Compendium of documents to facilitate preparation of detailed project reports on SWM in Uttar Pradesh

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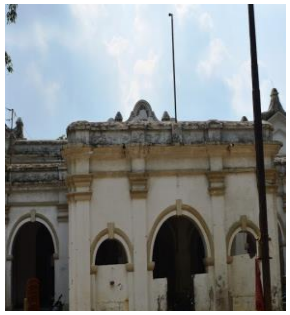
SECTION-1

A format of model DPR to facilitate preparation of DPR departmentally on collection, secondary storage and transportation components of municipal solid waste management

Municipal Solid Waste Management in

Nagar Palika Parishad

BAHRAICH



DETAILED PROJECT REPORT

ON

DOOR TO DOOR COLLECTION, SECONDARY STORAGE & TRANSPORTATION OF WASTE

Year- 2017
Cost-

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Annexure: Specifications
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1 PROJECT BACKGROUND

With the 74th Amendment of the Constitution of India in 1992, municipal authorities in the country have been recognized as a third tier of government. The 12th schedule of the Constitution has laid down the functions envisaged to be performed by the municipal authorities; one among those functions is solid waste management. As per municipal Acts governing the local bodies in the country, it is an obligatory duty of municipal authorities in the country to keep cities/towns clean and provide a good quality of life to the citizens. However, the services provided by the municipal authorities are outdated and very inefficient. Domestic, commercial, biomedical and variety of toxic and domestic hazardous wastes are generally disposed of by the citizens on the streets, drains, open spaces, water bodies, etc., causing serious problems of health and environment. Problems of solid waste management are growing with rapid urbanization and change in the lifestyle of the people. The situation is becoming critical with the passage of time. The urban population in India has gone up five times in the last six decades. As per 2011 census 377,105,760 people live in urban areas in the country which accounts for 31.16% of India's population.

ULBs across India face challenges in handling and disposal of municipal solid waste in varying degrees: lack of adequate financial and human resources, poor technology and lack of public participation to list a few.

Management of Solid Waste, though an essential service, and an obligatory duty, is given low priority. This, coupled with lack of financial resources, institutional weakness, improper choice of technology & rapid urbanization, whose ramifications are more pronounced with uncontrolled growth rate of population, has made this service far from satisfactory, thus creating serious environmental and health problems.

Solid waste is 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), construction and demolition sites, domesticated animals (carcasses of dead animals, manure), parks (fallen branches, leaves from trees) and streets (sand, silt, clay, concrete, bricks, asphalt, residues from air deposition and dust).

Solid Waste Management (SW M) is a process of storage, segregation, collection, transportation, processing and disposal of solid waste in an environmentally acceptable manner. There are optional collection methods, var ied transportation equipment, recyclable waste recovery mechanisms, processing technologies such as composting; refuse derived fuel (RDF), waste-to-energy, incineration etc and disposal of residual waste in a engineered (sanitary) landfill.

The selection of a suitable system of SW M and waste processing technology are m ostly dependent on the quantity and quality of waste produced as well as financial and technical capabilities of local bodies.

1.1 INITIATIVES of GOVERNMENT OF INDIA TO IMPROVE SWM

Some of the key initiatives are briefly discussed below:

1.1.1 HON'BLE SUPREME COURT OF INDIA APPOINTED COMMITTEE RECOMMENDATIONS

A major initiative was taken by the Hon'ble Supreme Court of India in 1996 when a public interest litigation was filed against the Central Government , State Governments and several municipal authorities in the country for their failure to manage municipal solid waste in an environmentally accepted manner. This led to the formation of an expert committee to study the current status of SW M in Indian cities and make suitable recommendations to im prove the situation .This committee identified the deficiencies in the existing SW M system in the country and made recommendations to improve the systems of solid waste management in 300 Class I Cities of India (Class I cities are cities with a population above one lakh population). These recommendations were shared with all class 1 cities of India and t hey were directed to take measures recommended.

1.1.2 SOLID WASTE MANAGEMENT RULES, 2016

The Ministry of Environment &Forests notified MSW Rules, 2000 in Sept 2000. This was followed by new set of Rules framed by Ministry of Environment ,Forests and climate change (MOEF &CC), GoI, named "Solid Waste Management Rules, 2016" (SWM Rules 2016). These rules are framed under the Environment Protection Act, 1986 and aimed at standardization and enforcement of SWM practices in the urban sector. The rules mandate that, "Every municipal authority and urban centre shall, within its territorial area be responsible for the implementation of the provisions of these rules and infrastructure development for collection, storage segregation, transportation, processing and disposal of municipal solid wastes". These rules laid down the timelines of implementation of the mandates given making citizens also accountable besides Municipal authorities and other stakeholders

1.1.3 CREATION OF SWACHH BHARAT MISSION

The Hon. Prime Minister of India has given special emphasis to make India clean by Oct, 2019 and GOI has setup Swachh Bharat Mission with an objective of making India open defecation free and have appropriate systems of Solid and Liquid waste management in the counntry to make India clean and provide a good quality of life to citizens. A huge budget is set a part to meet the objective of Mission by extending financial and technical support to all urban and rural areas in the country. All municipal authorities in the country are eligible to get 35% grants from government of India for Solid Waste management under Swachh Bharat Mission and are further likely to get additional grants for Public awareness and training and Capacity/town Building to the extent of 12% and 3% respectively. This project report is therefore, prepared to avail government of India and State grants expeditiously for improving SWM services.

1.1.4 FOURTEENTH FINANCE COMMISSION RECOMMENDATIONS

The 14th Finance Commission GoI, has also recommended measures to improve urban infrastructure in the country. Funds are available to support infrastructure development in the states which includes Solid Waste Management.

1.2 INITIATIVES TAKEN BY THE GOVT. OF UTTAR PRADESH

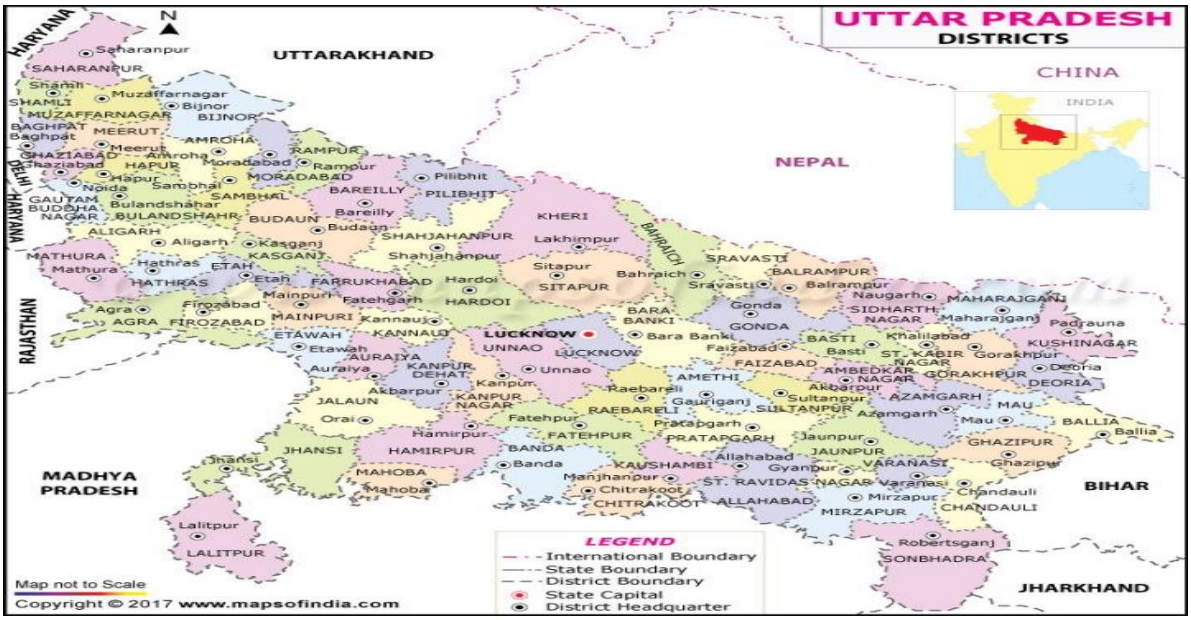
The state of UP has taken several initiatives to improve urban governance and urban infrastructure in the state. Priority was given to improve SWM in large urban areas in the state. Now the focus is on all urban areas in the State . There is therefore a need to improve the existing SWM system in Nagar Palika Parishad Bahraich .
town and to make this city/town Clean and liveable. The purpose of this Detailed Project Report (DPR) part-1 is to study the existing SWM practices in relation to primary collection, secondary storage, street sweeping and transportation of municipal solid waste in Nagar Palika Parishad bahraich identify deficiencies/ gaps in the present system and
propose a comprehensive improvement plan for SWM in the city/town in compliance with the SWM Rules, 2016 and SBM (U) guidelines.

2 CITY PROFILE

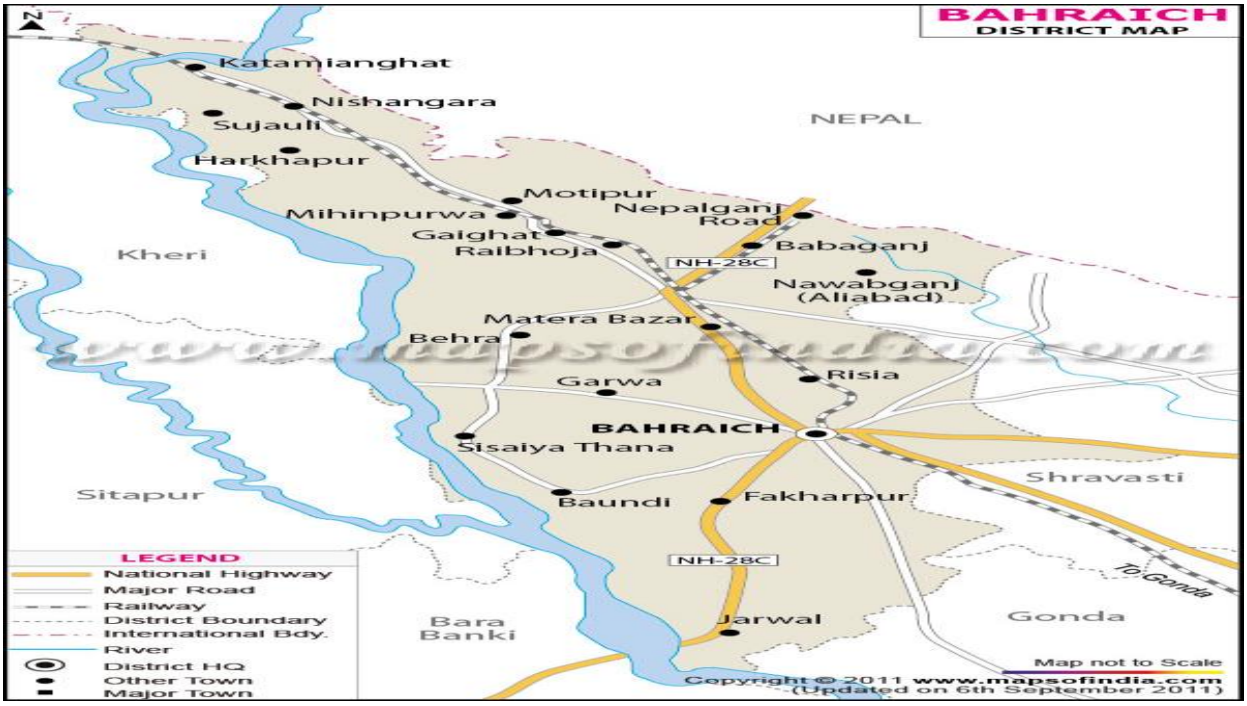
2.1 INTRODUCTION

Nagar Palika Parishad is well connected by road network to the various parts of the country. **Nagar Palika Parishad is the district head quarter palika** **And 125 km** from Lucknow, the state capital.

UTTAR PRADESH MAP



BAHRAICH MAP



2.2 CLIMATIC CONDITIONS

The **summer temperature** goes up to as high as **46.32 degrees C** and **winter temperatures** come down to as low as **5.7degrees C**. The city/town receives an **average annual rainfall 1030mm.**

2.3 AREA, POPULATION AND DECADAL GROWTH

The area of the NAGAR PALIKA PARISAD BAHRAICH is 13.36sq. kms. of the NAGAR PALIKA PARISAD BAHRAICH is The population estimated at 198925 as of 2017.

2.3.1 POPULATION AND DECADAL GROWTH

Population	1991	2001	2011
	135400	168323	186223
Decadal growth	35.55	24.32	10.63

Source: ……..city/town Municipal Council

2.4 WARD WISE POPULAT ION AND HOUSEHOLDS AS PER 2011 CENSUS

Sr. No.	Election Ward	Population
01	01	9502
02	02	6757
03	03	5692
04	04	6544
05	05	7510
06	06	3384

07	**07**	**5795**
08	08	5225
9	09	3907
10	10	4896
11	11	3857
12	12	5595
13	13	6916
14	14	4292
15	15	5491
16	16	11849
17	17	3964
18	18	4790
19	19	6333
20	20	3898
21	21	7208
22	22	5977
23	23	9437
24	24	6980
25	25	4011
26	26	4013
27	27	6375
28	28	7583
29	29	2419
30……..	30	4699
n 31	31	11329
Total	31	186233

2.5 POPULATION PROJECTIONS

The decadal change in the population of **Nagar palika parishad bahraicl1991 to 2011 is indicating population projections as under:**

2.5.1 Geometric growth model

Year	Population	Decadal GR	Annual GR
2011	186223	10.63	1.02
2016	197396	5.99	1.19

2021	**206113**	**10.68**	**1.06**
2026	**217243**	**5.33**	**1.06**
2031	**227283**	**10.27**	**1.02**
2036	**239101**	**5.19**	**1.03**
2041	**251374**	**9.58**	**0.95**

2.5.2 Arithmetic Growth Method

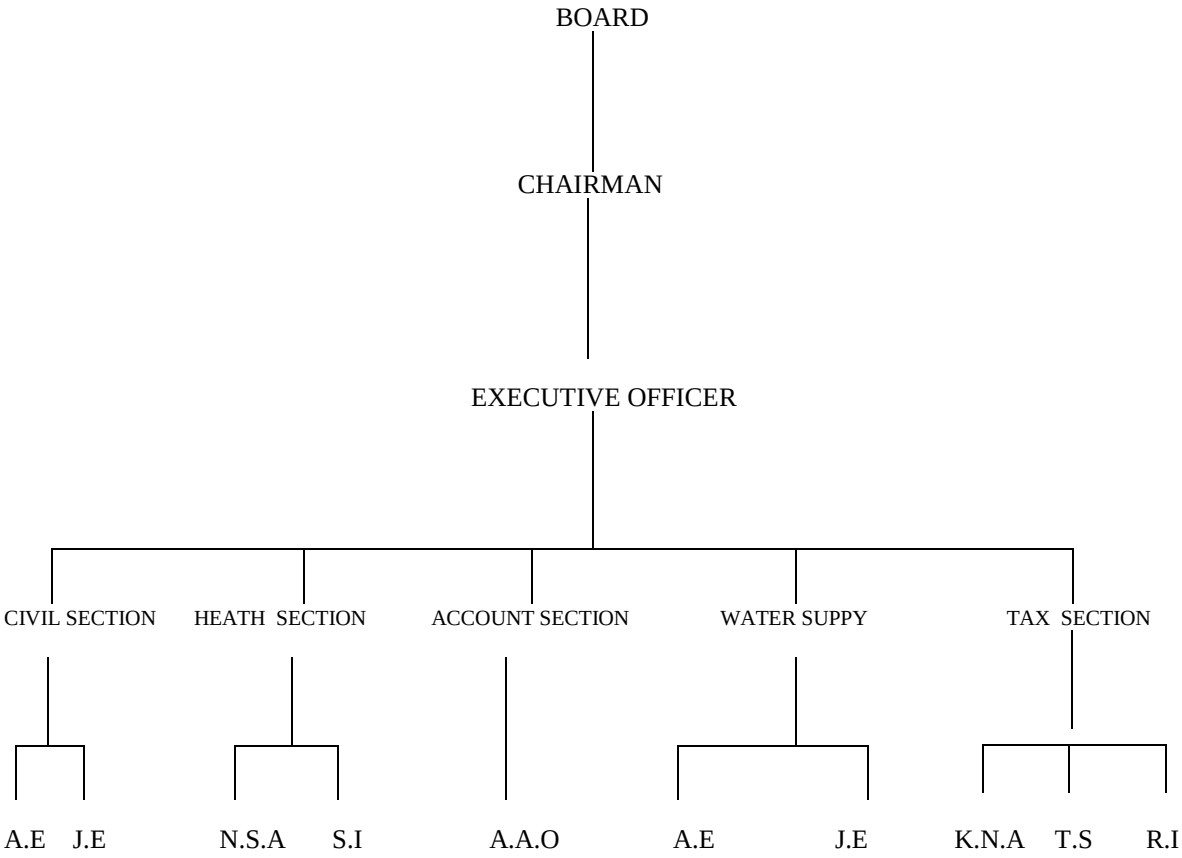
Year	Population	Decadal GR	Annual GR
2011	**186223**	**10.63**	**1.02**
2016	**198925**	**6.82**	**1.34**
2021	**211630**	**13.64**	**1.36**
2026	**224335**	**6.00**	**1.20**
2031	**237040**	**12.00**	**1.20**
2036	**249745**	**5.35**	**1..07**
2041	**262450**	**10.71**	**1.07**

2.6 POLITICAL AND ADMINISTRATIVE SET -UP

The Nagar Palika Parishad city/town has an elected body. There are 31 **wards** in.thecity/town. Each ward elects one councilor who collectively form a municipal council headed by chairperson/Mayor who governs the affairs of the city/town through the officers and staff of the Council headed by the **Executive Officer**. This elected body performs its functions within the broad framework of the Municipal Law governing the state local authorities. The municipal administration is headed by the **Executive Officer** who is assisted by var ious subordinate staff to perform the duties of the municipal authority. The principal duties include sanitation, health, repair and construction of roads, construction & maintenance Of surface drains street lightings etc. The function of solid waste management is **looked after by…….** in the NAGAR PALIKA PARISAD BAHRAICH

The organization structure of NAGAR PALIKA PARISAD BAHRAICH Municipal Council is as under:

2.7 ORGANIZATIONAL CHART OF MUNICIPAL COUNCIL



2.8 SOLID WASTE MANAGEMENT DEPARTMENT

The Solid waste Management department has the onerous duty of keeping the city/town clean by organizing collection, transportation, processing and disposal of solid waste. In NAGAR PALIKA PARISAD BAHRAICH. The following supervisory staff is responsible for solid waste management in the NAGAR PALIKA PARISAD BAHRAICH

Sr. No.	Designation of supervisor	No. of persons
1	EXECUTIVE OFFICER	1
2	SANITORY INSPECTOR	1
3	SAFAI NAYAK	17

2.8.1 Deployment of Sanitation Workers

Nagar Palika Parishad bahraich has a sanitation wing. Street cleaning operation is carried out by a work force of 415 **Safai Karmacharis**
and for collection of waste from bins. It is observed that the process of street sweeping existing in the Nagar Palika Parishad bahraich is still primitive. **(Pl write here 2 lines on how street sweeping is carried out and what types of tools are being used)**

The current deployment of workforce in sanitation department is as follows

Type of sanitation workers	No. of sanitation workers
Permanent	160
Temporary	40
On contract	215
Total	415

2.9 SLUMS AND INFORMAL SETTLEMENTS

The town has slums and informal settlements as under:

Sr. No.	Name of the slum/settlement	No. of households	Population
1	NAVRAIYA	1277	8505

2.10 MARKETS

There are 1 vegetable, 1 fruit, 1 meat& fish markets in the city.

3 ESTIMATION OF WASTE GENERATION AND PHYSICAL AND CHEMICAL CHARACTERISTICS OF WASTE

3.1 WASTE GENERATORS IN THE CITY

The sources of the solid waste generation are : households, shops, offices, commercial establishments, hotels, restaurants, markets , street sweepings, silt from the drains, waste deposited at vacant lots, construction and demolition sites, repairing sites, residual waste from treatment plants, parks, gardens, roadside trees, etc. The breakup of estimated waste generated is as under.

Type of waste generators (municipal waste)	**No. of units**
Households	22913
Shops, workshops	7250
Offices and institutions	35
Industries	25
Vegetable and fruit markets	3
Meat and fish markets	3
Number of hospitals	6
Number of Nursing homes	25
Number of laboratories	26
Number of beds	0
Number of hotels	30
Number of restaurants	150
Others	1000
Total	31,460
Floating population	25000

Source: *Municipal Council*

3.2 QUANTITY OF WASTE GENERATED

With a view to come to a correct figure of waste generated per day, an exercise was undertaken to estimate the quantity of waste generated per day. Weighing o f entire waste of the city was carried out for three consecutive days, which revealed that average waste generation rate Is 65 **MT/Day.**

To further validate the estimates, we undertook a study to determine the quantity of waste generated by households and shops etc in the city in three different economical and geographical areas. This was done by collecting 1 0 % / 2 5 s a m p l e s of waste from 100 units from 4 different categories for three consecutive days. The waste generation rates noticed are shown in the table below:-

Category wise waste Generation from a clusters of 25 houses/ shops each (in grams)

GENERATOR (Sample Size 25 units)	HIGH INCOME GROUP (grams)			MIDDLE INCOME GROUP			LOW INCOME GROUP (grams)			COMMERICIAL GROUP		
CATEGORY OF WASTE	DAY 1	DAY 2	DAY 3	DAY 1	DAY 2	DAY 3	DAY 1	DAY 2	DAY 3	DAY 1	DAY 2	DAY 3
ORGANI	500	450	600	230	250	300	75	80	90	15000	15250	15000
PAPER	25	20	30	10	10	15	--	--	--	500	800	600
PLASTIC	50	30	60	25	20	30	10	10	10	2000	2500	2300
METAL	--	--	--	--	--	---	--	--	--	--	---	--
GLASS	--	--	--	--	--	---	--	--	--	400	500	600
RUBBER	--	--	--	--	--	---	--	--	--	--	---	--
SAND	750	800	775	605	570	600	410	415	400	1050	1050	1050
OTHERS	1150	1200	1060	600	550	685	--	--		500	450	450
TOTAL	2475	2500	2525	1470	1400	1630	495	505	500	19450	20600	19950

AVERAGE (3 DAYs)	Grams	Grams	Grams		
	2500	1500	500	20000	

3.3 AVERAGE QUANTITY OF WASTE GENERATED PER HOUSEHOLD/DAY CATEGORIES WISE

Income Group	Biodegradable waste in Kg/Day	Non Biodegradable
High Income Group	.600 kg	1.900 kg
Middle Income Group	.350 kg	1.150 kg
Low Income Group Average	.075 kg	.425 kg

3.4 AVERAGE QUANTITY OF WASTE GENERATED PER COMMERCIAL ESTABLISHMENT/DAY

K

Type of Waste Generator	Average waste in g/Day
Commercial (Shops)	**20.000 kg**

3.5 PHYSICAL COMPOSITION OF WASTE

Further Segregation of dry recyclable waste collected from the doorstep was done within hours of waste collection and waste composition was determined. This exercise results revealed as under:

HIGH INCOME GROUP

Content	Percentage (%)
Organic(bio degradable waste)	20%
Paper	1%
Plastic	2%
Metal	Zero %
Glass	Zero %
Rubber	Zero %
Sand	30%
Others	47%
Total	**100**

MIDDLE INCOME GROUP

Content	Percentage (%)
Organic(bio degradable waste)	17%
Paper	1%
Plastic	2%
Metal	--
Glass	--
Rubber	--
Sand	40%
Others	40%
Total	**100.00**

LOW INCOME GROUP

Content	Percentage (%)
Organic(bio degradable waste)	16%
Paper	--
Plastic	2%
Metal	--
Glass	--
Rubber	--
Sand	82%
Others	--
Total	**100**

COMMERCIAL ESTABLISHMENTS

Content	Percentage (%)
Organic(bio degradable waste)	75%
Paper	3.5%
Plastic	11%
Metal	--

Glass	2.5%
Rubber	--
Sand	5%
Others	3%
Total	**100**

PERCENTAGE OF AVERAGE PHYSICAL COMPOSITION OF WASTE IN DIFFERENT INCOME HOUSEHOLD GROUPS

Contents	**Percentage(%)**
Organic(bio degradable waste)	20%
Paper	1%
Plastic	2%
Metal	
Glass	
Rubbers	
Type of waste generators (no. of munical waste)	72%
Others	5%
Total	**100**

Total quantity of waste generated in the Nagar Palika **Parishad bahraich**

Based on the sampling of domestic and commercial waste as well as assessing the waste generated In the markets, large institutions, and street waste collected daily etc, total quantity of waste generated by variety of waste generators is given below.:

Type of waste generators	No. of units	Quantity of waste per day
House holds	22913	5728 kg
Shops, workshops	7250	7250 kg
Offices and institutions	35	350 kg
industries	25	25000 kg

Vegetable and fruit Markets	3	9000 kg
Meat and Fish Markets	3	400 kg
Number of Hospitals	6	1000 kg
Number of Nursing Homes	25	25 kg
Number of Laboratories	26	75 kg
Number of Beds		
Number of Hotels	30	300 kg
Number of Restaurants	150	2250 kg
Other	1000	5000 kg
Total	**31466**	**56.37 M.T**
Floating Population		

3.6 CHEMICAL ANALYSIS

The Chemical analysis study of 5kg mix the municipal waste generated in the NAGAR PALIKA PARISAD BAHRAICH was carried out by

laboratory, Results of the characterization are given below:-

Insert here laboratory report

4 PRESENT SCENARIO OF SWM AND COMPLIANCE OF SOLID WASTE MANAGEMENT RULES 2016 IN THE CITY

The SWM Rules 2016, mandate the following seven essential steps

1. Prohibit littering on the streets, water bodies, drains, open spaces etc, not to burn or burry the waste, ensure segregation of recyclable waste at source and storage of waste at source in two bins; one for biodegradable waste and another for recyclable material, store domestic hazardous waste separately as and when generated, store C&D waste and
horticulture waste separately as and when generated and dispose of as per the direction of municipal authority, give away recyclables to waste pickers,
kabadiwalas, recyclers and promote home composting & biogas generation.

2. Organize Primary collection of segregated biodegradable and non- biodegradable waste from the doorstep, (including slums and squatter areas,) at pre-informed timings on a day-to-day basis using containerised tricycle/handcarts/pick up vans.

3. Organize Street sweeping covering all the residential and commercial areas onall the days of the year irrespective of Sundays and public holidays.

4. Abolish open waste storage depots and make provision of covered containers
or closed body waste storage depots or organize direct transportation of waste to processing facilities/disposal site.

5. Organize Transportation of waste in covered vehicles on avoiding multiple
and manual handling of waste a day to day basis

6. Set up treatment facilities for biodegradable waste using composting or waste to energy technologies, meeting the standards laid down in the Rules, 2016.

7. Minimise the waste going to the land fill and dispose of only rejects from the treatment plants and inert material at the engineered landfills meeting the standards laid down in SW M Rules, 2016.

These steps were as such to be implemented before 31st December, 2003 as per earlier MSW Rules, 2000. However, for various reasons, municipal councils have not been able to implement these steps to meet the requirement of law.

The present status of compliance of the SWM Rules 2016 in Municipal council/corporation is as under:

STEP 1: Prohibit litteringt of waste on the streets and storage of waste at source

The NAGAR PALIKA BAHARAICH has not yet prohibited littering of waste on the streets . The households, shops and establishments do not store the waste at source and continue to throw the waste on the streets and, therefore, the streets continue to remain dirty and littered. It is observed during the reconnaissance surveys that such wastes were either thrown on streets/drains or on public/private open spaces resulting in large-scale pollution of soil, water, air in particular and the general environment. Indiscriminate disposal of waste on the streets causes nuisance to the people, clog the surface drains, contaminates water bodies, etc. (correct the above observations suitably if need be)

Segregation of Recyclable Wastes

No special efforts are made by the NAGAR PALIKA PARISAD BAHRAICH to educate the citizens to segregate recyclable waste. However, because of its commercial value part of recyclables are collected from the system without any intervention on part of Municipal Administration. A chain consists of rag pickers, small kabadiwalas (scrap dealers) whole sellers and transporters are functional for collection, transportation to reuse of recyclables . Rest of the recyclable material is disposed of by the residents along with domestic waste in a mixed form. This waste finds its way on the streets, in the drains, dumping grounds, etc., from where rag pickers collect the waste to

earn their livelihood. Recyclable waste is generally found mixed with domestic waste. The compliance in regard to segregation of recyclable waste is reported to NIL.(CORRECT THIS PARA SUITABLY)

STEP 2: Primary Collection

Primary collection of Domestic, Trade and Institutional Waste

There are 30460 households, 30 hotels, 150 restaurants, 25 Offices & commercial establishments, in the NAGAR PALIKA PARISAD BAHRAICH

The system of door to door collection from households, shops and offices is not yet introduce in the NAGAR PALIKA PARISAD BAHRAICH. The entire NAGAR PALIKA PARISAD BAHRAICH continues to throw the waste on the streets, open space, drains, water body etc. adding to the piling up of waste along road sides and clogging of drains. The sanitary workers do not observe safety precautions during collection and subsequent transfer of waste to the disposal site.. It is noted that the waste deposited by the residents on the streets is collected by sanitation workers in early hours of the day and taken to open waste storage depots for onward transportation of waste to disposal site resulting in multiple handling of waste. (correct the above sentence suitably if Door to door collection is introduced in the town)

STEP 3: Street Sweeping

The Council has **12 main roads** as shown below and has a total road length of **294.52 Km.**
The details are given in table below.

Details of main Roads in Municipal council/corporation

1-PANITANKI SE KATI CHAURAHA TAK – 1 KM WIDTH 4.00

Sr. No.	Name of Road	Legth (K.M)	Width(M)
1	Golavaghat se dargah hote huye aasam road	8.00	7.00
2	Jhingaha ghat se gonda road dunakka tak	6.00	7.00
3	K D C se digiha tiraha tak	3.00	7.00
4	Hospital chauraha se dehat kotvali gonda road	1.50	4.00
5	Mahasi bas stand se jhingaha ghat tak	3.00	3.70
6	Ghanta ghar se chandpura chauraha hote huye nuruddin chak tak	4.00	4.00
7	Kaul sahab tiraha se police line tiraha tak	2.50	3.70
8	Jhingaha ghat se vaseerganj, kajipura hote huye ghanta ghar tak	2.60	3.70
9	Ghanta ghar se choti bazaar hote huye hospital chauraha tak	1.50	4.00
10	Pipal tiraha se kila tak	1.00	3.70
11	D M bangala se nagar palika hote hoye pipal tiraha	1.50	4.00
12	Choti bazar se panitanki tak	1.50	3.7

Total Road length

Length of concrete / asphalt roads in km	Length of non-asphalted roads km	Length of roads havi g dividers. Km n
172..585	121.935	-

The Density of Roads

The density of roads is shown in the table below. Certain areas are very dense whereas some portions of the city are having very low density.

Density of Roads

Density	Road Length
High density	172.585
Medium density	84.54
Low density	37.395

Frequency of cleaning the Streets

NAGAR PALIKA PARISAD BAHRAICH has undertaken cleaning of most of the streets on a day to day basis 90**%** of the streets are cleaned daily. The frequency of cleaning of all the streets is shown in the table below.

Street sweeping

Frequency of Street Cleaning (in percentage)				
Daily	**Alternate Days**	**Twice in a week**	**Once in a Week**	**Occasionally**
90 %	10%	--	--	--

The compliance level of this step **is…….**

Work Norms

NAGAR PALIKA PARISAD BAHRAICH utilizes 480 **sweepers** for street sweeping and waste collection. Each sweeper sweeps **200 rmt** of road length. The work of street sweeping is carried out in two parts; **morning 6 am to 10 am and afternoon 2 pm to 6 pm.** They are expected to walk about **……metres** for depositing their waste at waste storage depot.

<u>Tools Used in Street Sweeping</u> (<u>give</u> details here)

1- Auto three wheeler

2-Broom

3-J.C.B

STEP 4: Secondary Storage

Waste storage Depots

Waste storage depots are on an eyesore in the city

There are 302 **open** waste storage depots established in the city, the details of which are given in the Table below:

Location of Open Dustbins –in Municipal council

Sr No	Ward No	Place	Remarks
1	1	S P bangala police line road	
2		Bal shiksha school	
3		Dr sarves shukla jail road	
4		Samadhan hospital jail road	
5		Jail ke samne, dr r b singh road	
6		Pachho peer near avdh hospital	
7		Dr kediya	
8		Charch near manno kaul puliya	
9		Jata Shankar vidhayak(saneh utsav ke samne)	
10		Krishi state bank(near pani tanki)	
11	2	Shyam sundar ki dukan ki samane	
12		Indra pablice school ke samane	
13		Chngi naka road ki piche	
14		Gosiyana ki pass	
15		Sabhasad nivas ke pichhe	
16		Mahatma budh ke pichhe	
17		Chamaranpurva shiv mandir ke pass	
18		Sharab bhathi prabhat driver ke ghar ke pass	
19	4	Sri anil sabhasad ke ghar ke pass	
20		Divani kacheharee ke uttari gate ke pass	
21		Saikil stand ke ke pass	
22		Daak dhana ke bagal me	
23		D. M colony ke pass jiladhikari avas	
24		K D C road ke pass	
25		Daak bangala ke pass	
26		C D O avas ke bagal me	
27		Kansal sufipura road lal mandi avas tak	

28	4	Ram chandar gass vale ke pass	
29		Hanuman mandir vikas bhavan(bargad ke niche)	
30		Anuj pandey(near karbala road sufipura)	
31		Vikas bhavan chak mandal kore ka dhar	
32		Pani tankai chauraha vikas bhavan road	
33		Sachin singh ke ghar ke pass	
34		Saury medical ke samne	
35	5	Judges colony vali haad tak	
36		Vinod ki dukan ke samne	
37		Mankameshvar mandir ke pass	
38		city mantesari school ke pass	
39		Sharab bhatti ke pichhe	
40		sahu jarnal stork ke pass	
41		Transafarmar dhal khadanja	
42		Bhatte vala haad ke pass	
43		Parag brad faikatri ke pass	
44		Geeta singh nalkool colony ke pass	
45		District hospital mahila gate ke pass	
46		Gurnanak chauk ke pass	
47		T V clinic ki pass	
48		Sevende ke pass	
49		Nalkop karaylaya ke pass	
50		Niricachan bhavan ke pass	
51		Police line chauraha ke pass	
52		Shiv nagar	
53	6	Gantaghar ke pass	
54		Central bank ke pass	
55		Akkaka stand ke pass	
56		Sharabha bhatti	
57		Vajir bahg colony ke pass	
58		Raju bujawa ke ghar ke pass	
59		Jagadesh pathak ke ghar ke pass	
60		Mahaveer saikil ke dukan ke pichhe	
61		Sheeshe vali masajid ke pass	
62		Eye hospital ke pass	
63		Nanapara stand ke pass	

64		Mameer maha maleriya gate ke pass	
65	7	Sri raju sabhasad ke ghar ke pass	
66		Akhara imali ke pass	
67		Chhaboo nav ke pass	
68		Neem ke niche	
69		Hafij jee ki haad tak	
70		Bhagavat Prasad smriti sadan ke pass	
71		Cricket maidan chakki ke samne	
72	8	Parda house ke pass chavani	
73		G I C ke pass chavani	
74		Petrol pamp/ matnaheliya ke pass	
75		Agrasen chauraha ke pass	
76		Moolchandra hotal ke pass mal godam freeganj	
77		Sariya mill ke pass	
78		Sidha nath sinema haal ke pass	
79	9	Gulshan ke bhatte ke ghar ke pass	
80		Sudhakar mishra ke ghar ke pass	
81		Ravida mandir ke pass	
82		Nitin soni ke makan ke pass	
83		I S pabalic school ke pass	
84	10	Sir rais sabhasad ke ghar ke pass	
85		Lala prayag narayan ke ghar ke pass	
86		Rana road	
87		Indra stadiam ke pass	
88		Hospital road ke pass	
89	11	Rikkhi ram mandir ke pass	
90		Gandhi school hostal ke samne	
91		Dulara devi ke ghar ke pass	
92		Chooti takiya ke pass	
93		Anand mohan tivari ke ghar ke pass	
94		Majeed joota vale ke samane	
95	12	Nusi chauraha ke pass	
96		Anaar kali road ke pass	
97		Lathi gali ke pass	
98		Bhinga road ke pass	
99		Hak house ke pass	

100	12	Munna baba ke pass	
101		Dargah purvi gate ke pass	
102		Noori hotal ke pass	
103		Annan ke ghar ke pass	
104		Banjaran tola ke pass	
105		Mustafa aayaran ke dukan ke pass	
106		Patali chikava ke pass	
107		Mubeen chauraha ke pass	
108		Milan lohar ke pass	
109		Idgah ke pass	
110		Murgi foram ke pass	
111	13	Thakur tekparaha kothi ke pass kasimpura	
112		Kabaiya karnar kasimpura	
113		Chand ki dukan chandpura	
114		Kati imali chandpura	
115		kevat mandir kuva chandpura	
116		Chade shah takiya gate chandpura	
117		Ajad school ke pichhe takiya chandpura	
118	14	Guddo hotal ke pass	
119		Sankat mochan mandir ke pass	
120		Abbas trili ke pass	
121		Mo ali ke ghar ke pass	
122	15	Sri Danish sabhashad ke ghar ke pass	
123		Munshari majid ke pass	
124		Dr asharaf Husain ke clinic ke pass	
125		Beri vale baba ke pass	
126		Sri teje khan ke ghar ke pass	
127		Ajan miya bas vale ke samane v bagal me	
128		Maila dipo ke pass	
129		Googa school ke pass	
130		Kanongopura chauki ke bagal me	
131		Ajay cement dukan ke bagal	
132		Transafar ke pass	
133	16	Bhinga I O ke ghar ke pass	
134		Riyaj mekarani gate ke pass	
135		Mannan thekedar ke ghar ke pass	

136	16	Engeener colony ke pass	
137		Meraj tant house ke pass	
138		Idgah chauraha ke pass	
139		Madeena majid ke pass	
140		Musheer saufe vale ke pass	
141		Sikandar ke ghar ke pass	
142		Mishan ke pichhe	
143		Ladale ke ghar ke pass	
144		Mohataj khana ke pass	
145		Gullaveer colony ke pass	
146		Hasan nagar ke pass	
147		Raja ram ke ghar ke pass	
148		Nangoo hata ke pass	
149		Aafat ali ke ghar ke pass	
150	17	Dr bagali ke samane	
151		Josiyapura pathan tola ke pass	
152		City mantisary school ke pass	
153		Varma altrasaund ke pass	
154		Man halvai ke pass	
155		Makhan bhog ke samane	
156		Sangharni mandir ke samane	
157		Digiha petrol pamp ke samane	
158	18	pairadaij marrige haal ke pass	
159		Minachi mandir chauraha	
160		Basvadi puliya ke pass	
161	19	Avatar aato mobile /maulaveebagh	
162		Dr shyam ghambhir ke ghar ke samane	
163		Railway station	
164		Ram ghat road(chedi)	
165		Over brij shauchalay ke pass	
166		Dargah thane ke pass	
167		Basfod ke pass	
168		Svaraj agency	
169		Sabhasad ke ghar ke pass	
170		Munna kabadi/transafar ke pass	
171		Bhani ramka ke pass hanuman puri colony	

172	19	Dr arvind ke pass	
173		Ram vatika ke pss	
174		Veena tandan ke pass	
175	20	Arya kanya school pramaod babu ke ghar ke pass	
176		Rajesh shukla chitrasalaa ke pass	
177		Pagadi vale pandit je ke ghar ke pass	
178		Kati imali ke pass	
179		Dalamiya dharmshala ke pass	
180		Raghuveer sharn advocate ghar ke pass	
181		Mari ji ke ghar ke pass	
182		Dr akhilesh ke samne	
183		Manji vali haad	
184		Govind babu ke ghar ke pass	
185		Jain mandir ke pich	
186		Munsari majid ke ghar ke pass	
187		Ajay studio ke pass	
188		State bank ke samane	
189	21	Central veyar house ke samane	
190		Nooshi clinic ke samane	
191		Bhinga stand ke pass	
192		Mobin chauraha	
193		Bachcha kabristan ke pass	
194		Tedi puliya gosiyana	
195		Kailash hotal	
196		Manpura puliya	
197		Munna masjid transafar ke pass	
198		Shakeel hotal ke pass	
199	22	Gayatri mandir ke pass	
200		Bargad ke niche	
201		Pakakiya ke niche	
202		Chandpura chauraha	
203		Lal bas balli ke pass	
204		Dhal khadanja	
205		Munna kunshi ke ghar ke pass	
206		Dani ke ghar ke pass	
207		Barsati babu ke ghar ke pass	

208	23	Lohiya chauraha ke pass	
209		Dr prabhu dayal ke ghar ke pass	
210		Soni babu ke ghar ke pass	
211		Bachcho vali jail ke pass	
212		Police chauki ke pass	
213		Badi sangat ke pass	
214		Pani tanki ke pass	
215		Kallo aara mashin ke pass	
216		Mahajani school ke dhal ke pass	
217		Tej bahadur pandit je eke ghar ke pass	
218		Ram kishor gupta ke ghar ke pass	
219		Khanna je ke ghar ke pass	
220	24	Mushafir khana ke pass	
221		Thakur maidan ke pass	
222		Janta karyalaya ke pass	
223		Fatma masjid ke pass	
224		Chunna chaiyarman ke ghar ke pass	
225		Jama masjid madarsa ke pass	
226		Telephone khambhe ke pass	
227		Manjoor mahboob ke ghar ke pass	
228	25	Kandail akabarpura (Sharma gairej vale ke makan ke samane)	
229		Gutain akabarpura (shaka salauddeen masjid ke bagal)	
230		Nala akabarpura (nagar palika ke bagal se)	
231		Engeeniyar puliya nai basti (namakeen faitory ke samane)	
232		Kaptan sahib ke office ke pichhe akbarpura (kannaujiya vakil ke samane)	
233		Madhu pandey ke makan ke samane	
234		District judges avas kapurthala	
235		Colony gate kapurthala	
236		Basal tayar ke pass	
237	26	Homegard puliya chauki	
238		Tikonibagh police chauki	
239		Tikonibagh police chauki ke pichhe	
240		K D C petrol pamp ke pass	

241	26	Paniyar school ke pass	
242		Lalesuran	
243	27	Janta dava khanaa road par	
244		Kale khan masjid kajipura	
245		Maksood raini kajipura	
246		Neelam singh ke ghar pass kajipura	
247		Purana dhakkhana ke pass kajipura	
248		Begam park kajipura	
249		Asafak theki ke pass kajipura	
250		Badarul jarrah ke ghar ke pass kajipura	
251		Khaleel tambakho ke ghar ke pichhe	
252		Dr vakar ahamad shah ke ghar ke pass	
253		Gulacheen masjid kajipura	
254		Dhalar vandaja kajipura	
255		Murgi vale aage karnar ke pass	
256		Kajipura chauraha ke pass	
257		Metaka ke ghar ke pass	
258	28	Vahab maidan	
259		Saudagar masjid	
260		Atkonava chauraha	
261		Road vej ke pichhe	
262		Duldul house ke pass	
263		Abbasi vakeel ke ghar ke pass	
264		Sudheer gaud vakeel ke ghar ke pass	
265	29	Sri keshe sabhasad se ghar ke pass	
266		Fayar station ke pass	
267		Brijesh gupta ke dukan ke pass	
268		Nagal palika transfer ke pass	
269		Rani rehava hate ke dono gate ke pass	
270		Mahila thana ke bagal me	
271		Makabara chauraha ke pass	
272		Tara mahila school ke pass	
273		Thakur hokum singh ke ghar ke pass	
274	30	Girdhari lal ke ghar ke pass	
275		Kaharan tola ke pass	
276		Bakhsi je eke ghar ke pass	

277	30	Kedar pavva ke ghar ke pass	
278		Tadikhana ke pass	
279		Meera shishu mandir ke pass	
280		Pulloo singh ke ghar ke pass	
281		Jama masjid puliya ke pass	
282		Gandhi asaram ke pass	
283		Ram sharn khandanja ke pass	
284		Kultesvar nath mandir ke pass	
285		Chaya kuva ke pass	
286		Bhujyaniya ke pass	
287		Guddi ke chauraha ke pass	
288		Gandhi asaram ke pass	
289		Havaldar chauraha ke pass	
290	31	Kallo kasai chabban chauraha ke pass	
291		Nor children belvali haad par	
292		Markati ke pass	
293		Gulam pahalvan ke ghar ke pass	
294		Maulana saheb ke ghar ke pass	
295		Anandi ke ghar ke pass	
296		Madarsa ke pass	
297		India mark nal ke pass	
298		Noor ullah nala ke pass	
299		Gupta je eke ghar ke pass	
300		Mahajani school gate ke samane	
301		Kila kauv dhal ke pass	
302		Sabir baba ke ghar ke pass	

It can be observed from the above table that there are very few waste storage depots in the

city. 100% of the city waste is deposited on the streets (correct the sentence as per the current position) unhygienic conditions as seen from the photographs below.

The compliance of SWM Rules, 2016 in regard to this component is 0%.

STEP 5: Transportation

Transportation of Waste

The transportation system adopted in the NAGAR PALIKA PARISAD BAHRAICH is Primitive and inefficient. Waste is handled manually and loaded into tractor trolleys, open trucks from open waste storage sites, as could be seen from the photographs below.(correct suitably)

Manual loading of waste

Availability of Vehicles for Transportation of Waste

The number and types of vehicles available with the municipal Council is given in table below.

Details of vehicles available with the Council

Vehicle Type	Number	Capacity
Tipper Truck	2	2MT
Tractor Trolly	10	1 MT
Tempo	8	. 25 MT
Compector Truck	01	2MT

It is reported by the Nagar Palika Parishad bahraich that each vehicle makes **3 to 5 trips** per day between the assigned wards and the disposal site. These vehicles carry on an average 66 MT tonnes of waste per shift to the disposal site. Waste is transported to the dumping site called LAND fill located at a distance of 3 Km from the Nagar Palika Parishad bahraich.

20 drivers are deployed by the Council for transportation of waste.

The transportation work is carried out on all the days of the year. work is done on Sundays and public holidays.
(correct if required)

The Council has been using open vehicles for transportation of waste and therefore, the compliance of SWM Rules, 2016 in the matter of transportation of waste on a day to day basis in a covered vehicle is only 20 % though the transportation eficiency is 90%.

Overall compliance status

Step No.	SWM Rules Requirement	Present status	Shortcoming	Compliance %
1	Prohibit littering	Not yet prohibit ate	No awareness created	**0%**
	Storage at source	None. Residents throw waste on the streets	Lack of awareness	**0%**
	Segregation at source	Not practiced	Lack of awareness	**0%**
Step 2	Primary collection from door step	Not initiated	Citizens throw waste on the streets	**0%**
Step 3	Street sweeping on a daily basis	Not done regularly	All streets not attended daily. Inefficient tools used	**?????**
Step 4	Secondary storage in covered containers	……. Open storage depots in the city	Unhygienic depots, Insufficient sites, lack of synchronization with primary collection	**0%**
Step 5	Transportation in covered vehicles on a regular basis	Open tractors/trucks are used. Inadequate vehicles	Waste transported irregularly in open vehicles causing unhygienic conditions	**?????**

5 RECOMMENDATIONS TO IMPROVE SOLID WASTE MANAGEMENT

Government of India, Ministry of Environment, Forest & climate change have notified Solid Waste Management Rules 2016 on 8th April, 2016 and made it mandatory for all the municipal authorities in the country to implement the following steps within the timeline given in Rule, 2016.

This chapter provides an integrated system encompassing storage of segregated waste at source, primary collection from door step & secondary waste collection & transportation of waste. The proposed SWM system recommended here under are in accordance with the
SWM Rules, 2016, SBM guidelines and national manual on SWM. lay emphasis on
4R (Reduce, Recycle, Reuse and Recover),

The recommendations include the following:

1. Segregation & storage of waste at source at its generation
2. Promotion of 4Rs i.e. reduce, reuse, recycle and recover & home composting/biogas generation
3. 100% door to door collection and transportation of the segregated waste
4. Sweeping of streets at a regular basis
5. Secondary storage of waste in covered containers if required
6. Transportation of waste in covered vehicles, elimination of manual handling of waste, and the provision of the proper PPE to the workers
7. Promote information, education and communication (IEC) across the stakeholders to ensure system efficiency and sustainability.
8. Ensure economic sustainability of the proposed system by introducing user fees and public private partnership in Municipal solid waste management.
9. Propose institutional strengthening
10. Address health and environmental aspects

5.1 BASIS OF DESIGN FOR PROPOSED SWM PLAN

In order to propose a waste management plan and procurement of tools, vehicles and equipments for primary & secondary waste collection and transportation system for Nagar Palika Parishad bahraich city, the following were considered.

1. Population Census data of the year 1991, 2001 & 2011 including ward wise date.
2. Projected populations for the design period using average of two methods arithmetical and geometrical.
3. Area of Nagar Palika Parishad bahraich city
4. Quantity of MSW generated in the city as per field survey data.
5. Type and number of waste generators in the city
6. Per-capita waste generation in base year (2011) as per field survey.
7. Characterization of the current waste.
8. Existing and proposed secondary waste storage locations
9. Existing system deficiencies in primary collection, secondary storage, transportation, processing and disposal of waste.

5.1.1 Current waste generation rate

Type of waste	%	Estimated generation day (MT) in 2017	
Bio degradable		**20%**	
Non- biodegradable		**80%**	
Total		**100 %**	

Average waste generation per capita per day is **250 grams.**

5.1.2 Projected Waste Generation

Year	Population	Per capita waste generation (Kg)	Waste generation based on population MT/Day
2017	200000	.250 kg	50 MT
2021	217000	.300 kg	65 MT
2031	259000	.350 kg	96.50 MT
2041	315000	.400 kg	126 MT

5.2 RECOMMENDATIONS TO IMPROVE SOLID WASTE MANAGEMENT SYSTEMS IN TERMS OF MUNICIPAL SOLID WASTE MANAGEMENT RULES 2016

SWM Rules 2016 have laid down the following compliance criteria for waste generators in Rule 4.

Duties of waste generators.

- (1) Every waste generator shall,-

(a) segregate and store the waste generated by them in three separate streams namely bio-degradable, non biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorised waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;

(b) wrap securely the used sanitary waste like diapers, sanitary pads etc., in the pouches provided by the

manufacturers or brand owners of these products or in a suitable wrapping material as instructed by the local authorities and shall place the same in the bin meant for dry waste or non- bio-degradable waste;

(c) store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as

per the Construction and Demolition Waste Management Rules, 2016; and

(d) store horticulture waste and garden waste generated from his premises separately in his own premises and dispose of as

per the directions of the local body from time to time.

(2) No waste generator shall throw**,** burn or burry the solid waste generated by him, on streets, open public spaces outside

his premises or in the drain or water bodies.

(3) All waste generators shall pay such user fee for solid waste management, as specified in the bye-laws of the local bodies.

(4) No person shall organise an event or gathering of more than one hundred persons at any unlicensed place without intimating the local body, at least three working days in advance and such person or the organiser of such event shall ensure segregation of waste at source and handing over of segregated waste to waste collector or agency as specified by the local body.

(5) Every street vendor shall keep suitable containers for storage of waste generated during the course of his activity such as food waste, disposable plates, cups, cans, wrappers, coconut shells, leftover food, vegetables, fruits, etc., and shall deposit such waste at waste storage depot or container or vehicle as notified by the local body.

(6) All resident welfare and market associations shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorised recyclers. The bio-degradable waste shall be processed, treated and disposed off 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 body.

(7) All gated communities and institutions with more than 5,000 sqm area shall, within one year from the date of notification of these rules and in partnership with the local body, ensure segregation of waste at source by the generators as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorizsd recyclers. The bio-degradable waste shall be processed, treated and disposed off 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 body.

(8) All hotels and restaurants shall, within one year from the date of notification of these rules and in partnership with the local body ensure segregation of waste at source as prescribed in these rules, facilitate collection of segregated waste in separate streams, handover recyclable material to either the authorised waste pickers or the authorised recyclers. The bio-degradable waste shall be processed, treated and disposed off 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 body.

IEC for creating public awareness is the first essential step of solid waste management where citizens have to play a participatory role as without community participation SWM systems can never succeed.
Council may, therefore, take following actions to ensure compliance of this mandate. Issue directions that:

- No citizen shall litter on the streets/open spaces/drains/water bodies
- No citizen shall burn or burry the waste
- Citizens shall segregate the biodegradable and non- biodegradable waste at source and store the waste in two separate domestic bins
- The waste generators shall keep aside: i) the domestic hazardous waste as and when generated separately ii) C&D waste iii) Horticulture waste and deal with these waste as directed by the municipal council from time to time
- Give away recyclable material to waste pickers/recyclers
- Practice home composting/biogas generation to the extent possible
- Pay user charges for the service rendered
- Handover the waste to waste collector in the manner notified by the Municipal Council from time to time

To facilitate compliance by the citizens, the Council may take up awareness campaigns followed by enforcement measures to ensure compliance

5.2.1.1 Type of Domestic Bins to be Used for Storage at Source

Use of plastic or metal containers with lid as shown in the photograph below is advised for the storage of food/biodegradable/wet waste and a similar size bin or bag with or without lid may be used for storage of recyclable material. Two containers of 12-15-litre capacity for a family of 5 members would ordinarily be adequate. However, a household may keep larger containers or more storage of segregated waste in 2 bins than one container to store the waste produced in 24 hours having a spare capacity of 100% to meet unforeseen delay in clearance or unforeseen extra loads.

Storage of domestic waste

5.2.1.2 Measures for Households

Council may Issue direction to citizens prohibiting littering of waste on the streets, open spaces, water bodies, drains, etc., and direct them to store the waste generated at source in two bins, one meant f or biodegradable/food waste and another for recyclable material such as paper, plastic, metal, glass, rags.

The illustrative list of biodegradable and recyclable material is as follows:-

Food wastes of all kinds, cooked and uncooked, including eggshells, bones
Flower and fruit wastes including juice peels and house-plant wastes
House sweepings (not garden sweepings or yard waste: dispose on-site)

Types of recyclable wastes to be kept for collection byinformal sector

Paper and plastic, all kinds
Cardboard and cartons Containers of all kinds excluding those containing hazardous materials
Packaging of all kinds
Glass, all kinds
Metals, all kinds
Rags, rubber, wood
Foils, wrappings, pouches, sachets and tetra packs (rinsed)
Cassettes, computer diskettes, printer cartridges and electronic parts
Discarded clothing, furniture and equipment

5.2.1.3 Provision of community bins

The residents of multistoried buildings may be directed to provide a set of covered community bins of 100 litre capacity for 20 to 25 houses and advise the members of their society/association for storage of biodegradable and non-biodegradable these domestic waste in community bins separately to facilitate collection of such m u n i c i p a l waste by the city Council from the designated spot.

5.2.1.4 Shops/ Offices/ Institutions/ Workshops etc.:-

There are **…..shops**, workshops, offices and industries in the city reported by Municipal Council. All these establishments may be directed that:

- They should refrain from throwing their solid waste /sweeping etc. on the footpaths, streets and open spaces.
- They should keep their waste on-site as and when generated in a suitable container until the time of doorstep collection.
- The size of the container should be adequate to hold the waste they normally generate in 24 hours with 100% spare capacity to meet unforeseen delay in clearance or unanticipated extra loads.
- The association of large commercial complexes should provide one or more containers of the size that may be prescribed by the Council which match with the waste collection and transportation system of the Council for the storage of waste by their members. The association should direct their members to transfer their waste into the community bin before the prescribed time on a day-to-day basis.
- The association should consult the City Council in this matter and finalize the type of bin to be used and the location where such community bin/s should be placed to facilitate easy collection of such waste.

5.2.1.5 Hotels and Restaurants

There are **…… hotels and …….. restaurants** in the town. All the hotels and restaurants may be directed that:

- They should refrain from throwing their dry and wet solid waste/sweepings on the footpath, streets, open spaces or drains.
- They should also refrain from disposal of their waste into municipal street bins or containers.
- They should store their waste on-site in sturdy containers of not more than 100Litre capacity each. The containers should have appropriate handle or handles on the top or side and rim at the bottom for ease of emptying.

In case of large hotels and restaurants where it may not be convenient to store waste in 100 litres or smaller size containers, they may keep 1.1 cu.m containers which match with the primary collection and transportation system of the Council that is proposed to be introduced in the city.

5.2.1.6 Vegetable Markets

There **are …… vegetable and fruit** markets in the city**.** The vendors throw the waste on the floor of the market and create unhygienic condition.

The City Council may provide large 4.0 m3 containers as shown in photograph or covered tractor trolley at suitable locations within the market on full cost/partial cost recovery as deemed appropriate. The design and specification of such containers are kept at Annexure- A and B

The shopkeepers may be directed that they shall not dispose of waste in front of their shop/establishment or anywhere on the street or in open spaces and instead shall deposit their waste as and when generated into the container that may be provided for the storage of waste in the market.

5.2.1.7 Street Food Vendors

There are street food vendors in the town. They generate lot of waste at road side eating joints. A drive may be undertaken to educate street vendors and they may be directed not to throw any waste on the street or pavement. They must keep bins or bags for the storage of waste that generate during their activity. Their handcarts must have a shelf or canvas below for storage of waste generated in the course of business

5.2.1.8 Hospitals, Nursing Homes, Pathological laboratories etc.

The city has ……hospitals, nursing homes and path-labs.

These establishments produce bio-medical as well as ordinary waste. These establishments may be directed that they should not throw any bio-medical waste on the streets or open

spaces, as well as into the municipal dustbins or the domestic waste collection sites. They should also refrain from throwing any ordinary solid waste on footpaths, streets or Open spaces.

They should keep colour-coded bins or bags as per the directions of the Govt. of India, Ministry of Environment contained in Bio-medical Waste Management Rules, 2016 and follow the directions of CPCB & State PCBs from time to time for the storage of biomedical waste including amputated limbs, tissues, soiled bandages, used injections, syringes, etc. Another container with a lid for storage of food waste and other waste fit to be disposed of into the municipal domestic waste stream shall also be provided by them.

The storage of bio medical waste should be done strictly in conformity with directions contained in the Govt. of India's aforesaid notification.

5.2.1.9 Construction and Demolition waste (C&D)

Construction and Demolition Waste generated during the course of repairs, maintenance and construction activities comprising of bricks, stones, tiles, cement concretes, wood, etc., is generally not stored by the waste generators within the premises until its disposal. By and large this waste is deposited just outside the premises on the streets or open spaces causing hindrance to traffic and adversely affect the aesthetic of the city.

The Council may provide an enclosed area at suitable locations and declare them as C&D waste storage centers. Ask the citizens to deposit their construction and demolition waste at these centers. Council may lift this waste departmentally or through a private agency and transport the same through covered trucks to the processing site as per C&D waste Rules.

5.2.2 PROMOTING SEGREGATION OF WASTE AT SOURCE

It is essential to save the recyclable waste material from going to the waste disposal sites. Profitable use of recyclable material could be made by salvaging it at source for recycling.

This will save national resources and also save the cost and efforts to transport and dispose of such wastes at the landfills.

The Council may, therefore, draw up a program of conducting awareness campaign in various wards of the city utilizing the ward committees, local NGOS and resident welfare association. Simple literature may be developed for bringing in the awareness which may be publicized through media using cable net work and group meetings, distribution of handbills etc in different areas through NGOS. The sanitation supervisors may also create awareness during their field visits.

The following f urther measures may be taken by the Council towards segregation of recyclable waste:

- The City may mobilize NGOs to take up the work of organizing rag-pickers for collection of recyclable waste from the doorstep and take away the recyclable material which they collect each day to earn their living.
- The city Councils may actively associate resident welfare associations, trade & Industry associations, CBOs and NGOs in creating awareness among the people to segregate recyclable material at source and hand it over separately to the waste collector. The City Council may give priority to the source segregation of recyclable wastes by shops and establishments and later concentrate on segregation at the household level.
- The rag pickers may be given an identity card by the NGOs organizing them so that they may have acceptability in society. The City Council may notify such an arrangement made by the NGOs and advise the people to cooperate.

5.2.2.1 Expected Benefits of managing waste in segregated way

Table 1: Expected Benefits of managing Mixed waste in a Source Segregated way

S. No.	Variable	Way	Segregated way
1	Aesthetics Collection	ofMixed waste - necessitate multiple handling an segregation	Segregated waste - saves time effort ,money , energy etc n segregation of mixed waste a plant site
2	Work Conditions	Mixing of wastes lead hazardous and unhygienic wor conditions	Segregation of waste – hygienic work conditions

3	Sale Value	Mixing of Recyclable waste wit Bio degradable waste – low sal value	Source segregated waste – better sale value of each component
4	Processing waste	ofMixing of waste obstructs processing	Segregation of wastes at source facilitates processing cos effectively
5	Better Environmental Conditions	Poor environmental condition	Improved environmental conditions

Incentive Measures to promote source storage and segregation of waste at source

Recognizing the community engaged in segregation,
Rewarding key partners, groups and people on special occasions.

5.2.3 PRIMARY COLLECTION OF WASTE FROM THE DOORSTEP

The Council may introduce door to door collection of waste from all households, shops and establishments

The waste stored at the source of waste generation in a segregated manner need to be collected on a day to day basis at pre-informed timings

This is a very important function that the municipal Council must perform effectively to improve the system of solid waste management in the city. The SWM Rules 2016.

It is necessary for the Municipal Council to provide a daily service to all households, shops and establishments for the collection of organic/food bio-degradable waste as well as recyclable/non-biodegradable waste from the doorstep. This service must be regular and reliable. Domestic hazardous waste is produced occasionally so such waste need not be collected from the doorstep. People could be directed to deposit such waste at special domestic hazardous waste collection center that may be set up in the city by the Council as per SWM Rules, 2016 and be given wider publicity.

The following arrangements may be made by the city Council for primary collection of waste.

Introduce system of door to door collection

It is proposed that the Council may introduce door to door collection system through covered light commercial vehicles in all the areas that are accessible to such vehicles. It is assumed that about 80% population is living in areas which are accessible to LCVs & about 20% of the population is living in narrow lanes from where direct collection of waste in the motorized vehicles may not become possible. Such pockets may be served by a combination of containerized tricycles and LCVs.

The Council may therefore procure light commercial vehicles (LCV) for door- to- door collection of waste and identify private operators for operation and maintenance of the waste collection system through a transparent bidding process. A private operator may be assigned responsibility of door to door collection , transportation of municipal solid waste (MSW) from all households ,shops and establishments in the city or more than one private operator may be assigned the work to ensure that if one contractor fails to deliver another can take over and essential service does not get disrupted.

The Municipal Council may divide the city into units of 1500 households/ shops and establishments each and allot 1 LCV for door to door collection of waste per 1500 units. 2 sanitation workers per unit may be assigned the work of door to door collection of waste

every day in the morning between 7 and 11 am or any other time that may be convenient to the households and 9 and 1pm in commercial areas.

For collection of waste from 20% of the inaccessible areas, the Council may divide such households by 200 and allocate work of door to door collection to one sanitation worker per 200 households.

5.2.3.1 Method to be adopted for organizing door to door collection from households

The Door to Door Collection shall be carried out through motorized vehicles as shown in the photograph below.

1. Standard of services in the areas accessible through motorized vehicles:

a.The Council shall deploy at least one covered motorized tipping LC vehicle per 1500 households for Door to Door Collection of Waste, from residential and non-residential premises. The vehicles shall have non-conventional horn so as to alert the citizens about the arrival of waste collection vehicle. If the capacity of vehicle is smaller than 1 tonne MSW number of vehicles shall be increased proportionately.

b. Motorized vehicles shall ply on roads, streets, lanes & bye-lanes and each vehicle shall be accompanied by at least 2 sanitary workers. The driver shall blow the horn and the sanitary workers shall blow the whistle intermittently and collect the Waste from all the households, shops & establishments situated on both sides of the road / street etc. in the wards allotted under the contract for Door to Door Collection. The waste collectors shall collect the domestic / trade bins from the member or representative of the households, shops or establishments who may come forward to hand over the Waste to the waste collector on hearing the horn or the whistle.

c. The waste collectors shall in a routine course, educate the citizens to segregate the Bio-degradable and non Bio-degradable waste and keep ready in two bins and handover as soon as they hear the sound of the horn or whistle.

d. The waste collector shall transfer the contents of the domestic / trade bin into the waste collection vehicle and return back the container to the person who had handed over the waste.

e. The waste collector shall also pick up the Waste from the entrance of the premises if kept in a liftable container not exceeding 60 liters capacity by the Waste generator. The waste collector, after emptying the container into the waste collection vehicle, shall keep back the container to its original place.

f. In case of multi storied buildings or large commercial complexes/malls the waste collector will not be required to approach each unit in the premises. The waste collector shall report in front of the premises near the entrance at the ground f loor, announce his arrival and give reasonable time to the residents/traders/occupiers/management of the premises to deliver their Waste to the waste collector.

g. The Council may enter into a working arrangement with large commercial / institutional establishment/malls etc to pick up their W aste from a fixed point in their premises easily accessible to the waste collection vehicle.

h. The waste collectors shall move from house to house to collect the Waste from the entrance and shall not insist on the households to come to the vehicle and deposit the Waste inside the vehicle.

i. The waste collectors shall not enter inside the household premises for collection of Waste to save time and avoid any allegations of theft.

j. The waste collection vehicle shall move slowly in the residential & commercial areas during the collection process and intermittently stop for a while to enable the waste collectors to deposit the W aste collected from the Door to Door Collection into the vehicle

k. The waste collection staff shall wear the uniform and behave decently with the citizens they serve.

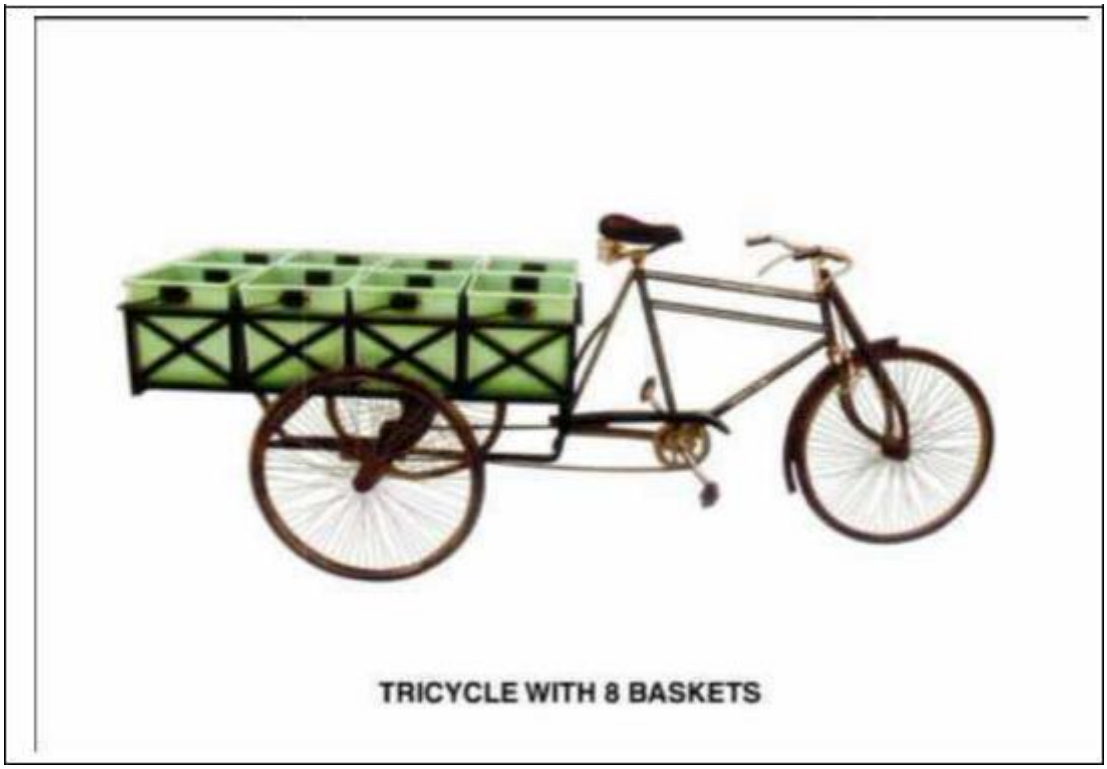
l. The waste collectors shall not demand any charges from the citizens for rendering service unless specifically permitted by the Authority.

m. The Council shall maintain the fleet of covered vehicles in a good working condition with minimum 10 % spare vehicles to maintain the adequacy of the fleet on the road.

Design and Specifications for LCV and tricycle for door- to- door collection of waste are given in Annex.

5.2.3.2 Door to door collection through tricycles in inaccessible areas

The municipal council may divide each inaccessible area into units of 150 to 250 houses each depending on the density of houses and access to roads and lanes. Looking at the difficult terrain in some of the areas, an average of 200 households per private waste collector worker is suggested. One part time worker per unit may be assigned the work of door to door collection of waste every day in the morning between 7 and 11 am or any other time that may be convenient to the households . Containerized tricycle may be used as shown below:-



TRICYCLE WITH 8 BASKETS

Part time workers may deployed in the wards by the Council through RWAs, NGOs or private sector preferably by upgrading the rag pickers or engaging the existing private sweepers working in several colonies and housing areas.

The waste collector should have a bell attached to the tricycle or given a whistle.

He should ring the bell or blow the whistle announcing his arrival at the place of his work and start collecting the waste from the doorstep. The people may be directed that on hearing the bell, they should come out and hand over their to domestic bin/bins the waste collector or deposit their domestic biodegradable waste as well as recyclable waste into the separate compartment of the handcart of the waste collector.

5.2.3.3 Collection of Waste from Shops and Establishments

Shops and establishments normally open after 9 am.

Waste collection from commercial areas may be organized between 9.00 am and 1.00 pm by using LCV.

5.2.3.4 Vegetable, Fruit, Meat Markets Waste

There are only…… vegetable and fruit markets. The market wastes should be removed on twice a day basis through a contractor on full cost-recovery basis

.

The large containers kept in the fruit and vegetable markets should properly be emptied during non-peak hours by engaging a contractor, or departmentally as deemed expedient by the City Council.

5.2.3.5 Collection of construction and demolition waste

The Council may collect the C&D waste from the enclosures with the help of loader and tractors/trucks departmentally or through contractors.

5.2.4 SWEEPING OF STREETS & PUBLIC SPACES

In absence of the system of primary collection of waste from the door step, street sweeping is the most common method adopted for the primary collection of various types of wastes disposed of on the streets. However, it is observed that all roads and streets are not being swept on a daily basis. Only certain important roads and markets are swept daily, some are swept on alternate days or twice a week. No planning is done to ensure that all streets would be swept regularly.

The street sweepers use short handle brooms to sweep the street which necessitate bending all the time. This cause fatigue and loss of productivity. They are also given in- efficient hand carts that do not synchronies with scientific secondary storage system necessitating deposition of waste on the ground. (Pl check this & correct as may be necessary)

Recommendations

Daily sweeping of public streets where there is habitation or commercial activity may be ensured. Isolated pockets or streets with little or no habitation around may be taken up at regular intervals.

The yardstick for cleaning open spaces should be prescribed based on local conditions. However, 30,000 sq.ft of open space can be given to a sweeper for cleaning per day.

The following measures may be taken to ensure regular sweeping of streets and public places:-

Street sweeping to be done on a daily basis in residential and commercial streets

Sweeping of the public roads, streets, lanes, by-lanes should be done daily having habitation or commercial activity on one or both sides of the street.

i. Out of the total …. Km road length, ….. km is high density road identified in the city may be swept daily in the morning hours. The remaining …. kms maybe swept on alternate days

ii. Similarly a timetable should be prepared for cleaning open public spaces periodically in the afternoon ensures that they do not become dump yards and always remain clean.

iii. The non-metaled roads may be taken up for cleaning in the afternoons by rotation as these hours are not appropriately utilized.

Total length of roads in the city is ….. Km. However the road length to be swept daily is …. Km. ….. man are required to clean these roads @ 2 persons per Km. besides, another …….. Km road length need to be swept on alternative days. Thus additional …… man will be required to clean these roads, thus a total of …. Sweepers would be required to ensure regular sweeping of the streets in the city.

it is proposed that each sweeper may be allotted work as per the following yard stick.

High and medium density road, market place = 400 to 600 RMT road lengths

Low density roads = 650 to 750 RMT road lengths

Every individual may be made responsible for street and drain cleaning the area allotted and pickup the waste collected in his/her containerized handcart and take to secondary

storage depot .Alternately one team of two sweepers each shall be made responsible for twice the stretch of road allotted to one person as mentioned above. It assumed that each sweeper will clean approximately 500m of road stretch, therefore two sweepers between themselves are responsible for cleaning 1 km of road. One containerized wheelbarrow/ handcart (with sealed ball bearings) shall be allotted to each sweeper where he is made responsible for sweeping and carrying the waste to the storage depot or else one hand cart shall be shared by a team of two sweepers.

The sanitary supervisor will be responsible for monitoring the performance of sanitary workers and making surprise checks and identifying if any team is not working properly.

Tools and protective gears to be given to Sweepers

Use of appropriate tool plays an important role in improving the efficiency of the work force. Presently most of the tools utilized by the sanitation workers are inefficient and outdated and need to be replaced by eff icient containerized tricycles and handcarts. Traditionally the work force resists any change, even if it is for their good. Persuasion and awareness efforts will ther efore be necessary to convince the workforce to adopt improved tools and equipment. Presently……. handcarts are available to sanitation workers that need to be replaced by containerized handcart or tricycle.

The NAGAR PALIKA PARISAD BAHRAICH Council safai karmacharis shall do street sweeping daily.

The tools required for street sweeping is estimated based on length of roads in NAGAR PALIKA PARISAD BAHRAICH and safai karmacharis required for street sweeping.

Sl.No	Description	Unit
1	Number of safai karmacharis required	560
2	Wheel barrows required per person @ 1/person	600/ once in 3 years
3	Wheel barrows required per pair	300/ once in 3 years
4	Number of brooms required @ 2 brooms per worker/ month	400 month
5	Number of metal tray and metal plates required @ 2/year/person	200 twice a year

PPEs required for the street sweeping staff include gloves, boots, safety mask and uniform.

Sl.No	Description	Units
1	Required number of gloves @ 2/year	**1120**
2	Required number of pairs of boots @ 1/year	**30**
3	Required number of safety mask @ 2/year	**560**
4	Required set of uniform @ 2/year	**560**

Cleaning of surface drains

In many part of the city there are open surface drains on both sides of the road, into which quite often the sweepers and the public dispose of waste in an un-authorized manner. These drains need to be cleaned on a regular basis to permit free flow of wastewater. Sweepers and citizens may be educated not to dispose of any waste into drains. W hatever waste is removed from the drains should not be allowed to remain outside the drain for long for drying. The silt may be allowed to dry for about 4 hours outside the drain before transporting the semi-solid silt for disposal. In special situations a maximum of 24 hours should be allowed for removal of such waste. (pl verify the above data & correct as may be necessary)

Provision of litter bins

With the introduction of door to door collection of waste and mandating the citizens not to litter on the streets, it is essential that the Municipal Council provides the facility of litter bins in market places, railway station area and other areas frequented by

the people, so that people can deposit the litter in hand into such bins while on the move and keep the streets litter-free.

To begin with the Municipal Council may provide
…….(200)??? litter bins at locations on the main commercial streets, temple area , railway stations, bus stations,
market places, parks and gardens to prevent littering of streets and public places.
The design and specification of these litter bins have been given in Annexure ……..

Such bins could be of the design shown in the photograph. The removal of waste from these litter bins should be done by the beat sweepers during their street cleaning operations. The waste from the litter bin should be directly transferred into the handcart of the sweeper.

The removal of waste from these litter bins should be done by the respective street sweepers during their street cleaning operations. The waste from the litter bin should be directly transferred into the handcart/tricycle of the sweeper.

Such facilities can be created at no cost to the City Council by involving the private sector and giving them advertisement rights on the bins for a specified period to or by allowing them put their name on the bins as a sponsor.

6.2.5 Abolish open waste storage sites &replace the same by metal containers

Overflowing of dust bins and heaps of garbage lying unattended at open waste storage depots is a serious problem faced in the city.

Covered containers may be placed at strategic locations in the city.

Estimated need of secondary storage containers for …. wards

There are ….. open sites for secondary waste storage in Municipal council/corporation town. All these sites may be totally eliminated and instead 1.1 cu.m black color covered bins maybe placed at the …… existing locations. ….. new sites have also been identified where black containers maybe placed. Thus the total requirement of black containers would be……..

TABLE A: Details of. Existing waste storage sites where 1.1 cum containers are to be placed.

No.	EXISTING LOCATION	NO OF CONTAINERS
1		
2		
3		
4		
5		
6		
7		
8		
9……n		

Table-B new **Location of Dustbins in city/ t ow n where closed containers of 1.1cu.m need to be placed**

No.	NEW LOCATION	NO OF CONTAINERS
1		
2		
3		
4		
5		
6		
7		
8		
9……..n		

MSW collected from the doorstep shall be taken directly to the landfill through MRF.

Proposed requirements for secondary waste collection system

The total containers required for the city would be ….. of black colour … 5% .. containers.

….. maybe kept spare for immediate replacement in case

of damage. Thus, the total number of containers to be

procured will be ….. The design and specification of 1.1 cu.m.

container is kept at Annexure ….

5.2.6 TRANSPORTATION OF WASTE

Presently ….. open tractors/trucks are used for transportation of waste. Use of all the open tractors need to be dispensed with and instead covered tractor trolly/twin bin dumper placer/ Refuse Collector/ Compactor which is compatible with tractor trolly/4 cu.m / 1.1 cu.m./ containers respectively should be used. These vehicles would be very hygienic and efficient for transportation of waste. The design and specifications of twin bin dumper placer & refuse compactor machine are given in annex

5.2.6.1 Requirement of refuse compactors

One compactor would be in a position to serve 60-70 containers in a day.
Therefore, …….

compactors and 1 standby compactors to maintain reliability of service maybe procured.

Design and specification of compactors are given at annex…….

The transportation of market waste may be done through dumper placer machines.

The design and specifications of dumper placer are given in Annexure

5.2.6.3 Transportation of Construction Waste and Debris

Council may give the contract for the management of C&D waste storage centres or remove the waste departmentally to disposal site using front-end loader and trucks/tractor trolleys ……loader and ……..trucks/ trolleys maybe procured for the purpose. The design & specifications are given in Annexure ……

(C&D waste management rules 2016 may followed here)

5.2.6.4 Workshop Facility for Vehicle Maintenance

The workshop is the backbone of solid waste management system. If fleet of vehicles and equipment are not properly maintained, the solid waste management services would suffer substantially. The Council should therefore identify a good garage within the city which can take up repairs and maintenance of the vehicles and equipment that are proposed to be procured in this report.

5.2.6.5 Regular/washing of containers and trucks

It is essential to maintain the fleet of vehicles and containers and make an arrangement of their regular washing and cleaning.

High pressure water jetty for washing the containers, bins is recommended.

6 INSTITUTIONAL AND CAPACITY BUILDINGS

The subject of solid waste management has remained neglected for the past several decades with the result that the level of service is highly inadequate and inefficient. For improving the solid waste management services it is essential to adopt modern methods of waste management, have a proper choice of technology, which can work in the given area successfully. Simultaneously, measures must be taken for institutional strengthening and internal capacity building so that the efforts made can be sustained over a period of time and the system put in place can be well managed. Institutional strengthening can be done by adequately decentralizing the administration, delegating adequate powers at the decentralized level, by inducting professionals into the administration and providing adequate training to the existing staff. It will also be necessary to fix work norms for the work force as well as for supervisory staff and the output expected from the vehicles and machinery utilized. NGO/private sector participation also needs to be encouraged to make the service competitive and efficient.

6.1 PROPOSAL FOR INSTITUTIONAL STRENGTHENING

6.1.1 INDUCTION OF QUALIFIED SUPERVISORY STAFF

The subject of solid waste management has remained neglected over a period of years and qualified supervisory staff is not inducted to manage the systems effectively. It is essential to induct professionals in various cities looking to their population adopting the following yard stick. Looking to the population of NAGAR PALIKA PARISAD BARAICH the requirement of professional staff is shown in the table below:

Yard stick for induction of Qualified engineers, inspectors and supervisors

Designation of Post	No. of Post Required	Existing Posts	Shortfalls/ surplus	Sanctioned Posts
1Environmental/civil/PH Engineer of supdt. engineer level for city above 2 million	--	--	--	---
1Environmental/civil/PH Engineer of executive engineer level for city bet. 0.5 to 2 million	1	--	1	--
1Environmental/civil/PH Engineer ofasst. executive engineer level for city bet. 2.5 to 5 lacs	---	---	---	---
1 JE +1 Chief Sanitary Inspector per 1 lac Population	2+2	--	2+2	--
1 Sanitary Inspector per 50000 population	4	1	3	2
1 sanitary Sub Inspectors per 25000 population	8	--	8	--
1 Supervisors per 25 sanitation workers or 12500 population	15	10	5	13
Total				

Keeping in view the aforesaid yard stick, and the population of NAGAR PALIKA PARISAD BAHRAICH
Following supervisory staff need to be inducted

6.2 HUMAN RESOURCES DEVELOPMENT

Human resources development is very essential for internal capacity building for any organization. Training, motivation, incentives for outstanding service and disincentives for those who fail to perform are essential for human resources development.

Concerted efforts should be made by the Municipal council to inculcate among its officers and staff a sense of pride in the work they do and to motivate them to perform and give their optimum output to improve the level of services of the city and the image of the Municipal council.

6.2.1 TRAINING

Special Training to Unqualified Staff

Unqualified supervisory staff should be given in service training to qualify for supervising sanitation works.

Refresher Courses for Supervisory Staff

Refresher courses should be conducted for the supervisory staff at least every 5 years, or they should be sent for training to get an exposure to advance in this field.

6.3 WORK NORMS

6.3.1 NORMS OF WORK FOR STREET SWEEPERS

The sweepers may be assigned “Pin point” individual work assignments according to the density of the area to be swept. The yardsticks given earlier may be adopted.

The norms of work for the supervisors may also be pr escribed and monitored by the Municipal council , for the extent of sweeping areas and the number of garbage collection points to be inspected each day by the various levels of supervisor s and inspection of processing and disposal sites etc. to ensure adequate output of the supervisory staff.

The sanitary must remain on the field for 4 hours in the morning between the time of street sweeping and lunch break.. The junior level supervisors should supervise till the end of the working hours of the street sweepers and transport staff. This supervision will have a direct impact on the quality of service.

For capacity building of the department, senior officials should be frequently exposed to developments taking place in various parts of the State and country by sending them out on city visits and to attend seminars, workshops and training courses. They should also be involved in all decision making processes.

6.4 INTER- DEPARTMENT AL CO-ORDINATION

Since the SW M department depends greatly upon the support of various departments of the Municipal Council, more particularly the Engineering department, the Municipal Commissioner /executive officer may hold regular monthly co-ordination meetings to sort out problems faced by the SW M department such as expeditious repairs of roads, drains, water- supply pipe-lines etc. which cause hindrance to street and city cleaning. The reinstatement of roads dug up by utility services should also be given priority.

The procurement procedures for the SW M equipment also need to be expedited and simplified in such meetings. A Rate-contract system should replace time consuming tendering procedures.

Laying and maintaining of services in slums, provision of public health engineering services and water supply for public toilets and road construction in the slums to improve overall health and sanitation in the city may also be regularly reviewed in the co-ordination committee meetings.

6.5 ENCOURAGEMENT TO NGOS AND WASTE COLLECTOR CO- OPERATIVES

NGOs may be fully involved in creating public awareness and encouraging public participation in SWM planning and practice.

The Municipal Council may also encourage NGOs or co-operative of rag pickers to enter this f ield and organize rag pickers in doorstep collection of waste and provide them an opportunity to improve their working conditions and income. The Municipal council can give incentives to NGOs in their effort of organizing rag pickers in primary collection of recyclable and/or organic waste, and provide financial and logistic support to the extent possible.

6.6 NGOS/ PRIVATE SECTOR PARTICIPATION

SW M services are highly labour intensive on account of increased wage structure of the Government and municipal employees this service is becoming more and more expensive. Besides, the efficiency of the labour force employed in the Municipal Council is far from satisfactory. High wage structure and ineff iciency of the work force results into steep rise in the cost of service and yet the people at large are not satisfied

with the level of service being provided by the Municipal Council. Efforts to increase the efficiency by H.R.D. and institutional strengthening will, to some extent improve the performance but they may not be enough. It is, therefore, necessary that the Municipal Council seriously consider augmenting NGO/private sector participation in solid waste management.

Private sector participation or public private partnerships may be considered by Municipal Council keeping in mind the provisions of the Contract Labour (Regulation and Abolition) Act 1970 of the Government of India under which state governments can prohibit contracting out the services already being provided by the Municipal Council. Therefore, while considering any measure of privatization it is necessary to keep in mind the provisions of the above law, the directions that may have been issued by the state government under this law in those areas which are not prohibited and where Municipal Council is not currently providing a service. This will check growth in the establishment costs, bring in economy in expenditure and introduce an element of healthy competition between the private sector and the public sector in solid waste management services. There should be a right mix of private sector and public sector participation to ensure that there is no exploitation of labour as well as of the management.

NGO/private sector participation can, therefore, be considered in newly developed areas, under-served areas and particularly in areas where Municipal Council has not been providing service. Some examples are given below:

NGO/private participation is recommended in the areas of door to door collection of domestic waste, door to door collection of commercial waste, door to door collection of hospital waste, hotel waste, construction waste, and yard waste, and in the area of awareness and creating public participation. The private sector may also be brought in for the operation and maintenance of compost plants and other treatment plants and O& M of engineered landfill facility.

Major repairs and maintenance of vehicles at a private garage may als o be considered seriously.

7 PROMOTION OF RRR & CREATION OF PUBLIC AWARENESS

7.1 REDUCE, RE-USE AND RE-CYCLE (R-R-R)

Everyone is concerned with the growing problems of waste disposal in urban areas with the scarce availability of land for processing and disposal of waste and environmental remediation measures becoming ever more expensive. It is therefore necessary to not only think about effective ways and means to process and dispose of the waste that we generate each day, it is also essential to seriously consider how to avoid or reduce the generation of waste in the first place and to consider ways to re- use and recycle the waste, so that the least quantity of waste needs to be processed and disposed of. This requires a very effective public awareness campaign coupled with commitment by industries and the efforts of decision-makers at all levels.

While the quantity of food waste generated per capita has remained almost static, the quantity of packaging waste material and non-bio-degradable waste is going up alarmingly every year. This increases the burden on council in dealing with the problem of non-biodegradable and non-recyclable components of waste landing up at processing and disposal sites.

The following measures are therefore proposed to Reduce, Re-use and Recycle waste:

Re-Use

One person's waste can be useful material for others. Efforts should therefore be made to encourage collection of such re-usable material through waste collectors, waste producers, NGOs and private sector instead of allowing reusable waste to land up on the disposal sites. Bottles, cans, tins, drums and cartons can be reused.

Re-Cycling

In the era of excessive packaging materials being used, a lot of recyclable waste material is generated. All-out efforts are necessary to retrieve recyclable material and fed to the recycling industries

7.2 PUBLIC PARTICIPATION

Public participation is the key to success in these efforts. Information, Education and Communication (I.E.C.) mechanisms should be used to ensure effective public co-operation.

7.3 PUBLIC INFORMATION, EDUCATION, COMMUNICATION AND AWARENESS PROGRAMS

For the successful implementation of any program involving public participation, it is essential to spell out ways in which public participation in hygienic Solid W aste Management (SWM) can be promoted and ensured, hand in hand with Municipal initiatives.

Citizen co-operation is vital for keeping garbage off the streets, especially at the very first stage of keeping biodegradable "wet" kitchen and food wastes unmixed and separate from recyclable "dry" wastes and other hazardous wastes. If the reasons for this are explained, public participation is bound to improve. A series of measures can be taken to bring about a change in public behavior through public awareness campaigns, which could be as under:

7.3.1 INVOLVEMENT OF PROFESSIONAL COMMUNICATORS

If messages are not conveyed in the right way, they may not yield the desired results. Professional inputs are necessary in developing a strategy for effective large communication. Most advertising agencies have Social Marketing experts to convey civic messages effectively. They can be contacted at the city level to create suitable messages for various uses, preferably free or at cost as a public service.

7.3.2 INFORMATION HOT-LINE

The key to success of any public-education, awareness and motivation program is to provide as many ways as possible for the public to interact, as promptly and conveniently as possible, with policy-makers, to seek clarification of doubts, share ideas or give suggestions which are constructively followed up. A telephone hot line or Post Box number for written communications could be one of the ways to have of inputs from members the public. This need to be manned during working hours (or even later) by polite, responsive and dynamic persons who are well informed, interested in the subject and available at all stated times. These communication

channels (one or more) can be set up and monitored by using suitable in-house staff of the Council.

7.3.3 USE OF CABLE TV AND CABLE CHANNELS

This is a very powerful medium and can be used to advise citizens not to litter and instead keep two bins for the storage of waste at source, one for biodegradable waste and another for recyclable waste. Citizens may also be advised to cooperate in handing over their waste to the waste collector on a day to day basis as per the collection arrangements and timings prescribed by the municipal Council. This network can also publicize the contact numbers of the officials for addressing their grievances as regards to solid waste management.

7.3.4 ADS IN NEWSPAPERS

Advertisements may be given in local news papers from time to time to create public awareness. Local newspapers can also be requested to start a regular Suggestion Box on the city page to improve solid waste management services in the city. They may also be requested to give coverage to successful initiatives that have overcome such problems in a constructive way.

7.3.5 USE OF HOARDINGS/BANNERS

Special Hoardings/banners may be put in the city covering messages seeking public participation. Alternatively, all Municipal-licensed Hoardings should have a space reserved for civic messages. This will add a "socially-aware" image to the advertisers and will not reduce the usefulness of the hoarding to them at all. The messages can be those developed by advertising agents to promote any of the recommendations of this new waste-management policy. The Hoardings should also publicize the hot-line numbers etc.

7.3.6 ISSUE OF HANDBILLS

Council may get handbills printed with photographs showing the new system of waste management and advise the people to cooperate in making their city clean and healthy. Such handbills could be got prepared from the professionals for effective delivery of message. Council can use newspaper delivery services for distribution of handbills besides distributing the same through health department network.

7.3.7 DISPLAY OF SLIDES IN CINEMA THEATRES

Very brief messages may be displayed through cinema slides to educate the citizen for participating in SWM services.

7.3.8 NGO INVOLVEMENT

Many NGOs are committed to improve SWM practices to protect the environment and have been very active in this field. They have also developed good mass- and communication skills education programs for the public. Such NGOs may be persuaded to actively support the new strategies recommended in this report and associate in public awareness campaigns. Those that wish to conduct programs for sections of the public on the new SW M strategies should be encouraged to do so through direct support or through use of Council facilities:

7.3.9 STREET PLAYS IN SLUMS

NGOs may be requested to organize simple street plays through college students and high school students to convey message to handle the SWM effectively by the community. All the slum pockets could be covered by staging street plays t o educate the slum dwellers.

7.4 USE OF SCHOOLS AND COLLEGES

Children are powerful communicators. Parents who do not listen to advice from others will often take their children seriously. Children are idealistic and would like to change their world for better. The municipal Council may motivate the schools in the city to take out rallies in the morning carrying placards conveying brief messages against littering and storage of waste at source. The strategy should be not just passing through the streets and shout slogans and instead the students may be disbursed in each land and by lane to communicate the message in person to the parents and reassemble after covering lanes from the left and right sides of the main roads and thus cover the whole city. Large number of schools if involved simultaneously would be in a position to cover the city in a very short time and effectively.

Involving commercial sponsors

Firms can be encouraged to adopt certain areas or sponsor cleanliness drives and give awards to those who maintain cleanliness in the selected areas.

The following budget may be allocated for creating public awareness for initial 2 years of IEC activity

Description	Amount in lakhs
Publicity through local cable network.	
Advertisement in all local newspapers	
Distribution of pamphlets.	
Banners. Put 2 banners of 12 ft. x 4 ft in each ward at strategic places. Total ……. banners.	
Cinema slides.	
Street plays. Organize one street play in every slum through NGOs in one year.	
Organize rally of students. 4 rallies in a year for two years.	
Awareness training to municipal staff. Sweepers for 1/2 day, sanitary supervisors for 1 day.	
TOTAL	

8 FINANCIAL ASPECTS

8.1 FINANCIALS OF MUNICIPAL COUNCIL

The municipal finances are showing an / s t e a d y unsteady trend in its annual growth as could be seen from the summary of revenue receipts and expenditure for the years 2014-15 to 2016-17 as under.

Item	2014-15	2015-16	2016-17
		Amount in Rs.	
Revenue receipts			
Revenue expenditure			
Expenditure on SWM			

It is observed that the Municipal Council is mainly dependant on government grants. The current financial position of t he municipal council could thus be considered unsatisfactory. The council, therefore, need to take concerted measures to improve its financial health.

With the modernization of solid waste management system, the annual expenditure on repairs and maintenance of tools, equipment and vehicles will increase though; there would be a reduction in manpower cost for the operation and maintenance of the modern equipment. The council needs to make adequate provision for the maintenanc e of tools, and fleet of vehicles as well as for their replacement of the tools, equipment and vehicles at the end of their useful life.

Until now the council never did scientific disposal of waste and therefore, practically did not spend any amount on treatment and disposal of waste. But now, when it is mandatory to treat and dispose of the waste scientifically, the council will have to shell out money towards the tipping f ees per tonne of waste to be disposed of at the scientific landfill as soon as it is ready for operation. It is therefore, essential for the municipal council to earmark adequate funds for solid waste management hereafter and also provide for an annual increase in the cost on account of population growth and escalation in prices. The council needs to set apart a minimum 5% of ca pital amount towards the repair and maintenance for tools and

equipment and 10% to 33% cost of tools and equipment towards their replacement at the end of their useful life and also provide for a minimum of Rs. 350 per MT of waste as a tipping fee for the disposal of at least 25% of the waste rejects This minimum amount will have to be set apart each year besides the normal expenditure of fuel and the wages of the staff engaged in solid waste management services.

The requirement of funds for the procurement of tools and equipment as has been recommended in this report is shown in the table 8.2 below which is followed by a table 8.3 showing the requirement of funds for annual repairs and the replacement of the tools, equipment and vehicles at the end of their useful life which is ranging from 3 years to 10 years. This will be a recurring cost besides the normal salaries and allowances and fuel cost for running the fleet of vehicles.

8.2 REQUIREMENT OF TOOLS, EQUIPMENT, VEHICLES AND FUNDS FOR THE PROCUREMENT OF THE SAME AS WELL AS FOR THE CONSTRUCTION OF TREATMENT AND DISPOSAL FACILITY AND REMEDIATION OF OLD WASTE DUMPS

Sr. No.	Activity	Tool, Equipment, Vehicle etc.	Yard Stick	Quantity Required	On Hand	Short fall	Unit cost	Amount Require d to meet shortfall (Lacs)
1	Storage of waste at Source	Domestic Bin (12-15 Litre)	1 per Household	----	0	----	150	-- --
2	Door to Door Collection	LCV	1 per 7500 population		0		6.5 Lacs	---
2b	- Do -	Containerized Tricycles for 20% population	1 per 1000 population	-- --	0	-- -	15000	
3	Street Sweepers	Handcart with metal tray + plate (6 sets)	1 per 500 Running meter road length		0	-	10000	
4	Prevent Littering	Litterbins	1 per 50 meter of Commercial Street + Tourist Spots		0		5000	-
5a	Secondary Storage	1.1 Cu.M. metal Container (Black)	1 per Storage depot		0		25000	
5b	- Do - (For construction waste)	Enclosures	1 per zone		-		500000	
5c	- Do -	Cement Platform	1 per Depot		0		10000	

Sr. No.	Activity	Tool, Equipment, Vehicle etc.	Yard Stick	Quantity Required	On Hand	Short fall	Unit cost	Amount Require to mee shortfall (Lacs)
6a	Transportation	Refuse Compactor	1 per 60-70 Containers		0		30 Lacs	
6b	-Do- (Market Waste)	Twin bin Dumper Placers	1 per 10 Containers		0		17 Lacs	
6c	-Do- (Construction Waste)	JCB+ Tractor	1 per 30 MT 2 per JCB				25 lacss	
7	Public awareness IEC							--
	TOTAL							
8	**Contingency (2.5%)**							
9	**GRAND TOTAL**							
10	**Say**							
11	**In Crores**		**17**	**In words: Rupees**				

8.3 ANNUAL REQUIREMENT OF FUND FOR REPAIRS AND REPLACEMENT OF TOOLS, EQUIPMENT, TREATMENT AND DISPOSAL FACILITY

Sr. No.	Item of Expenditure	Quantity Required	Cost per unit in Rs.	Total Expenditure (in Lakhs)	Annual cost of repair (2017value) in Lacs	Expected life of eequipment and vvehicles in years	Proportionate annual cost of replacement in Lacs (as per 2017 value)
1	LCV		6.5 Lacs			7	
2	Containerized Tricycles for 25% population		15000			4	
3	Handcart with metal tray + plate (6 sets)		10000			4	
4	Litterbins		5000			3	
5	1.1 Cu.M. metal Container (Black+ Green)		25 lacs			4	
8	Refuse Compactor		30 lacs			10	

Sr. No.	Item of Expenditure	Quantity Required	Cost per unit in Rs.	Total Expenditure (in Lakhs)	Annual cost of repair (2017value) in Lacs [@5% of capital value]	Expected life of quipment and ehicles in years	Proportionate annual cost of replacement in Lacs (as per 2013 value)
9	**Dumper Placers**		17 Lacs			8	
10	**JCB**		25 Lakhs			10	
	TOTAL						

It will be seen from the table above that annually Rs. -----Lacs would be required for repairs of the tools, equipment and vehicles, Rs.------ Lacs would have to be set apart towards the sinking fund for the replacement of the vehicles and equipment at the end of their useful life. Besides, a tipping fee @ Rs. 350 per MT for nearly ---- MT per day will have to be paid which will amount to Rs.----- Lacs annually. This will make a total of Rs.

----Lacs towards the cost of repairs, replacement and landfill fees which council will have to find from its own budget. These funds will have to be found each year besides the salaries and allowances of the existing staff and fuel cost. The cost of escalation will have to be added as per the market conditions prevailing at a relevant time.

8.4 FUNDING FOR CAPITAL EXPENDITURE

As per the estimates of the cost of procurement of tools, equipment, vehicles and construction of treatment and disposal facilities, the Council would need Rs. ----crores to put the entire system in place.

As the time limit for implementing SWM Rules 2016 is approaching fast the council, need to pr ocure all the tools, equipment, vehicles and construct treatment and disposal facility very expeditiously and put the system in place within a period of less than 1 year.

Estimation of Annual Operation and Maintenance cost

The DPR envisages PPP mode in service delivery. However services like street sweeping, Drain cleaning, etc. have to be provided departmentally with permanent sanitation workers and supervisory staff. Door to door Collection, transportation, Processing and Disposal is desired to be done on a PPP mode to keep the cost low and improve the efficiency. The following cost estimates may be kept in view while budgeting for SWM Services.

Estimation of Annual Operation and Maintenance Cost				
A	Salary of municipal staff			
	Designation	Average Monthly pay	No. of Staff	TOTAL (IN LAKHS)
	Sweeper			
	Drivers			
	Supervisor			
	Sanitary Inspector			
	Engineer…..n			
B	Annual Repairs and maintenance cost of vehicles and Equipment			
	As per DPR Para LAKH			
C	Annual Cost of Operating Dumper Placers/ Compactor for Container lifting	x1500 x365 = LAKH x 4000 x 365 = LAKH x 1500 x365 = LAKH TOTAL = **LAKH**		
D	Tipping Fee to Contractors for Door to Door Collection	1000/-- @ per TPD		----LAKH
E	Tipping Fee to Contractors for Waste disposal at Sanitary Landfill	350/- @ per TPD		---- LAKH
Total (IN LAKHS)	--------			

Finance for O&M

Whereas, the Municipal Council may find the financial support under the Govt scheme for capital investment; but it will have to find funds for maintaining the services in a sustainable manner and ensure that all the facilities created are maintained effectively and adequate funds are made available for the same.

Solid Waste Management is one of the most essential services and needs to be provided satisfactorily so that health and sanitation is maintained and the environment is well protected. It is an obligatory duty of Municipal Council. It cannot escape the responsibility of providing this basic service on the grounds of paucity of funds. The Municipal Council has, therefore, to find or raise funds to maintain the minimum level of service recommended in this report.

Following measures may be initiated to improve financial health of the local body.

8.4.1 IDENTIFY PRIORITY AREAS

8.4.2 INTER-SE PRIORITY AMONG OBLIGATORY SERVICES:-

8.4.3 IMPROVE COLLECTION EFFICIENCY

8.4.4 REVIEW THE EXISTING RATE AND CHARGES

8.4.5 NGO/PRIVATE SECTOR PARTICIPATION

8.4.6 REVIEW ESTABLISHMENT COSTS

8.5 COST RECOVERY THROUGH USER FEES, AND SELLING COMPOST, ETC.

The municipal authorities in the country generally do not provide door to door waste collection service and do not levy any charges exclusively for solid waste management as solid waste management services are funded from the general taxes levied by the municipal authorities.

Now when door to door collection system is being introduced through private sector **o** participation, it is essential to seriously consider the cost recovery for this personal service rendered. This can be best done by levy of user fees from the beneficiaries by prescribing different rates for different categories of waste generators.

The following rates are suggested.

h

Category of beneficiary	Monthly user fee	Projected annual recovery of user fees (Rs. In Lacs)
Low income group house holds (--------)	Rs. 20month	
Households other than low income group (-------)	Rs. 30/month	
Restaurants ------)	Rs. 300/month	
Normal Shops and establishments -------)	Rs. 100/month	
Large institutions/commercial esta.	Negotiated rate to recover full cost	

Hotels (------)	Rs. 500/ Month or negotiated rate	
Income from Compost Plant [as investment is to be made by municipality]	Rs. 500/tonne	
TOTAL		

Considering 85% collection efficiency, council may be able to recover Rs. ---- Lacs, say Rs. ----- lacs annually. Out of the above amount Rs. - - - Lacs may be spent towards door to door collection services. This would leave a balance of ----Lacs annually to be used towards O&M cost as against expected cost of Rs --------- leaving a balance of---- Lacs towards replacement cost. Therefore the council will run shorof Rs. ------Lacs annually towards replacement cost which should be made up either by raising user charges or paying from general tax. Cost of street sweeping should be spent from general tax.,

Project implementation schedule

There has been enormous delay in implementation of the SWM Rules, 2016 for various reasons. It is now essential to take concerted measures to implement the rules expeditiously. This necessitates 1) procurement of tools, equipment and vehicles from the funds and grants available with Local body on a fast track and2) to invite private sector to provide services on a PPP mode.

Following schedule is proposed for Implementation to ensure that all activities are taken up parallel and implemented within the time lines indicated in the SWM Rules, 2016 and Swachh Bharat Mission.

ACTIVITY SCHEDULE FOR PROJECT IMPLEMENTATION									
Sr. No.	Activity	Timeline							
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1	Invite Bids for Procurement of tools equipment and vehicles and bid evaluation								
2	Give work order								
3	Procure the tools, equipment and vehicles								
4	Invite RFP for awarding PPP contacts for . Collection and transportation								
5	Bid Evaluation and award of contract								
6	Commissioning of services by the first concessioner								

ANNEXURES

ANNEXURE A- Secondary Storage containers metres of 1.1 Cubic

General:

Steel Garbage Containers for waste collection shall be provided with 4 Castor Wheels with Blocking System. The Garbage Collection Bins shall be of 1100 Ltrs Capacity as per DIN Standards. These should be closed type hygienic bins meeting DIN Standards. These Bins should be provided with Bin Cover which opens automatically when the Bin Lifter lifts the Bin onto the machine hopper. For this purpose, the Bins should be provided with special link arrangements, which are operated by the Compactor Bin Lifter. The Bin construc tion should be of Pressed Steel Sections for ensuring adequate structural strength required for handling with the Compactor Bin Lifter. Bin shall be designed to be lightweight and with facility to be easily handled by two Bin Handlers.

Capacity: 1100 Litre. (1.1 m3)

Base Material:

Body : Steel

Lid : Steel

Dead weight : 125 kgs (Approx.) Load

capacity : 1000 kgs (Approx.)

Other Requirements:

a) Four heavy duty swivel castors (360^0 turning) capable to bear up to 1125 Kg weight without failure, including two wheels with locking device and steering guides.

b) Adjustable spring supported lid for easy opening and closing

c) Rubber Profile on the lid, which should protect fingers before closing the lid of sections min. 3 cms between body and lid

d) Handles on body e)

Handle on the lid

f) Painted Green / Blue/ Black as specified.

G.A. Drawing shall be submitted for approval before manufacturing.

ANNEXURE B- Secondary Storage container of 4.0 Cubic metres

Applications

The container would be used for storage of municipal solid waste. The container shall have capacity of 4 cum MSW and shall be made of reinforced steel frame and cladded with sheets. The lifting hooks would be integrated into the frame and be capable of taking the load specified. The container should be suitable for placing on Dumper Placers.

Type

Container shall have adequate strength to handle a weight of 2500 kg (excluding self - weight). The dimensions shall be approximately as per drawing and will be got conformed by getting actual drawing approved from the purchaser. The bins would have a top hinged door with locking arrangement with provision for tipping of the wastes.

Materials

The material of the container shall be steel conforming to IS: 2062. Adequate provision for corrosion should be included in the design. All MS sheets for wall to be 3.15 mm thickness except for windows and tail gate which can be of CRC sheet of minimum 2.5 mm thickness.Bottom plate to be of 5.0 mm thick MS sheet. The support channel to be of 100 x
50mm channels of minimum 5mm thickness at bottom and 50x50x5mm angles all around & sides and should have continuous welding. Top door hinges, tail gate hinges, top flap support, top, bottom frame supports, angles, channels, tee, anchor pins, locking arrangements of tailgate shall be of heavy duty rugged steel.

Opening and Covers

The top of the container shall be closed with flap type closure. There shall be 4 nos. loading windows (height 400mm, width as approved), 2 on each side which would provide access to container excluding end supports. The covers would have a hinged door for closing which can be kept in open position using hooks. Similarly, the tail gate with hinges at top to open automatically while tipping.

Hooks for Container Lifting

The hooks/pin for lifting the container would be integral to the structure of the container. 4
Nos of Lifting Pins of minimum 40 mm dia. each shall be provided with the necessary

reinforcement to handle the design weight for lifting with adequate factor of safety. The shape and size would be as per design of the lifting tackle. The pin position is to be decided by manufacturer to ensure the ease of lifting and compatibility with Dumper Placer. The pin position and other parts of Container Bins shall be finalized in consultation with the purchaser to have compatibility with the Dumper Placer.

Painting

The container shall be sand blasted prior to coating/painting. Outside & inside of the container is to be coated with one coat of zinc rich primer. The internal surface shall be coated with two coats of bitumenistic epoxy paint and external surface shall be painted with two coats of synthetic enamel paint to ensure long lasting structure suitable for handling raw garbage under corrosive conditions. Colour shade/make of paint shall be as specified by the purchaser. Logo of the ULB and container number & slogans shall be painted on the body of the container.

Durability

The container design shall be of proven performance. The container shall be guaranteed for a period of 2 years against any manufacturing defect.

General Requirements:

The container shall conform to the following:

The internal form and surface of the container shall be such that it will not trap any contents.

There shall be no sharp edges anywhere on the container.

The internal & exter nal surfaces shall be smooth, free from dents, distortion, paint blisters and other surface blemishes or defects.

The bins shall be used in outdoor conditions and accordingly should be able to withstand outdoor weather conditions in Bihar.

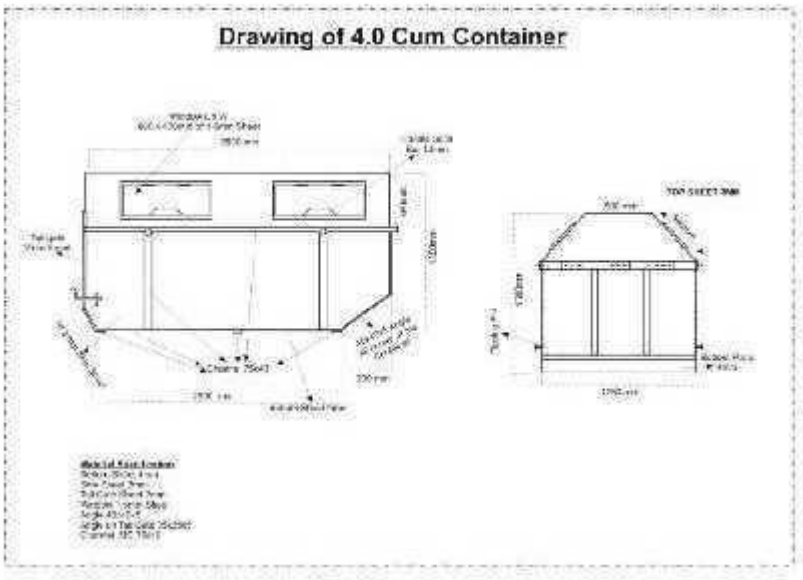
The container shall be provided with adequate stiffeners/ribs on all sides and at bottom for enhancing the structural strength of the container.

Tests for MS Containers:

The container should be free from defects like de-shaping, holes; cuts/cracks etc. The capacity is to be checked as per dimensions

The thickness is to be checked by ultrasonic gauge

Any other test on container/lid/MS frame/ Finish/or any other component as decided by the purchaser shall be got conducted by the supplier at his own cost.



ANNEXURE C- Technical Specifications of Front End Loader with Backhoe Machine

The equipment shall be matching all requirements of various govt. agencies and/or RTO rules/ norms & the following technical specification as the minimum requirement.

Functional Requirements: The Machine shall be rugged and shall incorporate latest technological features offered by the manufacturer. The machine shall be suitable to work in various earthmovings, Municipal solid Waste handling related, Encroachment removal related (Demolition of Bricks/RCC based construction etc), C & D waste removal activities etc. The Machine should fulfil following minimum requirements;

Engine shall be confirming to EURO-III/BS III standards, for which the tenderer shall submit the copy of the certification issued by competent institution recognized by Government of India. It is expected that the machine shall be incorporated with water cooled Diesel Engine having dual modes of operation such as Economy Mode to perform regular functions of collection and transfer of MSW, Debris and construction materials, collapsed building materials etc., into transport vehicle and the other mode of operation shall be at Maximum Power which here in afterwards to be called as Turbo Mode for performing the demolition activities. OR else system duly incorporated with automatic load sensing for light or heavy- duty applications. The Engine shall have the capacity and power to develop not less than 72
H.P. @ 2200 R.P.M. or as per CMVR / ARAI approval.

Electrical:

All harness/connectors to be dust and water proof, conforming to International Standards with minimum four fronts and two rear working lights to be provided.

Alternator - 12 Volts

Battery - 12 Volts

Transmission:

Synchro shuttle transmission incorporating Torque converter, reversing shuttle and synchromesh 4 speed gear box in one resiliency mounted unit. Electro-hydraulic direction control through a steering column mounted switch for four forward and at least one reverse speeds.

Axles:

Front Axle: Steering Axle to absorb the oscillations to the range min. 15 degrees to meet the desired performance / output while operating at unlevelled land.

Rear Axle: Two Wheel Drive Axle rigidly mounted, incorporating torque proportioning differential, driven by suitable gears.

Brakes:

Hydraulically actuated, dual line, self adjusting, oil immersed, multi disc type on the rear axle, well protected from dirt, water, etc. Parking Brake shall be incorporated in the system especially of Disc type.

Steering:

Full Power, supply through pr iority valve. In the event of Engine or hydraulic power failure, the system shall be incorporated with manual capability to steer the machine. It is further desired that separate gear pump especially for steering operations shall be incorporated.

Hydraulic System:

Hydraulic pump with minimum 100 litres /minute flow and developing system pressure of not less than 3000 psi for both Loader and Excavator end and Priority Valve for Steering.

Stabilizer:

Machine with Vertical Stabilizers / butterfly stabilizers shall be required.

Tyres ;

Front : 9.00 x 16-16 PR

Rear : 14.00 x 25-20 PR Heavy Duty

Cabin :

Confirming to relevant international standards with two doors walk through access and safety glass all around.

Operational Features:

i) Loader End:

Bucket: Min. 6 in 1, Clamp Shovel, Bottom Dump bucket of minimum 1.00 cu.m capacity.

Dump height: Not less than 2.6 mtrs. **Dump**

Argle : Not less than 42 degrees **Breakout**

Forces : Not less than 5500 Kgs. **Roll back at**

ground : minimum 40^0

ii) Excavator / Backhoe End :

Bucket: Not less than 0.24 cu.m. capacity.

Dig Depth : Not less than 4.5 mtrs.

Bucket tear out Force : Not less than 5300 Kgf.

GENERAL:

ADDITIONAL FEATURES :

The equipment shall be incorporated with following systems:

i) To save the fossil fuel which is the national need it is necessary that some sort of sensors are to be provided in the hydraulic system by virtue of which fuel according to load requirement only be transmitted and used.

ii) To avoid the multiple operations, the need of unique mode of operations is always essential in the modern age of science. Therefore all the multiple operations to be carried out by the loader end bucket are to be performed by minimum number of operations to reduce the cycle time and fatigue of the operator and the system.

FINISHING & PAINTING:

All exposed parts (internal & external) of the front-end loader shall be cleaned, and painted with suitable anti-corrosive protective point. The final painting shall be of two coats of synthetic enamel paint approved make and shade and having gloss finished.

MISCELLANEOUS:

The machine shall be provided with -

i) Safety cabin with two doors walk through access and safety glasses all round and cabin light.

ii) Comfortable operator seat.

iii) Front & Rear Lights, Direction Indicators, and Front working lights,
iv) Electric Horn.

v) Heavy Duty Wiper Machine with an Arm Blade for front Screen, vi) Rear View Mirrors,

vii) Instruments for engine speed, engine hour, fuel oil level, water and charging current along with all Audible / Visual warning system for hydraulic fluids and other working par ameters.

The hydraulic system shall be of reputed make. The hydraulic pipes, hoses, coupling should be of high quality to withstand high pressure.

All required safety & warning control system & mechanism should be provided in built.

Party has to submit the latest test certificate/report for quoted model of ARAI / C MVR confirming latest emission norms applicable in Gandhinagar city, Gujarat along with its technical bid.

Tenderer has to furnish the following details.

Model, Engine H.P. at RATED R.P.M.

Transmission details.

Hydraulic system details.

Party has to submit the list of their authorised service centres in the Gandhinagar, Gujarat. Any other relevant technical details.

OTHER INSTRUCTIONS:

The tenderer shall offer the Model which is current standard model of production, also which is substantially the same as one proved in successful use.

TOOL KIT:

A standard and recommended tool kit shall be supplied along with each roller for regular maintenance of the machine and all fittings and attachments.

INSTRUCTION MANUAL:

Copies of each operation instructions manual, service manual and spare parts list shall be supplied with each machine.

WORK TESTING;

The successful tenderer shall make arrangement for testing/ demonstration of the mac hine both at the works of manufacturer (if required) and at the Municipal site (as may be required). The tenderer shall issue a test certificate for the performance of the Rollers.

Inspection will be carried out by Joint Director (Mechanical) &/or his authorised representative & if any corrections / suggestion given during inspection for better working / usage of vehicle; same shall be incorporated by contractor without any extra cost to GMC.

JCB type machine for C & D waste

ANNEXURE D- Containerized Hand carts with 6 bins

Containerised hand cart fabricated out of MS angle, Tee and Flats, suitable to accommodate 6 Bins of 25 litre capacity & ideal for solid waste collection and transfer to central collection collectors. The cart shall be strong & sturdy and suitable to satis fy the critical needs of waste collection and transportation. The Hand Cart should be of minimum size 1010 mm x 700 mm x 250 mm with 6 Compartments for accommodating 6 Nos of HDPE bins of 25 litres capacity as per following specifications

Main frame: 25mm x 25mm x 3mm thick MS angle in all directions. The frame should be suitable to fit 6 bins of 25 litre capacity.

Bottom: 50mm x 25mm x 5mm thick M.S 'T' section; one placed at the centre longitudinally and two placed laterally.

Top: 25mm x 5 mm thick M.S flats one number longitudinally at the center and two numbers laterally.

Sides: 25mm x 5 mm thick M.S flats 6 nos vertically and the front portion covered with M.S Sheet of 18 gauge thick welded properly which shall be used as Name Plate for identification of Hand Cart.

Handle: The handle of the same width of Cart at about 890 mm height from the base at maximum angle of 45^0 made of 20 mm dia M.S pipe of 16 gauge thicknesses fitted with the cart by means of 25 mm x 25 mm x 5 mm M.S angle & supporting angles. Special rounded rubber grip of about 150 mm length should be provided on the handle for easy holding.

Wheels: The Handcarts should be fitted with two numbers of strong & sturdy wheels fabricated out of MS Tee. W heels to be provided with rubber on circumfer ence should be about 500 mm dia with support of MS flat of 40 x 5 mm with 25 x 25 mm single axle double bearing provided on two sides. One number of HMHDPE rear wheel with 200mm dia x 75 mm width should be provided with proper CI hub, shaft etc.

Painting: Painting with two coats of anticorrosive paint as per colour approved by the purchaser. The front side MS sheet shall be painted with two coats of anticorrosive paint with identification No., name & logo of ULB, slogans etc

Materials and Body Constructions of Bin : The body of the bins shall **specifications**

be made of High Density Polyethylene (HDPE) grade conforming to IS 10146-1982 suitable for injection/ roto moulding applications where good mechanical properties, gloss, dimensional stability & good ESCR are required. The physical characteristics & typical properties of raw material shall be as per BIS/ ASTM standard.

Details of M.S. sections:

S. No.	Material	Size	Details	No
1	M.S.ANGLE	25X25X3 mm	Top Frame	----
2	M.S.ANGLE	25X25X3 mm	Bottom Frame, standing support	------
3	M.S.Tee	50x25x5 mm	Bottom Frame	3
4	M.S.Tee	40x40x6 mm	Banding wheel	2
6	M.S.Flat	40x6 mm	Support wheel & hub	12
7	M.S.Flat	20x5mm	For Axle Bracket	2
8	M.S.Flat	20x5 mm	Barrow Section Flat	----
9	M.S.Square bar	25x25 mm	Axle	1
10	Round Head rivet	32x10 mm	Riveting	2 wheel
11	Round Head Rivet	25x8 mm	Riveting	2 wheel
12	Round Head Rivet	20x6 mm	Joint Frame & Handle	2 Side
13	Haxagonal Bolt	40x10 mm	Axle & Bracket	2 Side
14	M. S. Washer	21x46mm-6Gauge Thick	Inside and outside hub	2 Side
15	Cotter Pin	6x50 mm Length	To Joint	2 Side
16	C.I.Hub	Complete with axle Hole 20 mm hole 6 Nos wit turning etc., the weight each hub 3.5 Kg	Each Side	2 Side
17	HMHDPE rear	200mm dia x 75 mm	Rear side	1 Side

S. No.	Material	Size	Details	No
	wheel			
18	Bearing	SKF or equivalent standard make 6204 ZZ	For wheels	2 Side
19	Galvanise MS Tube with rounded rubber grip	20 mm, 16 guage 'B' Grade	For Handle	-------
21	M.S.Bush	ID=21 mm wall Thickness- 3 mm	For two sides of the wheel	2 Side
22	M.S.Angle	25x25x05 mm	For Handle	2 No.
23	M.S.FLAT	50X6 mm	Front wheel Clamp	1 No.
24	M..S.Pin with washer 16 g.	Pin-1" 5"Length W asher ID 27 mm OD 50 mm	For Front wheel Fixing one side pin	1NO 2NO
25	Cotter Pin	6x50 mm length	Fixing pin other side	1 NO
26	Hard Rubber lining	40x5 mm	Hard Rubber lining should be fixed on MS wheel	2 nos.

All the MS Material used for fabr ication of hand cart shall be of reputed manufacturers such as SAIL, TISCO etc. conforming to IS:2062/99 (updated) or equivalent.

Accessories: Every handcart shall be equipped with 1500 mm long 5 mm M S Chain and 7 lever Godrej/ Navtal Lock. M.S.

chain should be provided with Fitting arrangement from 6 mm round Bar with each hand cart.

ANNEXURE E- HDPE/ LLDPE Litter Bin with MS Frame (60 Litres)

General Requirements: The litter bins shall be smooth, strong & sturdy and should conform to the following:

The internal form and surface of the container shall be such that it does not trap the contents.

There shall be no sharp edges on the container.

The internal & external surfaces shall be smooth and non porous, free from cracks, splits, dents, distortion, blisters, voids, air bubbles and other surface blemishes or defects.

The bins are expected to be used in outdoor conditions. They should be able to withstand outdoor weather conditions in India.

The test certificate of U.V. stabilization from original manufacturer of polyethylene is to be supplied with bins. The approved make of the polyethylene material shall be IPCL/GAIL/Reliance.

The moulded plastic container shall be made in one piece through Injection/ Roto Moulded Process with top rim outside.

The bins shall conform to the colour code and have embossment of Logo of ULBs and any other markings as specified through a sticker fixed on the body of container.

The bins shall be provided with adequate stiffeners/ribs on all sides and at bottom for enhancing its structural strength.

The Front rim of the bin shall be fitted with support and guide ribs and bar net of high capacity, double angle edge for greater safety during tipping.

Dimensions and Other particulars:

1	Volume	60 Ltrs.
2	Container Dimensions:	
a)	Top	Min 350 x 350mm (clear inside dimensions)
b)	Bottom	Min 300 x 300mm (clear inside dimensions)

c)	Height	Min 550 mm (clear dimensions)
3	Thickness	Minimum 4mm
4	Embossing	Logo of the ULB to be embossed on one side of the container body
5.	Colour	Blue or green (as specified)
6	MS Jacket	A jacket of MS Flat 30mm x 5 mm shall be riveted to the bin.
7	MS Frame	A Frame of 32x32x5 mm MS Square Pipe comprising Two No verticals & one Nos Horizontals shall be provided with 2 Nos of 32x32x5 mm MS Angle Hold fasts 200mm long at Bottom. Locking arrangement shall be provided.
8	Lid	The lid shall be fully openable but should not depart from the bin at the time of opening. In closed position there should be garbage dropping space on the front side.
9	Handle	On the back side of the bin there should be an inbuilt HDPE Rod for easy pushing of the Bin.
10	Painting	All metallic parts shall be powder coated with minimum 40 micron thickness & black in colour.

Material specifications and Body Construction : The body of the bins shall be made of Virgin UV stabilized High Density Polyethylene (HDPE) / Linear Low Density Polyethylene (LLDPE) with appropriate quantity of HALS to give long service with continuous outdoor exposure with or without blending of any carbon black manufactured by Rotomoulding/Injection Moulding process and confirming to the typical characteristics as per BIS/ AST M standards. It should meet the r equirements stipulated in standard IS 10146-1982 and confirming to the following :

S. No.	Property	Testing Method	Unit	Value
1	Density	IS-7328-1992	gm/cm^2	Should be between 0.94 to 0.96

S. No.	Property	Testing Method	Unit	Value
2	Melt Flow Index	IS-2540-1963	gm/10min	0.8 to 5
3	Tensile Strength	IS-8543, part-4/Sec 7- 1984	Kg/ cm^2	224 to 255
4	Flexural Modulus	IS-13360 Part 5/Sec 7- 1996	MPa	900 to 1000
5	Hardness (Shore)	IS-13360 Part 5/Sec 1-1992	D Scale	>D 50
6	Vicat Softening Temp.	IS-13360, Part 6/Sec 1-1992	Deg. C	>90
7	Impact Strength (2.5kg/1 mts)	IS-12701-1996	J/mm2	No sign of cracking, puncture/damage of sample
8	Weathering	IS-22530-1963	-	No 4 grayscale.
9	Colour fastness to Artificial light/Rating	IS-2454: 1985	As per guidelines of IS 2454 (using sun test) CPs + Instrument	
10	Accelerated Ultra Violet Test (QU.V)	ASTM-G-53, (50˚ C)	Should be tested with QUV test type accelerated weather meter for 200 hours. Tensile strength and flexura modules should each be not less than 70% of the values before exposure.	

Tests for Litter Bins:

The bin container should be free from defects like de-shaping, holes, cuts/cracks etc. The thickness is to be checked by ultrasonic gauge

The density test/MFI/tensile strength/flexural modulus / impact / hardness / weathering (colour fastness) and accelerated ultra violet tests (QUV) on bin material and bins are to be

carried out only at Government approved laboratory and the testing charges shall be borne by the supplier.

One sample per supply lot shall be collected at random by inspecting authority in the presence of supplier and got tested by the supplier at his expense.

Any other test on container/lid/MS frame/Wheels/Finish/or any other component as decided by the inspecting authority shall be got conducted by the supplier.

ANNEXURE F- Twin Bin Dumper Placer for 4.0 cum capacity containers

General

The Dumper Placer Truck shall be of Side Loading T ype, suitable f or lifting two Nos of 4.0 cum MSW storage containers & shall be rugged and durable, shall incorporate the latest technological features offered by the manufacturer/supplier. The vehicle shall be hydraulically operated & should be used to load/unload/tip 4.0 cum containers and transport with suitable arrangement. The equipment shall have arrangement to transport the garbage in covered and packed condition. The equipment shall confirm to following specifications.

Specifications of Truck Chassis cum cab

Sr. No.	Specifications	Technical criteria
1	Make	Tata/Leyland/Eicher/Force
2	Garbage with container weight carrying capacity	Minimum 6000 kg
3	Gross Vehicle Weight(GVW)	Minimum 9000 kg
4	Engine	4 Cylinder Turbocharged Intercooler, Diesel Engine: BS-IV Compliant
5	Power	70 KW min. at3200 RPM / rated RPM as per CMVR/ ARAI approval.
6	Torque	Minimum 275 NM @ 1300 -1600 RPM
7	Clutch Dia	Minimum 270 mm of Clutch Lining
8	Gear Box	Synchromesh type
	No. of Gears	5 Forward and One reverse
9	Brakes- Service	Full Air Dual Line/ Hydraulic/Air Brakes on Rear as per ARAI Certificate
10	Frame	All Steel Ladder Type 'C' ChannelHeavy Duty

		or as per CMVR / ARAI approval with Riveted/ Bolted Cross members
11	Cabin	All Steel non sleeper hydraulic tilt cab
12	Min Turning Dia	Maximum 14500 mm
13	Ground clearance	Minimum 200 mm
14	Wheel Base	Minimum 3800 mm
15	General	Factory Fitted PTO to be provided

Cab: All steel, semi forward / full forward control driver's cab. Cabin should have minimum two nos. foam padded adjustable seats with seat belts. Cab should have all standard accessories provided by the chassis manufacturer and required under Motor Vehicles act.

Painting: Complete truck chassis along with dumper placer mechanism and the platform shall be thoroughly cleaned as per standard industrial practice and then applied with primer paint followed by two coats of automobile grade Paint of colour shade specified by the purchaser.

Fabrication of Body for Dumper Placer

Lifting Capacity/Test Load

The system will be able to lift two Nos containers of 4.0 cubic meter capacity each of approved design. The Test load shall be 2750 kgs for each container including dead weight of container.

Hydraulic Pump

The Hydraulic pump shall be Gear pump,9.0 GPM, 207 Bar Max Pressure of standard make as used by truck chassis manufacturer.

Hydraulic System

The Hydraulic system will have 1No, 3 spool direction control valve of Badestnost/ HydroControl make. All hydraulic hoses will be of R2 Type of Gates/ Markwell/

Yokohama/Super Seal having operating pressure of 3500 PSI and bursting Pressure of 14000 PSI. All metal pipes will be seamless type having 12.5 mm dia. Boom

Arms & Out Rigger

The system will have 2 sets of two booms each. Each boom set shall be joined with the help of Boom Cross Bar made of M.S Pipe C Class as per IS1239 of minimum 88 mm Outer Dia. The boom will be fabricated with the help of channels of 5mm thickness which are joined together to make a box section of 145 mmx80 mm x5mm. The boom arms will be fitted with self – Lubricating bushes for mounting with the frame. The boom length will be such that it can lift the container horizontally even from unlevelled ground without jerks. 2 Nos Inclined Outriggers shall be provided.

Hydraulic Cylinders

Each boom set will be operable with the help of two double acting single stage hydraulic cylinders having a bore of 110 mm and shaft dia. of 56mm. Total Nos of Cylinders for lifting shall be 4 Nos. The stroke of the cylinders will be suitably adjusted so that the machine can lift the container from the ground without difficulty.

Frame

The Main frame structure will be of Box type made from cold form pressed steel sections of 5 mm thick plate mounted on Vehicle chassis through rolled Mild steel channel sub-frame consisting of long runner made by ISMC 100x50 ,cross runner by ISMC 75x40 and IS 35 and support box IS MC 125 boxed. The frame will be properly strengthened with cross members for proper load distribution and to avoid point loading dur ing operations. Frame will be covered with the help of floor sheet of 4 mm thickness. The floor will be having stoppers in the front and at the sides so that the container does not skid during transportation and also do not hit the boom cylinders.

Hydraulic Stablizer

A roller type Hydraulic stabilizing arrangement having proper ground clearance will be provided at the rear of the machine for providing stability of the equipment during lifting and tipping of the containers.

Tipping Hooks

The machine will be provided with 2 nos tipping hooks at the rear which will be operated manually for unloading of the garbage from the refuse container.

Hydraulic tank

The hydraulic tank shall have adequate capacity for storage of hydraulic oil with first filling alongwith required filters etc.

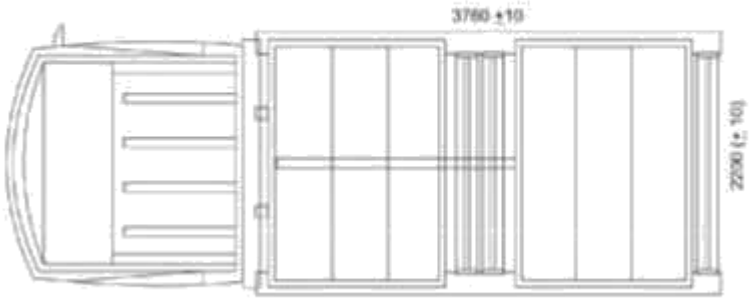
Lifting Chain

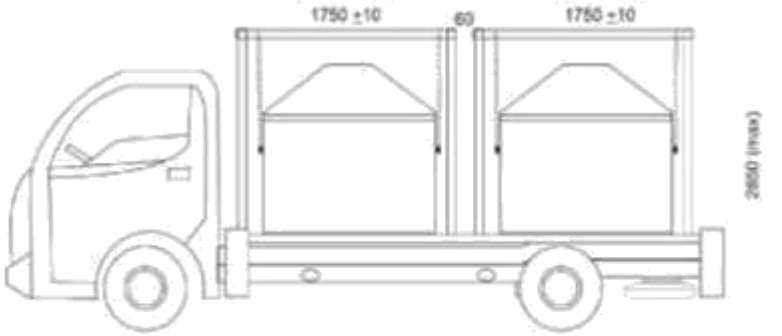
The equipment will have tested MS chain of 5/8" for lifting and ½" for tipping conforming to IS -5616 & IS 2429 (Part II)

Safety Features

The machine will have Overload Protection Valve, Load Holding Valves in the boom Cylinders circuit as well as the Stabilizer Jack Circuit so that the cylinders do not collapse on load or on hose failure.

DRAWING OF TWIN DUMPER PLACER OF 4 CUM CAPACITY (EACH)





NOTES :	
BOOM RAMS	110 Bore : 4 Nos. Double Acting
BOOM ARMS	Box Section 150mm X 75 mm 4mm Thick
FLOOR SHEET	3mm Thick

MAIN PRODUCT
Carrier Vehicle for 2 x 4 Cum Capacity Container

ANNEXURE G- Technical Specifications for Garbage Compactor Capacity 14 cu.m.

Specification of Truck Mounted Garbage Compactor 14 Cu. m capacity

A. Suitable Chassis with BS-III/BS- V (as may be applicable to Ahmedabad city) Engines or RTO approved Engines with Driver-cum- attendant Cabin as per specifications. B.

Supply & fitment of Compactor equipment & body as per specification Chassis:

The equipment shall be designed, fabricated, mounted and integrated to the chassis having EURO III/IV (BS- III/IV) norms & matching all requirem ents of various govt. agencies / RTO rules/ norms & the following technical specific ation as the minimum requirement

Functional Requirem ents: HC V c ab-c hassis with PTO is requir ed to build up t he hydraulically operated Garbage Compactor having 14 Cu. mt. capacity as per the specifications and requirements mentioned in the tender documents.

Specifications for driver cabin (If cabin not provided by chassis manufacturer)

Driver Cabin: All steel welded driver's cabin with steel structure and M.S.panelling should be provided. It should be dust and water sealed and with sound and heatproof treatment. For clear visibilit y singlewide cur ved/ both side wind screen glass with wiper motor/s should be provided, wind up type front door on both sides should be provided with heavy duty hinges and locking ar rangements. It should be f ully painted w ith glass finish, All-steel full-f orw ard control driver's cab having easy maintenance facility and provision for maintenance of various engine, electric, chassis related parts. Necessary controls and other provisions as per latest RTO rules must be provided inside the driver cabin. Proper lighting and seating arrangem ents for dr iver and co driver with metallic pouch for keeping log diary should be provided. The chassis must have following minimum technical specification:

1 ENGINE: Six cylinder, in line direct injection water-cooled diesel engine having engine capacity minimum of 130 PS @ 2400 rpm as per CMVR with turbo

charger with intercooler. It must have minimum EURO- III/EURO- IV (BS- III/IV) emission norms as may applicable to AMC, Ahmedabad.

2 MIN.TORQ UE: 500 N-m at 1400-1700 RPM as per CMVR TAP 115 / 116.

3 AIR FILTER: Oil bath type, remote mounted or dry type its equivalent.

4 CLUTCH: Single plate, dry friction type and outside diameter of clutch lining 330 MM minimum.

5 GEAR BOX: Synchromesh 5 forward and 1 reverse.

6 FRONT AXLE: Heavy duty, forged 1 beam, Reverse Elliot type or Semi-elliptical.

7 REAR AXLE: Single reduction, hypoid gears, fully floating axle shafts.

8 STEERING: Power assisted – Hydraulic type

9 BRAKES: Service brakes-Dual circuit full air S-cam brakes. Parking brake-spring actuated parking brake acting on rear wheels.

10 FRAME: Ladder type frame with riveted/bolted cross members side members are of channel section.

11 SUSPENSIO N: Semi elliptical leaf spring at front and rear

12 W HEEL & TYRES: Tyres-10.00 X 20 PR diagonal ply wheel rims -7.50 X 20

No. Of wheels: Front: 2,Rear: 4,Spare: 1

13 FUEL TANK: 150 litres capacity minimum .

14 CAB: All-steel full-forward control driver's cab

15 ELECTRICAL SYSTEM: System voltage-12 Volts / 24- Volts.

16 W HEEL BASE: appx. 4200 mm

17 Complete chassis and tools) less than 6200 Kg. kerb weight with cab (with spare wheel more

18 Min. Permissible GVW: than 16000 Kg

19 Payload Capacities: min 10000 Kg.

20 PTO. POWER TAKE OFF UNIT. Total power take off is entirely designed allows to draw the ample power from vehicle engine. The PTO will be provided on the body of gearbox and one auxiliary output. The engagement and dis-engagement of PTO outputs will effected pneumatically or electrically or mechanically operated and controlled system situated in the driver's cabin. Output H.P of PTO should be as required by system for smooth and trouble free operation.

<u>COMPACTOR EQUIPMENT</u>:

CONSTRUCTION:

General:

The rear loading compactor shall be mounted on suitable 16 Ton GVW chassis. The compactor shall comprise of three main parts.

The body and Ejection Barrier

The Hopper and compaction hydraulic unit at rear body.

The packing system will comprise of two moving plates the packing plate and the sweeping plate. The packing plate will travel angular track, and at the end of the stroke, sweeping plate will be activated and clean the hopper, at the end of its travel, packing plate start it's reverse travel and start compressing the refuse into the body. It's called one complete cycle of compaction.

The entire compaction system shall be operated at designed speed with auto throttle.

It shall be easy to handle and will allow the loading personnel to operate the vehicle with minimum physical effort and maximum safety.

The Loading height shall not be more than 1.0 Mtr from the ground level. The

body will consist of:

Front bearings of the refuse collection body, Refuse collection body with ejection panel. Tailgate with hopper; slide plate, and Bin lifter (optional).

1. The Body and Ejection Barrier:

A. The Body:

With optimum total volumetric capacity of 14 cu.m, the body shall be constructed from high tensile steel ST 52 having 'keel' type floor. The Rear entry floor plate is constructed form Hardox 450/EN-36.Tenderer has to submit the complete structural and overall design of the compactor unit.

1. Material - high tensile steel ST 52/EN 24/as per 2062 Steel IS Specifications

2. Sides - 4 mm thick

3. Flooring - Minimum 5 mm thick

4. Rear Crossbar - Minimum 6 mm thick

The body fabrication shall be such that it improves aesthetics and increases body capacity.

Floor shall be having Keel shape and fitted with under – floor sump and floor channels to ensure 100% of leachate collection in the floor sump at the front of the body.

Tailgate:

Swept volume capacity shall be optimal for having fewer packing cycles giving high rate of packing garbage to have benefits of reduced wear, minimize fuel consumption, time & noise;

Loading width shall be optimal for facilitates to accommodate bulky material to be packed.

Rave rail height shall be 1.00 m to facilitate for manual loading and versatile bin – lift mounting (if required later on)

Sweep/Packer blade thickness; Minimum 2.5mm thick

Bottom of hopper 5mm high tensile Steel

Rear side of hopper; 6mm EN 36 Steel

Tailgate sides are made up of at least 4 mm thick high tensile abrasive resistant Hardox 450 steel/EN 36 steel and formed with integrated guide channel to guide the packing mechanism/ as per system requirement for easy movement.

Hopper/ body should be designed in such a way that it shall be provided with seal to prevent liquid leakage from bottom edge and Hopper sides.

Rear overhung shall be as minimum as possible for improved weight distribution and manoeuvrability. Rear over hang shall be within the RTO norms.

Packing Mechanism:

It shall be of two plate fabricated packer / sweeper design. Manufactured out of high tensile abrasive resistance Hardox 450/EN 36 steel.

Packing mechanism shall slides in integrated side channels and shall be provided with low friction self-lubricating Ertalon LFX / Bronze / Synthetic pads guides.

Hydraulic cylinders shall be of good quality and shall be of Wipro, Dental, Techno, Rexroth, Hywa &/or other standard make possessing IS &/or ISO standard to ensure the efficient sweeping and packing cycle, within a nominal cycle time of 35 seconds and less maintenance.

Compactor system shall be having good compaction ratio (1:2)

Refuse Ejection Barrier:

Ejector Barrier plate shall be manufactured from 4 mm thick high tensile abrasion resistant Hardox 450 steel/ EN 36 high Tensile Steel and formed in such a shape gives smooth and unobstructed discharge of garbage.

Heavy duty Ertalon LFX self-lubricated/ Bronze pads/ Synthetic pads guides shall be provided to allow the barrier to move smoothly along the rail, provided within the body.

Multi – staged double acting telescopic hydraulic cylinder shall be pr ovided with correct geometrical mounting for efficient ejection and retraction travels, without any side load on sliding guides.

Hydraulic System:

Gear/Axial/Vane type pump shall be provided which shall be PTO Mounted and shall deliver minimum 80 LPM at 1000 RPM. (Shaft connection between PTO & Pump will not be accepted)

Oil Tank shall be mounted in such a way that which optimises the mounting space and shall be equipped with Return Line Filter, Breather, level indicator and shut-off Valve.

It shall be provided with Full flow minimum 10-micron return line filter to control contaminant levels.

It shall be provided with electro-pneumatic throttle control system, which maintains engine speed automatically, when hydraulic power consumption increases.

It shall be provided with Electro – pneumatic operated spool valves to control all system functions separately, with inbuilt dump valve for retraction process.

It shall be provided with automatically adjusted high and low pressure system to give efficient and smooth working of the system and protect the system from over stress and to obtain better fuel efficiency.

Sweeping cylinder with spherical bearings shall be provided in such a way that it protect the piston rod from direct contact of acidic waste/garbage.

Heavy-duty Packing cylinders shall be mounted outside the hopper to give more clearance in Hopper loading area and also to protect the piston rod from direct contact of acidic waste/garbage

Hopper / Tailgate lift Cylinders shall be of proper design to protect it from accidental damage.
Double check valve shall be provided for extra safety in case of hose failures.

Electrical System:

All required electrical and fully integrated logical system and printed circuit board shall confirm IP66 weatherproof norms and located on the body.

Hydraulic Cylinder:

It shall be provided with Heavy-duty double acting sweeping cylinders and must be fitted with maintenance free spherical bearings – 2 nos.

It shall be provided with Heavy duty double acting packing cylinder mounted outside the hopper, clear of the loading area – 2 nos.

It shall be provided with Heavy-duty double acting hopper lift cylinder – 2 nos.

It shall be provided with Heavy-duty multi stage double acting telescopic cylinder for ejection plate - 1 no.

Maximum no. Of cylinders is 07 nos. (Double acting)

OTHER EXTRA FITMENTS:

Two Footsteps of good quality and design will be provided one each on left and right side at the rear & two hand bars one on each side at the rear side shall be provided for the equipment operators to stand and travel when the compactor is moving (as and when required).

One large flashing light will be provided in the front in the centre at the highest point so as be seen clearly

Two emergency stop switches will be provided on either side of the body to instantly stop the operation in case of emergency.

A level indicator will be provided to indicate hydraulic oil level in the tank

The Vehicle will be provided with reverse horn so that it gives the indication at the time of reversing.

Arrangement will be pr ovided to get an indication as soon as the garbage contained reached its maximum. Arrangement shall also be provided to stop the operating cycle as soon as the Compactor is full.

MATERIAL FOR BODY:

Sr. No	Description	Specification
1	Material	High Yield Strength (More than 300 N/sq.mm) Steel, – ST52/EN 24/IS-2062
2	Roof Paneling	4 MM (Minimum)
3	Side Paneling	4 MM (Minimum)
4	Floor Thickness	5 MM (Minimum)
5	Rear Cross Bar Thickness	75 x 40 x6 MM (Minimum)

MATERIAL FOR TAILGATE:

Sr. No	Description	Specification
1	Material	Special High yield Strength (More than 500 N/sq.mm) steel – Hardox 450/EN 36/ ST52
2	Side Paneling Thickness	4 mm (Minimum)
3	Rear Side Hopper Plate Thickness	6 mm (Minimum)
4	Hopper Bottom	5 mm (Minimum)
5	Superstructure member thickness	6 mm (Minimum)

EJECTOR SYSTEM:

Sr. No	Description	Specification
1	Ejector Plate Materials	High yield Strength (More than 500 N/sq.mm) Steel, – ST 52 /IS-2062with bottom portion from Hardox 450/EN36
2	Pads	Etalon LFX Bearing / Bronze/Synthetic pads

The tender shall provide material Test Certificate and invoices along with related documents at the time of fabrication / inspection.

HYDRAULIC SYSTEMS:

Sr. No	Description	Specification
01	P.T.O	Preferably Vehicle Manufacturers
02	Hydraulic pump pressure	Min. 14 0kg per CM Square
03	Packer plate Hyd Cylinder Internal Diameter	100 diameter (Minimum)
04	Tailgate Hyd Cylinder Internal Diameter	70 diameter (Minimum)
05	Carrier plate Cylinder internal diameter	110 (Minimum)

06	Ejector Cylinder	Telescopic type
07	Ejector Cylinder No. of stages	Multi
08	Ejector Cylinder internal diameter	140 (Minimum)
09	Hydraulic Cylinder	Hyva / Wipro / Dental / Rexrorth /Techno Make
10	Hyd. Valve	Reputed Imported make .
11	Oil Capacity	Minimum 125 Litres
12	Size of suction filter	Minimum 140 microns
13	Size return line filter	Minimum10 microns
14	Duration of Ejection	About 35 Seconds
15	Pump and PTO mounting	Directly coupled without any intermediate shaft

The Compactor equipment sha ll be mounted on suitable hea vy-duty chassis with PTO like TATA / ASHOK Leyland or equi valent of 16 Ton GVW and appx. 4200mm wheel base. Bidder shall furnish full details of vehicle chassis in the technical bid. Bidder shall also make arrangements to procure the vehicle with cabin from the manufacturer. The standard tools accessories and spares supplied with the chassis shall be handed over to us at the time of delivery of the unit.

The Bidder shall make arra ngeme nts fo r mounting equipment o n the chassis according to the rules laid down by the Regional Transport Office,Ahmedabad and loads recommended by the chassis manufacturer on the front and rear axles. The bidder shall make arrangements for registra tion of the complete unit along with its design approva l with the Regional Transport Office. The Gove rnment fees required for registration of the units shall be paid byAMC.

GENERAL DESCRIPTION:-

The compactor body shall be constructed of steel as per the details given: -

The compactor body must be sufficiently strong and will have inside volume of minimum 14 Cub.M

The equipment i.e. the compactor shall be suitable to carry payload of minimum 9 tonnes. The

equipment shall be rear-loading type

Arrangement shall be provided to manually load the vehicle also. The height of hopper for manual loading shall not be more than 1000mm.

The construction of the vehicle will consist of the body, the ejector system and the tailgate

The garbage will be loaded in the hopper either manually or by emptying the containers hydraulically with the help of lifting mechanism. The garbage from the hopper shall be swept by sweeping plate fitted at the end of packing plate and pushed inside the body and then compressed against the ejection plate.

The tailgate shall be equipped with heavy-duty turnbuckle one on each side/other suitable mechanism to hold tailgate and body together.

The tailgate shall be provided with sturdy arrangement for raising and controlling of descent.

The operation of the tailgate mechanism shall be such that it avoids the possibilities of accidents.

Hose burst non-return valves shall be provided to prevent the tailgate event descending in the of hydraulic failure.

The packer plates shall be designed as per the specifications given.

Lever shall be provided on the rear side of the vehicle to start packing mechanism. Arrangement shall be provided to stop the system instantaneously with the help of switches provided at the rear of the vehicle.

The packer blade shall be designed as per the specification given. The

packer blade shall be fitted with sturdy mounting to the cylinders.

There shall an inter lock valve fitted to prevent packing/occurring when the hopper is raised.

Arrangement shall be provided to control the speed of the engine automatically at the time of operation of Compacting system so that the speed is not depend on the throttle opening of the engine when the vehicle is stationary.

The ejector plate shall be suitably angled & so that proper ejection takes place when operated.

Arrangement shall be provided such that the tailgate will not come down even in case of hydraulic failure.

Pressure regulation switch shall be provided for setting desired pressure of telescopic cylinder on the ejector plate. The regulation switch shall have a key lock arrangement for pressure setting & for safety of the system.

MISCELLANEOUS

The cabin shall be provided and fixed with

Roof Light - 02 Nos.

Heavy duty Wiper Machine - 02 Nos. (with Arm & Blade)

Heavy-duty Bracket type convex mirror - 02 Nos.

Hand operated Traffic Signal - 01 No.

Extra wiring wherever necessary

Suitable size battery box shall be provided under the attendants seat. The tenderer shall provide the extra length of battery cable.

Stoplights, direction indicator lights and tail lamps shall be provided and fitted.

All controlling switches for lights, driver cab light and wiper machines shall be provided on dashboard panel or near driver's seat to operate easily.

V. The cabin shall be painted externally and internally in Dulux paint of approved shade.

PAINTING

The under chassis parts and the portion shall be painted with anticorrosive black. Complete unit including cross and super structure member shall be painted with superior quality anti- rust paint. All the paint material shall confirm to ISI specifications and shall be of specified makes. The cabin shall be painted with Asian/ Nerolac / Berger / ICI /Shalimar/Dulux paint externally and internally. The colour scheme will be informed at the time of fabrication.

The compacting unit shall be painted with anti- corrosive primer before painting with two coats of polyurethane paint of ISI approve make. All necessary indicative labels shall be pasted on for easy operation.

The rear body shall be painted from outside with Asian/ Nerolac / Berger / ICI /Shalimar/Dulux. The colour scheme will be intimated later.

All welding work must be MIG welding only. All necessary finishing shall be carried out prior painting. Welding wire shall be of ESAB/ADOR/L&T only.

All angle and channels and other raw materials are as per Indian standard.

All MS material shall be of Tata / SAIL / Jindal / Vishakhapatnam steel/ Essar /Ispat/Hardox/as suggested in the tender (for angle/ channel if not available of above brand then it shall be of IS/ISO approved make) only. Contractor has to submit necessary test report and/or invoice copies.

Paint must be of standard brand only like Asian, Nerolac, Berger, ICI, Dulux and Shalimar only.

Other Conditions:

The work involves design, fabrication, erection, supply and commissioning of Garbage compactors having minimum 14 Cu.M capacity mounted on suitable Chassis to be purchased by Tenderer, as per specifications attached.

These specifications only show the requirement brief ly. Each tenderer shall att ach descriptive literature along with a detailed description of the machine covering all the salient features.

The compactor shall be built to with stand the strength and vibration of the roads as well as those at landfill site. The tenderers are requested to see landfill site in order to ensure the conditions under which the vehicles are expected to operate.

All moving parts shall be provided with adequate means of lubrication by providing nipples etc.

All reciprocating parts shall be suitably guarded

The equipment shall be capable of being operated under average conditions for at least 12 hrs. Continuously without any ill effects on its component

The refuse compactor will meet the requirement of Motor vehicle Act 1989 with the latest emission norms, if any.

The tenderer will have to give the demonstration of the compactor offered whenever called for by the department

However imported components shall be approved by principals and international organisation with certificates.

Every part of the equipment including rubber hoses shall be guaranteed for a period of one year.

Tenderer has to optionally quote for bin lifter mechanism, as per following requirement.

BIN LIFTER

The bin lifter shall be made from 2062 Steel IS Specification.

Two double acting hydraulic cylinders (one on each side) shall be provided for lifting the bin. The bin

lifter shall be suitable to lift the standard containers of size 120 liters, 240, (HDPE Bins) 660 and 1100 liters. (GI Bins) / Structural steel.

The bin lifter shall contain a bin catcher made from EN series steel

A control panel shall be installed at convenient position such that the working of hydraulic cylinder can be controlled safely.

The length of the bin lifter shall be minimum 1.4 mtrs.(or suitable to tail gate & bin lifting operation)

The safety valve shall be provided to avoid sudden descent of bin lifter in case of failure of hydraulic pressure.

Both arms types &

Refuse Compactor Machine of 12 / 18 CMT capacity for Vegetable waste

SECTION-2

Format of data collection on existing SWM services to facilitate preparation of DPR in terms of SWM Rules, 2016

Proforma for data collection to assess current situation & facilitate DPR preparation in terms of SWM Rules, 2016

Name of the City/town	**NAGAR PALIKA PARISAD**
name of the district	**BAHRAICH**
Name of the state	**UTTAR PRADESH**

A. CITY PROFILE

a. Area of municipal limit 13.30 Sq. Km.

b. Population :

Population	**1991**	**2001**	**2011**	**current population**
		168323	186223	
Decadal growth	**%**	**%**	**%**	

c. No. of municipal wards/sanitation wards :

No. of municipal wards	**No. of sanitation wards**
31	16

d. Ward-wise area &population (please attach statement)

e. Ward-wise No. of slums/informal settlements & slum population (please attach statement)

f. Details of Households, shops, offices, schools etc. in the city

Type of property	**No. of units**	**approximate quantity of Waste generated per day**
Households	22913	5728 kg
Shops and workshops	7250	7250 kg
Offices and institutions	35	350 kg
Industries	25	25000 kg
Vegetables markets	2	5000 kg
Fruits markets	1	4000 kg
Meats markets	2	300 kg
Fish markets	1	100 kg
No. of hospitals	6	1000 kg
No. of nursing homes	25	25 kg
No. of path laboratories	26	75 kg
Total no. of hotels	30	300 kg
No. of restaurants	150	2250 kg
Others	1000	5000 kg
Total	31466	56.37 M.T

g. Main industries in the city (attach list)
h. Main tourist and pilgrimage spots in the city.(attach list)
i. Rainfall and climate

Annual rainfall	Minimum temperature	Maximum temperature

B. INSTITUTIONAL PROFILE OF THE CITY

a. Organizational chart of the local Government body (please attach)

b. Organizational chart of SWM department (please attach)

c. Manpower details (sanitary worker and drivers)

Type of sanitation workers/drivers	No. of permanent sanitation workers/ drivers	no of temporary sanitary workers /drivers	sanitation workers/ drivers on contract
street sweepers	100	--	150
drain cleaners	60	--	150
transportation labour staff	--	40	--
Sanitation workers engaged in treatment of waste	--	--	--
Sanitation workers engaged for disposal of waste	--	--	30
Drivers	06	--	21
TATOL	166	40	341

d. supervisory staff deployed

designation	Nos.
lowest level supervisors(Mukadam/Jamadar etc)	
Sanitary Supervisor	13
sanitary inspectors	1
chief sanitary inspectors	--
environmental/ civil engineers	--
health officer	--
Executive engineer/superintending engineer/chief engineer	--

Director solid waste management	--
Total	1

e. Tools given to sanitary workers for Street sweeping, surface drain cleaning, etc

1-Auto three wheeler

2-Broom

3-J.C.B

C. PRESENT SCENARIO OF SOLID WASTE MANAGEMENT PRACTICES

a. Storage of waste at source

1.	Whether the local authority has prohibited littering of waste on the streets, open spaces, drains, water bodies and directed the citizens to segregate and store the waste at source in terms of rule 15(g)	**No**
2	Whether households, shops and establishment Keep domestic, trade, institutional bins at the Source of waste generation for storage of waste? If yes; What percentage of population store the waste at source?	**No** **(%)**
3	What percentage of population throws/burn/burry the waste on streets, open spaces, etc	**(%)**
4	Whether there is a system/practice of segregation of recyclable waste at source? If yes; What percentage of households/ shops/ establishments keep separate bins for storage of bio degradable (wet food waste) and dry non biodegradable (recyclable) waste at source?	**No** **(%)**
5	a. Do the citizens store C&D waste separately within the premises as per rule 4field of SWM Rules, 2016 b. Whether there is any facility created by municipal authority to facilitate citizens to deposit C&D waste, If yes, give details	**Yes/No/partially** **No**
6	a. Do the citizens segregate and keep domestic hazardous waste separately as per rule 4(a) b. Is there any arrangement for deposition of domestic hazardous waste within the city in terms of rule 15(i) of SWM Rules, 2016 If yes, give details	**No** **No**

7.	a. Do the citizens store the horticulture and garden waste within their premises b. has the local authority made any arrangements for separate collection of such waste If yes, give details	**No** **Yes/No**
8	Whether the street vendors keep suitable container for storage of waste If yes what % of street vendors follow this practice	**Yes** 60%
9	Whether resident welfare and market associations are actively involved in ensuring segregation of waste at source by their members and facilitate collection of segregated waste in terms of rule 4(6) of the SWM Rules, 2016 If yes give details	**No**
10	a. Whether gated communities and institutions having more than 5000 sq/area are adequately motivated to segregate the waste at source and handover recyclables to waste pickers/recyclers b. whether gated communities as above, have set up biodegradable waste processing facilities within their premises in terms of rule 4(7) of SWM Rules, 2016 If yes give details of % compliance	**No** **No**
11	Whether hotels and restaurants have been segregating wet and dry waste separately and whether they have set up bio degradable waste processing facilities within their premises in terms of rule 4 (8) of the SWM Rules, 2016 If yes give details of % compliance	**No**

b. Primary collection of waste

1.	Has the local authority introduced any system of door to door collection of waste from households , shops and establishments If yes, the no. of wards and percentage of population covered through Door to door collection system?	**Yes** **20 (%)**
2.	Has the municipal authority arranged for collection of segregated waste from all waste generators in terms of rule 15 (b) If yes give details of % compliance	**No**

3.	Whether any organization/association of waste pickers has been recognized/organized by the local authority for integrating them in door to door collection of waste/recyclables in terms of rule 15field. If yes give details of % compliance	**Yes**
4.	Whether any self help group have been formed and encouraged to take up door to door collection of waste in terms of rule 15(d) if yes give details of % compliance	**Yes**
5	Whether Private sector/ NGO /CBO/Resident welfare association is involved in D2D collection? **If yes, give details on a separate sheet**	**No**
6	Whether the local authority has setup domestic hazardous waste collection centres in the city in terms of rule 15 (i) If yes give details	**No**
7	Mention the system of waste collection adopted in the City for collection of household waste, commercial waste, market waste, bio-medical waste, construction waste. **(Attach a sheet mentioning the above details)**	C & T Land Fill site

c. Street sweeping

1. Whether there is a separate arrangement for collection of waste from the door step and from the streets by sanitation workers/contractors ensuring that these two streams do not mix anywhere

Yes

ii. Overall road /street length of the city.

Length of concrete/asphalts roads in KM	**Length of non-metal led roads in KM**	**Total road length that need to be covered in street sweeping operations**

iii. Divide the above road length in 3 parts

- High density road length 172.585 Kms.
- Medium density road length 84.54 Kms.
- Low density road length 37.395 Kms.

iv. Give list of main roads of the city in the following table:

Name of the Road	**Length**	**Width**	**Whether it has divider?**	**Ward**

v. The work norms adopted for allotment of work to sanitation workers

vi. Status of cleaning the streets.

Daily	Alternate day	Twice a week	Once a week	Occasionally
60%	20%	10%	10%	--%

vii. No. of slums & status of cleaning of slums and informal settlements

Daily	Alternate day	Twice a week	Once a week	Occasionally
25%	20%	20%	50%	5%

viii. No. of handcarts/ tricycles with the SWM department.	200
ix. Whether each street sweeper is given independent handcraft/tricycle.	No
x. Whether the handcrafts are containerized or are traditional necessitating unloading the waste on the ground?	Yes
xi. Duty hour of the street sweeping	8 hrs
xii. Type of brooms given – Long handled or short handled?	Long handled
xiii. What minimum distance the sweeper has to walk with his handcart/tricycle to unload the waste at the waste storage depot.	100 m
2. Whether street sweeping is done on all the days of the Year, including Sundays and public holidays. If not, on which days no work is done.	Yes -- No
xiv. Whether private sector/NGO is involved in this activity? If yes give full details.	
3. **Waste storage depot.** i. Whether the city has secondary waste storage System (dust bin)	Yes
ii. If yes, give ward-details in a separate table as under:	

Name of the ward	No. of open waste storage sites	No. of masonry bins	No. of round concrete pipe bins	No. and type of covered metal containers	Other type of bins, if any	Total bins / storage sites in the ward	total storage capacity of the bins / sites
1	10	--	--	45	25	70	
2	8						
3	--						
4	16						
5	18						
6	12						
7	7						
8	7						
9	5						
10	5						
11	6						
12	16						
13	7						
14	4						
15	11						
16	17						
17	8						
18	3						
19	14						
20	14						

21	10						
22	9						
23	12						
24	8						
25	9						
26	6						
27	15						
28	7						
29	9						
30	16						
31	13						
TOTAL	302						

iii. Normal distance between two bins — 100 mt

iv. Bin population ratio in each ward. (Population of the ward divided by no. of bins) — one bin per ----- -- persons

v. whether waste collected from the door step and the streets is stored separately — No

or

Whether both types of waste are mixed in a common bin/vehicle — Yes

vi. Whether private sector/ NGO is involved in this activity? — No

If yes, give details

vii. Frequency of lifting waste from open waste storage sites and clearing the street bins / containers : — twice a week

viii. Show all waste storage sites on the citymap

e. <u>Transportation of waste</u>

i. No., type and age of vehicles utilized for Transportation of waste. (Attach statement)

Type of vehicles	**No. of vehicles**	**Volume of each vehicle in MT/ capacity to lift containers .**	**Age of the vehicles**	No. of trips made by each type of vehicle in one shift

ii. No. of drivers deployed

iii. No. of shifts in which transportation activity is carried out.

First shift	**Second shift**	**Third shift**
.....MT	.....MT	.....MT

vi.	Quantity of waste transported each day.	66 MT
v.	How the quantity of waste transported is measured? By weight (through Weigh Bridge) volume, or visual estimate.?	Through Weigh Bridge volume, or visual estimate
vi.	Whether only segregated waste is collected from the door step & transported directly to waste processing site?	No
vii.	If no, whether mixed waste is collected from the door step and delivered to a processing facility/disposal site	No
viii.	Whether waste collected from the door step is mixed with street sweepings during transportation of waste?	Yes
viii.	What is the average and maximum distance the vehicle has to travel to reach the processing /disposal site.	4. 5. Km
ix.	Whether transportation of waste is carried out on all the days of the year including Sundays and public holidays.	Yes
x.	Whether there is any arrangement for transportation of bio-medical waste, hotel waste, construction and demolition (C&D) waste separately. If yes, give details for each on a separate page.	No
xii.	Whether private sector is involved in this activity? If yes, give details.	No
xiii.	Give existing Route map for transportation of waste?	

F. <u>Processing of waste.</u>

i.	Whether any processing of solid waste is being done? (such as 149andfi composting/ microbial composting / Bio- methanation/RDF/waste to energy.)	No

If yes, give details.

ii. Quantity of waste treated each day

iii. Technology/ technologies adopted

iv. Area of the processing site.(in acres/hectors)

v. Distance of the processing sites in KM from

- city center
- Boundary of the city
- nearest residential area
- nearest water body
- nearest airport (if within 20 km)
- historical / religious place(if with I one km)

Yes/No

vi. Whether private sector/NGO is involved in this activity? If yes, give details.

yes/No

vii. Is community involved in door step or community level composting or bio gas generation from bio degradable waste if yes give details.

yes/No

viii. Is any incentive given by local authority or state agency to promote home/ decentralized composting or bio gas generation

yes/no

If yes, give details

ix: Are any efforts made to setup dedicated compost plant or bio methanation plant within or around the vegetable/fruit/flower/meat market etc
If yes, give details

x. whether any efforts are made to setup horticulture/garden waste processing facilities within the parks and gardens
If yes, give details

g. <u>Disposal of waste.</u>

xi. Whether material recovery facility (MRF) is created at suitable locations to enable waste pickers to retrieve recyclables before the waste is given away/utilized for processing

Yes/no

yes/no

i. How many municipal solid waste disposal sites (dumpsites)- are currently available with the local body. Give details in the following table

name of dump site / landfill site	whether open dump or sanitary landfill	distance from the city centre	distance from nearest city boundary	area in hectare	Since when in use?	expected life of Landfill / dump Site	Current height of the dumpsite

Distance of landfills from habitation etc

name of dump site / 152andfill l site	distance from nearest habitation	distance from nearest water body	distance from nearest historical monuments	distance From nearest religious Places	distance from nearest airport
NEAR GULVA GHAT BRIGE	1KM	200 M	--	--	--

ii. Whether the waste deposited at the landfill site is spread on day to day basis?	Yes
iii. Whether the waste deposited at the landfill site is covered with inert material on day to day basis?	No
iv. What are the equipments available at the landfill site for spreading/ compacting/covering the waste,	Loader Mechine For compacting
v. Do you have separate arrangement for collection, transportation and disposal of bio-medical waste, If yes, give details.	No
vi. Whether bio degradable and recyclable waste are being disposed of at the landfill site along with inert waste If yes, give proportion of disposal of such wastes at the landfill	no
vii. Whether material recovery facility is created for allowing waste pickers/recyclers to salvage recyclables before disposal of waste at the landfill If yes, give details	no
viii. Whether any investigation have been carried out on closed or operational dump sites about the potential bio mining or bio-remediation If yes, give details	no
xi: Whether any old dump sites have been capped and made safe If yes, give details	no
x. Whether there are any existing plants or plans for extracting Methane gas from the existing landfills If yes, give details	no

h. <u>Disposal of dead animals</u>

6. How do you disposal of dead animals?	
ii. Whether private sector/NGO/ contractor is involved in this activity? If yes, give details.	Yes

By the help of contractor Shami Ullah Vaild 2018

D. Financial aspects (Give on Separate Sheets.)

a. Give details of the annual revenue & capital budget of the local body for last three years.

b. Give details of the allocation of funds for SWM (such as street sweeping, primary collection Secondary storage , transportation ,processing and disposal of waste including staff salaries)in the budget during last three years.

c. Give details of the amount actually spent on providing SWM (such as street sweeping, primary collection secondary storage , transportation ,processing and disposal of waste during last 3 years. This should include salary of sanitation staff, supervisors, drivers, vehicle maintenance, petrol, diesel, etc. used for SWM department including payments made to contractors for providing SWM services.

d.	whether any user charges are levied from the beneficiaries ? if yes give the detailed structure of levy of user fees from Residential, Commercial, Institutional, premises etc.	No

E. Health Aspects

a.	Whether any protective gears such as uniforms, shoes, masks and gloves, etc., are given to sanitary workers. If yes, give details.	No
b.	Whether sanitary workers are subjected to periodical medical check. If yes, give details.	No
c.	Whether any medical allowance or free medical service is given to sanitary workers. If yes, give details.	No

F. Legal aspects

Whether local government has framed Bye-laws for:

a. regulating solid waste management in the city,	no
b. levy of spot fines	no
c. levy of user charges? If yes, give details	No

G. Special Problems

Give details of special problems if any faced by the local body in Solid Waste Management.

7. **Special efforts made**

Give details of special efforts, if any, made by the local body for improving solid waste Management practices on a separate sheet.

I. Management information system

Whether management information system / monitoring mechanism is in place?	Yes/no

If yes, give details.

Whether any fines are levied for littering of waste on the streets and for non adherence to Rules, byelaws etc	Yes/no

If yes, give details.

Signature of Head of the organization

Date:

SECTION-3

Format to assess the gaps in service delivery

proforma for assessing the gaps in service delivery

Sr. No.	Type of service	Standard of service expected	Existing level of service	Gap in service delivery
1	Segregation and storage of waste at source	100%		
2	Primary collection from the door step	100%		
3	Sweeping of streets	100%		
4	Secondary storage where required in markets	100%		
5	Transportation of waste	100%		
6	Processing of bio degradable waste	100%		
7	Handing over recyclables to waste pickers/recyclers	100%		
8	Disposal of inert residual waste at the landfill	100%		
9	Cost recovery through user fees	75%		
10	Monitoring & resolving public complaints	100%		

SECTION-4

Format to conduct field survey to assess quality, quantity and characteristics of solid waste

METHODOLOGY OF CONDUCTING SAMPLE SURVEY TO ASSESS WASTE GENERATION RATES & MANNER OF DETERMINING THE QUANTITY OF WASTE GENERATED IN THE VILLAGE

Instructions to surveyor

The surveyor is advised to have meetings with the mayor/chairman, the municipal commissioner/executive officer and a few key well informed officers and citizens etc, to understand the approximate no. of HH falling in the three economic categories mentioned below and do extensive filed visits to collect the required information as shown in the tables below:

8. Economic status of households

Surveyor may ascertain during local consultations the economic status of HH in the village under survey

Table: 1

Economic Category	Number of Households
High Income Households	
Middle Income Households	
Low Income Households	
Total	

9. Estimation of waste generation rates at a household level

The surveyor may select 10% or 25 households each whichever is less from high income, middle income and low income households for undertaking detailed survey as under and record the findings in table 2A & 2B 3, 4,5 & 6 as under:

The surveyor may undertake an exercise to determine the quantum of bio degradable, non bio degradable waste generated at household level every 24 hours. He may draw samples for 3 consecutive days by distributing pre-numbered/marked one set of two waste storage bags per day for three days to each household selected and request the household to 1) segregate wet and dry waste at home 2) store in one of the bags all their bio-degradable waste (food waste) **which they normally throw away.** 3) Store in another bag all Non bio-degradable waste (dry waste such as paper, plastic, metal, glass, bottles) etc which they generally throw away on the streets, drains, open spaces etc. This should not include the recyclable material they generally keep aside for sale to kabadiwala/recycler and 4) Handover both the bags each day to the surveyor.

The surveyor should then arrange to collect the bags at pre-informed timing each day and weigh the domestic waste bags individually and record the weight of bio degradable waste and non biodegradable waste against the name of waste generator for 3 days and keep day to day records of the same in the formats given.

The surveyor should not mix food waste with dry recyclables at any stage of this exercise. He should only mix the dry non biodegradable waste collected from 10% households or 25 HH category wise **whichever is less** and find out the quantum of recyclables such as paper, plastic, metal, glass etc and inert waste such as dust in the waste delivered by high income, middle income and low income households separately. This exercise should be repeated for 3 days and accurate details should be recorded in the formats given.

SEPARATE SAMPLES MAY BE DRAWN FROM 10% OR 25 OF SUCH PREMISES WHICHEVER IS LESS ON THE LINES INDICATED FOR SAMPLING HOUSEHOLD WASTE AND THAT DATA MAY BE ADDED IN THE TOTAL WASTE GEENRATION OF THE CITY

Table 2A: Estimates of Quantity of biodegradable Solid Waste in Sample of Households

Household Number	Name of head of household	Number of family Members (N1)		Weight of Biodegradable solid Waste generated per Day(grams)			
				Day1	Day2	Day3	avg
High income							
1	Sushul kumar mahesvari	7		2.500	2600	2400	2500
2	Murari lal agarwal	8		2.400	2500	2600	2500
3	Rajesh jain	5		2.600	2400	2500	2500
4	Kanhiyalal rupani	6		2.400	2800	2600	2600
5	Dr vineet dohia	6		2.700	2300	2400	2560
6	Dr arvind kumar	7		2.30	2600	2000	2500
7	Rajesh mitaal	6		2.450	2550	2500	2500
8	Atul jain	8		2.50	2800	2600	2630
9	Kuldeep singh	7		2.600	2400	2600	2630
10…..n	Perkash	5		2.400	2600	2000	2500
Total		67		24850	25550	25000	25100
Middle income							
1	Munna	8		1400	1500	1700	1500
2	Hasir	9		1500	1600	1700	1600
3	Mujeeb khan	7		1300	1400	1200	1300
4	Kemmo	8		1500	1600	1500	1500
5	Shadige khan	9		1400	1600	1500	1500
6	Irfanul hage	12		1800	1700	1900	1800
7	Munna thakedar	10		1500	1600	1700	1600
8	babbu	9		1600	1400	1500	1500

Household Number	Name of head of household	Number of family Members (N1)		Weight of Biodegradable solid Waste generated per Day(grams)			
				Day1	Day2	Day3	avg
9	Shabbeena	6		1300	1400	1500	1400
10…n	Aftab	5		1200	1400	1300	1300
Total		83		14600	15200	15200	15000
Low income							
1	Palloo	6		500	450	550	500
2	Suneeta	5		450	350	550	450
3	Pagaloo	7		550	650	600	600
4	Nafees	5		400	500	600	500
5	Rajendra	6		500	400	600	500
6	Jubeda	8		600	700	500	600
7	Nanke	6		400	500	300	400
8	Sheela devi	7		500	400	600	500
9	Chada	5		400	500	450	450
10….n	Parveen	6		500	600	400	500
Total		61		4800	5050	5150	500

TABLE 2B: Average of three day measurements to get one-day value for each household (Calculating from Table 2A)

Table 2B: Average values for three days for biodegradable waste Category (Take from table 2 A)

Category Total (for all samples)	Average Number of members (N1) per household	Average weight of biodegradable solid waste generated in selected households daily (kg.)
High Income Households	6.7	2.51 kg
Middle Income Households	8.3	1.5 kg
Low Income Households	6.1	.50 kg

Table 3: Estimates of non biodegradable waste and its Components in Sample of Households:

Waste Composition: Dry Non biodegradable Waste collected from group of 10% households from high income, middle income and low income category should be mixed (group wise) and thereafter various components of waste such as paper, plastic, metal, glass and inerts (ash, dust) may be separated manually and weighed and recorded and the component wise details of waste generated by each category of household may be given in the proforma 3 below

Table 3.(1) (Day 1)

Category of households (total of 10% samples each)	Non biodegradable Waste (Gram) Total of day 1	Paper component in 1 (Gram) 2	Plastic component in 1 (Gram) 3	Metal component in 1 (Gram) 4	Glass component in 1 (Gram) 5	Other non bio degradable waste component in 1(gm) 6	Dust & other inert component in 1 (Gram) 7
High Income Households	500	25	50	--	--	1175	750
Middle Income Households	255	15	30			600	600
Low Income Households	80	--	10				410

Table 3.(2) (Day 2)

Category of households (total of 10% samples each)	Non biodegradable Waste (Gram) Total of day 1	Paper component in 1 (Gram) 2	Plastic component in 1 (Gram) 3	Metal component in 1 (Gram) 4	Glass component in 1 (Gram) 5	Other non bio degradable waste component in 1(gm) 6	Dust & other inert component in 1 (Gram) 7
High Income Households	490	35	60				760
Middle Income Households	260	20	20				610
Low Income Households	90	5	5				400

Table 3.(3) (Day 3)

Category of households (total of 10% samples each)	Non biodegradable Waste (Gram) Total of day 1	Paper component in 1 (Gram) 2	Plastic component in 1 (Gram) 3	Metal component in 1 (Gram) 4	Glass component in 1 (Gram) 5	Other non bio degradable waste component in 1(gm) 6	Dust & other inert component in 1 (Gram) 7
High Income Households	510	35	30			1150	775
Middle Income Households	265	15	15			595	610
Low Income Households	70		10				420

Table -4. Average (Day 1+2+3) data given I tables 3 (1,2,3 above) (for group of samples taken in each category)

Calculate the average value for each cell by averaging the values in that cell for day 1, 2 and 3. For example, add the values in the paper column – High income cell for day 1, day 2 and day 3 and divide by 3.

Category Total (for all samples)	Paper (Gram)	Plastic (Gram)	Metal (Gram)	Glass (Gram)	Inserts (street sweepings, dust) (Gram)
High Income Households	320	47			762
Middle Income Households	17	22			607
Low Income Households	2	8			410

Table 5 average of waste generation rate <u>per household/day</u> in each category

(Divide the figures given in table 2 B for bio degradable waste and table 4 above for non bio degradable waste by the number of samples taken in each category

Category	Food Waste (Gram)	Paper (Gram)	Plastic (Gram)	Metal (Gram)	Glass (Gram)	Inserts (street sweepings, dust) (Gram)
High Income Households	500	320	47			762
Middle Income Households	260	17	22			607
Low Income Households	80	2	8			410

Note: prepare similar details for commercial/institutional waste samples and add the quantities in the quantities derived from household waste generation assessment.

Table 6: Summary table showing waste generated by total household in each category

Put in this table the various components of waste generated per household/day as per table 5 above X by total households in each category

Category 1	Total Food Waste (Gram) 2	Total Paper waste (Gram) 3	Total Plastic waste (Gram) 4	Total Metal waste (Gram) 5	Total Glass waste (Gram) 6	Other mixed waste 7	Total household waste total of (2to7) 8	Total ash waste (grams) 9
	Figure as per table 5 above X Number of Household in each category as per table 1 above	Figure as per table 5 above X Number of Household in each category as per table 1 above	Figure as per table 5 above X Number of Household in each category as per table 1	Figure as per table 5 above X Number of Household in each category	Figure as per table 5 above X Number of Household in each category as per table 1 above	Figure as per table 5 above X Number of Household in each category as per table 1 above		Figure as per table 5 above X Number of Household in each category as per table 1 above

Category 1	Total Food Waste (Gram) 2	Total Paper waste (Gram) 3	Total Plastic waste (Gram) 4	Total Metal waste (Gram) 5	Total Glass waste (Gram) 6	Other mixed waste 7	Total household waste total of (2to7) 8	Total ash waste (grams) 9
			above	as per table 1 above				
High Income								
Middle Income								
Low Income								
Total								

10. Estimation of street waste and silt collected from surface drains

The surveyor may assess the quantity of waste generated in the form of street sweepings and the silt removed from surface drains (Naalis) by studying the pattern of such waste collected by street sweepers and add this quantity of inert waste separately in the final total of the waste generated in the city.

TABLE-7 SUMARRY OF WASTE GENERATED BY THE CITY/TOWN

S. NO.	TYPE OF WASTE	QUANTITY OF WASTE GENERATED PER DAY (KG)
1	BIO DEGARDABLE WASTE (TABLE 6-2)	
2	RECYCLABLE WASTE TABLE (6-TOTAL OF 3-7)	
3	NON BIO DEGARDABLE OTHER WASTE DUST WASTE (TABLE-6 COLUMN 9)	
4	COMMERCIAL/INSTITUTIONAL WASTE	
5	STREET SWEEPINGS/SILT FROM THE DRAINS AS PER FIELD ASSESSMENT	
	TOTAL	

SECTION-5

Yard sticks for assessing the requirement of tools, equipment, vehicles etc for different levels of cities

Type of vehicles and equipment to be used for different level of cities & yard stick for the use of the same

City population 1	Containerized Handcarts for street sweeping 2	Tricycles for d2d collection 3	LCV/tractor for d2d collection 4	Container- 1.1 cum for secondary storage of street sweepings 5	Container-4 cum for secondary storage of market waste 6	Dumper placer for lifting large container 7	Compactor for transport of waste from 1.1 cum containers 8
Up to 20000	1 handcart per 500 RMT street to be swept	1 tricycle per 200HH in 20% of inaccessible areas	1 LCV or covered tractor per 6000 population or 1200HH in the city including those covered in column-3	Nil	1 container per market or commercial streets	1 dumper placer per 10 containers or part thereof	Nil
20001-50000	Do	Do	Do	Nil	1 container per market or commercial streets	1 dumper placer per 10 containers or part thereof	Nil
50001-75000	Do	Do	Do	4 containers per sq.km area	Nil	Nil	1 compactor per 60 bins or part thereof
75001-100000	Do	Do	Do	4 containers per sq.km area	Nil	Nil	1 compactor per 60 bins or part thereof

Above 100000	1 handcart per 350 RMT in high density areas, 1 per 500RMT in medium density areas & 1 handcart per 750 RMT in low density areas	Do	1 LCV per 1500HH or 7500 population in the city including those covered in column-3	4 containers per sq.km area	Nil	Nil	1 compactor per 60 bins or part thereof

SECTION-6

Detailed format for assessing the specific need of tools, equipment, vehicles and funds

Proforma for determining need of Vehicles, Equipment, Manpower & Finances for SWM

Under SBM Project

Sr. No.	Particulars	
1	Name of the city/town	Bahraich
2	Area in sq.km	13.36 sq.km
3	Population (2011 census)	186233
4	Total waste generated/day	66 MT
5	Total waste transported/day	64.4 MT
6	Distance of processing facility/facilities	Zero
7	Distance of landfill/dumpsite	2-3 km

Need Assessment

A. Door to door collection

a. Population living in accessible areas having motorable streets

b. Population living in inaccessible areas not having motorable streets such as slums, congested areas

c. Need for door to door collection from accessible areas:

i. Light covered commercial vehicles of 3cum/5cum capacity with central partition for storage of wet and dry waste separately @ 1 vehicle per 7500/10000 population respectively to cover entire population of the city (including inaccessible areas)
(city population/7500 or 10000 as the case maybe)

ii. Need of waste collectors to accompany Light commercial vehicle (LCV) for d2d collection (2persons per 1 LCV as per (i) above)

iii. Need of drivers for door to door collection of waste (1 driver per LCV as per (i) above)

d. Need for door to door collection from inaccessible areas:

i. Containerized tricycles (4/6 containers) required @1 tricycle per 1000 population living in inaccessible areas as per A (b) above for d2d collection & direct transfer of waste in collection vehicles stationed outside the congested areas set apart from **c (i)** above

ii. Need of waste collectors (1person per 1000 population shown in A (b) above)

e. Spare vehicles and tricycles required for immediate replacement in case of break down and preventive maintenance to ensure reliability of service [10% of LCV shown in c(i)& 5% of tricycles shown in d(i)]

……LCV
……Tricycle

f. Cost of vehicles, equipment & manpower per year:

Item	Quantity required	Unit cost (Rs.)	Total cost/ annual cost
LCV	As per c(i) above	As per market rate approx (6.5	

		lacs)	
Containerized tricycle (including 4/6 containers of 25/30lt capacity)	As per d(i) above	As per market rate (approx Rs.15000)	
Waste collectors for D2D collection vehicle	As per c (ii) above	As per prevailing minimum daily wage in the state	
Waste collectors for d2d collection through tricycle	As per d (ii) above	As per prevailing minimum daily wage in the state	
Drivers for d2d collection	As per c (iii) above	As per prevailing minimum daily wage in the state	

Note: The state agency may ascertain the prevailing market rate of LCVs and tricycle as well as minimum wage rates to the officials concerned to maintain uniformity in determining costs.

B. Street sweeping

i. Requirement of street sweepers

Type of roads	Road length in km	Yardstick for manpower deployment	Manpower required for street sweeping
High density areas	…….km	1 per 350running mt	
Medium density	…….km	1 per 500 running mt	
Low density	…….km	1 per 750 running mt	

Total			

(Average requirements of street sweepers 1 per 500 running mt)

ii. Number of handcarts/tricycle required @1 per street sweeper as per B(i) above+5% additional for replacement in case of break down

iii. Cost of handcarts/tricycles B(i) X unit cost of handcart/tricycle

C. Secondary storage of waste

Note: secondary storage facilities may be provided in a situation where it may not be convenient to transfer street sweepings from handcarts/tricycles directly to collection vehicle stationed at strategic locations to facilitate street sweepers to transfer their waste into collection vehicles meant exclusively for street sweepings and silt from surface drains etc.

i. No of secondary waste storage depots required in the city/town @ 4 covered black color containers per sq.km of city area if bin size selected is ranging between 3 & 5 cum volume or 8 per sq.km if the bin size selected is between 0.6 and 1.1 cum volume (city area in sq.km X 4 or 8) depending on the density of population and quantum of waste is generated in a given area.
A mix of both can also be adopted

ii. Cost of containers

Type of containers	No. of metal containers required	Unit cost	Total cost
4.5 cum	As per C(i) above	As per market rate (approx 60,000/-)	
3 cum	As per C(i) above	30,000/-	
1.1 cum	As per C(i) above	24,000/-	

0.6 cum	As per C(i) above	10,000/-	

iii. Construction of transfer station :

- If the distance between collection area and processing/disposal facility is more than 15 km, it is desirable to have transfer station @ 1 transfer station per 300-400 tonnes of waste or part thereof.
- The transfer station should have either large hauling vehicles or static compactor and large containers for bulk transfer of waste. The capacity of hauling vehicle or container should be at least 10 metric tonnes of waste. 3 trips to the processing/disposal site would be possible in a working shift carrying at least 30 tonnes of waste per hauling vehicle or large container with container lifting device.
- In small cities where quantity of waste is less, a simple transfer station may be proposed where small vehicles can go over a ramp and directly transfer the waste into large hauling vehicles parked at a lower level.
- The cost of transfer station would vary according to the quantum of waste to be transported. It could vary between 1 and 4 crores rupees. The cost may be estimated @ 1crore per 100 tonnes of waste to be handled at a transfer station including facility of computerized weigh bridge costing around Rs. 10 lacs.

D. Transportation of waste

i.

Quantity of waste currently being transported per day	654 Metric tonnes
Quantity of waste that need to be transported per day as per tentative estimation as under	66 Metric 180ones

Yardstick

Town under 1 lac population	250 grams/capita/day
City between 1 & 5 lacs population	350 grams/capita/day
City between 5 & 20 lacs population	400 grams/capita/day
City between 20 & 50 lacs population	500 grams/capita/day
City above 50 lacs population	600 grams/capita/day

Note: If the waste estimation carried out on the field revels larger quantity of waste, that figure may be taken into consideration.

60 No. and type of vehicles required for transportation of waste

Type of vehicle	No. of vehicle required	Unit cost	Total cost
LCV for D2D collection	As per A (c)(i)+ A (e)	……@1 vehicle per 10 containers	
Dumper placers for lifting 3-5 cum containers			
Refuse collectors/compactor for 0.6 to 1.1 cum containers	….@1 compactor per 60 containers or part thereof		
Large hauling vehicles for bulk transfer of waste from d2d collection vehicles/ 3-5 cum containers at transfer station if distance of processing facility/disposal site is more than 15 km	….@1 large hauling vehicle per 30 tonnes of waste to be transported		
Spare vehicles required	Minimum 10% vehicles may be additionally procured for pressing into service in case of break down or preventive maintenance		

Total manpower requirement for collection and transportation of waste

Sr. No.	Type of service	Manpower required	Daily wage cost	Annual cost
1	Waste collectors for D2D collection	As per A(f)		
2	Drivers for	As per A(f)		

	D2D Collection			
3	Street Sweepers	As per B (i)	250	
4	Drivers for Transportation Of containers & Large Hauling vehicles	As per D (ii)	27	
5	Sanitation Workers to Accompany Transport Vehicles Covered in 4 above	@ 2 per Vehicle		

Total capital cost Rs….
Total establishment cost per year Rs…….

Date: