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Present status of msw generation in NCT-Delhi and managementin light of new waste management rules

Gestión y estado actual del NCT-Delhi debido a nuevas normas en la gestión de residuos.

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ABSTRACT

Composition of municipal solid waste (MSW) varies in quantity and quality which includes food waste, household waste, market waste and commercial waste materials that are no longer useful. MSW generation in India have been heavily increased due to population explosion, fast industrialization and urbanization in the last decades. In 2036, population in India is expected to grow to 1.52 billion and urban population will be 39.06%. Urban India is expected to generate about 11,95,000 Tonnes Per Day (TPD) by 2050. National Capital Territory (NCT) of Delhi, being India's national capital and a metropolitan city having high population density facing tremendous task in managing collection, segregation, transport and disposal of solid wastes. Five Municipal bodies/ Urban Local Bodies (ULBs) are responsible for solid waste management in Delhi. Along with ULBs, profit-oriented private sectors, the non-profit voluntary organizations or non-governmental organizations (NGOs) and numerous unorganized individuals engaged in collection, segregation, recycling and disposal of MSW. The existing MSW collection and handling systems in Delhi seems inadequate for compliance to the new Solid Waste Management Rules- 2016. The four sanitary landfills in Delhi are oversaturated and the MSW generated needs proper segregation and recycling of materials at source to minimize disposal. Decentralized methods of waste processing, reduction, recycle and reuse, which include composting, bio-methanation, fossilization are need of the hour. The informal sectors like the private companies, Non-Governmental Organizations (NGOs), waste collectors (rag pickers, kabadiwalas) and waste recyclers shall be integrated into the solid waste management system.

Keywords: Municipal Solid Waste, India, Solid Waste Management, NCR-Delhi, Rules

RESUMEN

La composición del residuo sólido urbano (RSU) varía en cantidad y calidad, donde se incluyen residuos alimenticios, domésticos, de mercado y materiales comerciales que ya no son necesarios. En India, la generación de RSU ha estado creciendo enormemente debido a la explosión demográfica y la rápida industrialización y

urbanización en las últimas décadas. Se espera que en 2036 la población en India se eleve a 1.52 mil millones de habitantes y que la población urbana sea de 39,06%. Además, en el año 2050, se espera que en la India urbana se generen alrededor de 11,95,000 TPD. Por otra parte, el Territorio de la Capital Nacional de Delhi, al ser capital nacional de India y ciudad metropolitana, cuenta con una alta densidad poblacional, enfrentando así la inmensa tarea de gestionar la recolección, clasificación, el transporte y la eliminación de los residuos sólidos. Cinco organismos municipales, también llamados Organismos Locales Urbanos, son los responsables de esta tarea urbana en Delhi, se suman a ellos los sectores privados con ánimo de lucro, las organizaciones voluntarias sin ánimo de lucro u organizaciones no gubernamentales (ONG) y numerosos individuos que no forman parte de estos grupos pero que están comprometidos en la recolección, separación, reciclaje y eliminación del RSU. En Delhi, la recolección y los equipos de manipulación actuales del RSU parecen ser inadecuados para el cumplimiento de las nuevas Normas de Gestión de Residuos Sólidos de 2016. Los cuatro vertederos en Delhi están sobresaturados, el RSU generado necesita una temprana y adecuada clasificación, además de reciclaje para minimizar la eliminación. Actualmente se necesita de una gestión descentralizada para el tratamiento de residuos, reducción, reciclaje y reutilización, que incluye: el compostaje, la biometanización y fosilización. El sector informal, como las compañías privadas, las ONG, recolectores de desechos (recolectores de basura y kabadiwalas) y recicladores, también deberían ser parte del sistema de gestión de residuos sólidos.

Palabras clave: Residuo Sólido Urbano, India, Gestión de Residuos Sólidos, Delhi, normas.

INTRODUCTION

Solid waste is generated due to the human activities. Solid waste can also be defined as the organic and inorganic waste materials produced by households, commercial & industrial establishments that have no economic value to the owner. These wastes which can pose risks to the health and environment stored, collected and disposed off. Solid waste can be broadly household waste or municipal solid waste, Industrial waste as hazardous waste, biomedical waste or hospital waste. Municipal Solid Waste (MSW), commonly called garbage or trash is a discarded waste from our everyday life. MSW includes degradable materials (like paper, textiles, food waste), partially degradable (like wood, sludge) and Non-degradable materials (like plastics, leather, glass, metals) (Neha et. al. 2015). Generation of MSW is much higher in cities comparing to villages because of higher population density, better standard of living and availability of resources in cities. Human societies are facing a huge challenge to properly manage this solid waste due to the huge volumes and heavy expenditure associated with solid waste management.

India is the second most populated country in the world and fastest growing economy. Population of India was 1.21 billion (Census of India 2011) in 2011 and is expected to grow to 1.52 billion in year 2036 (Census of India, 2011). The level of urbanization of the country is expected to increase from 31.14% in 2011 to 39.06% in 2036 (Census of India 2011). There has been a significant increase in MSW (municipal solid waste) generation in India in

the last decades. The waste generation estimated in India as on January, 2020 was 147613 TPD (Statewise Status of Implementation 2020). Waste generation is expected to grow at 5% per annum due to increase in the population and urban lifestyle (Planning Commission 2014). Migration of people to cities, rapid industrialization and population explosion in India are behind the daily generation of enormous MSW (Gupta et. al. 2016). It is assumed that urban India will generate 1195000 TPD solid wastes by 2050 (Planning Commission, 2014). As on January, 2020 only 60% of the total MSW generated in the country is processed (Statewise Status of Implementation 2020). The remaining waste is disposed at dump/ landfill sites without treatment. The State and Union Territories (UT) wise details regarding waste generation, waste processed in 2019 (ENVIS 2019) are given in Table 1 and shown in Figure 1.

Table 1: MSW generation and % processed in Indian States/ UTs

Sl. no.	Name of State/ UT	Total Waste Produced (TPD)	Total Waste Processed (TPD)	Total waste processing (%)
1.	Andhra Pradesh	6141	2948	48%
2.	Andaman and Nicobar	100	65	65%
3.	Arunachal Pradesh	181	0	0%
4.	Assam	1432	759	53%
5.	Bihar	2272	1159	51%
6.	Chandigarh	479	455	95%
7.	Chhattisgarh	1650	1485	90%
8.	Daman & Diu	32	24	75%
9.	Dadra& Nagar Haveli	55	55	100%
10.	Delhi	10500	5775	55%
11.	Goa	250	175	70%
12.	Gujarat	10274	8938	87%
13.	Haryana	4783	2248	47%
14.	Himachal Pradesh	377	294	78%
15.	Jammu and Kashmir	1489	238	16%
16.	Jharkhand	2135	1281	60%
17.	Karnataka	10000	5400	54%
18.	Kerala	2696	1914	71%
19.	Madhya Pradesh	6424	5653	88%
20.	Maharashtra	23450	13601	58%
21.	Manipur	174	101	58%
22.	Meghalaya	268	11	4%
23.	Mizoram	236	83	35%
24.	Nagaland	461	277	60%
25.	Odisha	2721	1170	43%
26.	Puducherry	415	54	13%
27.	Punjab	4100	2501	61%
28.	Rajasthan	6500	4550	70%
29.	Sikkim	89	62	70%
30.	Tamil Nadu	15437	10188	66%
31.	Telangana	8634	6735	78%
32.	Tripura	450	239	53%
33.	Uttar Pradesh	15500	8990	58%
34.	Uttarakhand	1541	709	46%
35.	West Bengal	7700	693	9%

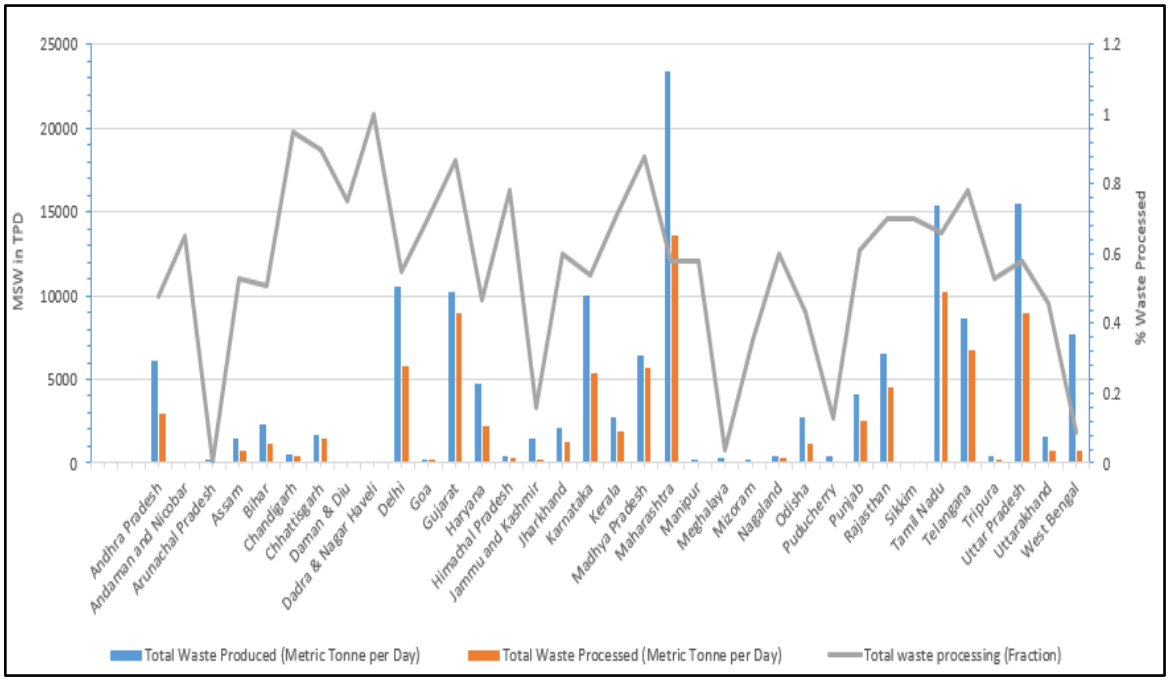

Figure 1: MSW generation and processing status for Indian States and UTs

National Capital Territory (NCT) of Delhi is the India's national capital and is bordered by Haryana and Uttar Pradesh. The NCT of Delhi has five Urban Local Bodies (ULBs) which are namely South Delhi Municipal Corporation (SDMC), North Delhi Municipal Corporation (North DMC), East Delhi Municipal Corporation (EDMC), New Delhi Municipal Council (NDMC) and Delhi Cantonment Board (DCB). The overall generation of MSW in NCT-Delhi is 10817 TPD (Annual Report 2018-19) and it is estimated that by 2030, the total generation of the MSW is expected to increase to 17000 TPD (State Policy 2017). All ULBs of the NCT- Delhi are responsible for securing efficient scavenging and cleaning of all streets and premises which includes the daily surface cleaning of all streets, collection, storage, segregation, transportation and final disposal/ treatment of the Municipal Solid Waste (MSW). Along with ULBs, private sectors, non-profit voluntary organizations or non-governmental organizations (NGOs) and numerous unorganized individuals are engaged in collection, segregation, recycling and disposal of MSW. Municipal waste management in Delhi is becoming a serious issue particularly due to huge increase in urban population and increasing affluence resulting in generation of large volumes of solid waste. The existing collection and transportation of waste seems not efficient enough, which also led to unauthorized dumping. There is capacity deficiency for MSW storage at landfills and waste processing facilities. Waste management must involve waste segregation at source to allow value extraction and recycling. Separating dry (inorganic) and wet (biodegradable) waste also have significant benefits and should be the responsibility of the waste producers. Long-term waste management planning requires visionary planning by the ULBs, the private sectors and NGOs. The future waste management in Delhi must involve extensive involvement of the informal sector throughout the system.

The objectives of study were: 1) To study the MSW generation quantity and characteristics of MSW in Delhi; 2) To Assess of existing status of collection, storage, transportation, treatment, and disposal activities of MSW. 3) Review of MSW Management in light of applicable laws, bye-laws and manuals.

STUDY AREA

NCT of Delhi is a union territory and is located between 28.24 - 28.53 degrees (North Latitude) and between 76.50 - 77.20 degrees (East Longitude) (Ashwani 2013, Economic Survey of Delhi 2018-19). Delhi covers an area of approximately 1483 sq. Km., of which 369.35 sq. Km. is rural and 1113.65 sq. Km. is urban (Census 2011). There are 11 Districts (namely Central Delhi, East Delhi, New Delhi, North Delhi, North East Delhi, North West Delhi, Shahdara, South Delhi, South East Delhi, South West Delhi, West Delhi), 33 Sub-divisions, 110 census towns and 112 villages in the NCT of Delhi (Economic Survey of Delhi 2018-19). Figure 2 shows ward wise map of NCT-Delhi as per Census 2011. Delhi metropolitan area lies within the NCT- Delhi and has five local municipal corporations or Urban Local Bodies (ULBs) namely North Delhi Municipal Corporation (North DMC), South Delhi Municipal Corporation (SDMC), East Delhi Municipal Corporation (EDMC), New Delhi Municipal Council (NDMC) and Delhi Cantonment Board (DCB). The municipal corporations handle civic administration including MSW management for the city. The civic bodies in Delhi have been making all efforts to properly organize the management of Municipal Solid Waste (MSW). As per the 2011 Census, the density of population in Delhi was approximately at 11320 persons per square kilometer which was the highest in all states and union territories. Areas under SDMC, North DMC, EDMC, NDMC, DCB are 656.91 sq Km (44.26%), 636 sq Km (42.85%),105.98 sq Km (7.14%),42.67 sq Km (2.87%) and 42.8 sq Km (2.88%) respectively (Annual Report 2019-2000). Population under SDMC, North DMC, EDMC, NDMC, DCB are 70 lakhs (32.7%), 90 lakhs (42.04%), 50 lakhs (23.36%), 2.75 lakhs (1.28%), 1.332 lakhs (0.62%) (Annual Report 2019-2000). Pie-charts showing area and population distribution among the 5 ULBs are shown in Figure 3 & 4.

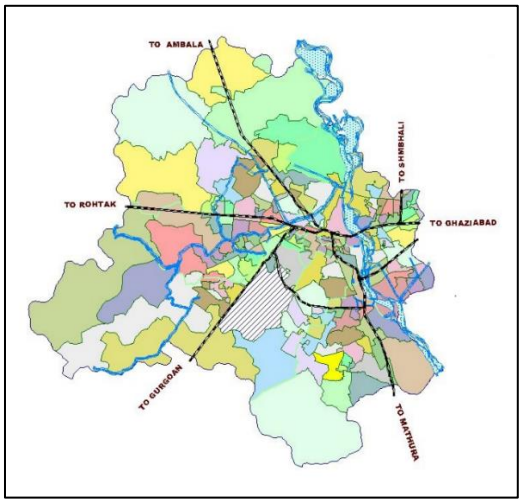

Figure 2: Ward-wise NCT-Delhi map as per Census-2011

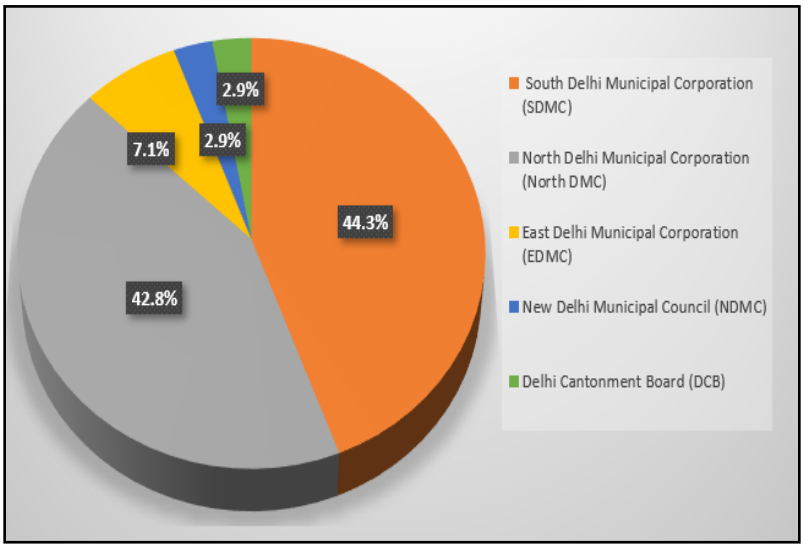

Figure 3: Area percentage of ULBs in NCT-Delhi

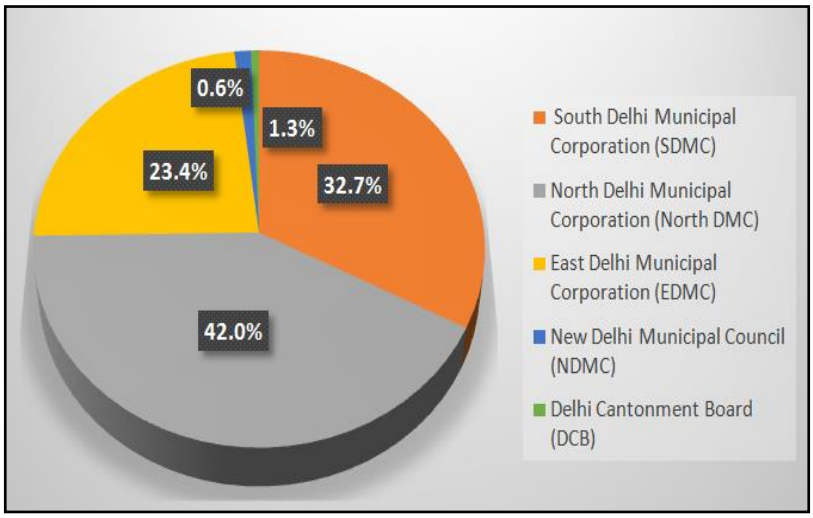

Figure 4: Population percentage of ULBs in NCT-Delhi

RULES AND POLICIES ASSOCIATED WITH MSWM

This section provides review and analysis of national, state, and municipal level laws, rules, policies, programmes, and guidance related to Municipal Solid Waste Management (MSWM). Solid Waste Management (SWM) Rules, 2016 notified by Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India is the backbone for the policies, strategies and bye-laws applicable for Municipal/ State MSWM. The MSWM Manual2016 by the Central Public Health & Environmental Engineering Organization (CPHEEO) and the recommendations of Report of Task Force on Waste to Energy, Planning Commission, 2014 have detailed the guidelines and frameworks for MSWM to be carried out by ULBs. The ULBs and States regularly comply to SWM

Rules, 2016. The Government of NCT of Delhi, has prepared the State Policy and Solid Waste Management Strategy for Delhi in 2017 and the bye-laws for Delhi's 5 ULBs. A brief description of applicable national law, bye-laws and MSWM strategies are provided below:

- **Solid Waste Management Rules, 2016:** To deal with the growing amount of municipal waste, the Ministry of Environment and Forests has notified the new SWM Rules, 2016 with clear responsibilities assigned to various classes of consumers. These rules are in sixth category of waste management rules and do not include plastic, e-waste, biomedical, hazardous and construction & demolition waste. The SWM Rules-2016 is the revised version of the MSW (Management and Handling) Rules, 2000 and prepared in line with the Environment (Protection) Act, 1986. The SWM-2016 details responsibilities and duties in terms of collection, segregation, storage, transportation, processing and disposal of municipal solid waste (MSW). It also specifies the landfilling requirement, site selection, facilities at the site, specifications for landfilling, Pollution prevention and waste processing options like composting and incineration.

- **State Policy and Solid Waste Management Strategy for Delhi:** In pursuance of SWM Rules-2016, Govt. of NCT of Delhi has framed the State Policy and Solid Waste Management Strategy for Delhi in 2017. This document envisages a framework to guide the development and activities of Solid Waste Management in Delhi. It is designed to assist all Urban Local Bodies in introducing necessary changes and establishing benchmarks as per Municipal laws and even beyond. This policy/strategy supports the goals to clean, collect, transport, treat and dispose of solid waste efficiently. It aims at improving public health, reducing reliance on landfills, conserving energy and natural resources and reducing pollution and emission of greenhouse gases. This policy is prepared with a vision to equip the NCT of Delhi with efficient, environmentally friendly and sustainable waste management system with complete segregation, safe collection, transportation, treatment and disposal facilities. The aim of this strategy document is to achieve improved environmental outcomes by adopting appropriate measures.

- **Solid Waste Management Bye-Laws:** Govt. of Delhi directed the 5 ULBs namely EDMC, North DMC, SDMC, NDMC and DCB to follow Bye-laws, 2017 which are namely, East Delhi Municipal Corporation SWM Bye-Laws, 2017, North Delhi Municipal Corporation SWM Bye-Laws, 2017, South Delhi Municipal Corporation SWM Bye-Laws, 2017, New Delhi Municipal Council SWM Bye-Laws, 2017, Delhi Cantonment Board SWM Bye-Laws, 2017 vide Gazette notifications. All the five local bodies have enforced the bye-laws in their jurisdiction. The bye-laws were framed by a 16-member committee constituted by the Delhi High Court. The members of the committee include Centre for Science and Environment, MoEF&CC, Ministry of Urban Development (MoUD) and all five municipal bodies of Delhi. The bye-laws have strengthened the need for operationalize segregation at source, door-to-door collection and

transportation of segregated solid waste, decentralized or semi-decentralized systems to process waste, levying fees/ penalty for services like garbage collection, transportation and disposal from waste generators.

- **Municipal Solid Waste Management Manual by CPHEEO:** Central Public Health & Environmental Engineering Organization (CPHEEO) under the Ministry of Housing and Urban Affairs prepared the MSWM Manual-2016 which is updated version of its MSWM Manual-2000.The aim of this manual is to guide all waste generators particularly ULBs towards Sustainable SWM by adopting suitable measures for waste minimization at source with an emphasis on the principles of 3Rs (Reduce, Reuse and Recycle) with proper systems of collection, segregation, transportation, processing and disposal in line with applicable regulations. The revised manual addresses planning, technical, institutional, financial, and legal aspects of MSWM.

There are various programmes run by Government of India like Jawaharlal Nehru National Urban Renewal Mission (JnNURM), Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT) under which funds were allocated for improvement of MSWM. In order to give a push to the municipal solid waste management in cities, Swachh Bharat Abhiyan launched by Prime Minister of India in 2014. The Swachh Bharat Mission (SBM) aims to address the challenges in management of municipal solid waste and to support cities in developing modern and appropriate systems.

MUNICIPAL SOLID WASTE MANAGEMENT IN NCT-DELHI

In NCT-Delhi which has five local municipal corporations or ULBs namely North DMC, SDMC, EDMC, NDMC and DCB handle the massive MSW management (collection, segregation, transportation and disposal) for the city as per the SWM Rules- 2016. In SDMC areas, out of the 4 Zones, most work of Collection and Transportation of MSW has been outsourced. Only in Najafgarh Zone, the work of Collection and Transportation of MSW is being carried out by SDMC's departmental staff and machineries. In North DMC areas, the work of door to door Collection, Segregation, Transportation and Processing/Disposal has been outsourced in all 6 zones except in Narela Zone where there are being carried out by North DMC's departmental staffs and machineries. NDMC has outsourced all the works of door to door collection, segregation and transportation of MSW to third parties. DCB has partly outsourced the work of segregation, collection and transportation of MSW in their areas (State Policy 2017).

(1) COLLECTION, SEGREGATION OF MSW: Total MSW generation in Delhi is 10817 TPD (Annual Report 2018-19). For proper treatment and disposal of the MSW, the ULBs are following the bye laws, strategy plan of waste segregation at source, door to door collection, intermediate storage and transport facility with GPS for the segregated waste including Material Recover Facility. The municipal bodies of NDMC and DCB have achieved

almost complete segregation of waste at source, door to door collection and transportation. Other 3 municipal corporations namely EDMC, SDMC and North DMC have achieved segregation in 3 model wards in each corporation and are in the process to implement the same in rest of the wards (Compliance Report 2020). Total MSW generation in NCT-Delhi is approximately 10817 TPD out of which 10614 TPD is collected (Annual Report 2018-19). 5714 TPD of MSW is treated and 5225 TPD waste is landfilled (Annual Report 2018-19).

There are two waste collection systems running in Delhi (Recommendations 2017). Under one system, collection is done by formal sector (the municipal staff/ authorized party/ private concessionaire). Under the other, the informal sector is responsible for majority of door-to-door collection of garbage, which is further transported to dhalaos after the waste pickers takes up the recyclable fraction. The informal sector is integrated into the collection systems by an informal contractor (Recommendations 2017). The ragpickers play a critical role in the recycling industry and help to recycle tonnes of wastes. This waste generated by the citizens is deposited in the community bin or dhalao either by the citizens themselves or through private waste pickers and the same is taken to various facilities for processing & disposal. ULBs have fixed the responsibilities of Waste generators as given in Table 2. In India, the average composition of MSW is approximately biodegradable: 51%, non bio-degradable: 32%, recyclable: 17% (Planning Commission 2014) whereas in Delhi, the composition of MSW is biodegradable:38%, non Bio-degradable 38%, recyclable 24% (MPD2021). This is primarily because in cities recyclables like plastics, paper, metals etc. are used more often and also due to some public awareness, the organic parts are segregated at source and used for domestic composting. In Fig. 5, the comparison is shown.

Table 2: Responsibilities of individual MSW generators

Waste Generation Source	Respective Responsibility
Households/ Approved Colonies	❖ To compulsorily segregate into wet, dry and domestic hazardous waste
RWAs, Market Associations, Gated communities, institutions with more than 5000 sq.mtr. area, hotels and restaurants	❖ To segregate at source, ❖ Create systems to treat wet waste at source ❖ Channelize dry waste to recyclers ❖ Only inert and non-recyclable waste to be collected from these areas by local authorities
Street Vendors	❖ To segregate waste into wet and dry ❖ Transfer the waste every day to the nearest municipal litterbin or in a collection vehicle designated by local authorities
Meat, Fish and Poultry Shops	❖ Slaughter waste from meat, poultry and fish shops shall be stored separately in a bin ❖ Transferred every day to the nearest municipal litter bin or in a collection vehicle designated by local authorities
Other shops	❖ To segregate waste in to wet and dry ❖ Transfer the waste every day to the nearest municipal litter bin or in a collection vehicle designated by local authorities

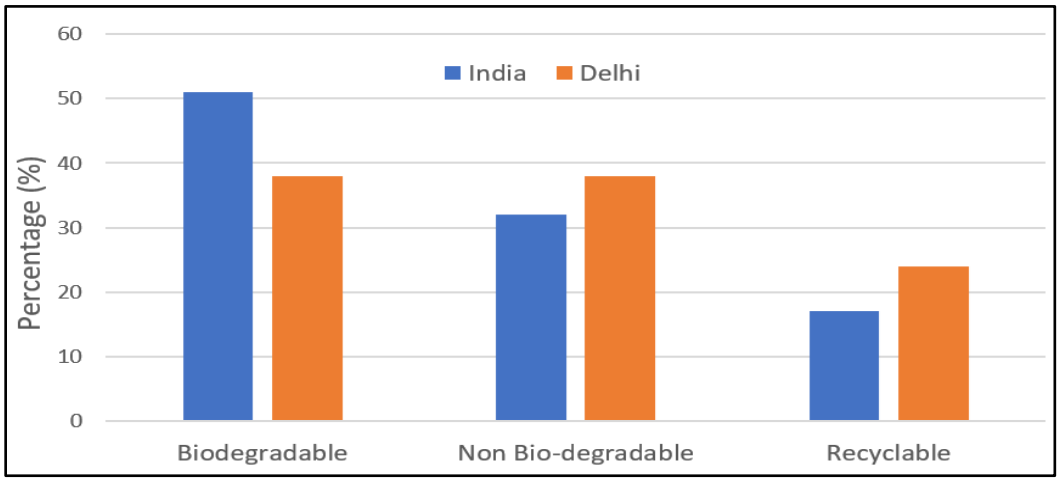

Figure 5: Average composition of MSW for India and Delhi

As per Annual Report 2019-2020 of Delhi Pollution Control Committee, the five ULBs reported the following: approximate MSW generation under their service area is 10470.57 TPD. Out of this 5193.57 TPD is goes for treatment and 5276 TPD is goes to disposal sites. Lifting/ Collection of MSW is 100 % in all ULBs except in DCB area where it is 94%. Around 50%-100% of households are practicing storage of waste at source in domestic bins and households that dump solid wastes on the street in the Delhi are 0% -10% (Annual Report 2018-19). The status of waste generated, collected, segregated and processed has been provided in Table 3 and Figure 6 (Annual Report 2019-2020).

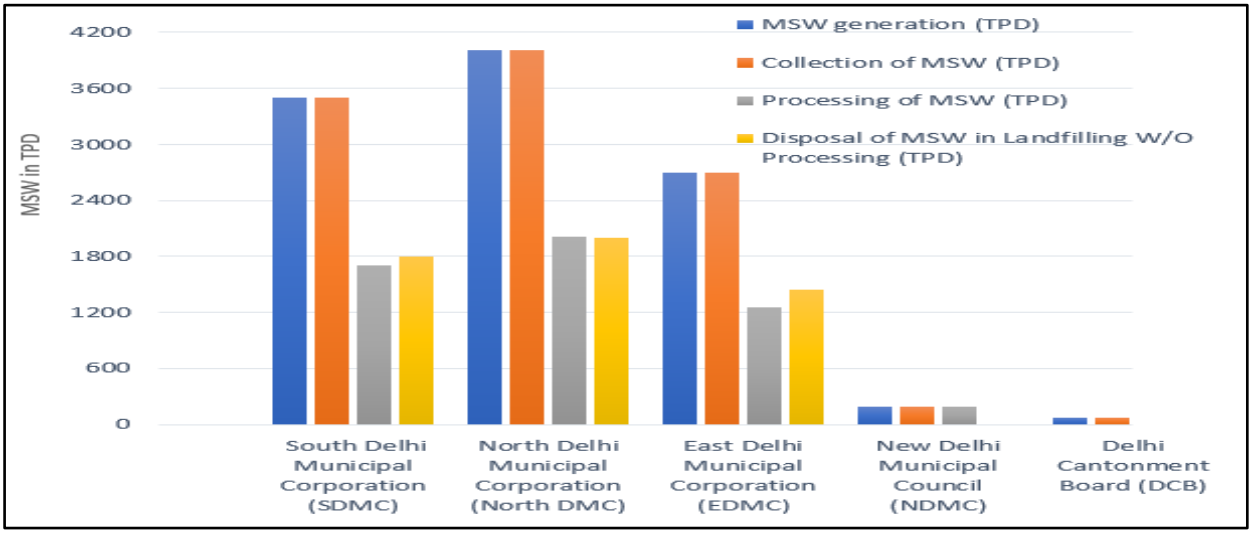

Figure 6: Details of MSW collection, segregation, treatment and disposal by five ULBs

(2) MSW PROCESSING AND DISPOSAL: In Delhi, there are four dumpsites or sanitary landfills at Ghazipur, Bhalaswa, Okhla and Bawana. There is one Integrated Solid Waste Management Facility (ISWMF) at Bawana having

2000 TPD of MSW processing capacity. of having a Waste to Energy (WTE) Plant, a Compost Plant (of 700 TPD capacity) and a Engineered Sanitary Landfill (Compliance report 2020, Annual report 2019-2020). An ISWMF is also at Okhla having 1950 TPD of MSW processing capacity having a WTE Plant, a Compost Plant (of 200 TPD capacity) and a Engineered Sanitary Landfill (Compliance report 2020, Annual report 2019-2020). There is another WTE plant of capacity 1300 TPD at Ghazipur. In Delhi there are total three operational WTE plants with total processing capacity of 5250 TPD (Compliance report 2020, Annual report 2019-2020). Detail of WTE plants in Delhi is given in Table 4.

Table 3: Details of MSW collection, segregation, treatment and disposal by five ULBs

	Name of ULB					
	SDMC	North DMC	EDMC	NDMC	DCB	Total
Approx. MSW generation (TPD)	3500	4013	2700	185.57	72	10470.57
Lifting/ Collection of MSW (%)	100	100	100	100	94	99.96
Segregation at Source (%)	10	80 (In Model Wards only)	10	90	90 (civil area); 60 (army area)	-
Processing (Treatment) of MSW (TPD)	1700	2013	1250	185.57	42	5193.57
Disposal of MSW in Landfilling Without Processing (TPD)	1800	2000	1450	0	26	5276

Table 4: Operational WTE Plants in Delhi

Sl. No.	Waste to Energy Plant Location	Name of Operator	Existing MSW Intake Capacity (TPD)	Power generation Capacity (MW)
1.	Okhla	Timarpur Okhla Waste Management Company Ltd.	1950	23
2.	Bawana	Delhi MSW Solutions Ltd.	2000	24
3.	Ghazipur	East Delhi Waste Processing Company Ltd.	1300	12
		Total	5250	59

One new WTE plant of capacity about 2000 TPD is proposed at Tehkhand and another 1800 TPD in the Integrated Waste Complex at Tehkhand and another 1800 TPD in the Integrated Waste Complex at Ghonda Gujran. After commissioning of these 2 proposed WTs capacity of WTE plants will increase from 5250 TPD to 9050 TPD by 2021 (Compliance report 2020). One Engineered Sanitary Landfill is also proposed to be developed by SDMC at Tehkhand for managing 2000 TPD. An Integrated Solid Waste Management Facility for 2000 TPD is proposed to be developed by EDMC in joint venture with NTPC at Ghonda Gujran. Besides other facilities the said facility will be having WTE plant. Also, a site at Sonia Vihar in the EDMC area has been identified for development of Engineered Sanitary Landfill (Compliance report 2020).

There are some compost plants/ bio-methanation plants operated by the ULBs as part of decentralized waste management Facilities. MSW generated at source is segregated and processed at these sites instead of sending to dump sites. Details of such decentralized plants as on 2019-2020 are given in Table 5 (Compliance report 2020, Annual report 2019-2020). Fig. 7 shows the overall flow path of present MSW collection, segregation, transport and its disposal in Delhi.

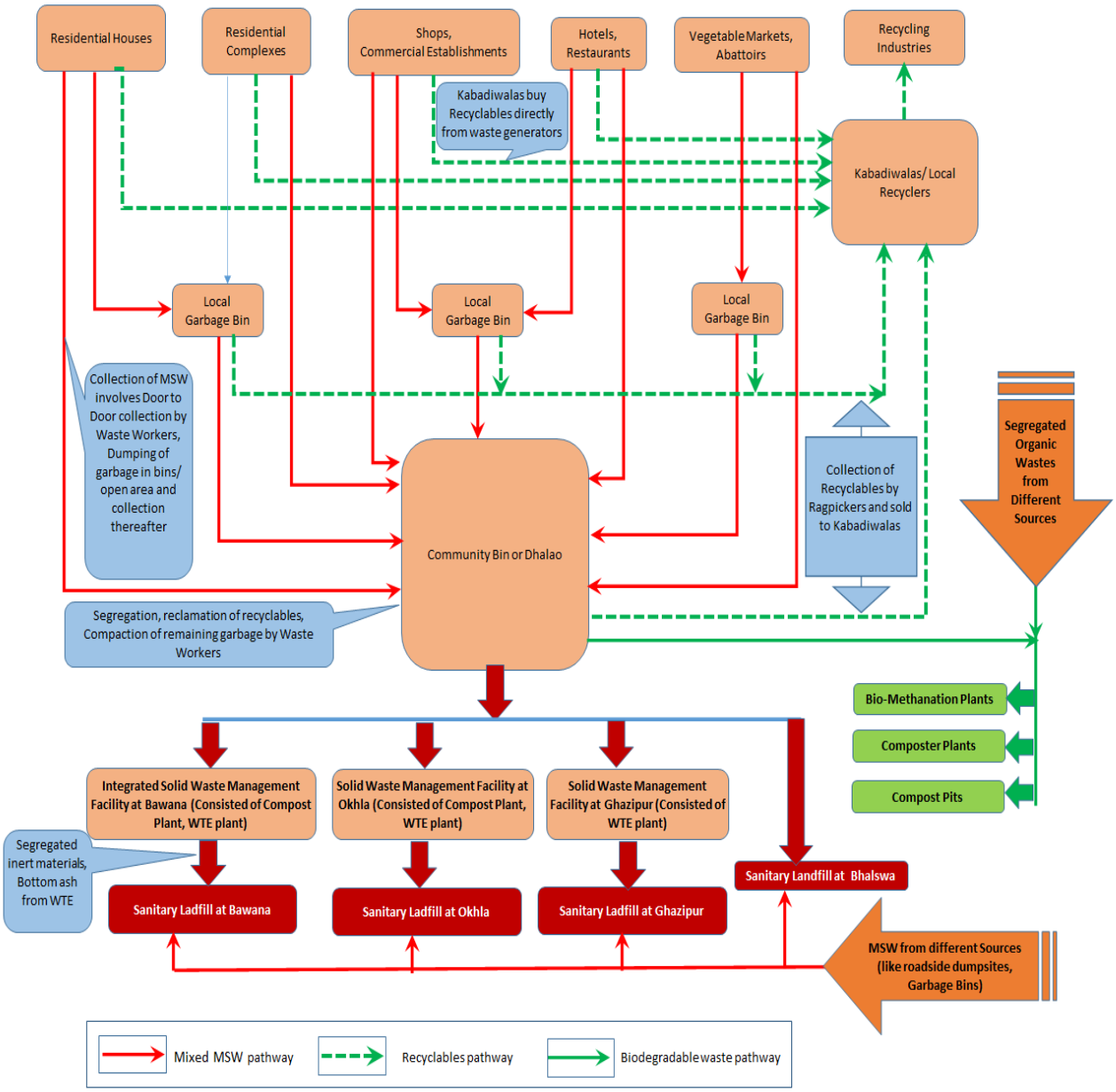

Figure 7: Flow diagram of present MSW collection, segregation, transport and disposal in Delhi

Table 5: Details of the composter/ bio-methanation plants in Delhi (as on 2019-2020)

Sl. No.	Name of ULB	Type of plant	Existing	Proposed
1.	North DMC	Accelerated Composter/ Bio-methanisation Plant 1 TPD Capacity	2 plants already commissioned at Bhorgarh Nursery and Rajendra Nagar Nursery.	4 more plants.
		Bio-Methanation Plants 5 TPD Capacity	2 Plants already commissioned at Roshanara Bagh and MVID Hospital	2 more plants.
		200 TPD Bio-Methanation Plant (Based on Cow Dung)		1 plant at Bhalswa Dairy Colony
2.	EDMC	Composters of 1 TPD capacity	7 plants already commissioned	3 more plants
		Bio-methanation plants – 5 TPD capacity	1 plant at Geeta Colony already commissioned	1 more plant at Shastri Park
		100 TPD Bio-methanation plant		1 plant at Ghazipur
3.	SDMC	4 Nos. Compost Plants of 1 TPD capacity each	2 Plants already commissioned	2 more plants
		Bio-methanation plants – 5 TPD capacity each	2 plants commissioned	2 more plants

FUTURE CHALLENGES AND WAY FORWARD

The problem of solid waste management in Delhi is related to increased population, urbanization, city lifestyles resulting in generation of large volumes of solid waste. The garbage from unauthorized residential areas is not collected by ULBs which results in open dumping on the streets (MPD 2021). By 2036, 100% population will be urbanized in Delhi (Census 2011). As per MPD 2021, the projected average garbage generation in the year 2021 will be 680 g per capita per day and total quantum of solid waste will be 15750 tons/day (MPD 2021). For effective waste management, its segregation at the community and neighborhood level is very much necessary. For this, involvement of rag pickers with residential welfare associations, private parties and NGOs is to be encouraged. For biodegradable and recyclable waste, which is segregated at the source, decentralized treatment at neighborhood level may be adopted, while for non-biodegradable, centralized treatment is acceptable. Adequate land should be allotted for MSWM keeping in view a long-term plan in the Zonal Plans (MPD 2021). Keeping in view the fact that finding new sanitary landfill sites in Delhi is becoming extremely difficult, there is no option, but to search for alternative and decentralized methods of waste treatment, reduction, recycle and use, which include vermiculture, fossilization and composting. Pilot projects have also been taken up by the ULBs. There is also lack of capacity for waste storage at landfill sites and waste processing facilities. The SDMC, North DMC and EDMC lack resources and technical expertise (MPD-2021). There is also lack of awareness about waste segregation, recycle, reuse, reduction and good solid waste management practices. Waste management needs to be regarded in Indian society as a

crucial service requiring sustainable financing. Also funding for waste management must be raised from waste producers through some waste tax (Sunil et. al. 2017). Also, there is lack of political priority for waste management in India (Rajendra et. al. 2012). There is an urgent need to integrate and upgrade the formal and informal sectors and incentivize the collector for collection of segregated waste. There is also need to develop training and capacity building at every level of MSWM.

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