SOLID WASTE MANAGEMENT ACTION PLAN

for

MATHURA-VRINDAVAN

NAGAR NIGAM MATHURA-VRINDAVAN

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ABBREVIATION

BWG	Bulk Waste Generator
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organization
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MTD	Metric Tonne per Day
MVDA	Mathura-Vrindavan Development Authority
NGT	National Green Tribunal
NNMV	Nagar Nigam Mathura-Vrindavan
NUSP	National Urban Sanitation Policy
PPP	Public Private Partnership
RWAs	Resident Welfare Associations
SBM	Swachh Bharat Mission
SFI	Sanitary and Food Inspector
SPCB	State Pollution Control Board
SWM	Solid Waste Management
ULB	Urban Local Body

1. INTRODUCTION TO SOLID WASTE MANAGEMENT

1.1 Definition

Solid Waste Management (SWM) is defined as an organized process of storage collection, transportation, treatment, and disposal of solid waste in a manner that is not detrimental to the environment. The processes involves several collection methods, varied transportation equipment, storage, recovery mechanisms for recyclable material, reduction of waste quantity by methods such as composting, waste-to-energy, recycling and disposal in a designated sanitary landfill.

The selection of a suitable SWM process is driven by the source and quality of waste produced. Solid waste can be generated from a number of sources which include: households (kitchen and yards), commercial areas (shops, hotels, and restaurants), industries (raw material and packaging), institutions (schools, hospitals, and offices), parks (fallen, braches, leaves from trees), and streets (sand, silt, residues from air deposition and dust).

1.2 NGT Order

Hon'ble NGT in OA No. 199/2014 (Almitra H. Patel vs. Union of India) on 05.02.2015 directed that "the Central Pollution Control Board shall submit independent comments in relation to formulation of a National Policy with regard to collection and disposal of the Municipal Solid Waste as a model policy to be adopted. The Court further directed that every status report will specifically indicate if there is even a single district or village in the entire state / UT where the MSW is collected in its entirety segregated and disposed of in accordance with MSW Rules, 2000. It will also be stated as to how the MSW is being converted to an environment friendly beneficial end product i.e. whether it is totally converted in the usable material /component or is it composted or recycled"

1.3 Problems Due to Solid Waste

Accumulation of solid waste in open areas leads to breeding ground for insects and vectors such as rats and mice that can lead to severe health hazards. Apart from linkage to public health, accumulated solid wastes results in an eyesore, diminishes real estate and property value. It also causes odor nuisance, reflects the unorganized nature of the community, and creates a poor

environment for growing children.

Improper disposal of solid waste in open areas and landfills causes contamination of soil, surface water, ground water and generates toxic and green-house gases that negatively impact the living conditions of human being as well as the overall environment. It results in spread of communicable and non-communicable diseases among human beings and animals. However, use of adequate information, resources, and efficient management practices can turn solid waste into a useful resource.

1.4 Current Status of SWM in India

Solid Waste has been a growing concern to the general public and business communities across India. The issue is more aggravating in urban areas due to rapid population growth, coupled by an economic boom that encourages the consumption of goods and hence waste generation. As per Census 2011, the urban population accounts for 31.1 percent of the Indian population. The Local Governing Bodies namely municipalities and municipal corporations are responsible for providing Solid Waste Management services in the urban areas. In most of the urban areas, insufficient funds, use of obsolete and/or inefficient technologies, lack of public awareness, and proper infrastructure have had resulted in a poor state of SWM. All this is changing with certain initiatives by the Government such as the National Urban Sanitation Policy and Swachh Bharat Mission-Urban.

1.5 Initiatives to Improve SWM

The Government of India has taken several initiatives in the recent years to improve the existing SWM practices in the country. Some of the key initiatives are discussed in this section.

1.5.1 Swachh Bharat Mission-Urban

Swachh Bharat Mission-Urban was started by our Honorable Prime Minister of India on 2nd October 2014 with the primary aim of completely sanitizing our cities and urban areas by 2nd October 2019, the 150th birth anniversary of the father of our nation, Mahatma Gandhi. The objectives of the mission include-

- ✓ Elimination of open defecation
- ✓ Eradication of Manual Scavenging
- ✓ Modern and Scientific Municipal Solid Waste Management

- ✓ To effect behavioral change regarding healthy sanitation practices
- ✓ Generate awareness about sanitation and its linkage with public health
- ✓ Capacity Augmentation for ULBs to create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance)

The mission is actively engaging ULBs to take measures to keep the city clean by eliminating open dumping spots and promoting door to door collection of segregated waste. The ULBs are also being supported for setting up scientifically designed solid waste management infrastructure and also land reclamation of erstwhile dumpsites.

1.5.2 Solid Waste Management Rules, 2016

The Government of India published the Solid Waste Management Rules, 2016, the salient features of which are given below.

- ✓ Rules are now applicable beyond Municipal areas and extend to urban agglomerations, census towns, notified industrial townships, etc.
- ✓ Source segregation of waste has been mandated.
- ✓ Responsibilities of Generators have been introduced to segregate waste in to three streams, Wet, Dry and domestic hazardous wastes and handover segregated wastes to authorized rag-pickers or waste collectors or local bodies.
- ✓ Integration of waste pickers/ rag pickers and waste dealers/ Kabadiwalas in the formal system should be done by State Governments, and Self Help Groups.
- ✓ Generator will have to pay ‘User Fee’ to waste collector and a ‘Spot Fine’ for Littering and Non- segregation.
- ✓ Used sanitary waste like diapers, sanitary pads should be wrapped securely in pouches provided by manufacturers or brand owners of these products or in a suitable wrapping material and shall place the same in the bin meant for dry waste/non- bio-degradable waste.
- ✓ All manufacturers of disposable products such as tin, glass, plastics packaging etc. or brand owners who introduce such products in the market shall provide necessary financial assistance to local authorities for the establishment of waste management system and all such brand owners who sale or market their products in such packaging material which are non-biodegradable should put in place a system to collect back the packaging waste generated due to their production.

1.5.3 Swachh Survekshan

Swachh Survekshan is a ranking exercise taken up by the Government of India to assess urban areas for their levels of cleanliness and active implementation of Swachhata mission initiatives in a timely and innovative manner. The objective of the survey is to encourage large scale citizen participation and create awareness amongst all sections of society about the importance of working together towards making towns and cities a better place to live in. Additionally, the survey also intends to foster a spirit of healthy competition among towns and cities to improve their service delivery to citizens, towards creating cleaner cities and towns. The Ministry of Housing and Urban Affairs, Government of India takes up the Swachh Survekshan in urban areas. The Quality Council of India (QCI) has been commissioned the responsibility of carrying out the assessment.

1.6 MSWM Principles

- ✓ Highest Degree of Community participation and community led management of MSW
- ✓ Segregation at Source
- ✓ Waste to value through maximizing recycling
- ✓ Endeavour to achieve zero landfill status
- ✓ Scientific land fill
- ✓ Polluters to Pay

2. CITY PROFILE

2.1 Introduction

Mathura is full of stories of Krishna, his birth and the part of his life he spent there with Radha Rani.The land of Mathura starts from Kotvan near Hodel about 95 km from Delhi and ends at Runkata which is known specially for its association with the poet Surdas, an ardent Krishna devotee long line of picturesque ghats - with their steps leading to the water's edge, arched gateways and temple spires extending along the right bank of the River Yamuna, emphasize the sacred character of the town of Mathura. The birth place of Lord Krishna, "the best known, best loved and most complex of Lord Vishnu's manifestations": Mathura is today, one of the most important place of pilgrimage Before the advent of Buddha the territory that Mathura is located in was called Surasena. In Buddhist literature Mathura is called Madhura. It was also known as Mathera. Mathura was a prosperous city and the capital of a large territory. A Buddhist center was established in Mathura during the reign of the Mauryas dynasty. This center existed for a few centuries. Emperor Ashoka made many Buddha stupas in Mathura on the bank of the Yamuna. Emperor Kaniska in the first century BC and his successors constructed many Buddhist stupas and chaityas. At this time Mathura was the largest city in North India and was the capital city of the area for administration. During these times the present town of Vrindavan was just dense forests without any people living there. In the beginning of the 5th century AD the Chinese traveler Fahien saw twenty viharas (Buddhist monasteries) and three thousand Buddhist priests living in Mathura. By the middle of the 6th century AD Buddhism started to decline in the Mathura area. Many Buddhist relics have been found in the Mathura area. Many of which are found in the museums in Mathura, Calcutta and Lucknow.

2.2 Location & Geographical Area

Mathura geography has a major influence on its climate and topography. Mathura lies between the coordinates 27°41'North latitude and 77° 41' East longitudes. This city in Uttar Pradesh is located on the beautiful banks of the river Yamuna. Mathura, popularly known as centre of Braj bhoomi is 145 km south-east of the capital city of New Delhi. The holy city is just 58 km from Agra, where the beautiful Taj Mahal is located. Mathura and BrijBhumi is the alternative name of Birth place of Lord Shri Krishna and Radha Rani. Mathura without Lord Krishna is like

Bethlehem without Christ. Mathura is located on the western bank of river Yamuna at latitude 27°41'N and 77°41'E. Mathura city is located at a distance of 145 km south-east of Delhi and 58 km north-west of Agra in the state of Uttar Pradesh (India).

Mathura is a city in the North Indian state of Uttar Pradesh. It is located approximately 50 km north of Agra, and 145 km south-east of Delhi; about 11 kilometers from the town of Vrindavan and 22 kilometers from Govardhan. It is the administrative centre of Mathura District of Uttar Pradesh. During the ancient period, Mathura was an economic hub, located at the junction of important caravan routes. Moreover, Mathura is one of the seven most holy places for Hindus in India

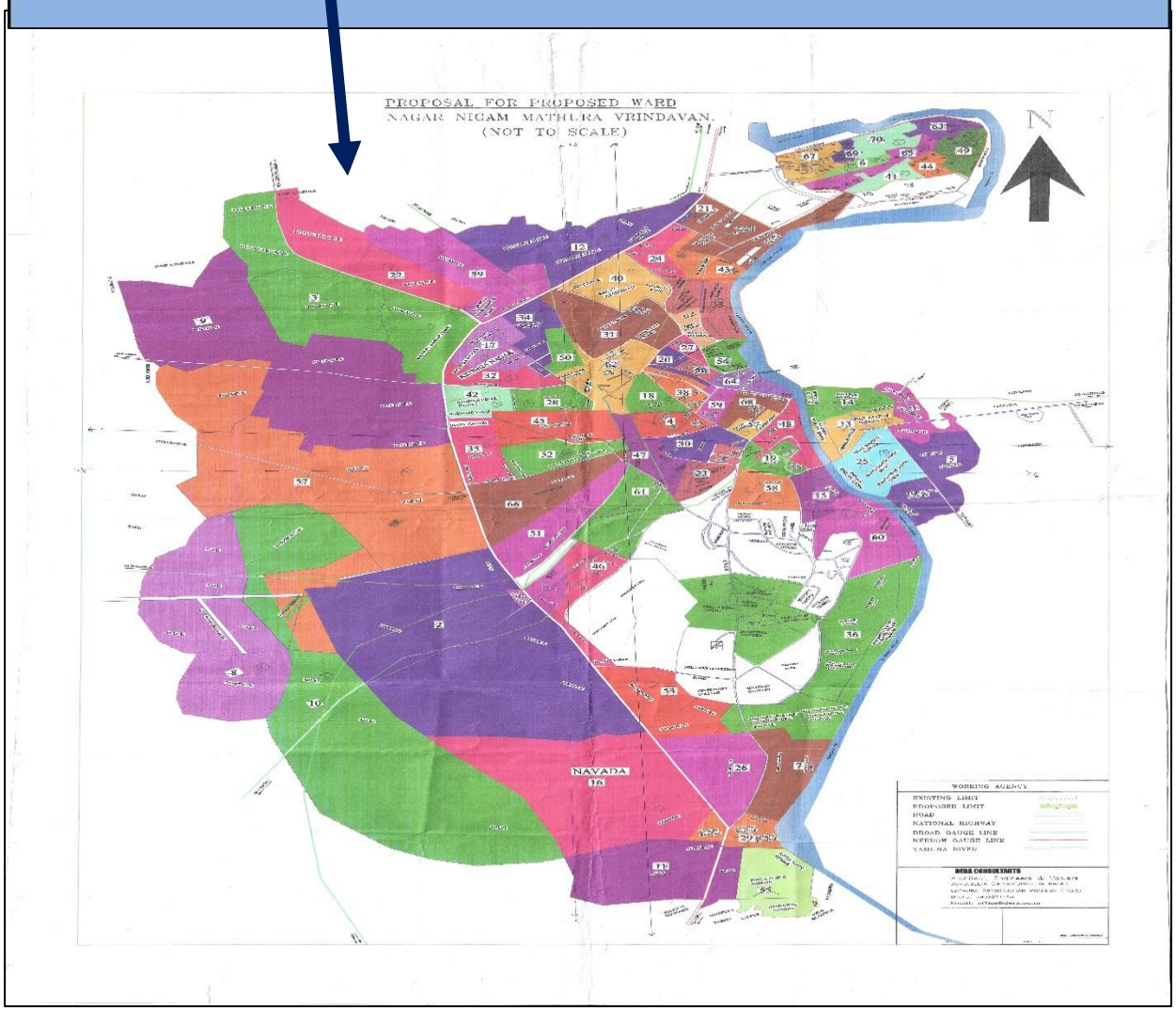
2.3 Historical importance

Located in the western part of Uttar Pradesh, Mathura is a jumble of never-ending lanes teeming with folks, rickshaws and glittering shops. The city is dotted with magnificent temples, most of them dedicated to Lord Krishna, the city's presiding deity and its first citizen. These temples depict various phases of Lord Krishna's life, taking the devotees back to the divine era. Mathura is an important pilgrimage destination of the Hindus and is one of the seven sacred cities of India. Lord Krishna was born around 5000 years ago on this land as an 8th child to Mata Devaki and Vasudeva in the prison cell of the tyrant Kansa, Lord Krishna's maternal uncle. The land is daubed with an enchanting culture, which is enough to capture your heart and touch your soul. Vrindavan is a holy town in Mathura and is the most significant pilgrimage site in Braj region, attracting around 10 million pilgrims every year. It is believed that Lord Krishna spent his childhood here. Even the dust of this holy place is said to be sacred and devotees are often seen smearing it on their forehead. It is believed that Vrindavan was lost over time, until the 16th century, when it was rediscovered by the saint from Nabadwip, Chaitanya, Mahaprabhu, who travelled to Vrindavan in 1515.

2.4 Regional Setting

The city of Mathura-Vrindavan is situated along the bank of river Yamuna. It is located at a distance of 145 km South-East from National Capital Delhi and a distance of about 330 km in South-East direction from state capital Lucknow. The city is well connected by Delhi, Lucknow,

Agra and the other cities of the state by road and railway network. NH-19 is passes through the city.



2.5 Demographic Characteristics

Population of Nagar Nigam Mathura-Vrindavan has increased rapidly from 2001 to 2011 due to the addition of 51 villages in Nagar Nigam Boundary. Population projection for Nagar Nigam Mathura-Vrindavan is shown in below Figure-2.

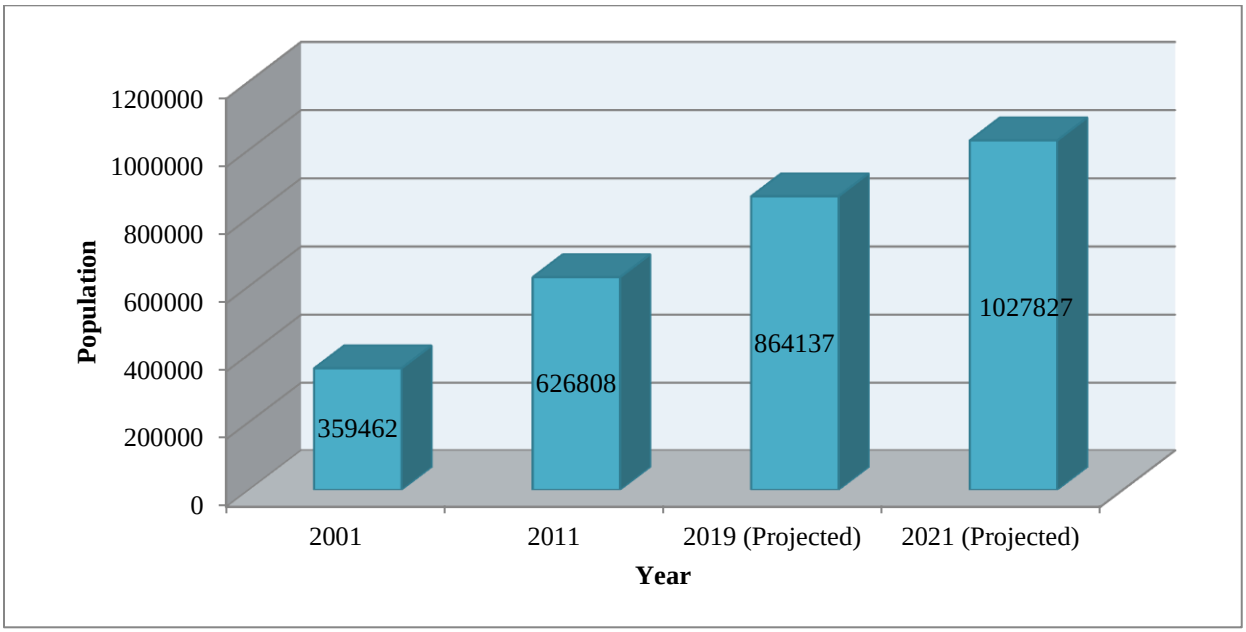


Figure 1: Population graph of NNMV

Table 1: Mathura-Vrindavan City at a Glance

S.No.	Name and Address	Nagar Nigam Mathura-Vrindavan, Mathura
1	No. of Zones	4
2	No. of Wards	70
3	Population (Census 2011)	6,26,808
4	No. of Households (Census 2011)	108483
5	Area under Jurisdiction	165.29 sq. km
6	Location	Between 27°41'North latitude and 77° 41' East longitude
7	No. of Slums (Census 2011)	93 Notified slums
8	No. of Schools	400

9	No. of Hospitals	150
10	No. of Industrial Areas	2
11	No. of Hotels, Marriage Halls , Banquet Halls, Restaurants	550
12	Market complexes/ Malls	50
13	Shops	20000+
14	Mandi - Veg/ Fish/Agri.	3
15	No. of PCTS/Dhalao Ghar	10
16	Location of open points/GVPs	39
17	No. of Parks	10

2.6 Administrative Setup for MSW Management

The area falling under Nagar Nigam Mathura-Vrindavan is currently divided into 4 zones and 70 wards for administrative purposes, the details of which are as below:

Table 2: Zone wise details of wards

Zones	Total Number of wards in zone	Number of wards in zone
Zone 1 North	24	6, 12, 18, 20, 21, 26, 27, 31, 32, 38, 41, 44, 49, 54, 56, 59, 62, 63, 64, 65, 67, 68, 69, 70
Zone 2 South	15	2,8, 10, 11, 16, 34, 36, 37, 45, 46, 51, 52, 53, 61, 66
Zone 3 East	21	1,4,5,7, 13, 14, 15, 19, 23, 24, 25, 28, 29, 35, 43, 47, 48, 55, 57, 58, 60
Zone 4 West	10	3, 9, 17, 22, 30, 33, 39, 40, 42, 50
Total		**70**

The Municipal Commissioner heads the whole NNMV and the department of Solid Waste Management comes under the ambit of Joint Municipal Commissioner. The head of the Solid Waste Management Department is the Municipal Health Officer. At the zonal level it is either Zonal Sanitary Officer or Chief Sanitary and Food Inspector. Wards are grouped and the responsibility is given to Sanitary and Food Inspector (SFI).The Sanitary Supervisor/Beat in-charge manages the Sanitary Worker/Safai Karmcharis. The sanitary workers can be direct, contractual or outsourced. The details of the manpower deployed for SWM in the NNMV are as given below.

Table 3: Manpower Engaged in NNMV for MSW Management

S.No.	Designation	Number
1	Municipal Health Officer	0
2	Chief Sanitary and Food inspector	0
3	Sanitary and Food Inspector	7
4	Sanitary Supervisor	70
5	Sanitary Workers/ Safai Karamcharis	1450

3. CURRENT PRACTICES OF MSW IN NNMV

3.1 Introduction

It has been a fact that cities and towns are littered with garbage (MSW) which gives unaesthetic view at many places in the city. Only important locations of city are maintained thus, leaving many other places choked with uncollected waste. The collected waste is disposed on un-attended landfills or dumpsites and it is almost long way to go ensure that entire waste collected by a city or town is processed and only remnants is disposed through landfill or SWM plant. The municipal solid waste management is a complex issue for Urban Local Bodies but essential and important with respect to public health, environment, and quality of life of the citizens. The Municipal Solid Waste Rules, 2016 warrant and adoption of environment friendly and cost-effective MSW management. The issue of MSW management is becoming sensitive due to various factors such as increase in population, development activities, changes in socio-economic scenarios and improved standard of living etc. The rate of MSW generation is an index of socio-economic development and economic prosperity of the region. Increasing industrialization and rising income levels leads to greater use of resources which further leads to the increased MSW generation and more complex composition of MSW than earlier. Thus, waste quantities as well as composition are inextricably linked to the vibrancy of economic activity and resource consumption pattern of the society which generates the waste. Further, the technologies adopted for MSW management and processing predominantly depend upon MSW quantity, quality and range of variations.

Municipal solid waste management is an obligatory function of the urban local bodies in India. As per the definition provided by the Solid Waste Management Rules, 2016 of GoI, MSW includes residential and commercial wastes generated in Municipal or Notified areas in either solid or semi-solid from excluding hazardous waste but including treated bio-medical wastes.

3.2 Sources and Quantity of Waste Generation

Based on outcome of the discussion and incorporation of various viewpoints of the officials, major problematic areas related to waste generation and its management is identified. After detailed discussions and understanding of the ground realities, the major sources of waste generation have been identified. The exercise was carried out to get the focus points of waste

generation and its management. The major waste generating sources in NNMV are shown below in figure:

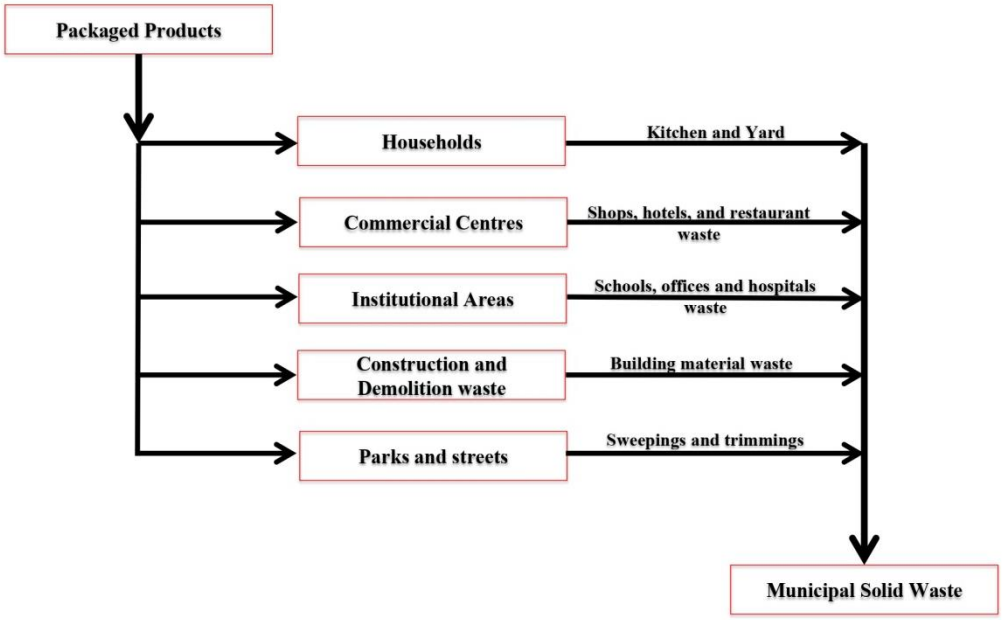


Figure 2: Sources of Waste Generation

Total solid waste generated can be calculated by either weighing all the vehicles carrying waste to the dumpsite or by multiplying city population with suitable quantity of waste generated per capita per day (i.e. 400-500 gm as per CPHEEO Manual).

Table 4: Ward details under NNMV

Ward No.	Ward Name	Ward Population	Number of Household
1	Taiyapur	12460	2155
2	Birjapur	12667	2192
3	Girdharpur	12426	2151
4	Bharatpur Gate	5815	1006
5	Lohwan	12166	2106
6	Gandi Nagar	8659	1499
7	Aurangabad Pratham	9228	1597
8	Tarsi	8740	1513
9	Palikheda	12345	2137
10	Adooki	7419	1284
11	Baad	14559	2520
12	Kota	6510	1127

13	Laxmi Nagar	7527	1303
14	Ishapur	6280	1087
15	Aheer Pada	12593	2180
16	Nawada	5867	1015
17	Krishna Nagar Pratham	6465	1119
18	Badri Nagar	10073	1743
19	General Ganj	7140	1236
20	Arjunpura	9736	1685
21	Charrora	10321	1786
22	Bakalpur	14455	2502
23	Naya Nagla	5990	1037
24	Radhey Shyam Colony	8565	1482
25	Ram Nagar Yamunapar	8658	1498
26	Aurangabad Second	9961	1724
27	Bairagpura	5985	1036
28	Navneet Nagar	7298	1263
29	Ranchi Bangar	12536	2170
30	Bankhandi	11231	1944
31	Govind Nagar	11545	1998
32	Krishna Nagar Second	5797	1003
33	Jaysingh Pura	10987	1902
34	Radha Nagar	7262	1257
35	Baldev Puri	10442	1807
36	Civil Lines	12935	2239
37	Maholi	14486	2507
38	Manopharpura	7039	1218
39	Ganeshra	11894	2059
40	Sarai Ajmabad	7153	1238
41	Gaura Nagar	7972	1380
42	Radhika Bihar	10042	1738
43	Birla Mandir	11881	2056
44	Radha Niwas	6209	1075
45	Dwarika Puri	12702	2198
46	Natwar Nagar	5805	1005
47	Dampier Nagar	7183	1243
48	Holi Gate	11240	1945
49	Patthar Puri	7746	1341
50	Govind Nagar	11833	2048
51	Chandarpuri	10336	1789
52	Pratap Nagar	12545	2171
53	Balaji Puram	11364	1967

54	Gau Ghat	7900	1367
55	Koyla Alipur	6752	1169
56	Mandi Ramdas	6365	1102
57	Koyla Gali	7150	1237
58	Krishnapuri	6477	1121
59	Ghati Bharalay	10791	1868
60	Maliyan Sadar	5115	885
61	Dhouli Pyau	7068	1223
62	Jagannath Puri	5256	910
63	Kesi Ghat	6087	1053
64	Hanuman Teela	5862	1015
65	Mathura Darwaja	6526	1129
66	Shanti Nagar	9904	1714
67	Kaimarwan	5634	975
68	Choubiya Pada	5564	963
69	Ratan Chattri	6430	1113
70	Biharipura	7854	1358
	Total	**626808**	**108483**

The total Municipal Solid Waste generated within the ULB is 389 MTD considering 450 gm per capita per day waste generation for the projected population of 8,64,431 (for the year 2019). Currently, city has floating population of 10% of its current population. In absence of any standard norms for calculating waste generation for the floating population, 10% of the waste will be added to the above calculated waste of 389MTD. Thus, the total waste generated within the ULB is 430 MTD will be considered for this study.

With increase in the urban area, population over the decade has increased manifolds and simultaneously generation of municipal solid waste has also increased vis-a vis per capita generation of waste due to change in socio-economic characteristic of the residents. Solid waste generated trend in accordance with the population since last decade has been shown in Table-4 below:

Table 5: Solid Waste Generation Trend

	2001	**2011**	**Upto 2019**
Population(as per Census)	359462	626808	864131 (projected

			population)
Total Solid waste generated (MTD)	145	282	390
Waste generated per capita (kg per day)	0.40	0.45	0.45

3.2.1 Commercial Area

At Present in municipal limits no commercial area is authorized by Mathura-Vrindavan Development Authority (MVDA). There are more than 20,000 shops in municipal limit. There are some malls and shopping center in NNMV includes Highway Plaza, City Centre Mall, Moti Manzil, S.N. Tower Shopping Mall etc. Major commercial areas in NNMV are listed in below table.

Table 6: Major Commercial Areas in NNMV

Ward No.	Name of Commercial Area	Ward No.	Name of Commercial Area
23	Vikas Bazar	32	Krishna nagar
61	Dhauli Pyau	35	Maholi Road
70	Bankhandi Mahadev Market	57	Chhata Bazar
69	Harinikunj Chowk	28	Kanakali Bhuteshwar Road
48	Holi Gate	67	Bankey Bihari Complex and Market
64	Chauk bazar	47	Saunkh Adda
49	Rangnath Market	38	Deeg Gate
4	Bharatpur Gate	67	Ramanreti Market
44	Chungi Chowk	70	Loi Bazar

3.2.2 Hospitals & Nursing Homes

There are more than 150 Hospitals, Nursing Homes, 200 Medical Clinics, 40 Pathology labs, 50 Dental Clinics and more than 1000 Private Doctors listed within the corporation limits. But the actual numbers of these medical services are more than the listed figures.

Biomedical waste generated in these locations includes used syringes, cotton, human and animal tissues, apart from domestic waste. As per the Biomedical Waste Management Rules, 2016, Bio-medical waste has been classified in to 4 categories instead of 10 to improve the segregation of waste at source. These agencies have to pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilization on-site in the manner as prescribed by the World Health Organization (WHO) or National AIDs Control Organization (NACO) guidelines and then sent to the common bio-medical waste treatment facility for final disposal.

Few hospitals have in-house facilities for incineration of biomedical waste. The list includes hospital such as Nayati Hospital. Other hospitals hand over their waste for incineration to the authorized agency.
Currently, NNMV has not authorized any agency for collection, transportation and safely disposed off of biomedical waste generated within the Municipal limits.

3.2.3 Street Sweeping and Drain Silt

The length of roads, streets, lanes, bye-lens in the city is approximately 1500 km. Street sweeping starts between 7:00 AM and continues up to 2:00 PM. The sweepers are provided with jhadoo (brooms), pans, favda, hand-carts, panji (bamboo stick used to clean nalas [drains]), gayti (pointed favda to clean roads), and buckets to clean drains. During the sweeping process one sweeper cover an area of 5000 sq.m. of roads and adjacent drains. They collect the waste on road sides.

The major portions of the drain silt are generated by throwing of the household sweepings/ part of the street sweeping in the small drain flowing across the various streets and gullies. Some silt formation also happens through the blowing of the construction and other debris lying alongside the drains. The drain silt typically comprises dust, household waste, sweepings, construction waste etc. The drains are cleared of the accumulated solid waste twice or thrice a week/even fortnightly in a few parts of the city. The cleared waste is left for drying for one to two days adjacent to the drains. The street sweepings and the drain silt is collected in handcarts by the safai karmacharis of NNMV and deposited at nearby dhalao ghars/storage bin.

From where it is loaded into containers by JCBs and taken to Laxmi Nagar plant for processing

and disposal. The vehicles used for transportation of MSW start at the workshop in the morning hours. Labor and fuel to each of these vehicles are provided in the workshop itself, when the waste collection process begins. The vehicle drivers are supposed to make an entry in the log register, when they return in the evening in the workshop. These entries include details about the amount of fuel issued, fuel used, number of hours worked and timings and the route taken.

3.2.4 Religious Places

Mathura-Vrindavan boasts of Hindu religion, as Mathura is the birth place of Lord Shri Krishna. Tourist from all over the India and world visit Mathura and Vrindavan and number of tourist or tourist outfall in NNMV increases manifolds during the weekend and on holidays. Temples generally generate a lot of organic waste in the form of used flowers. Nagar Nigam Mathura-Vrindavan is planning to utilize these flowers for making incense sticks and sell them through an NGO. There are few NGOs in Vrindavan which used wet waste generated from temples for the making of paper, incense sticks and compost. List of major tourist spots in Mathura-Vrindavan is shown in table below.

Table 7: Major Tourist Spots

S.No.	Ward No.	Tourist Places	S.No.	Ward No.	Tourist Places
1	67	Iskon Temple	**10**	49	Tatiya Sthan
2	65	Govind Dev Temple	**11**	70	Radha Ballabh
3	69	Madan Mohan temple	**12**	63	Nidhivan
4	70	Radha Damodar Temple	**13**	49	Rangnath Temple
5	70	Sewa Kunj	**14**	48	Vishram Ghat
6	70	Radha Shyamsunder	**15**	70	Bankey Bihari Temple
7	70	Shah Bihari Temple	**16**	63	Keshi Ghat
8	62	Shri Krishna Janam Bhoomi	**17**	49	Katyani Temple
9	48	Dwarikadeesh Temple			

3.2.5 Bulk Waste Generators

BWG means and includes buildings occupied by Central Government departments undertaking, State Government department or undertaking, local bodies, hospital, hotel, school, college, RWAs etc having an average waste generation rate exceeding 100 kg per day. Some BWGs in

NNMV are listed in table 8.

Table 8: List of BWGs

S.No.	Ward No.	Name of BWG	Location
1	54	Agarwal Sewa Sadan	Vrindavan Gate
2	40	Brijwasi Lands Inn Hotel	Masani Byepass, Mathura
3	54	Kedardham	Masani Road
4	40	Radha Ashok	Masani Byepass, Mathura
5	24	Wingston Hotel	Masani Byepass, Mathura
6	31	Shikar Guest House	Govind Nagar, Mathura
7	31	Hotel Green Land	Mahavidya, Mathura
8	62	Radhika Guest House	Potra Kund, Mathura
9	33	Radha Rani Complex	Jaisingh Pura, Mathura
10	27	Hotel Dignity	Masani Road, Mathura
11	47	Mukund Hotel	Dampier Nagar,Mathura
12	47	Brijwasi Royal	Dampier Nagar,Mathura
13	47	Hotel Hera Invitation	Dampier Nagar,Mathura
14	64	Brijwasi Godam	Hanuman Tila, Mathura
15	38	Taj Hotel	Daresi Road, Mathura
16	27	Mukund Vatika	Masani Road, Mathura
17	57	Brijwari Mithaiwala	Holi Gate, Mathura
18	19	Shankar Mithaiwala	Holi Gate, Mathura
19	48	Swami Narayan Mandir	Campu Ghat, Mathura
20	47	Yogiraj Hotel	Dampier Nagar,Mathura
21	66	Brijwasi Centrum Hotel	Near Bus Stand, Mathura
22	70	Bankey Bihari Temple	Vrindavan
23	67	Iskon Temple	Raman Reti, Vrindavan
24	48	Dwarkadeesh Temple	Vishram Ghat, Mathura
25	62	Shri Krishna Janam Bhoomi	Mathura
26	70	Damodar Temple	Raas Mandal, Vrindavan

27	70	Sewa Kunj	Sewa Kunj Road, Vrindavan
28	63	Nidhi Van	Vrindavan
29	34	Nayati Hospital	Goverdhan Chatikara Byepass, Mathura
30	17	Radha Valley	Krishna Nagar, Mathura
31	51	Goverdhan Palace	Opposite Narholi Thana, Mathura

3.2.6 Construction and Demolition Sites

The quantity of Construction and Demolition wastes generated varies from time to time depending upon the construction or demolition activities in Mathura-Vrindavn. At Present there is no mechanism adopted by the NNMV for the collection and processing of C &D waste generated within the municipal limit. The individual generating construction waste generally engages private vehicles to collect the construction waste and dump it elsewhere in the city for a nominal cost or they directly dumped into the nearby low lying areas or in any open place. From where NNMV authorized vehicle collect the construction and demolition debris by JCB tippers/tractors or in hydraulic three wheelers owned by NNMV.

3.3 Primary Collection of Waste

Door to door Collection of Municipal Solid Waste in Nagar Nigam Mathura-Vrindavan is outsourced to private companies for all 70 wards. Out of 70 wards only 44 wards are covered under door to door collection partially and households in rest wards have dumped their waste in nearby dustbins or secondary collection points. Fringe areas within the Nagar Nigam have faced main problems due to deficiency of dustbins or secondary collection points as these are the newly added villages in the ULB.

Table 9: Door to Door collection and Coverage in Wards

S.No.	Ward Number under door to door collection	Percentage to Ward Covered under door to door collection
1	4	70
2	5	50
3	13	60

4	40	60
5	24	70
6	28	75
7	46	70
8	47	80
9	52	60
10	66	70
11	19	40
12	27	70
13	31	75
14	39	60
15	64	40
16	11	30
17	16	70
18	17	50
19	20	60
20	23	60
21	25	70
22	32	75
23	34	70
24	35	80
25	42	60
26	45	70
27	48	30
28	50	70
29	51	75
30	54	60
31	56	40
32	57	30

33	58	60
34	61	80
35	59	70
36	62	90
37	6	80
38	41	70
39	44	90
40	49	90
41	63	70
42	65	70
43	69	80
44	70	80

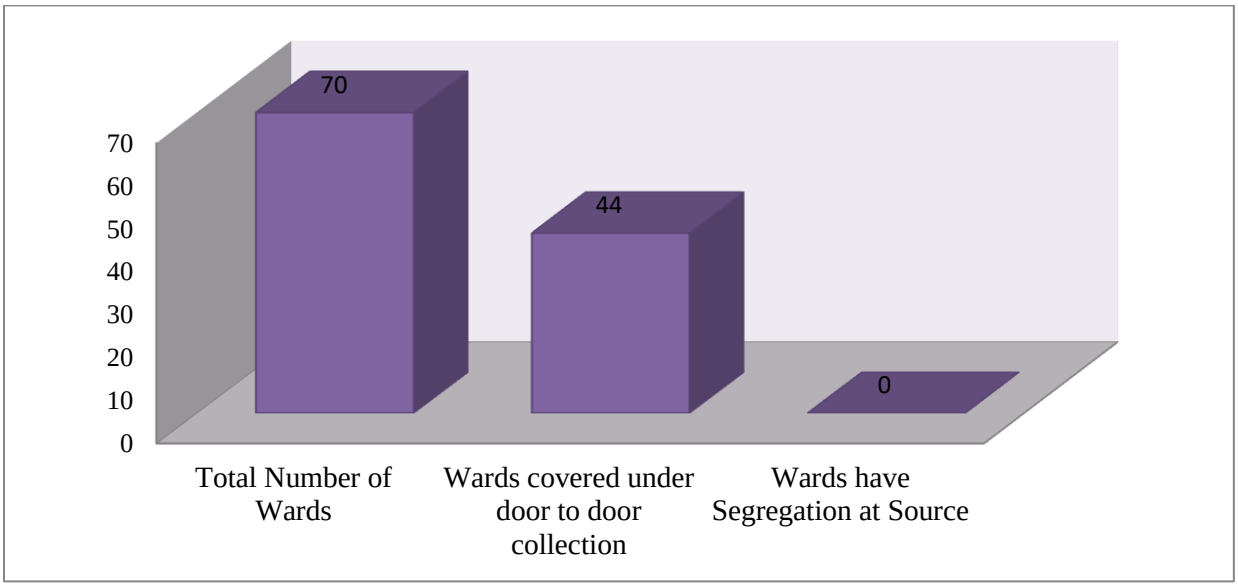


Figure 3: Door to Door Waste Collection Coverage in Wards

There is a mechanized and semi-mechanized door to door collection activity in residential areas by deploying tricycle (rickshaw) and tipper vehicles. The households of some areas individually transport their waste to the secondary collection points. Sanitary workers driving tricycles collect the waste from households and commercial areas and dump it at secondary collection points

(dumper placer/ refuse collector) whereas tipper drivers collect the waste and transfer it directly to the plant or dumping ground.

The waste is collected by handcarts, tricycle, tipper, and tractor-trolley. All the hanging dustbins are cleaned by Nagar Nigam Sanitary Worker on a daily basis or an alternate day depending upon the location. In addition, there are some unauthorized open areas where households throw their wasteonto streets, drains and in open spaces within the localities, due to lack to proper collection system and civic sense, which creates unhygienic condition for living. Lack of door to door collection is one of the main reason this situation. Another issue in door to door collection of waste is non-performance of some of the local sanitary worker (informal worker) which creates problem during the collection of waste at household level, leaving that area un-served.

3.3.1 Gap Analysis-Primary Collection

- ✓ Organized system of primary collection of waste is non-existent as the proper system of storage of segregated waste at source is yet to be developed.
- ✓ Segregation of the collected waste at household level is not being practiced at large scale, leading to mixing of waste and entrainment of recyclable waste being dumped without its full recovery.
- ✓ Absence of adequate manpower, regulated transport, narrow streets and financial constraints are some of the reasons that are deterring 100% door to door collection.
- ✓ Synchronizing with the storage of waste at source is first essential step towards better solid waste management.
- ✓ The system is non-functional as people throw the wastes on the streets and the grounds outside the community waste storage points, forcing to double handle the waste through street cleansing.
- ✓ Sanitary workers beats are not decided as per any work norms. Therefore, they don’t work as per standard requirements.
- ✓ The charges to be levied are not collected in an efficient manner.
- ✓ Sanitary workers sweep the streets and transport the waste up to collection points but drains abutting streets are not being cleaned by them on time.
- ✓ The tools and equipments are insufficient and inefficient. The designs of equipment mainly un-containerized tippers are required to be containerized.

- ✓ Only important roads swept on daily basis, roads in market places, public places are swept twice a day while the other roads/ streets are not swept regularly.
- ✓ Primary collection system is not adequate leading to backlog of waste at certain locations resulting in complaints from the inhabitants.

3.4 Secondary Storage System

Nagar Nigam Mathura-Vrindavan, has two types of community bins available: a dumper placer bin and refuse collector bin having capacities of 4.5 cum and 1.1 cum respectively. The frequencies of cleaning of these bins are daily or in alternate days depending upon the area. These bins are placed at convenient locations in residential and in commercial areas as people can easily access these bins to dispose their waste in an appropriate manner.

The waste collected by the handcarts and rickshaw (under door to door collection) transfer their waste into these storage bins. The collection vehicles- dumper placer and refuse collector picks up these bins and transfer the waste directly to plant/ dumpsites.

Placement of the containers is decided on availability of space, past practice and personal preference. There is an immense pressure against placing of the these bins as most of the containers are not cleared in time; more waste remains scattered around the bins, sometimes due to bins completely filled and sometimes people throw their waste from a distance which falls on the ground creating unhygienic condition, attracting stray animals mainly cows and monkey scurrying through the waste in search of eatables. Few of the collection points are on open plots or along the roads which is a cause of bad odour, proliferation of flies, mosquitoes, degradation of quality of ground water and other diseased vectors. The present system is not sufficient to meet the requirement of waste generation within the ULB.

Dhalos which are located at various places in the ULB are removed as these create nuisance, grazing of animals, flies and during rainy seasons waste from these dhalos flows to the drains along with water thereby choking the drains.

In addition of the above hanging dustbins which are placed in all commercial areas in NNMV at a distance of 50 to 100 m, also have cleaning problem as these are not cleaned on regular basis

except some major commercial areas. Sometimes cows and monkey break the dustbins and throw the waste outside the dustbins in search of eatable items.

3.4.1 Gap Analysis - Existing Storage System

- ✓ Many of the collection points are located on the roadside, the spill over from these collection points are making the whole are filthy. Moreover, the lifting of the wastes from these areas is also done once in a day, keeping the dirt lying whole day creating nuisance and congestion to the passing traffic.
- ✓ Most of the households, shop and commercial establishments are often found throwing solid waste on the street at random hours and around the secondary collection points and not into it and thus littering the roads, streets etc.
- ✓ The spacing of the containers in many places is not satisfying the requirement of CPHEEO norms.

3.5 Waste Transportation System

Nagar Nigam Mathura-Vrindavan has refuse collector, dumper placer, tippers, tractor trolleys, which are in operation presently for transportation of waste to plant and dumpsite located at Laxmi Nagar, Mathura and Vrindavan respectively. There are hydraulic tipper with manual loading are managed by drivers with one sweeper for waste collection from door step. There are various models of trucks which imply that planning and inventory for spares is a costly proposition. These vehicles for the purpose of transportation of solid waste in NNMV have already been considered, while assessing additional number of vehicles for collection and transportation of solid waste from different areas/localities NNMV area. Due to inaccessibility of some localities, there is multiple handling of waste and hence type and design of vehicle used is to be evaluated but presently numbers of refuse compactor and mechanized dumper placers are being used on a limited scale.

Tractor-trolleys are also used for transportation of the waste. Earlier there were regular complaints from the localities because of spilling of garbage during the transportation. To avoid this all open transportation vehicles were covered by the thick material after the loading of waste so that no spilling of garbage occurs during waste transportation. Since tricycles, handcarts and manual lifting of waste is being practiced, setting up of transfer station is required. Hydraulic

vehicles need proper preventive maintenance and there is a need for specialized and trained personnel for their maintenance which would source for efficient and better services. Waste accumulated in the community containers are removed by open body tippers and tractor-trolleys. The present system of waste transportation is manual and multi-handling system.

As the collection and transportation of waste is outsourced to private agencies in NNMV so, scheduling of trips and routing of the refuse vehicles is done in unscientific and uneconomical manner. Since all the tippers are functioning properly, manual loading and unloading has become a common practice. The number of trips made by the vehicles per day is reduced due to manual loading and unloading, which is time consuming. Hence most of the vehicles make only 2-4 trips per day against the scheduled 5-6 trips. The combined average waste carrying capacity of all vehicles ranges from 2-8 MT per day and the total waste thus transported is about 200 MTD form the NNMV area. The list of the transportation vehicles is provided in table below:

Table 10: Vehicle Details

S.No.	Type of vehicles	Number
1	Handcart	550
2	Tricycle	50
3	Tipper	53
4	Refuse Collector	9
5	Dumper Placer	2
6	Tractor-trolley	35
7	JCB Loader	15

3.5.1 Gap Analysis: Waste Transportation System

- ✓ No route had been prepared for the collection and transportation of waste in the wards;
- ✓ Transport system is not fully synchronized with the system of waste storage facility;
- ✓ All types of mixed waste including construction and demolition waste are recovered by transport vehicles;
- ✓ There are no standby vehicles for deployment during periodical maintenance or breakdown of vehicles in service.

- ✓ The vehicles are not properly covered by the sanitary workers which result to spreading of foul smell and lighter waste material being spilled along the way;
- ✓ No dedicated transportation system for collection of drain silt from drains;
- ✓ In absence of any weighbridge for weight, exact information about actual waste transportation is not available;
- ✓ Most of the transport system is dependent on manual labour attached with each vehicle as well as on mechanized means;
- ✓ Transport vehicles are also old due to which regular breakage happens causing a lot of problems.

3.6 Treatment and Disposal System

Currently there is one waste to compost plant facility available in the NNMV but due to some issue with the previous company plant is not in running condition. Besides this, there is a dumpsite available in Vrindavan. All the collected waste within the ULB is dumped at two locations-one is in Waste to Compost plant in Mathura and other is at dumpsite in Vrindavan having areas of approx. 6.5 and 1.0 hectares respectively. From the past 3-4 years all the waste is dumped at waste to compost plant without any processing, which causes degradation of ground water quality in-surrounding areas due to percolation of leachate generated from the waste. On the other hand dumpsite in Vrindavan is properly designed and the leachate generated from the waste will be penetrating into the ground. There is no scientific landfill site available in NNMV. Other impacts associated with the sites are:

- ✓ The site is a breeding ground for vermin which gives rise to foul odour. Incineration is common which causes health impact to the nearby areas and also degrade environmental quality
- ✓ The health of the sanitary workers involved in manual unloading of waste is affected due to non-availability of protective gears
- ✓ Rag pickers collect the recyclable materials from these sites, which poses serious health impacts to these rag pickers

3.6.1 Gap Analysis-Waste Disposal Practices:

- ✓ A large quantity of waste ultimately finds access to a major source of environmental pollution. During monsoon, leachate directly enters into the ground.
- ✓ Present method of waste disposal is unscientific. The waste in mixed form is dumped without any processing and covering.
- ✓ Construction and demolition waste, biomedical waste and other kinds of waste are currently getting access along with other waste;
- ✓ Leachate control or recovery of biogas is not being practiced.

3.7 Informal Waste/Rag Pickers:

Rag picker or informal waste collector is someone who makes a living by rummaging through refuse in the streets to collect material for salvage. Scraps of cloth and paper could be turned into cardboard, broken glass could be melted down and reused, and even dead cats and dogs could be skinned to make clothes.

In NNMV jurisdiction limits, many rag pickers are identified who collect dry waste which are recyclable (like glass, metal, tin, can, plastic bottles etc.) and sell these materials to their bound vendors. These rag pickers have a positive impact on waste management as these rag pickers collect the useful materials from the waste getting discarded by the households.

NNMV has currently identified these rag pickers and formalized them into the solid waste management process.

3.8 Overall Gaps in Existing MSW Management with respect to SWM Rules, 2016

The SWM rules 2016 have laid out very detailed and specific criteria for management of solid waste. It has also laid down the guidelines, guidance notes and specific work standards to be adopted by Municipal personnel or personnel involved with solid waste management for organized SWM practices (starting from waste collection, segregation, transportation, to environmentally safe waste disposal practices). As per Solid Waste Management Rules, 2016, the following activities have to be completed within the stipulated time frame from the date of publishing the rules which is from April 2016.

3.8.1 Lack of Segregation at Source

The waste generated in Nagar Nigam Mathura-Vrindavan area is not being segregated at the source before being handled by the waste pickers. As per the CPHEEO Manual, 2016 on SWM, waste generators should segregate and store the waste generated by them in three separate streams namely bio-degradable/wet waste, non-biodegradable/dry waste and domestic hazardous waste in suitable bins namely green, blue/white and black respectively and handover segregated waste to authorized waste pickers or waste collectors. Segregation of waste is the key to the most of the problems associated with solid waste management. This can be achieved by regularly sensitizing of citizens through IEC and Capacity Building activities and programs.

3.8.2Primary Collection of Solid Waste to be improved

NNMV through third party organization has initiated the provision of door-to –door collection of the solid waste service to its residents in all 70 wards in the ULB. The waste whether segregated or non-segregated is collected by the waste pickers into tricycle or auto tippers. Though the service is available in 44 wards but some households still prefer to dump the waste in open spots, drains and streets. Steps are being undertaken to bring them to the ambit of door to door collection by sensitization as well as penalizing.

3.8.3Transportation of Solid Waste

Trucks, tractor-trolleys, and auto tippers in NNMV are covered during the transportation of waste but due to improper covering of these vehicles light waste like plastic and paper waste get scattered on the road. To overcome this problem proper mechanism are adopted like waste transportation vehicles must be covered at all times expect while loading and unloading activities and the loaded waste should not exceeded the permissible capacity of the these vehicles. Moreover, loading and unloading of waste is done manually and sanitary workers involved in this activity do not use any Personal Protective Equipment (PPE) for their protection.

3.8.4 Decentralized Treatment of Waste to be undertaken

Decentralized treatment of waste has to be prompted. Decentralization will reduce the load of transportation and also increase the lifetime of the landfill/ plant/ dumpsite and waste management facilities. Space in a plant/dumpsite is a precious resource. It will also indirectly

promote segregation. A decentralized waste management unit ideally consists of a compost yard for wet waste and a Material Recovery Facility (MRF) for storage of dry waste. Among the dry waste, recyclable waste will be sold to recyclers and rest of the waste can be forwarded for plant/dumpsite.

3.8.5 Bio-remediation or Bio-mining of old and abandoned dump sites

The solid waste collected in NNMV over many years was used to be dumped in plant located at Laxmi Nagar, Mathura. Detailed Project Report had been prepared by the Third party agency for treating the legacy waste, bio-remediation of the waste dumped at plant and land reclamation. The work on this project is expected to start soon. The project is expected to be completed in 2 years.

3.8.6 Lack of awareness among city residents

Public participation is very essential in successful implementation of the MSW management plan in the ULB. Therefore, a concerted effort is required to bring about awareness among the public and make them realize their responsibilities as individuals and as a community. In summary, public awareness, community participation, transparency and accountability in administration, at all levels is the need of hour so as to ensure success of any MSW management plan.

3.8.7 Integration of Informal Waste pickers

Integrating informal waste pickers into an improved SWM system would mean their co-existence with the private players and ULB. As this would give them job security as the entry of private agencies (companies as well as contractors) into waste management could hamper their livelihood.

The only sustainable way to upgrade and protect the livelihoods of the informal waste pickers is to involve them in a formal waste management system. It is proposed to involve them in decentralized waste management systems of compost yards and MRF. For this they will be enumerated, surveyed, trained and employed through SHGs and identity cards will be provide to them by the NNMV.

4. SOLID WASTE MANAGEMENT ACTION PLAN

4.1 Introduction

This chapter provides an action plan for the remaining work to be taken up in order to achieve the objectives of the Solid Waste Management Rules, 2016. The primary objectives include the following:

- ✓ Compulsory segregation of waste at source
- ✓ 100% door to door collection of solid waste
- ✓ Waste to be covered at all stages of handling
- ✓ Decentralized processing and treatment of waste
- ✓ 100% collection, transportation and treatment of construction and demolition waste
- ✓ Promotionof information, education and communication across the stakeholders to ensure system efficiency and sustainability

The waste streams have been classified as domestic waste, commercial waste, C&D waste, biomedical waste, e-waste and street sweepings & drain silt. As per SWM rules, 2016, BWGs must make their own arrangements for managing their wet waste to the extent possible. The management aspects of these streams of wastes have been depicted in the figure below and discussed in detail in this chapter.

Through IEC dissemination citizens will be sensitized towards waste reduction, waste segregation, door to door collection, anti-littering, home composting, handling of domestic hazardous wastes, etc. Behavior Change Communication is the key to achieve these targets.

Citizens will be encouraged to segregate waste at household level, compost the wet component and handover the dry waste to Kabadiwallas for recycling. The remaining waste will be handed over to the waste pickers who in turn will deposit it at PCTS. Those who don't have space/will for composting and access to Kabadiwallas can simply segregate the waste and hand it over to waste pickers who will collect it at their door step. The wet waste will be composted at one of the compost yards created at parks/gardens or spaces created exclusively for composting. The dry recyclables will be sorted and stored in Material Recovery Facility (MRF) and later sold. Only the left over inert waste will be taken to Portable Compactor Transfer Station (PCTS) and

compacted and then taken to landfill for disposing. This will greatly reduce the cost of transportation and also ill effects of concentrating all the wastes in a single place.

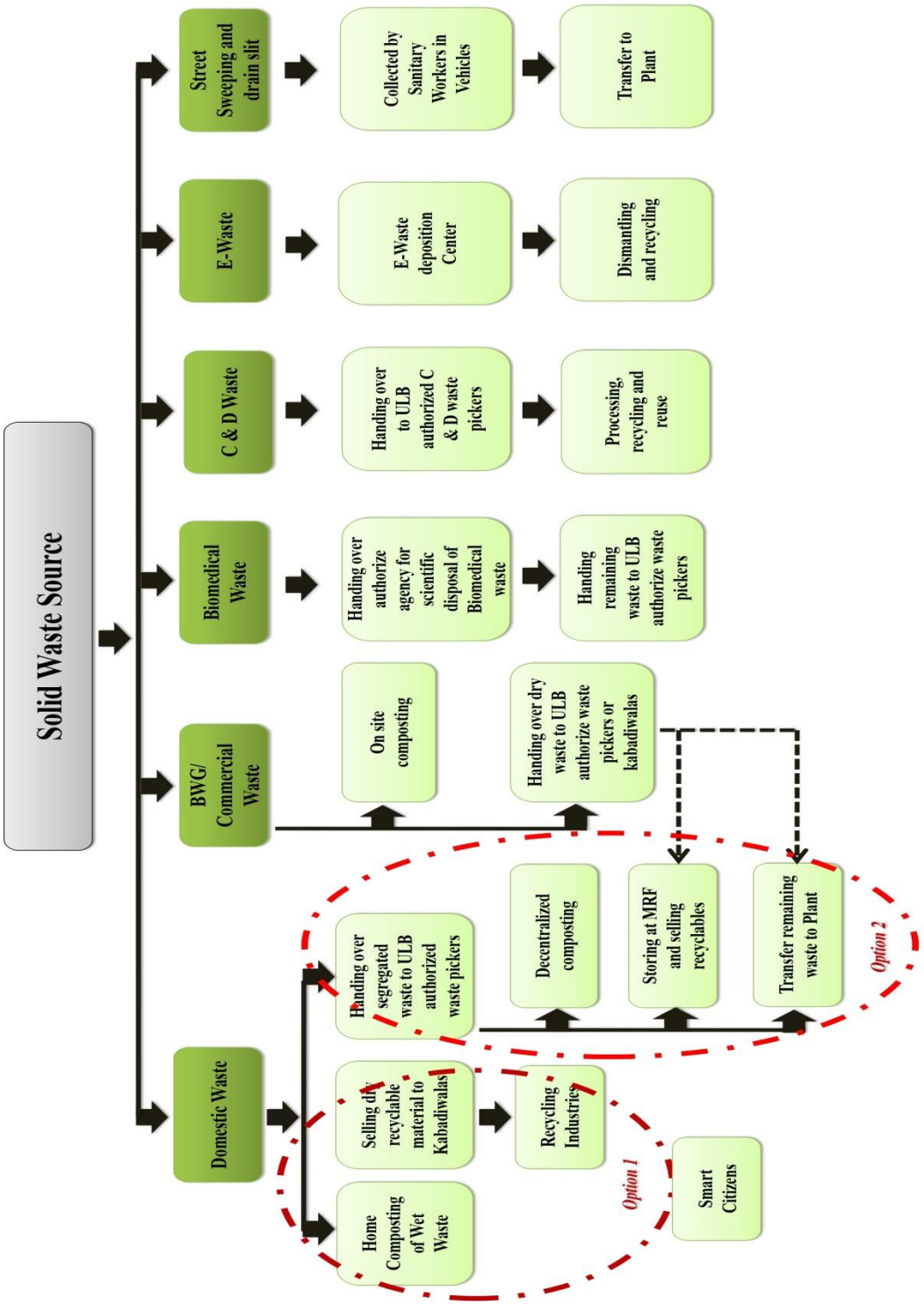


Figure 4: Management of Solid Waste

4.2 Creation of Solid Waste Management Clusters

To facilitate 100% door to door collection and decentralized processing and treatment of waste, it is envisaged to further divide wards into SWM clusters. Working at cluster level will improve service delivery efficiency and faster grievance redressal.

A cluster will ideally consist of 200 Households and may vary based on geography and other factors of the wards. Planning of manpower, infrastructural services and IEC dissemination will be done at the cluster level in order to reach out to every citizen and penetrate every household effectively thus improving service delivery of door to door collection. Decentralized treatment of waste will cut down the huge costs involved in transportation of crude waste and also extend the life of landfill/plant by saving precious space. The proposed number of clusters has been given in Table 11. In all 552 clusters have been planned to be formed.

Table 11: Cluster Details

Ward No.	Ward Population	Number of Household	Proposed Cluster
1	12460	2155	11
2	12667	2192	11
3	12426	2151	11
4	5815	1006	5
5	12166	2106	10
6	8659	1499	7
7	9228	1597	8
8	8740	1513	7
9	12345	2137	11
10	7419	1284	6
11	14559	2520	13
12	6510	1127	6
13	7527	1303	7
14	6280	1087	5
15	12593	2180	11
16	5867	1015	5
17	6465	1119	6
18	10073	1743	8
19	7140	1236	6
20	9736	1685	8
21	10321	1786	9
22	14455	2502	13
23	5990	1037	6

24	8565	1482	7
25	8658	1498	7
26	9961	1724	9
27	5985	1036	5
28	7298	1263	6
29	12536	2170	11
30	11231	1944	10
31	11545	1998	10
32	5797	1003	5
33	10987	1902	10
34	7262	1257	7
35	10442	1807	9
36	12935	2239	11
37	14486	2507	14
38	7039	1218	7
39	11894	2059	10
40	7153	1238	6
41	7972	1380	7
42	10042	1738	9
43	11881	2056	10
44	6209	1075	5
45	12702	2198	11
46	5805	1005	5
47	7183	1243	6
48	11240	1945	10
49	7746	1341	12
50	11833	2048	10
51	10336	1789	9
52	12545	2171	11
53	11364	1967	10
54	7900	1367	7
55	6752	1169	6
56	6365	1102	6
57	7150	1237	7
58	6477	1121	6
59	10791	1868	9
60	5115	885	4
61	7068	1223	6
62	5256	910	5
63	6087	1053	5
64	5862	1015	5

65	6526	1129	6
66	9904	1714	8
67	5634	975	5
68	5564	963	5
69	6430	1113	6
70	7854	1358	7
Total	**626808**	**108483**	**552**

4.3 Planning at Cluster Level

It is proposed to achieve 100% door to door collection of solid waste in all the 552 clusters and initiate decentralized waste treatment wherever possible. But first citizens will be encouraged to segregate the waste into wet waste, dry waste and domestic hazardous waste. Citizens will be given option of home composting of their wet waste, selling dry waste to Kabadiwalla and rest to waste pickers. The citizens who do this would be given known as 'Smart Citizens' and all citizens will be encouraged to become one. Those citizens who don't prefer this can directly hand over their segregated waste to the authorized waste pickers.

Extensive IEC/BCC activities will be done to motivate all residential and commercial establishments to segregate waste. Citizens and RWAs will be sensitized to segregate wastes into wet, dry and domestic hazardous wastes. The segregated wet, dry waste and domestic hazardous wastes will be collected separately in bins mounted on manual rickshaws, e-rickshaws or mechanical vehicle and taken to the decentralized waste treatment unit. The committees that will monitor at each level are represented in the diagram below:

The above figure shows that 200 households will be organized into one cluster. NNMV has 108483 households in their jurisdiction as per Census 2011, hence there will be around 552 clusters. The cluster level committee will have two members of which one will be mandatorily a female. A ward level sanitation committee will be formed to supervise the clusters and will be responsible for overseeing the progress being made at the cluster level. The ward level committee will be headed by Ward Councilor and members will include SFI, Swachhata Protosahan Samitis, other BWG representatives etc. These ward level committee will be further organized into a zone level sanitation committees headed by Zonal Officers. The members of zone level committee will be CSFI, BWGs representatives, Religious leaders etc. Finally, all the

committees will be associated into a city level committee headed by the Mayor, Municipal Commissioner. It will include Municipal Commissioner, Additional Municipal Commissioner, Joint Municipal Commissioner, Executive Committee members, Ward Councilors, BWG representatives (Hotel Associations, RWA Association, Hospital Associations, Institutions etc.) as members.

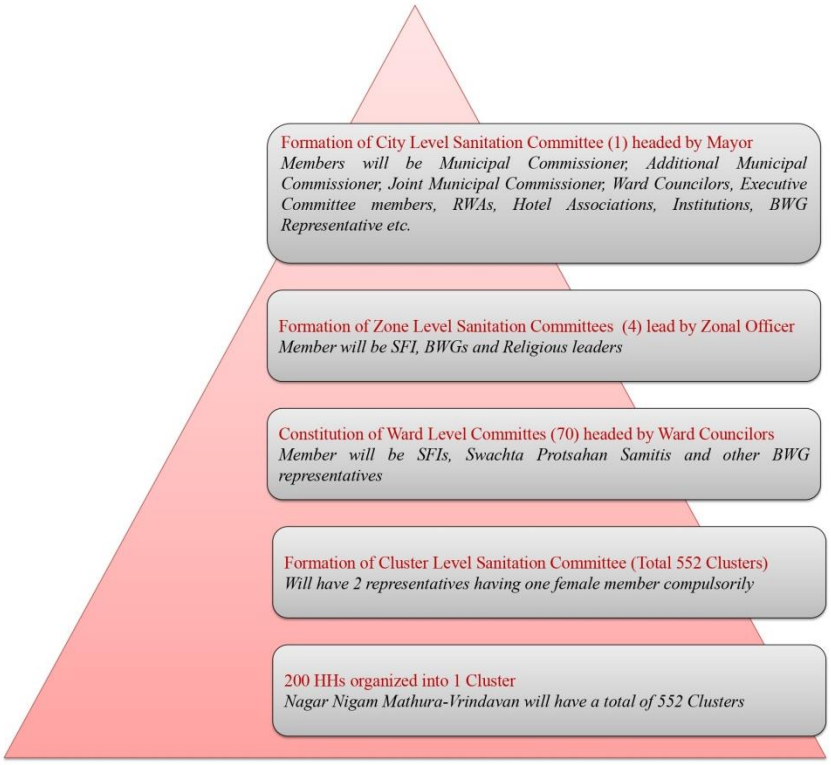


Figure 5: Formation of Committees details

4.4 Establishment of MRF and Compost Yards/Pits

A decentralized waste treatment unit would be setup ideally by making clusters of wards. The unit will consisting of material recovery facility (MRF), a composting unit or both. They will be located based on space availability and accessibility from the respective cluster of wards. The details of location of MRF and compost pit are given in below table:

Table 12: Locations of MRF and Compost Pit

Ward Number	Ward Name	Location
25	Ram Nagar	Baldev Adda, Yamuna paar

7	Aurnagabad-I	Near Barrage, Aurangabad
31	Govind nagar	Near Ram Leela Ground
16	Nawada	Near Overhead tank, Nawada
24	Radhey Shyam Colony	Concor Teela
9	Pali Kheda	Palli Khera
49	Pattharpura	Behind Hazarimal Somani College ground
21	Charrora	Near Dumping Ground, Vrindavan

MRF is a facility where non-compostable solid waste is temporarily stored to facilitate segregation, sorting and recovery of recyclable waste from various components of waste. A compost pit/yard is a place where controlled microbial decomposition of organic matter happens. Suitable sites for this purposed will be identified. The infrastructure cost for setting up one MRF is approximately Rs. 20 lakhs. Some of the MRF will be running directly by NNMV whereas some will be operated on PPP mode.

Waste collected will be transported to the MRF and compost yards once it starts functioning. At the MRF dry waste will be further segregated into paper, plastic, cardboard, etc and stored. After a sufficient quantity gets accumulated, it will be sent/ sold for recycling. Wet waste will be transported to the compost yard where it will be composted in a suitable method. Manpower for running MRF and compost yard will be sourced locally by tapping the current unorganized sector involved in waste management. Kabadiwallas and rag pickers will be enumerated and their associations/SHGs will be created and they will be formally involved to run these units.

Integrating Waste Pickers into an Improved SWM System would mean they co-exist with the private players and ULB. As this would give them job security and the entry of private agencies (companies as well as contractors) into waste management would not hamper their livelihood.

The only sustainable way to upgrade and protect the livelihoods of the informal waste workers is to involve them in a formal waste management system. A model of waste management thus developed will integrate the informal waste workers, while at the same time offering better accountability and cheaper services to the citizens. This model will also improve their working conditions and the respectability of their work.

After segregating wet and dry recyclable waste, only the left over inert waste will be transferred to the Portable Compactor Transfer Station (PCTS) where it will be loaded into containers and hook loader and then taken to landfill. Based on the number of households in each cluster, cluster level requirement of vehicles and manpower for door to door waste collection has been estimated and given in the table below.

4.5 Responsibilities of Bulk Waste Generators

Bulk Waste Generators(BWGs) means and includes buildings occupied by the Central government departments or undertakings, State government departments or undertakings, local bodies, public sector undertakings or private companies, hospitals, nursing homes, schools, colleges, universities, other educational institutions, hostels, hotels, commercial establishments, markets, places of worship, stadia and sports complexes having an average waste generation rate exceeding 50 kg per day but could be modified with respect to ULB. All BWGs will be instructed to segregate their wastes and make arrangements for treatment at their own premises. Wet waste can be composted on site and dry waste can be sold to recyclers. All hotels and restaurants should segregate biodegradable waste and ensure that it is utilized for composting / bio- methanation in a standalone or a common plant. All Resident Welfare and market associations, gated communities and institution with an area >5,000 sq. m. should segregate waste at source into valuable dry waste like plastic, tin, glass, paper, etc. and handover recyclable material to the authorized recyclers. The bio- degradable waste should be processed, treated and disposed of through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the waste collectors or agency as directed by the local authority.

4.6 Information Education and Communication for Solid Waste Management

The quintessence of Swachh Bharat Mission-Urban incepted in 2014 is the Social Behavior Change Communication to sensitize Indians about cleanliness/sanitation and its linkages to public health through IEC activities. The Information, Education & Communication (IEC) strategy aims to create awareness and disseminate information regarding the benefits available under the schemes/programmes to guide the citizens on how to access them. The IEC strategy is supposed to cater to the different needs of the urban masses through various tools used for communication.

One of the key elements to the success of SBM is the effective implementation of the Information, Education and Communication (IEC) strategy. City shall prepare an annual action plan, with details of City level funding commitment, for Public awareness & IEC. At least 50% of the IEC fund in each annual plan, as approved by State HPC, must go to the ULB's for IEC activities at the grass root level. HPEC at State level shall be the competent authority to authorize and delegate administrative powers for use of the state level funds within the approved plan. ULB's shall be competent to spend the minimum 50% part of the ULB level funds, as per approved plan.

4.6.1 Four Es of Behaviour Change: Educate, Encourage, Empower and Enforce:

Change in behaviour is not a change that can be witnessed overnight. It is a time consuming and lengthy process that can be brought about with the concerted efforts at different levels; public, mobilizers of behavior change agents, development agencies and concerned authorities etc. The process from the lack of awareness stage to the final stage of improved behavior amongst people has been depicted below:

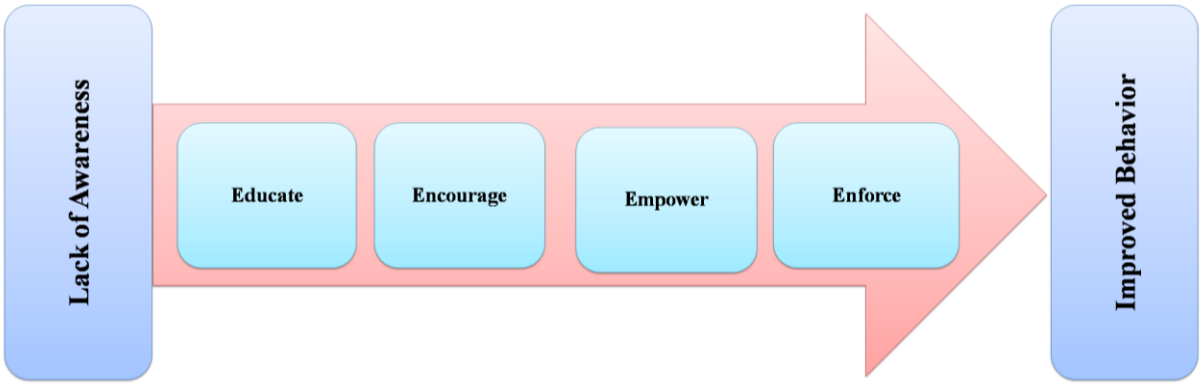


Figure 6: 4 R's of Behaviour Change

The first step is to *Educate* people about what, why, where, when and how's of sanitation practices with regards to SBM Urban goals and objectives. To *encourage* is the second step that aims to inspire, encourage and raise the spirits of people to adopt the new behaviours in their lives on day to day basis. Thirdly, emphasis will be laid to *empower* the masses with the knowledge on cleanliness and sanitation, how smallest of the good habits imbibed and internalized in people can prevent them from stress emerging due to recurring health issues

amongst the society. And last one is to *Enforce*, where all the concerned stakeholders will play their role in making NNMV a clean and green place to live in.

4.6.2 Stakeholder's engagement in Implementation of IEC Strategy

The implementation of the IEC plan will revolve around various stakeholders involved in the process. The stakeholders will be sensitized and mobilized to demonstrate their engagement with high levels of commitment. The details of these different stakeholders along with their roles and responsibilities are given below table-13.

Table 13: Stakeholders Engagement

Level	Stakeholders
State Level	State SBM Team, Sanitation Consultants, IEC Experts/Consultants(Government and private)
Nagar Nigam Mathura-Vrindavan	Mayor, Municipal Commissioner, Additional Municipal Commissioners, Municipal Health Officer, Zonal Officers, Sanitary and Food Inspector, Sanitary Workers, etc.
SwachhataProtsahanSamiti	Committees formed for cleanliness and sanitation will be engaged in implementation of the IEC and SWM plan.
SVM , PSPL and Evirozone and Instrumentation Pvt. Ltd. (Agency outsourced for Door toDoor Collection)	Management Staff and the staff engaged in collection, segregation and disposal of waste
CSOs, NGOs and other development institutions engaged with SBM (U)	Members , consultants and other team members for SBM

4.6.3 Designing of IEC/ Communication Materials

Communication material for bringing about a change in behaviour for door to door collection of waste and segregation of waste under the solid waste management will be developed. These

IEC materials will be designed in synchronization with the needs and requirements of the targeted audience. The developed IEC materials will be used in communication activities for sensitizing the public for massive awareness. These include SWM Brochure, pamphlets on SWM, roles and responsibilities of bulk waste generators, home composting methods etc.

4.7 Capacity Building and System Strengthening

Training and capacity building in good IEC techniques is needed at all levels to ensure that the right messages are getting to the right people in the most effective and cost effective manner. There is a strong need for training and capacity building for IEC as the perception of officials, support agencies and implementing authorities needs to be aligned with an IEC focus for SWM and critical aspects of waste prevention and waste reduction as a priority. Training and capacity building is to ensure that the thrust of IEC campaigns is primarily on prevention and minimization rather than disposal which would be secondary. The capacity building plan is as given below:

Table 14: Capacity Building Plan

Target Groups	Duration	Total No. of Batches	No. of Participants	Topic of Training
Orientation of Nagar Nigam Staff	2 Hours	7	200	Solid Waste Management, SWM Rules, Roles of ULBs in SWM, Source Segregation
Orientation of Clusters	2 Hours	Weekwise coverage has been given in IEC Plan	552 Clusters	Source Segregation and Home Composting
Orientation of BWGs	2 Hours	Through Sensitization and Awareness Drive across the city	200 +	Roles of BWGs in SWM, Source Segregation and On-site Composting

Contents of Training:

- ✓ Concept and Practice of Solid Waste Management
- ✓ Roles of ULBs in SWM
- ✓ Solid Waste Management Rules2016
- ✓ Home Composting
- ✓ Process of Clustering and their nomenclature

As given in the IEC plan, 70 clusters in week 1 of April 2019 will be covered for orientation on SWM Rules 2016, segregation of waste and home composting. Similarly remaining clusters will be covered and the coverage of the clusters will range from 100 to 150 clusters every week. It is proposed to sensitize all the clusters by the end of June 2019. It is expected that after the sensitization process is completed, the segregation of waste will be done by the households. The Nagar Nigam Mathura-Vrindavan with the support of technical assistance team will monitor the sensitization and implementation of these IEC activities in order to ensure that the citizens are practicing the waste segregation process.

4.7.1 Orientation of Nagar Nigam Staff

It is proposed to carry out orientation of the manpower available at the Nagar Nigam who are engaged in the implementation of SBM, door to door collection of waste, Engineers, Zonal Officers, Sanitary and Food Inspectors, Sanitary Workers etc. They will be oriented for one day on Solid waste management, SWM Rules 2016, home composting and roles of ULBs in SWM.

4.7.2 Orientation of Clusters

On similar lines, all the representatives of clusters will be oriented on the contents. This will be done to ensure all the clusters are aware about the solid waste management. This increase in the awareness levels on SWM will aid them in discharging their duties are sincere citizens committed to a better quality of living.

4.7.3 Orientation of BWGs:

Bulk waste generators will also be capacitated on the concept of SWM, SWM Rules and their roles & responsibilities as a BWG. They will be made responsible for segregation of their waste on their own. Further, they will be introduced to onsite composting methods to manage and handle their waste being generated in bulk quantity on daily basis. Nagar Nigam will ensure that segregation of waste and their treatment at source is being done. According to SWM Rules 2016, they will also be asked to pay fines if the expected responsibilities are not being

discharged effectively. This will sort out the sanitation issues of the BWGs.

4.7.4 Home Composting: An ideal remedy for handling wet waste

Composting is a controlled process involving microbial decomposition of organic matter. This has emerged as an ideal remedy for handling the wet waste. If the wet waste is composted at the household level, in parks, onsite composting is done by BWGs then about 40 % of the waste will be treated on the spot. This will lessen the burden on the local authorities or the outsourced agencies in the transportation and disposal of wastes.

Let us make a new beginning, let us practice home composting

Therefore, during awareness raising, individuals and groups in all the 552 clusters will be sensitized to practice segregation of domestic waste and compost the bio degradable waste. The ward having the highest number of households practicing home composting will be awarded an appreciation certificate by the Nagar Nigam.

4.7.5 Anti- Littering

Littering is the practice of throwing garbage in public places. In order to prevent this, the National Green Tribunal has instructed the authorities to impose a fine of Rs 10,000/- on any person, hotel, resident, slaughter house, vegetable market etc. that throws waste over any drain or public place. It has been made a statutory obligation for all authorities to ensure that waste is collected, transported and disposed of in accordance with the Solid Waste Management Rules, 2016. All major sources of municipal solid waste generation should be directed to provide segregated waste and handover the same to the corporation in accordance with rules.

4.7.6 Innovative activities

Research and innovations have time and again attracted the interest of people. Hence, few innovative activities are also being planned to be carried out amongst the people. This will enhance their willingness and enthusiasm levels to adopt the segregation at home practices. Some of the innovative activities are listed below:

a) ***Home Composting Exhibition:*** A week long exhibition on home composting can be organized at the city level. Different stakeholders involved in the process can visit the

exhibition and benefit from the information being shared here. Citizens will get to know about various recycling methods to recycle the waste generated in the households instead of depending on the civic body. We can hire a team of 2 people to teach SWM with emphasis on segregation of waste in one school in all 70 wards and in turn put pressure on parents.

b) ***Sensitizing Children in Schools on Composting:*** Schoolchildren will be encouraged to learn the best solid waste management practices. Coined as 'Let us make a new beginning, let us practice home composting', the initiative persuades households with children to recycle waste at home. If more students in a school were found practicing home composting, winners would be identified through a lot. The school will award certificates to their students who are found recycling waste at home.

c) ***Social Media:*** Team at the Nagar Nigam will manage social media platform to engage citizens on a wider scale. The social page created on Facebook will further shoulder the responsibility of sensitizing public on a large scale by updating the public with the actions being taken by the corporation.

d) ***Development of a Model Ward:*** The concept of model ward is being proposed with an intent to specially focus on one ward in each zone while working collectively in all the 70 wards of the city. The best practices carried out in hygiene and sanitation in the model ward will be later on replicated in other wards. A model ward in each zone will be identified from 70 wards of the city. The indicators on which the wards will be developed as a model ward will be:

- ✓ All the households are aware segregating the wet waste
- ✓ All the wet wastes generated by the households are being composted at pre-decided spots
- ✓ 100% children in all the schools are aware about segregation of waste and methods of home composting
- ✓ Decentralized composting is practiced across the ward
- ✓ All the dry waste materials are reaching the material recovery facility and the ward has adequate number of MRFs to cater to the needs of the residents.

The team will focus on developing the chosen wards on all the above mentioned indicators. After achieving success in the selected wards, good practices will be

documented and replicated in other wards of the city. Regular monitoring and ongoing supportive supervision will be done to ensure the success in the selected ward. The table below details out the schedule for implementation of various IEC activities.

Annexure 1: Action Plan for IEC and Capacity Building

Category	Activities	Target Group	Topic	April	May	June	July	August	September	October	November	December	Total No. of batches/activities
Institutional Strengthening	Orientation on Concept of SWM, SWM Rules 2016 and Role of ULBs under SBM(U)	Zonal Officers, SFI and Supervisors etc.	SWM Rules 2016, Segregation of Waste Bin +1 bag concept	3	4	-	-	-	-	-	-	-	7
	Inclusion of SWM concepts and practices in training of 1348 Sanitary Workers	Sanitary workers of NNMV	Cleanliness, use of safety gears, segregated collection of waste	7	7	-	-	-	-	-	-	-	14
	Orientation of waste collectors for door to door collection of segregated waste	Waste collectors of SVM, PSPL and Envirozone	Segregated Collection of waste	2	-	-	-	-	-	-	-	-	2
IEC Activities	Door to door campaigning, demonstration of	People with emphasis on women	Segregated collection of waste and home	100	150	200	102	-	-	-	-	-	552

	source segregation and concept of 2 bin and 1 bag system		composting										
	Role Play on the importance of SWM and how to manage waste	People with emphasis on women	Segregated collection of waste and home composting	10	10	20	20	10	-	-	-	-	70
	Development and distribution of SWM brochure, pamphlets, home composting methods etc. in IEC activities	Residents under the ambit of NNMV	SWM door to door collection and segregation of waste and home composting	-	10	15	15	15	15	-	-	-	70
Ward Level Activities	Beautification of Government school toilets in all wards	1 school in each ward	Beautification of toilets in Government schools	-	10	10	10	10	10	10	10	-	70
	Sensitizing all the hospitals through posters on processing and treatment of BMW	All the hospitals	Process to manage BMW at their premise	10	15	15	20	20	20	20	20	10	150
	Monitor the GVPs and sensitizing the people for anti-littering	People throwing garbage at	Prevent littering of waste	-	10	10	10	10	10	10	10	-	70

		GVPs											
	Distribution of Twin Bins		To promote at source segregation of waste	-	-	-	√	√	√	√	√	√	0
IEC Activities at Zone Level	Already covered un SWM Action Plan		To promote at source segregation of waste and composting	√	√	√	√	√	√	√	√	√	0
IEC Activities at NNMV Level	Advertisement through hoardings, brochures and banners on SWM and source segregation at major places	NNMV City and City Dwellers	To promote at source segregation of waste and composting	√	√	√	√	√	√	√	√	√	Ongoing
	Promotion of source segregation on TV, FM, Newspaper, etc.	City	To promote at source segregation of waste and composting at parks, RWAs, etc.	-	-	-	√	√	√	√	√	√	Ongoing

	Ringtones of CUG Numbers	Mobile Users	To promote at source segregation of waste and composting	-	-	-	√	√	√	√	√	√	Ongoing
Innovative Activities	Selection of a model ward in each zone and working on IEC and sanitation components	1 ward from each zone	Total population of ward	-	-	4	-	-	-	-	-	-	4
	Organization an exhibition on Home composting to promote household segregation and waste recycling with particular emphasis on participation from all the schools	Residents and school children in the selected wards of all the 4 zones	Home composting for recycling of waste	-	1	1	1	1					4

Annexure II Action Plan for Solid Waste Management for NNMV

		April				May				June				July				Aug	Sep	Oct	Nov	Dec
#	Category	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4					
A	Information Collection and Planning Phase																					
	Ward wise collection of baseline data of all 70 wards																					
	Formation of cluster @ 200 (552 Nos.) and providing a number to these clusters																					
	Preparing a route chart , manpower and vehicle analysis for planning on sensitization of all the																					

	clusters																					
B	Information dissemination and Sensitization Phase																					
4	Sensitization of different stakeholders on SWM Rules, 2016 segregation of waste and home composting as given below:																					
a	Office Staff/ Sanitary Workers																					
b	Clusters																					
c	Schools																					
d	Slums																					
e	RWAs																					
f	Hotel Association																					
g	Hospital																					

	Associations																					
h	Market Associations																					
i	Institutions- MVDA, Awas Vikas, Railways																					
j	Universities and Colleges																					
k	Vending Association and Kabadi Associations																					
l	Marriage lawns/ banquet halls/petrol pumps																					
m	Religious leaders																					
n	Distributors and stockists of plastic products																					
C	Solid Waste Management																					

5	Formation of cluster committees at cluster level, ward level, zone level and city level																				
6	Segregation of waste																				
a	Practice of segregation of waste at HH level (70 wards/552 clusters)																				
b	Collection of segregated waste																				
7	Treatment of wet waste (composting)																				
a	Identification of place for de-centralized composting of waste																				

b	Setting up places for decentralized composting																					
c	Construction of compost pits in all the parks under the ambit of NNMV for composting where RWAs don't have facility of composting																					
d	Linking the clusters with parks for composting and remaining clusters with decentralized composting spots																					
8	Treatment of Dry Waste (MRF)																					
a	Identification of land for																					

	establishment of MRF																				
b	Development of infrastructure for MRF																				
c	Deployment and capacity building of human resource																				
d	Start of MRF																				
e	Ensuring smooth functioning of all MRF																				