Waste Segregation and Solid Waste Management in Delhi: Challenges and Suggestions

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Abstract: *In the last 30 years, population of Delhi has increased more rapidly than anticipated. The proper and safe handling of enormous amount of waste is the pre-requisite condition, in order to ensure sustainability, human health and well-being in a mega city like Delhi. This paper attempts to assess the current waste management practices adopted by the civic bodies in Delhi and identifies major challenges obstructing waste segregation and sustainable solid waste management in the city. At last, it provides suggestion that can help in tackling the problem of waste management. The sustainable management of solid waste is also important, in order to achieve several sustainable development goals like ensuring good health and wellbeing for all, ensuring sustainable management of water and sanitation for all, promoting decent work and economic growth.*

Keywords: *Solid waste management, waste segregation, challenges, Municipal bodies, open dumping sites, unauthorized colonies.*

I. INTRODUCTION

Solid waste management of escalating solid wastes in Indian megacities has become a critical issue of concern. Though the management of solid waste is considered as the responsibility of the civic bodies, several other stakeholders of society can play significant roles in the process [1]. The concept of solid waste management is very broad, it comprises waste management at various levels, i.e., waste segregation at origin, storing and collection from primary source to temporary secondary source, then transportation of the segregated recyclables for processing and resource recovery, and finally scientific disposal of the remaining non-recyclable waste [1,2,3].

The NCT Delhi had the population of 62,20,406 in the year 1981 which increased to 1,67,87,941 by the census year 2011. By 2041, the population of NCT Delhi could rise to more than 2,37,44,200 [4]. In the past 30 years, Delhi has witnessed an unprecedented increase in population growth leading to continuously rising human needs for meeting day to day life, putting stress on existing infrastructure and resources, and severely affecting their carrying capacity [4,5,6]. Over the decades, national and worldwide discourse on waste management in cities has become pivotal area of concern for mankind at various international platforms [2,3]. Lack of waste segregation and unsustainable solid waste management in Delhi has emerged as a great challenge to ecology, human health and well-being and sustainability [7,8].

The haphazard urbanization, mushrooming slums and JJ colonies in order to satisfy the shelter needs of migrant labour workforce have created a massive problem of waste generation in the National Capital Territory of Delhi [2,7,9]. It has been estimated that solid waste generation (in MT/day) in NCR will rise up to 19,238 (MT/day) in the year 2021 from 13,199 (MT/day) in the year 2011. Total solid waste generation in the NCT Delhi sub region is likely to reach about 12,158 MT/day by the year 2021 from 10,051 (MT/day) in the year 2011, followed by Uttar Pradesh sub region with 3,591 (MT/day) by the year 2021 from 1,638 (MT/day) in the year 2011, further followed by Haryana and Rajasthan sub region with 2,998 MT/day and 491 MT/day by the year 2021 from 1,373 (MT/day) and 137 (MT/day) respectively in the year 2011 [10].

Absence of proper solid waste management and waste segregation in the high density population zones of Delhi has caused dumping of wastes into pits, emergence of scathing landfill/dumping grounds which further result in pollution of air, land and water resources [2,11]. Waste segregation in Delhi is still done in a haphazard manner [3,11]. Garbage collection in the study area is done manually before lifting it on the operational trucks [2]. The workers associated with manual waste collection are exposed to several health hazards due to lack of awareness about protective gears and measures [11].

Objectives of the Study

1. To study the current waste management practices adopted by the civic bodies in Delhi
2. To identify major challenges obstructing sustainable solid waste management in the city.
3. To suggest new measures that can help tackle the problem of waste management.

II. METHODOLOGY

The present study is based mainly on the secondary data sources collected only after the review of published materials, reports, applicable laws. Though for attaining the second objective of the study field survey was conducted at selected dumping sites of Delhi along with discussion with different stakeholders of the society.

III. RESULTS AND DISCUSSIONS

Composition and Characteristics of Indian Municipal Waste

The Indian municipal waste could be categorized under biodegradable waste, recyclable material, inert waste material and domestic hazardous waste. The biodegradable waste includes food and kitchen waste, green waste (vegetable, flowers, leaves and fruits). While the recyclable waste material consists of paper, glass, bottles, cans, metals, certain plastics, etc. The inert waste material comprises of dirt and debris while the domestic hazardous waste includes paints, chemicals, light bulbs, fluorescent tubes, spray cans, batteries, shoe polish, etc. (Table 1). The recent government initiatives like Swachh Bharat Abhiyan emphasizes significantly on addressing the challenges in management of municipal solid waste.

Table 1- Municipal Solid Waste Generated in Delhi

		SDMC	North Delhi Municipal Corporation	EDMC	NDMC	DCB	Total
Waste collected (TPD)	MSW	3400	3950	2200	300	200	10050
	C&D waste	1000	2500	700	50	192	4442
	Drain silt	200	200	200	50	25	675
	Residue/ Ash	600	370	400	-	-	1370
Per capita waste generation (g/capita/day)		554	580	525	556	462	-
Disposed on dumping sites/ Landfills (TPD)		1700	1650	1200	-	60.53	4611

Source: SWM Presentation in all MCD, 2017 [12]

Major Obstructions to Sustainable Solid Waste Management in the City

On the face of it everything looks properly managed but substantial part of the waste generated in Delhi is processed daily while rest is dumped on dumpsites.

A. Inadequate and improper segregation of waste

According to expert committee report on long term action plan for waste management for Delhi, 2017, the segregation at source is merely 2 percent in the city restricted to few institutions and colonies only. Waste segregation at the household level is at the infant stage. In the light of new solid waste management rules, 2016 the municipal bodies (NDMC and EDMC) started the programme of waste segregation at household level by residents itself but four months later, residents in the areas selected for the drive- Minto Road, Pushpanjali Enclave, New Rajendra Nagar, Shakti Nagar, Vivekananda colony Indira Colony, Dilshad Garden, Preet Vihar, Loni Road DDA flats and Jhilmil- continue to dump waste without segregating them. The civic bodies have also not been able to procure enough vehicles or finalize plans for disposing segregated waste [16]. Even the segregated waste which is collected is mixed at *dhalaon* or FCTS and further transported to either dumpsites or waste to energy plants. And also there is no compartmentalization of the vehicle to keep segregated waste collected from household (Table 2).

Table 2- Current Processing and Disposal of Waste in Delhi

	SDMC	North Delhi Municipal Corporation	EDMC	NDM	DCB	Total
Disposed on dumping sites/ Landfills (TPD)	1700	1650	1200	-	60.53	4611
Composted (TPD)	200	1000	-	-	-	1200
Incineration (TPD)	1600	2000	1000	300		4900
Total waste processed (TPD)	-	-	-	-	-	6100

Source: SWM Presentation in all MCD, 2017 [12]

B. Presence of Large number of Unauthorized Colonies

These colonies have acutely poor solid waste management system as they pose problem of waste collection and transportation. Very few *dhalaon* bins exist here compared to the size of population they have (Table 3). Use of open plots for garbage dumping is a common site, some of the pictures have been taken where the open dumping issues are acute, i.e., Aya Nagar and Seelampur. The mixed garbage is collected both from authorized as well as unauthorized colonies.

Table 3- Waste Generation in Unauthorized Colonies of Delhi

	SDMC	North Delhi Municipal Corporation	EDMC	NDMC	DCB	Total
Unauthorized Colonies (In number)	932	449	253	-	-	1634

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urce: SWM Presentation in all MCD, 2017 [12]

C. Lack of space for dump sites as well as Dhalaons/ Bins

There is acute space crunch. *Dhalaon* bins do not have separate space for keeping the segregated hazardous materials. Delhi Development Authority (DDA) is unable to provide space in the city either for expansion of the existing collection points or establishing new. People strongly oppose any move by the authority if it creates a new space for garbage collection and sorting points. Although new dumping sites are identified by the municipal bodies but it faces stiff opposition from the residents of colonies / villages who live in the vicinity of these sites. The residents of Rani Khera and adjoining villages have decided not to allow dumping of waste in their neighborhood, protested and stopped the trucks, deflated the tyres [13]

Figure 1: Open dumping sites in Delhi


Source: Aya Nagar Urban Development Report




Source: Pictures taken by Authors during field visit (East Delhi)

D. Unscientific and illegal disposal of municipal solid waste on dumping grounds

Due to shortage of space and lack of operation of new dumping grounds due to various reasons the municipal bodies continue to dump their waste on these sites despite being declared illegal many years ago. Three out of four land fill sites are not designed as per the schedule three of Municipal Solid Waste rules. DPCC has refused to grant Authorization to all the three illegal land fill sites, i.e., Bhalswa, Ghazipur and Okhla. These Sites are potential threat to the health and lives of the residents living in its vicinity due to the presence of leachate and fire risk associated with it. Leachate is the liquid that drains or leaches out from a landfill. It varies widely in its composition on the basis of the age of landfill and type of waste dumped. It usually contains both, dissolved and suspended materials. Fires are also common in all the old landfill sites. It can lead to chemical poisoning through inhalation. The rag pickers and people residing close to dumping sites are prone to diseases like cancer, respiratory problems, congenital malformations, neurological diseases, nausea and vomiting.

E. Mismatch between waste input requirements and the quality of waste received by the waste to energy plants

Waste to energy plant must have waste inputs of specific qualities and quantities in order to function effectively. For self-sustained incineration, a year-round minimum greater than 1300 kcal/kg lower calorific value (that is, as received) is generally considered needed. For waste-to-energy plants, 2200 kcal/kg is the minimum calorific value desired [14]. According to a survey conducted by Shriram Institute for Industrial Research Delhi in SDMC area 55-60% of waste was biodegradable and the mixed waste had calorific value in the range of 1274.25 -1324 kcal/kg [12]. As per the Solid Waste Management Rules, 2016, minimum waste calorific value for incineration is 1500 kcal/kg

F. Underutilization of biodegradable waste for composting and biomethanation

Based on different studies it is estimated that 50 to 60 % of solid waste in Delhi are biodegradable and a major chunk is compostable, merely 1200 MT of waste is composted and rest end up in incineration or dumping sites. A total of 11.5 percent of total waste generated is used for composting while total compostable solid waste amount constitute 50 to 60 percent. Even the compost created in Delhi at major points have few takers because of poor quality and high cost. It is laden with heavy metals, toxins and glass because MSW is not segregated. Mixed waste is allowed to decompose in haphazard manner and sorting is also done only in the second phase [15].

G. Other Challenges

There is lack of reliable data about how much waste Delhi generates which raises the issue of lack of proper inventorization of waste. A big portion of waste (estimated 10 to 15 percent) is managed by the informal sector yet there is lack of credible data on it. Though Waste pickers/informal waste collectors form a vital part of solid waste management, their role is not duly acknowledged nor are they registered. Lack of trained workforce to supervise tasks of solid waste management further aggravates the complexity of waste management. The local authorities do not have designated officers to monitor the processes of waste management, i.e., to supervise waste segregation, adequate collection and transportation, further handling of segregated waste and scientific disposal techniques which is in accordance with SWM Rules [12].

IV. CONCLUSION AND SUGGESTIONS

As there is continuous flow of migrants to Delhi the quantity of waste generation is on the rise. Present infrastructure will be unable to manage the waste ten years from now. Key to efficient waste management is proper segregation for recycle and re-use. Although segregation at source has become mandatory after MSW, 2016 but the same is not been efficiently implemented. It is important to start extensive awareness campaigns for children, home-makers and at work-places. Segregation helps in processing of waste in waste to energy plants as it increases the calorific value of waste making it suitable for Waste to Energy plants. Waste segregation makes the emission toxin free if hazardous and toxic materials are removed before incineration and also makes the plant efficient and long lasting if inert materials are segregated. Waste to Energy Plant in the light of quantum of waste generated and lack of space for dumping becomes a popular choice for waste processing but it should not be looked upon as the panacea for all the waste management issues and therefore should not be blindly installed as an easy option. Composting and Biomethanation should take precedence over waste to energy planst because the nature of our waste requires composting and not incineration. There is need for effective decentralization of composting activity that would help processing at the source.

Public Private Partnership should be increased with enhanced incentives, more power and bigger role, especially in processing and waste to energy conversion. Clues should be taken from Alappuzha where people are segregating and composting, Government is handling the non-biodegradable waste through informal waste recycling sector. It is very important for the landfill sites to follow the guidelines provided by the new Solid Waste Management Rules, 2016, about not dumping the waste with high calorific value and keeping distance from water bodies. It is essential to recognize the potential of rag-pickers and workers engaged in collection of garbage. The role of informal sector in waste management is largely unrecognized, they reduce up to 20 per cent load on transportation to the landfill yet they are not even registered. Government should draft policies and

ensure that people working in such hazardous and insanitary conditions should necessarily get economic and health benefits on priority basis. Tipping fee to the concessionaires is paid for collection and transportation of the total waste. So the concessionaires are more interested in the total waste collection and not waste segregation; processing and disposal is lowest on priority. Some Means should be devised by the authorities to pay them on the basis of segregation. People should be strongly encouraged towards waste segregation at household level. It is necessary to have a Central Monitoring Committee to oversee every process from collection to disposal/ incineration of the waste as per the new waste Disposal Rules, 2016.

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