, they revealed that only 24% of the households have regular access to waste collection and that in rural areas it was less than 2%. Substantial number of household in areas without waste collection expects local authorities to collect their waste. **Vidanaarachchi et al. (2006)** showed that most sites in the province are under capacity to handle any increased demand on waste collecting. However, they suggested that urgent and immediate improvements of the waste disposal sites are necessary to meet the current demand for sustainable waste collection.

3. Objectives of study:

The research was carried out with the following objectives

1. To understand the waste management system in Delhi NCR
2. To understand the population pressure on waste generation and the amount of waste generated.
3. To establish the scope of hiring waste collection services in Delhi NCR.

4. Research Methodology:

4.1 Data collection methods:

Data was collected by primary as well as secondary method. Primary data was collected through questionnaire and discussions with the people from different cities like Delhi, Noida and Ghaziabad, while secondary data were collected from the research papers, articles, internet search e.g. blogs, official environmental programmes and ministries of government of India websites.

4.2 Sampling technique:

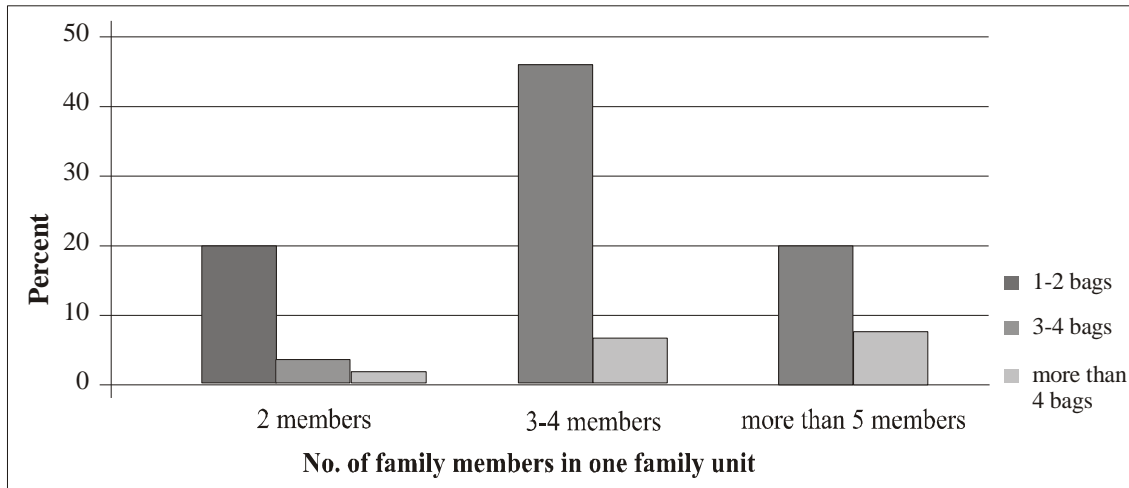
To select the sample for the purpose of research a non- probability sampling technique (Convenience and judgemental) was used on a Sample size of 100 people. (28% respondents from Delhi, 35% from Noida & 37% from Ghaziabad).

4.3 Scaling technique:

The 'Non Comparative Scaling Technique.' was used in the research. The rating scales used was Nominal Scale, respondents were asked to register their responses on the questionnaire by answering the questions to understand the patterns of activity amongst people for waste disposal and waste generation.

5. Data analysis & interpretation:

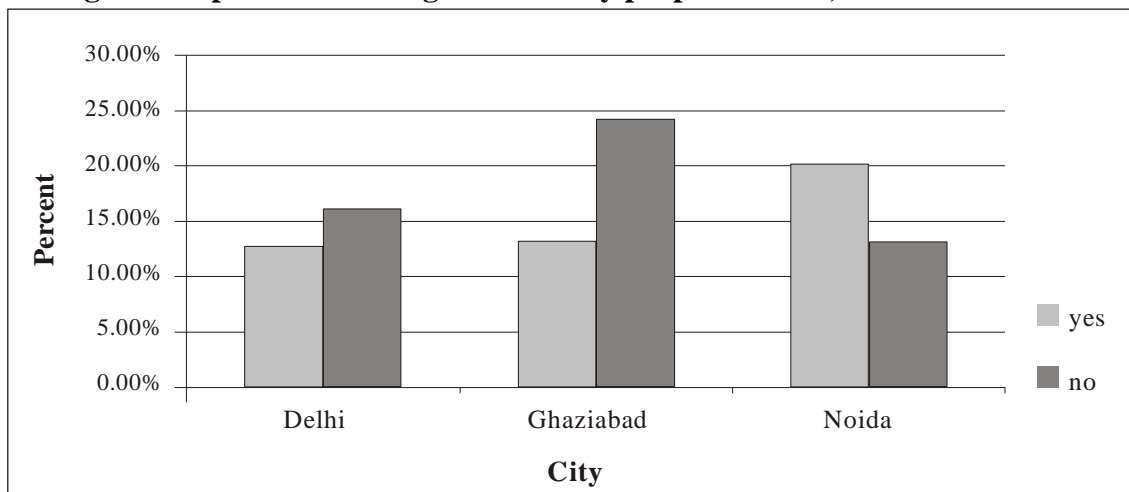
Fig. 1: Garbage generation per family unit



Inference :

- a) 20% Families with 2 members in the family generate 1-2 bags of garbage daily, 4% generate 3-4 bags & 2% generate more than 4 bags.
- b) 45% Families with 3-4 members in the family generate 1-2 bags of garbage daily, 5% generate 3-4 bags.
- c) 20% Families with more than 5 members in the family generate 1-2 bags of garbage daily & 8% generate 3-4 bags.

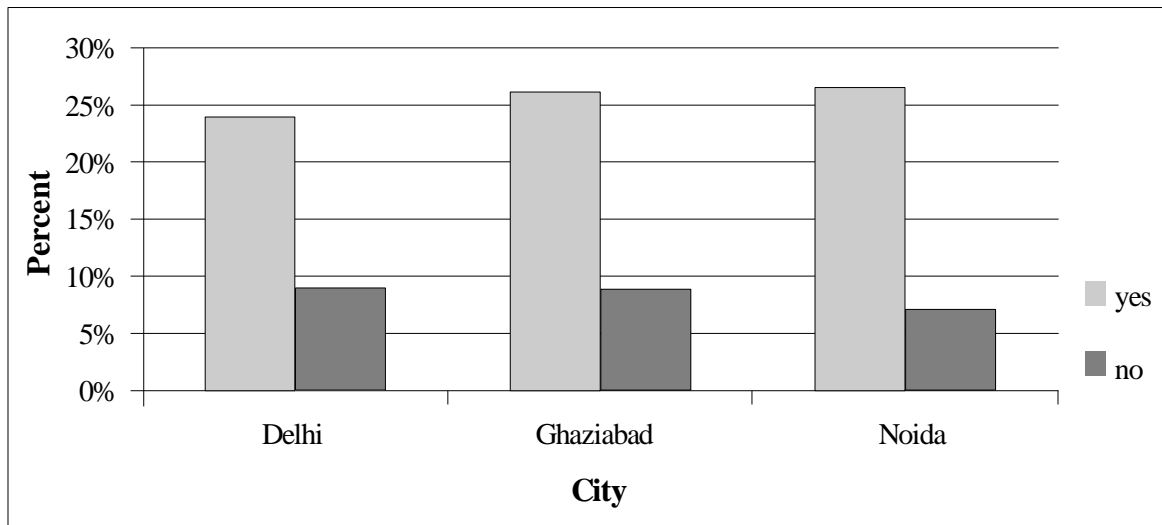
Fig. 2: The pattern of hiring of service by people in Delhi, Noida & Ghaziabad



Inference :

- a) 20% of the people who are hiring garbage collection services are residents of Noida, followed by Ghaziabad and Delhi.
- b) Interestingly the residents of Ghaziabad are the maximum amongst people who have not hired garbage collection service.

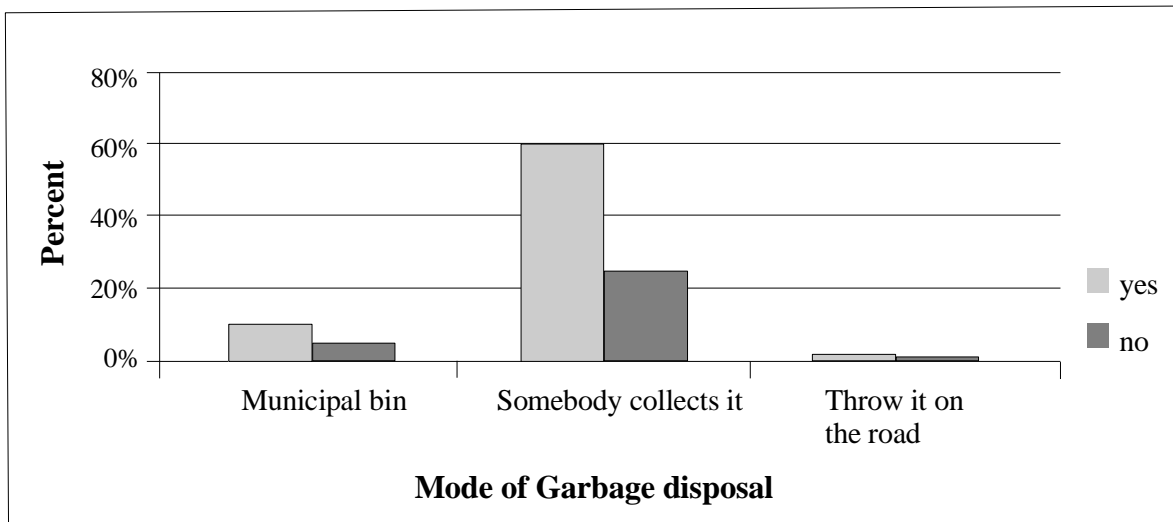
Fig. 3: Willingness to pay for hiring garbage collection service in Delhi, Noida & Ghaziabad



Inference :

- a) The willingness to pay for the service of garbage collection is high among all the cities.
- b) 9% respondents of Delhi & Ghaziabad and 7% of Noida are not willing to pay for hiring garbage collection service.

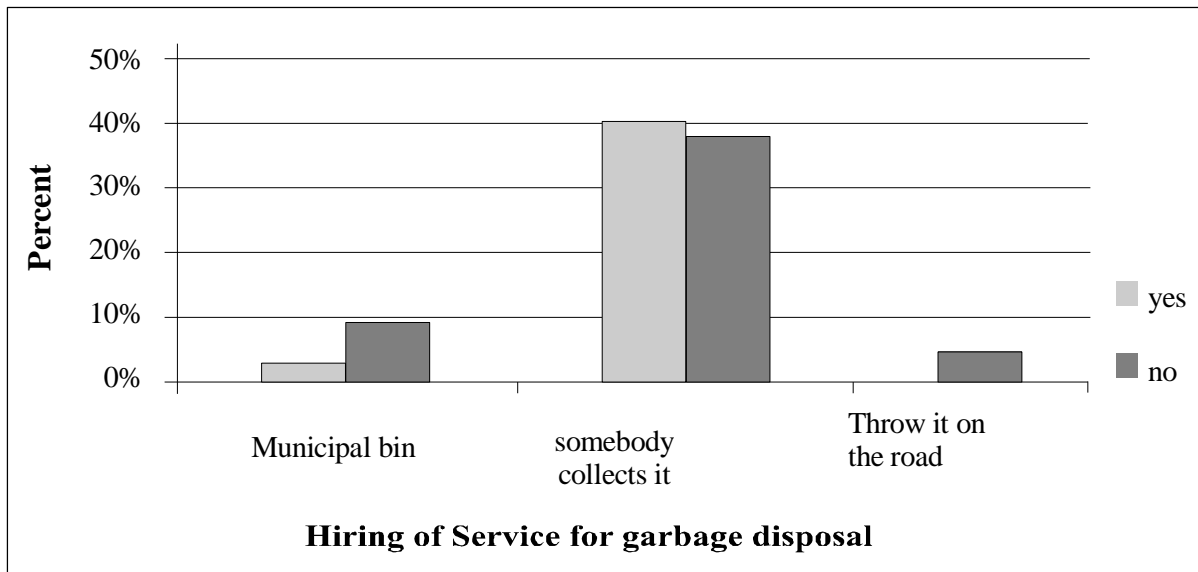
Fig. 4: Mode of garbage disposal



Inference:

- a) 60% Respondents who have already get their garbage collected by somebody else are willing to pay for a hire garbage collection service.
- b) 4% of the Respondents who throw their garbage on road are also willing to pay for the service.
- c) About 10% of the Respondents who dispose off in municipal bin are willing to pay for the service.

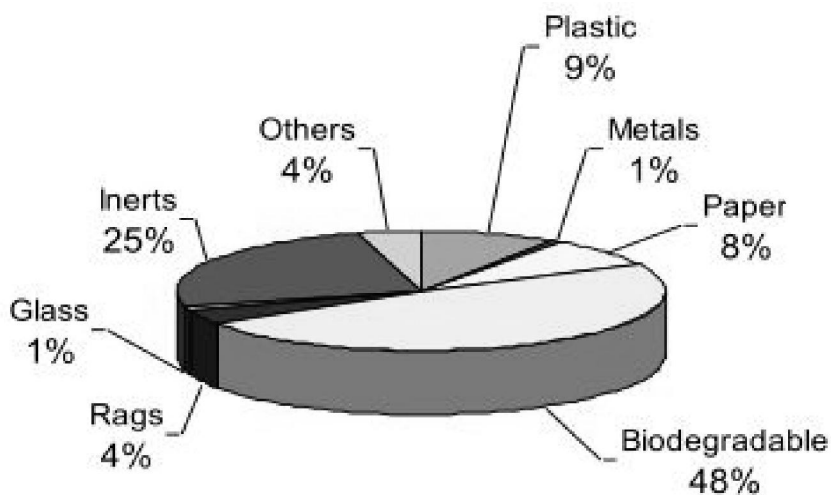
Fig. 5: Garbage disposal behaviour and pattern of hiring of service



Inference:

- a) 40% of the people who get their waste collected by somebody have hired a service .
- b) The above saying true the hiring of services is still not practiced by people irrespective of their garbage disposal behavior.

Fig. 6: Scope of recycling municipal solid waste



Inference:

- a) The chart shows 48% of biodegradables which is making half of what the waste is generated.
- b) It means a large amount of waste is available which can be recycled and treated.

6. Findings:

- 20% Families with 2 members in the family generate 1-2 bags of garbage daily, 4% generate 3- 4 bags & 2% generate more than 4 bags.
- 45% Families with 3-4 members in the family generate 1-2 bags of garbage daily, 5% generate 3-4 bags.
- 20% Families with more than 5 members in the family generate 1-2 bags of garbage daily & 8% generate 3-4 bags.
- 20% of the people who are hiring garbage collection services are residents of Noida, followed by Ghaziabad and Delhi.
- Interestingly the residents of Ghaziabad are the maximum amongst people who have not hired garbage collection service.
- The willingness to pay for the service of garbage collection is high among all the cities.
- 9% respondents of Delhi & Ghaziabad and 7% of Noida are not willing to pay for hiring garbage collection service.
- 60% Respondents who have already get their garbage collected by somebody else are willing to pay for a hire garbage collection service.
- 4% of the Respondents who throw their garbage on road are also willing to pay for the service.
- About 10% of the Respondents who dispose off in municipal bin are willing to pay for the service.
- 40% of the people who get their waste collected by somebody have hired a service.
- Large amount of waste about 48% is available which can be recycled and treated so there is a huge scope of recycling municipal solid waste.

7. Recommendations:

- The municipalities have to work more effectively by increasing the capacity of waste treated & collected on daily basis by strengthening the partnerships with PPP projects
- The Private waste management companies should be given tax evasions and relaxations on loans on investments made for business operations to increase the entrepreneurial initiatives.
- Working with the informal sector would increase the efficiency and coverage of the waste management process across the initiatives.
- Reducing the amount of garbage tipped in the landfills should be regulated by checking that the waste has been strictly passed through segregation and treatment process to reduce the carbon foot print and pollution of the environment.
- As the society is susceptible to throw the garbage anywhere unthinkably many public dustbins should be placed at 10 mtrs distance, educating the citizens about the civic sense and hygiene is important. Most importantly public areas like vegetable and meat markets.

- Collection of garbage from source and segregation of garbage from source so that the quality of garbage procured for recycling is good. As the waste gets more contaminated or decomposed for days the treatment of the garbage for recycling gets ineffective and difficult.
- The municipalities should give licenses to the private players in waste management, if contractual system is in place that will give more autonomy to the players and also flourish the garbage collection service.
- For a successful PPP competition, transparency and accountability are necessary which must be encouraged by municipalities.
- For waste management to work well, the city needs to address underlying issues relating to management structures, contracting procedures, labour practices, accounting, cost recovery and corruption.
- It is reflected through study that more than 50% of people who get their garbage collected from somebody are willing to pay for the service.
- From the primary study that was conducted the metropolitan cities like Delhi and Noida are more receptive to the idea of hiring services.

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