



## Why is the Waste Sector Wasting Too Many Business Opportunities? A Case Study of Delhi, India

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**ABSTRACT** Waste materials can be defined as substances that may no longer be required by one or a group of individuals. However, such materials may be of use for some other individuals or group of individuals. It is for this reason that the waste and junk management in some countries like USA is a billion dollar industry. The status of this sector in India, however, is far from satisfactory. This is despite the fact that India supports a large population and its cities are exhibiting high rates of resource consumption. For example Delhi, India's National Capital Delhi generates 8,370 Metric Tonnes of solid waste every day. Most of this waste is eventually dumped in three landfill sites in Delhi at Bhalswa, Ghazipur and Okhla. Although Delhi's population and solid waste generation capacity has increased consistently in the last two decades, the number of landfills has remained constant. As a result, all these three landfills are overflowing and are operating at 3-4 times their planned capacity. While the situation is considerably alarming, it is not being responded by taking adequate steps to address this problem. The administration maintains a business-as-usual approach even as the three landfills continue to increase in size each passing day. Two visible measures taken are the setting up of waste to energy plants and landscaping of the landfills. Waste to energy, in the absence of segregation of waste at source, comes with its own concerns. At the same time, landscaping of the landfill does not prevent it from contaminating the surface and ground water. Thus, while waste should be a resource yielding recyclable value for the economy, Delhi's solid waste continues to add to the environmental problems of the city of Delhi. This research contribution presents a case study of the waste management sector in Delhi and attempts to identify the challenges being faced by the former that are preventing its growth.

**Case Abstract:** A dozen kabadiwallahs (mobile junk dealers) were surveyed as part of a pilot experiment and their input-output in terms of time investment, mode of working and capital earned were noted. 100 households were also surveyed from among the residential colonies visited by these kabadiwallahs. The frequency of waste collection at doorstep, willingness to segregate waste, the total earning from selling junk were some of the observations made during this survey. It was found that on an average, a kabadiwallah invests 8-10 hours per day and earns on an average Rs. 12,000/- to Rs. 14,000/- per month. Further, only 16% of the households surveyed displayed willingness to segregate their waste. On an average, a household pays Rs. 75/- per month to the waste collector for disposing of their waste. This was followed by an experimental setup involving 10 households and 2 kabadiwallahs for understanding the practical and economic viability of segregation of municipal solid waste.

*The households who were made to segregate their waste earned Rs. 70/- in the first week, Rs. 110/- in the second week and Rs. 150/- in the third week by systematically selling it to the kabadiwallahs. Thus, even a basic intervention in the municipal waste management sector could help transform waste into sellable junk thereby creating business opportunities as well as reducing the amount of waste reaching the already overflowing landfills in urban agglomerations like Delhi.*

**Keywords:** Delhi, entrepreneurship, sustainable development, waste management;

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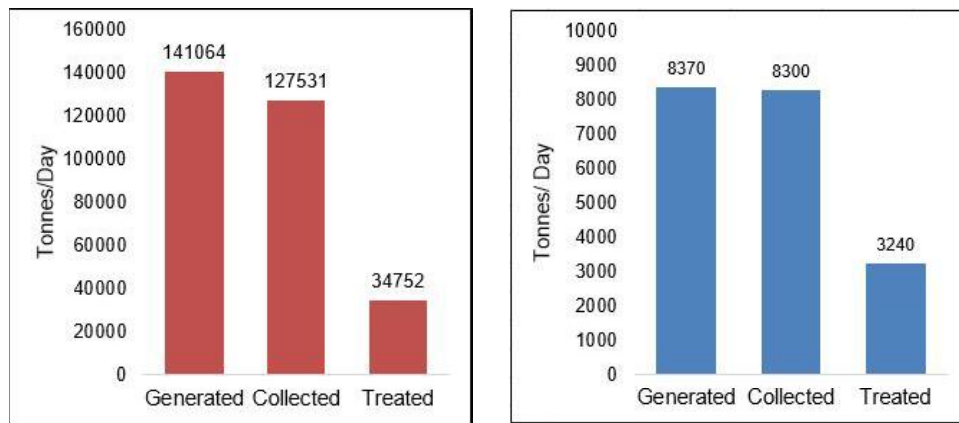
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## 1.0 Introduction

Waste management is one of the most prominent, and at the same time, understated urban sustainability challenge being faced by India in the ongoing twenty-first century. While the rise in urban population and a simultaneous increase in consumption patterns has led to a consequent increase in generation of municipal waste, the agencies responsible for managing this waste have not caught on. The rapid increase in urban population growth in India in the last decade (Singh, 2013) has only complicated matters further, with consistent increase in waste generation in the absence of the development of stronger and innovative practices towards its management. Municipal solid waste management (MSMW) in India is thus, without doubt, unsatisfactory (Keisham and Paul, 2015) and needs to go a long way for ensuring sustainable waste management.

The primary agency responsible for formulating policies related to waste management in India is the Central Pollution Control Board (CPCB). The CPCB has classified waste into the following broad six categories for the formulation of Rules and Regulations. The categories are: 1) Municipal Solid Waste, 2) Hazardous Waste, 3) Bio-Medical Waste, 4) Plastic Waste and 5) Batteries Management (CPCB, 2008). Rules and regulations are made by the CPCB under the aforementioned five categories. The Municipal Solid Waste, which is the most prevalent among these waste, is managed under the Municipal Solid Wastes (Management & Handling) Rules, 2000 (MSW Rules). The MSW Rules are applicable to all the municipal authorities in India which are responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid waste.

According to the most recent data available, the total amount of municipal solid waste generated in India on a daily basis is approx. 1,41,064 tonnes (CPCB, 2016). This is, of course, a conservative estimate calculated from total waste generation at the State level, as reported by the different states of India. This State-wise generation, collection and treatment data indicates that while states generate a total of 1,41,064 tonnes of waste each day, only 90% (or 1,27,521 tonnes/day) of this waste is collected by the respective municipal agencies. Further, only 27% (or 34,752 tonnes/day) of this waste is treated by the respective municipal agencies and the rest of the waste is simply not handled beyond collection (CPCB, 2016). Thus, almost three-fourth of the municipal solid waste collected in India is neither treated, nor recycled and receives only the basic response of being collected (Fig 1a).



**Figure 1:** Total amount of Municipal Solid Waste (in tonnes/day) generated, collected and treated in (a) India and in (b) Delhi as on February 2016 (Source: CPCB, 2016).

The large gap between municipal waste generated in India and its collection (10%) and the even larger gap between municipal waste collection and its treatment (73%) is concerning and calls for urgent interventions towards addressing this challenge. It also highlights the huge opportunity that exist for creating business models around waste collection, handling and recycling and the need for various agencies to come together and work in this direction (Zhu et al., 2008). The status of treatment of municipal solid waste in Delhi, the National Capital Territory (NCT) of India, is equally dismal. While Delhi is able to collect a considerable proportion of the waste generated in the city, there is a significant gap between waste collection and treatment of waste (Fig. 1b). As a result, the large amount of solid waste generated in Delhi contributes to the already overflowing landfills of Delhi, thereby further increasing their height and adding more to Delhi's waste management problem each passing day.

The present research contribution attempts to understand the municipal solid waste management scenario in the NCT of Delhi. The research work explores the reasons behind the slow pace of development of the waste management sector in Delhi and the difficulties in formalizing this relatively informal sector. The research work also focuses on the needs and benefits of waste segregation at the household level.

## 2.0 Municipal Waste Management Scenario in Delhi

The National Capital Territory of Delhi is divided into a total of five municipal zones and each zone is managed by its own municipal authority. The total geographical area of the NCT of Delhi is 1,483 sq. km and its total population according to Census 2011 is 16.8 million with an average population density of 11,297 people per sq. km (Census of India, 2011). The five municipal zones of Delhi are unevenly divided in terms of geography and demography and do not overlap with either the political divisions or even with the administrative (e.g. districts) divisions of Delhi. It should be noted here that Delhi is divided into 11 administrative divisions (or districts) which are under the direct administration of the Government of NCT of Delhi (GNCTD). However, municipal solid waste management is supervised by the municipal authorities of Delhi. Table 1 provides details of the five municipal zones of the NCT of Delhi and the total municipal solid waste generated in each of these municipal zones.

**Table 1:** Total Municipal Solid Waste Generated in Five Municipal Areas of Delhi  
(Source: CPCB, 2016).

Sl. No.	Municipal Zone	MSW Generated
1.	North Delhi Municipal Corporation	3100
2.	South Delhi Municipal Corporation	2700
3.	East Delhi Municipal Corporation	2200
4.	New Delhi Municipal Council	300
5.	Delhi Cantonment Board	70
<b>Total:</b>		<b>8,370 TPD</b>

All the Urban Local Bodies (ULBs) under the five Municipal Zones in the NCT of Delhi carry out house-to-house collection of municipal solid waste. The collection is either carried out through sub-letting to other agencies or individuals or through the circulation of the municipal mini-trucks to the various colonies at a specific time. At some places, both of the aforementioned methods are followed in order to ensure collection of all the municipal waste generated in Delhi. While this may seem adequate, Talyan et al. (2008) carried out a study of the state of MSWM in Delhi to conclude that the present policy and infrastructure are inadequate in dealing with the enormous quantity of MSW generated by the city of Delhi.

A significant drawback of the municipal waste collection system in Delhi is that it does not integrate segregation of the municipal waste, especially at the household level. Dry and wet waste are collected together and there is little motivation for the household residents to collect waste in a segregated manner. As a result, the municipal waste which is collected from the households and is first dumped at a dhallao (local waste collection centre) located near to the respective colony, consists an inseparable mix of dry and wet waste. From the dhallao, the municipal waste is transported, through trucks, to either a larger waste collection centre or directly to one of the four sanitary landfills in Delhi.

The four sanitary landfills are: 1) Bhalswa landfill, 2) Ghazipur landfill, 3) Okhla landfill, and 4) Narela-Bawana landfill and the first three of these landfills are already overflowing with waste. Ray et al. (2005) carried out a study of the status of one of these landfills with respect to its health impact on waste management workers. They found that landfill workers had significantly higher prevalence of both upper and lower respiratory symptoms, and they often suffered from diarrhoea, fungal infection and ulceration of the skin, burning sensation in the extremities, tingling or numbness, transient loss of memory, and depression (Ray et al., 2005). This is indicative of the large amount of waste, and the inability of the municipal administration to handle it in a safe and healthy manner.

Compared to the large amount of municipal waste generated in the NCT of Delhi, there is very little handling and composting of this waste. While this is evident from the lack of segregation at the household level, there is facility for composting only approx. 150 tonnes/ day of municipal waste in Delhi (CPCB, 2016). The most recent innovation in waste management in Delhi is that of setting up of the Waste to Energy plants. Three such plants have been set up in Delhi, viz. 1) at Okhla (which can generate 15 MW of electricity), 2) Ghazipur (12 MW) and 3) Narela-Bawana (24 MW). Of these, the Bawana Waste to Energy plant was most recently inaugurated (on 10 March 2017) and is the largest Solid-Waste to Energy plant in India (Sharma, 2017).

The working of the Waste to Energy plants require the incineration of solid waste in the process of generating electricity from it. However, at least one of these three plants have received opposition from the citizens residing in the neighbourhood of the plant, citing air pollution

concerns (PTI, 2017). The opposition against the respective Waste to Energy plant, and the inherent challenges the Plant must be facing are understandable since a primary pre-requisite of any Waste to Energy plant is receiving segregated waste as input. However, segregation at household level has not been achieved in the NCT of Delhi, because of which waste collected is a rigorous mix of dry and wet waste.

The presence of kabadiwallahs (junk dealers) and rag pickers also needs mention in Delhi's municipal waste management process, despite the fact that they share an informal space in the city. Kabadiwallahs (junk dealers) are relatively more organised door-to-door waste collectors who buy recyclable waste from the households. Rag pickers collect recyclable waste either from road side or from dhallaos and landfills. In doing so, they do play a role in carrying out segregation of waste in Delhi. According to Agarwal et al. (2005), the activity of the kabadiwallahs and the rag pickers is able to transport nearly 17% of Delhi's total municipal solid waste to Recycling Units. Thus, it can be inferred from the above discussion that the municipal waste management sector in Delhi is far from being organised, and a consistent improvement in this sector is wanting.

### **3.0 Survey Based Research**

A survey based research was carried out to understand the challenges of the municipal waste management system in Delhi and identify the reasons of the lack of innovation practices in this sector. The survey also focused on studying the scope and importance of waste segregation at the household level. The study was conducted in three neighbouring colonies, viz. Vijay Nagar, Old Gupta Colony and Kalyan Vihar located in the North Delhi Municipal Corporation, in the months of June-July, 2014. The Survey was carried out in three phases and the findings are presented below.

#### **3.1 Survey with Kabadiwallahs**

A total of 12 kabadiwallahs were identified in the above mentioned study area and were interviewed after obtaining their consent for the research work. The kabadiwallahs are not part of any formal network in the municipal waste collection system and were surveyed with the objective of understanding their working and revenue models. The survey revealed that on an average, a kabadiwallah spends 8-10 hours per day in visiting various colonies and looking for households who may have junk to give away. The kabadiwallahs are able to collect between 150-200 kg of recyclables on a weekly basis which excludes broken electronic items and plastic items (that are usually not weighed and are bought by the kabadiwallahs from individual households on case-by-case basis). On an average, a kabadiwallah is able to earn between 12,000-14,000 rupees on a monthly basis.

The kabadiwallahs also shared their experiences of working in the waste sector and specifically highlighted the issues faced due to the informal nature of their work. A kabadiwallah needs to visit each and every street of the colonies he is covering since the success of his business lies in locating households willing to sell their junk to him. Restrictions in some colonies at certain times of the day for hawkers in general is a challenge faced by some of the kabadiwallahs. At least one kabadiwallah was suspected of stealing junk items from a parking lot in one of the colonies he had been visiting. In addition, since the kabadiwallahs are middle-men between residents and the stationary junk shops, they feel that they often end up losing out during bargaining with the individual household while buying and also while re-selling it to the stationary junk shops.

### 3.2 Survey with Households

A total of 100 households were randomly surveyed from the three colonies, viz. Vijay Nagar, Old Gupta Colony and Kalyan Vihar located in North Delhi Municipal Corporation. The households were surveyed after obtaining their consent for the research work. The survey revealed that 100% of the households surveyed do not segregate their waste on a daily basis. Selected items such as newspapers, old magazines, large-broken plastic containers and glass bottles (at least 1 litre capacity) were some of the items kept aside by households for being sold to the kabadiwallah. On an average, a household availed the service of the kabadiwallah once every 3-4 weeks. None of the households surveyed had noted the contact/mobile number of any of the kabadiwallahs and did not have any preferred kabadiwallah.

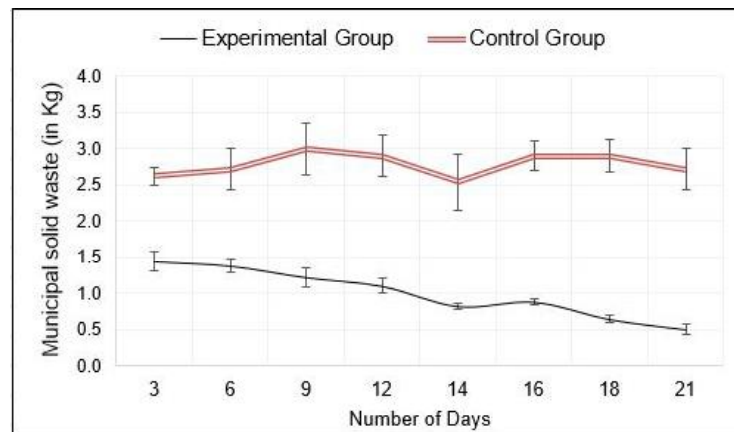
Only 16% of the households surveyed displayed their willingness to segregate the waste. Lack of availability of space was cited as the principal reason for not wanting to carry out waste segregation. The households surveyed did not face any difficulty in municipal waste collection and availed the service of an individual who comes and collects the waste from them every day. On an average, a household pays 75 rupees per month for availing the service of the aforementioned waste collector. The households surveyed did not consider waste management as a serious challenge being faced by the Delhi administration. The inability to manage waste by the Delhi administration, according to 75% of the total households surveyed, is due to political reasons. Only 25% of the households agreed to change their waste disposal habits, on the condition that they were guided for the same, and separate collection of dry and wet waste was ensured.

### 3.3 Survey for Understanding Practical and Economic Viability of Segregation

In the third phase of the interaction with the community, two kabadiwallahs were identified from the first phase and a total of 10 households were identified for conducting an experiment for understanding the practical and economic viability of segregation of municipal solid waste. The households were divided into group of 5 each, with one group being the Experimental Group and the other being the Control Group.

All the 10 households were instructed to give away their municipal waste to the waste collector after every three days, for a period of three weeks. In addition, the Experimental Group was instructed to segregate their waste into dry waste and wet waste. They were assured that their dry waste will be collected at the end of each week and that it will be purchased from them at the market price. They were also distributed awareness material on what constitutes wet and what constitutes dry waste, after ensuring that the kabadiwallahs agreed to buy all the items listed as dry waste.

The measuring scale of the kabadiwallahs were used to measure the total municipal waste generated after every three days by each household in both the Experimental and the Control Groups. The recyclable dry waste segregated by the Experimental Group was purchased by the kabadiwallahs on each Sunday of the week during the entire phase of the experiment. The average municipal solid waste generated by all the 5 households in the Experimental Group and all the 5 households in the Control Group, over a period of three weeks, is presented in Figure 2.



**Figure 2:** Graph showing average Municipal Solid Waste generated by the Experimental Group and the Control Group measured every three days for a period of three weeks.

The data shows considerable reduction in the total municipal waste generated by the Experimental Group where segregation of waste was encouraged. Further, there is a gradual decline in the total municipal waste generated in the Experimental Groups over a period of time perhaps indicating greater enthusiasm towards waste segregation due to incentives as well as visible results of this practice. On an average, each household earned Rs. 70/- in the first week, Rs. 110/- in the second week and Rs. 150/- in the third week from selling the recyclable dry waste that was collected after segregating their municipal solid waste.

#### 4.0 Discussion

Municipal Solid Waste Management is a significant challenge being faced by the city of Delhi, but one that the citizens of Delhi remain largely unaware of. The rapid increase in the population of the NCT of Delhi in the last few years has put additional pressure on the natural resources of the city, and on its municipal administration. At the same time, three of the existing four landfills in Delhi are overflowing with waste and are also causing air pollution and ground water contamination. This is even more concerning since Delhi is now preparing to become a ‘Smart City’ (Saha and Singh, 2017). The lack of awareness of citizens towards this emerging waste crisis therefore needs to be addressed so that citizens can become part of the solution to this imminent crisis.

The municipal solid waste management sector seems to have several players, some of whom have not been formalized in the system. These ‘informal’ actors continue to play a role in waste management and help in a crucial manner through carrying out segregation of municipal waste at source. In doing so, they also provide the necessary incentive for households to segregate their waste. The presence of such actors in the randomly selected study area highlights the key role they have been playing in waste collection and segregation. Formalizing these ‘informal’ actors like the kabadiwallahs and even the rag pickers, could not only be good social inclusion initiative, it will also boost municipal solid waste management in Delhi in a significant way.

The pilot study carried out in this research contribution highlights the significant role segregation of waste can play in reducing the burden on the municipal authorities and on the overflowing landfills in Delhi. While the Control Group continued to generate at least 2 Kg additional waste than the Experimental Group each week, the Experimental Group’s total municipal waste generation was found to decline with each passing day. This could be due to the monetary and assured returns this Group was receiving by segregating their waste which may



have acted as the necessary incentive. Greater effort was observed in the Experimental Group towards the third week, to better segregate their waste and also find and dispose of items they were no longer using (e.g. broken umbrella, etc.).

An interesting observation made during this study was the reluctance of the society to deal with the issue of waste. This reluctance was not only observed in the households but also in the kabadiwallahs, who maintained their distance from the waste collectors through the survey period. The social stigma associated with handling waste prevails in the society and was very evidently observed during the study. The waste management sector therefore would also have to fight this stigma, perhaps with the introduction of more mechanisation in waste handling and collection and by providing considerable gear (e.g. gloves, masks, etc.) to all the workers associated with this sector.

## 5.0 Conclusion and Recommendations

The rapidly urbanising NCT of Delhi needs to take urgent measures for reducing its ever increasing waste load. The first step in that direction has to be to involve citizens through sensitization programmes that inform them about the seriousness of the matter. Citizens should then be encouraged to follow the 3 Rs of Reduce, Reuse and Recycle and encouraged to segregate their waste. However, promoting waste segregation should simultaneously be accompanied by separate collection of dry and wet waste at the household level. The latter requires the formalizing of all actors presently involved in various levels of municipal waste management. The Delhi administration needs to develop a more holistic approach towards municipal solid waste management and begin addressing this problem through a decentralized approach.

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