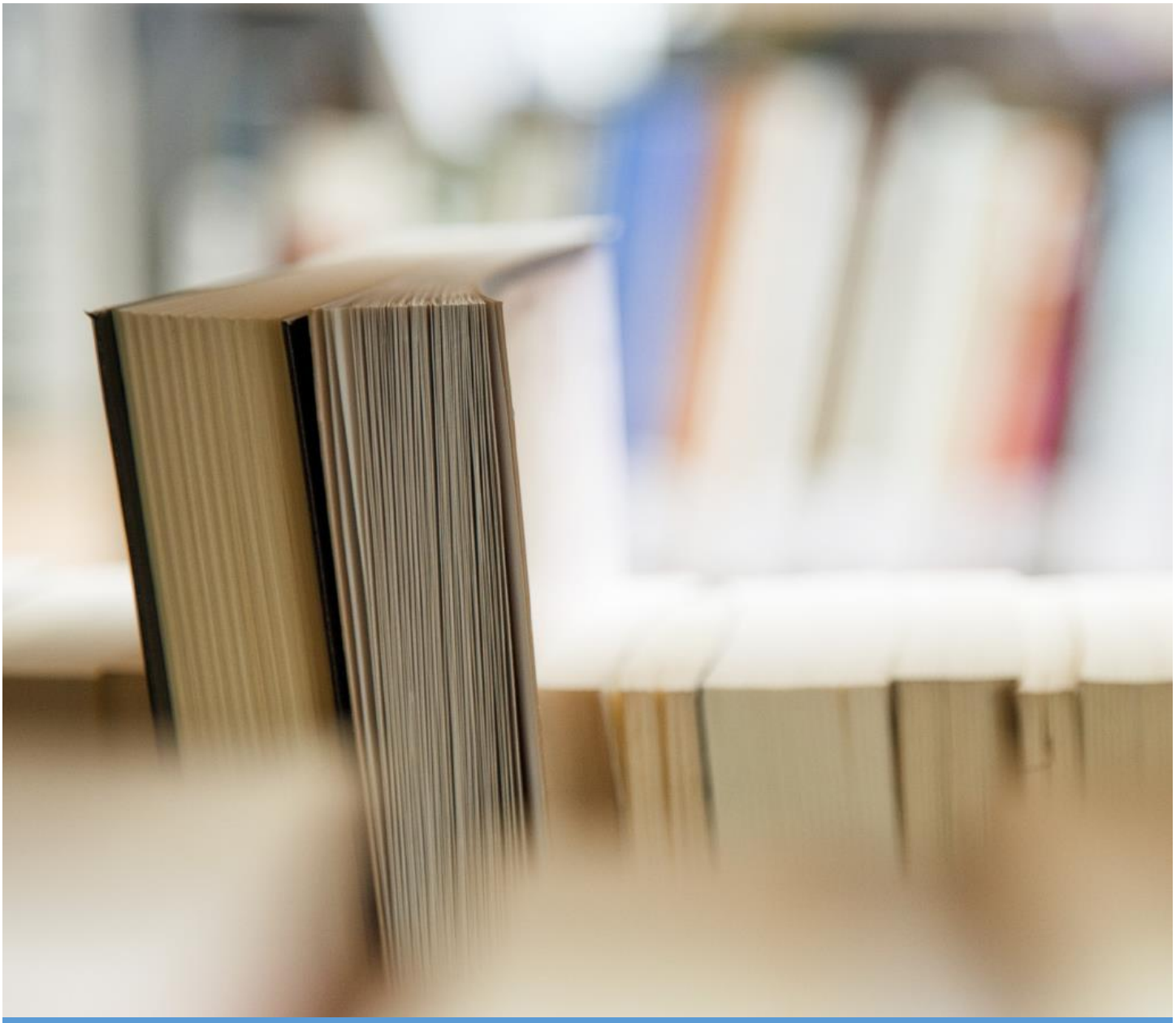

Rajasthan State Solid Waste Management Policy and Strategy, 2019

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Abbreviations

ADB	Asian Development Bank
BCC	Behaviour Change Communication
BOT	Build Operate Transfer
BOOT	Build Own Operate Transfer
BWG	Bulk Waste Generator
CBO	Community Based Organisation
C & D	Construction and Demolition
CCRS	Customer Complaint Redressal System
CCTV	Closed Circuit Television
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
DBFOT	Design Build Finance Operate and Transfer
DBOOT	Design Build Own Operate and Transfer
DISCOM	Electricity Distribution Companies of India
EPA	Environment Protection Act, 1986
EPC	Engineering Procurement and Construction
EPR	Extended Producer Responsibility
ETA	Estimated Time of Arrival
FAME	Fast Adoption and Manufacturing of Electric vehicles
FFC	Fifteenth Finance Commission
GIS	Geographic Information System
GPS	Global Positioning System
GPRS	General Packet Radio Services
GoI	Government of India
GoR	Government of Rajasthan
IEC	Information Education and Communication
ISWM	Integrated Solid Waste Management
JV	Joint Venture
LSG	Local Self Government

MDWS	Ministry of Drinking Water and Sanitation
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	Management Information System
MNRE	Ministry of New and Renewable Energy
MoA	Ministry of Agriculture
MoEF & CC	Ministry of Environment, Forest and Climate Change
MoHUA	Ministry of Housing and Urban Affairs
MoUD	Ministry of Urban Development
MoP	Ministry of Power
MRF	Material Recovery Facility
MoRTH	Ministry of Road Transport and Highways
MSME	Ministry of Micro, Small and Medium Enterprises
NGO	Non-Governmental Organisation
NGT	National Green Tribunal
O & M	Operations and Maintenance
PPP	Public Private Partnership
PPE	Personal Protection Equipment
PR	Panchayati Raj
PSP	Private Sector Participation
PVC	Polyvinyl Chloride
RDF	Refuse Derived Fuel
RRC	Resource Recovery Centres
RERC	Rajasthan Electricity Regulatory Commission
RFID	Radio Frequency Identification
RSPCB	Rajasthan State Pollution Control Board
RSRTC	Rajasthan State Road Transport Corporation
RTPP Act	Rajasthan Transparency in Public Procurement Act 2012
RTO	Regional Transport Office
RWA	Resident Welfare Association
SBM	Swachh Bharat Mission
SFC	State Finance Commission

SHG	Self Help Group
SWM	Solid Waste Management
SWMS	Smart Waste Management System
SLA	Service Level Agreement
SLB	Service Level Benchmark
SLRM	Solid and Liquid Resource Management
SoP	Schedule of Power
STA	Scheduled Time of Arrival
SW-APT	Solid Waste Appropriate Technologies
ToT	Training of Trainers
TPD	Tonne per Day
TS	Transfer Station
UDD	Urban Development Department
ULB	Urban Local Body
US EPA	United States Environment Protection Act
USAID	United States Agency for International Development
VGF	Viability Gap Funding
VTMS	Vehicle tracking and Monitoring Information Systems
WBG	World Bank Group
WtE	Waste to Energy

Abstract

This Policy acts as a key instrument in highlighting the vision and strategic goals of the State Government for the development of solid waste management in sustainable manner. It lays down a detailed roadmap of reduction, reuse and recycling of waste through innovative technology, consumer service and education for envisioning the environmental, social, cultural, economic, and technological and public health concerns.

Management of solid waste is a larger challenge not only because of its adverse health and environmental impacts but also due to huge quantities of waste generated. Most Local Bodies lack the capability to handle such huge quantities of solid waste due to financial and institutional frailty. Local authorities struggle from insufficient funds, resources, infrastructure and appropriate strategies to improve solid waste management.

The proposed policy on Solid Waste Management (SWM) in Rajasthan is in line with the SWM Rules, 2016 and provides comprehensive vision for SWM, enabling frameworks and strategies to manage the challenges of SWM in Rajasthan. The policy provides a stimulus to the waste management economy and promotes environmental up-gradation.

1. Introduction

1. Rajasthan, located in the northwest part of India, is India's largest State by area (about 342,239 sq. km or 10.4% of India's total area). As per Census 2011, the State's population is 6.86 Crores, of which around 24.87% people live in urban regions and 75.13% people in rural areas. It is projected that the State's population shall increase to 8.20 Crores by 2022[1] with 33% of such population to stay in urban areas and 67% in rural areas. There are 33 districts, 191 Urban Local Bodies, 295 Panchayat Samitis and 9892 Gram Panchayats in Rajasthan.
2. The total solid waste generated by the State in urban areas in 2019 is 6500 TPD[2], of which 99% (6435 TPD) is collected from door to door, 70% (3779 TPD) is segregated at municipal wards and 99% of this solid waste is transported to the respective processing units.
3. In order to manage and process the generated solid waste, there are 40 Operational Plants, of which 4 are Centralized and 36 Decentralized Plants with a total capacity of 613 TPD (9% of the total waste generated) and 256 TPD (4% waste) respectively. Besides, there are 7 processing plants under construction and 7 under environmental clearance with a total capacity of 746 TPD (11% of the total waste generated) and 567 TPD (10% waste) respectively. Along with these, there are 2 waste processing plants with a capacity of 567 TPD (10% of the total waste generated) and 10 Material Recovery Facilities (MRF[3]) with a capacity of 325 TPD (5% waste).
4. The Decentralised Processing (wet waste to compost) is carried out by Bulk Waste Generators at their premises with a total capacity of 650 TPD (10%) processed waste. For remaining 1352 TPD (21%) waste generated, the State Government has approved Annual Rate Contract for Processing/ Compost Machine (50-1000 kg) for processing of waste in decentralized manner.
5. 13 % (869 TPD) of the total waste is treated by 40 Processing Plants, 10% (650 TPD) by 549 Bulk Waste Generators and the remaining 4547 TPD has been dumped at dumping site.
6. Over the years, the State Government has worked diligently to effectively utilize its resources and work towards enabling the economy to extract value, generate employment and create a cleaner environment for its people.

1.1 The Rajasthan Solid Waste Management Policy and Strategy, 2019

1. The policy is in line with the Central Government's vision to scientifically manage solid waste towards making India garbage free.
2. In order to achieve these objectives, MoEF & CC has notified Solid Waste Management Rules 2016. Accordingly the State Government, aligning with the present SWM Rules 2016 has decided to come out with the Solid Waste Management Policy, 2019 for Rajasthan to have in place a strong solid waste management mechanism in the State.

[1] National Institute of Health and Family Welfare (NIHFW), 2014

[2] Local Self Government Department (LSG), Jaipur, Rajasthan

[3] Material recovery facility (MRF) is defined as a facility where non-compostable solid waste can be temporarily stored by the ULB or any other entity or any person or agency authorized by any of them to facilitate segregation, sorting and recovery of recyclables from various components of waste by authorized informal sector of waste pickers, informal recyclers or any other work force engaged by the ULB or entity for the purpose before the waste is delivered or taken up for its processing or disposal. (SWM Rules, 2016)

2. Vision

The Government of Rajasthan intends to adopt 5R[4] approach (Reduce, Reuse, Recycle, Recover and Remove) by imparting thrust on collection, segregation, improving data and analytics, minimizing environmental impacts, creating market for recyclable products and aiming towards sustainable development.

2.1 Objectives

1. To build a robust solid waste management framework
2. To create a favorable sustainable model for waste management
3. Enhance environmental aspects for sustainable development
4. To create conducive ecosystem for environmental up-gradation and sustainability
5. To bring a behavioral change in the citizens and ensuring their involvement towards efficient and effective management of solid waste

2.2 Title and Commencement

This policy shall be known as Rajasthan State Solid Waste Management Policy and Strategy, 2019 (hereinafter referred as the Policy). According to the SWM Rules 2016, the State shall prepare SWM plan for each local body as per the state policy and implementation strategy on SWM within 3 months from the date of notification of state policy.

The SWM plan has following components:

1. Institutional Strengthening;
2. Human Resources Development;
3. Technical Capacity Building;
4. Financial Capacity and Arrangements [Public Private Partnership (PPP) Framework];
5. Community Participation;
6. Legal Framework and Mechanism For Implementation & Enforcement; and
7. Public Grievance Redressal Mechanism.

The SWM plan should consider a long term planning horizon of 20–25 years. Short term implementation plans covering 5 years each should be slotted within the long term plan for ease of implementation. The short term plan should be reviewed and updated once every year for any midcourse correction as required. Local bodies[5] should ensure that the short term plan is aligned with long term planning and implementation. The SWM plan should be according to the SWM Rules, 2016 and SWM Manual (CPHEEO, 2016).

[4]SWM Manual, CPHEEO, MoUD, 2016

[5]Hereinafter, Local Bodies comprises of Urban Local Bodies (ULBs) and Gram Panchayats (GPs).

3. Solid Waste Management Components

The significant components for management of solid waste comprises of waste generation, source segregation of waste, primary collection & transportation of waste to transfer stations, secondary transportation of waste from transfer stations to processing plants, waste processing and waste disposal. The process flow of waste is depicted in the figure 1 below, each component leads to recovery of products. This section briefly discusses and highlights the value chain involved in solid waste management along with recovery of end products through waste processing techniques.

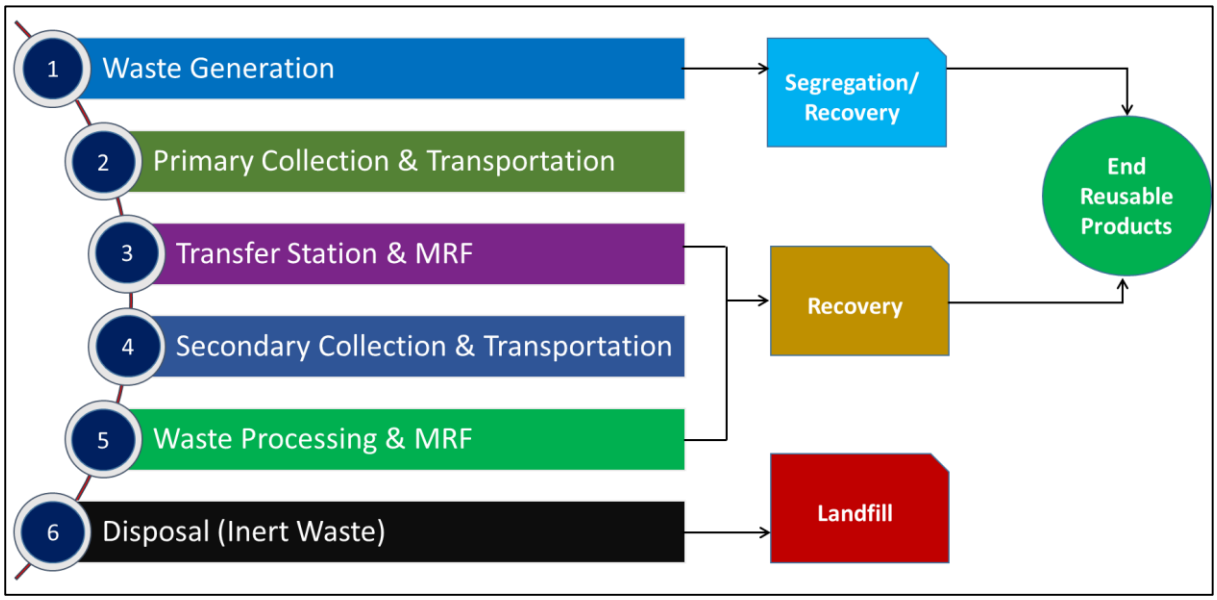

Figure 1: Process Flow of SWM

3.1 Waste Generation

Waste generation refers to the total quantity of solid waste generated in an area of respective local body. It is calculated as per capita waste generated by the ULB/ GP. The per capita waste generation is considered as 450 gm[6] for the State. Based on the projections of urban population for year 2021, the total waste generation in the State will be approximately 9,106 TPD.

3.1.1 Classification of Waste Generators

The waste generators are classified as follows:

1. **Residential Generators:** Residential waste generators are the household or domestic generators.
2. **Bulk Generators:** As per the SWM Rules 2016, Bulk Generators are defined as, buildings occupied by the Central government departments or undertakings, State government departments or undertakings, local bodies, public sector undertakings or private companies, hospitals, nursing homes, schools, colleges, universities, other educational institutions, hostels, hotels, commercial establishments, markets, places of worship, stadia and sports complexes having an average waste generation rate exceeding 100 kg per day.

[6]It is estimated that solid waste generated in small, medium and large cities/ towns is 0.1 Kg, 0.3-0.4 Kg and 0.5 Kg per capita per day respectively. (CPCB)

3.1.2 Waste Segregation

The SWM Rules, 2016 defines "segregation as sorting and separate storage of various components of solid waste namely biodegradable wastes including agriculture and dairy waste, non biodegradable wastes including recyclable waste, non-recyclable combustible waste, sanitary waste and non recyclable inert waste, domestic hazardous wastes, and construction and demolition wastes".

3.1.3 Types of Waste

1. **Wet Waste:** Wet waste is defined as per the SWM Rules 2016 as "Organic waste usually generated by homes, eateries and is heavy in weight due to high moisture content. It includes kitchen waste, fruits and flowers, leaves, meat waste, etc. The wet waste is biodegradable in nature and is decomposed aerobically or anaerobically into compost".
2. **Dry Waste:** Dry Waste is defined as the "waste other than bio-degradable waste and inert street sweepings and includes recyclable and non-recyclable waste, combustible waste and sanitary napkin and diapers, etc".
3. **Domestic Hazardous and other Wastes: "**Domestic hazardous wastes are defined as discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes, contaminated guage, etc. generated at the household level"[7]**.**

3.1.4 Benefits of Segregation

1. Waste segregation at source ensures that waste does not get contaminated and it can be collected and transported separately for further processing.
2. Segregation of waste optimizes waste processing and treatmenttechnologies.
3. It results in high proportion of segregated material that could be reused and recycled, leading to less consumption of virgin material.
4. Waste, if not segregated, can pose risks and constraints on the choice of operation of waste processing technologies. Plastic in waste if incinerated could lead to release of dioxins that are toxic and causes severe health hazards. Household hazardous waste if not segregated (e.g. spent batteries, etc.) can result in contaminated compost.
5. Waste segregation leads to a reduction in waste transportation, correspondingly the vehicular emissions reduce.
6. Due todumping of lesser quantity of waste, the life of the landfill increases.
7. As it is ensured through segregation that no organic or hazardous waste is dumped in the landfill, the risk to the ecosystem is reduced.
8. Segregated waste reduces health and safety related risks to waste pickers.
9. Proper segregation of waste thus leads to a 'Circular Economy' creating green jobs, reducing consumption of virgin resources and promoting investments and innovations.

3.1.5 Requirements on Source Segregation

The SWM Rules, 2016 defines segregation as sorting and separate storage of various components of solid waste namely biodegradable wastes including agriculture and dairy waste, non-biodegradable wastes including recyclable waste, non- recyclable combustible waste, sanitary waste and non-recyclable inert waste, domestic hazardous wastes, and construction and demolition wastes.

[7] Refer SWM Rules, 2016

Segregating waste at source ensures that waste is less contaminated and can be collected and transported for further processing. Segregation of waste also optimizes waste processing and treatment technologies. It results in high proportion of segregated material that could be reused and recycled, leading to less consumption of virgin material. For further details on source segregation, refer to Section 2.2 of SWM Manual (Part 2), CPHEEO, 2016.

3.2 Primary Collection and Transportation

1. The SWM Rules 2016 defines primary collection as, "means of collecting, lifting and removal of segregated solid waste from source of its generation including households, shops, offices and any other non-residential premises or from any collection points or any other location specified by the local bodies".
2. **Door to Door Collection**[8]: Primary collection of segregated solid waste from individual households and establishments is accomplished through the use of containerised pushcarts, tricycles or small mechanised vehicles, compartmentalised vehicles or tipping vehicles depending on the terrain of the locality, width of streets and building density.
    a. **Frequency of waste collection**: The frequency of door-to-door collection should be determined on the basis of the density of population, collection system, and climatic conditions.
    b. **Route Plan:** Waste collection route planning is critical to ensure an efficient collection and transportation system. All primary collection vehicles should run as per the prescribed route plans. The same plan should be available in public domain. Any deviation from route plans should be strictly noted and corrective or punitive actions to be taken accordingly.
    c. **Collection of Waste:** All deputed manpower on collection vehicles should be mandatorily trained for collecting only segregated waste as dry, wet and domestic hazardous wastes on their collecting routes. Mixed waste should not be collected.
3. **Involvement of Private Sector:** The Local bodies may engage with CBOs, NGOs, SHGs, RWAs or the private sector in providing doortodoor collection services. The representative of NGOs/ SHGs etc. may be deputed with collection vehicles for bridging and sensitizing citizens for source segregation and providing segregated waste.
4. **Vehicles for Primary Collection**[9]: Local bodies should assess the amount of waste generated, local climatic conditions, topography of the area, and available facilities for repair and maintenance of vehicles, before selecting vehicles for primary collection. Vehicles typically used for primary collection are:
    a. Light commercial vehicles (mini trucks, Auto Tippers) with hydraulic tipping containers (covered)
    b. Four-wheeled mini trucks with international standard garbage collection bins (covered)
    c. **Adoption of Electric Vehicles:** Local bodies should prefer electric vehicles for any procurement in addition to existing vehicles[10].

[8]Door-to-door collection means collection of solid waste from the door step of households, shops, commercial establishments, offices, institutions, or any other residential premises and includes collection of such waste from entry gate or a designated location on the ground floor in the housing society, multi storied building or apartments, large residential, commercial, institutional complexes or premises. (SWM Rules, 2016)

[9] Refer section 2.3.4 of SWM Manual (CPHEEO, 2016)

[10]Refer FAME (Fast Adoption & Manufacturing of Electric Vehicles) scheme.

5. **Staffing & Equipment Requirement**[11]: All local bodies must ensure that the operator of a facility provides personal protection equipments (PPE) including uniform, fluorescent jacket, hand gloves, raincoats, appropriate foot wear and masks to all workers handling solid waste and the same are used by the workforce. First-aid boxes also provided at work place.
6. **Intergration of Informal Sector**: All local bodies must ensure the involvement of informal sector[12] and integrated them into the waste management system of the city. The Local bodies can take help from the CBOs, NGOs, SHGs, RWAs or the private sector in integration of informal sector.

3.2.1 Transfer Stations

"The establishment of intermediate transfer stations is determined by the distance between secondary waste collection points and the final treatment and disposal point. If the distance from the city jurisdiction to the final treatment and disposal points exceeds 15 km, transfer stations may be established or as per availability and requirement of land.

The choice of secondary collection vehicles is to be synchronized with the design of secondary collection bins and storage containers in the transfer station. Compactors may be used to haul waste from transfer stations to the waste disposal site.

Transfer stations are usually part of the waste management system in large cities. The smaller municipal authorities should consider setting up simple transfer stations having a ramp facility for transfer of waste from a small vehicle or container to a large hauling vehicle. Normally large cities should consider setting up large transfer stations to handle over 300 tonne per day (TPD) of waste using static compactor facilities."[13]

Infrastructure development of transfer stations with Material Recovery Facility (MRF) in the cities with population size of more than 5 lakhs should be considered first then other local bodies in the priority order. MRF shall be developed probably at Transfer Stations or at Processing Plants or both depending upon the area of land and other key factors as per local requirements.

3.2.2 Secondary Collection and Transportation

1. **Definition:** The SWM Rules, 2016 defines secondary storage as, "the temporary containment of solid waste after collection at secondary storage depots or MRFs or Bins for onward transportation of waste to the processing or disposal facility". Secondary collection includes picking up waste from community bins, waste storage depots, or transfer stations and transporting it to waste processing sites or to the final disposal site.
2. **Mandatory Segregation:** Unsegregated waste, which has not been sorted at primary level, should be segregated either at an intermediate stage (e.g., transfer station) or at the processing plant, prior to treatment, in cases where waste is brought directly to the plant from the waste collection areas. Segregation may be accomplished through manual or mechanized segregation. Multiple handling of waste should be avoided.
3. **Vehicle and Equipment for Secondary Transportation**[14]**:** Larger capacity vehicles should transport waste from the secondary or tertiary collection point (depot or transfer station) to the processing and treatment facility or landfill. The types of vehicles should synchronise well

[11] Refer to SWM Manual (CPHEEO, 2016)

[12] The informal sector in any city includes the kabadiwalas or scrap dealers (the kabadi system) and the waste pickers. (CPHEEO, 2016)

[13] Refer to SWM Manual (CPHEEO, 2016)

[14] ibid

with containers placed at depots or transfer stations to prevent multiple handling of waste. Vehicles typically used for secondary transportation of wastes are:

a. Skip truck (dumper placer)
b. Refuse collector without compactor
c. Rear loading compactor truck (refuse compactor)
d. Light commercial vehicle with tipping floor
e. Hook loader or hook lifter

4. **Vehicle Tracking & Monitoring System (VTMS) for Waste Transportation:** Simple as well as advanced Vehicle tracking and Monitoring Information Systems (VTMS), with help of Geographic Information System (GIS), Global Positioning System (GPS), Radio Frequency Identification (RFID), and General Packet Radio Services (GPRS) should be developed by Local bodies to manage solid waste in city. The waste transportation vehicles must be equipped with these technologies and the data to be published in public domain, i.e. websites etc.

3.3 Waste Processing and Treatment

Processing and treatment of solid waste shall be as per the schedules provided in Solid Waste Management Rules, 2016. Processing[15] and treatment[16] of solid waste and adoption of processing technologies largely depend upon the quantity and characteristics of the total waste generated. It is essential to quantify and characterise the waste generated in the local body before adopting any processing and treatment technology. It is essential to adopt the Integrated Solid Waste Management (ISWM) approach to manage solid waste in a sustainable manner.

The waste management operations hierarchy proposed under ISWM[17] according to the environmental, economic, and energy impacts is depicted below in figure 2. Based on the ISWM approach, waste management hierarchy and local conditions, an appropriate system and technology should be selected by the local body.

(Most Preferred)	**At Source Reduction and Reuse**	**Waste minimization and sustainable use/multi use of products (e.g. reuse of carry bags/packaging jars)**
	Recycling	**Processing non-biodegradable waste to recover commercially valuable materials (e.g. plastic, paper, metal, glass and e-waste recycling)**
	Recovery (Composting)	**Processing organic waste to recover compost (e.g. on site composting, windrow composting, in-vessel composting, vermin composting)**
	Energy Recovery (Waste to Energy)	**Recovering energy before final disposal of waste (e.g. RDF, Bio-methanation, co-processing of combustible non-biodegradable dry fraction of solid waste, incineration)**
(Least Preferred)	**Disposal of Waste (Sanitary Landfills)**	**Safe disposal of inert residual waste at sanitary landfills**

Figure 2: ISWM Hierarchy (Source: CPHEEO, 2016)

[15] Processing means any scientific process by which segregated solid waste is handled for the purpose of reuse, recycling or transformation into new products. (SWM Rules, 2016)
[16] Treatment means the method, technique or process designed to modify physical, chemical or biological characteristics or composition of any waste so as to reduce its volume and potential to cause harm. (SWM Rules, 2016)
[17] Integrate Solid Waste Management (Refer to Solid Waste Management Manual, 2016)

The most preferred methods till the least preferred methods, according to the ISWM hierarchy, are explained in the sections below:

3.3.1 Source Reduction and Reuse

1. Source reduction and reuse includes activities that reduces waste generation as a result of product creation and reuse. It also encompasses those activities that increase product durability, reusability and reparability[18].
2. As per the SWM Rules 2016, the local bodies should create public awareness for source reduction and reusing waste by following the 5R approach (reduce, reuse, recycle, recover and remove), banning usage of plastic to the maximum extent at all times.
3. The ISWM (Integrated Solid Waste Management) hierarchy of waste management prioritises reduction at source and reuse as the most preferred waste management strategy.
4. Source reduction and reuse results in savings, which accrue through avoided collection, treatment, and disposal costs. Reduction in the use of environmental and material resources accrues as a result of Source reduction and reuse programmes.
5. Extended producer responsibility (EPR) is a policy approach wherein a producer is held responsible for the post-consumer stage of a product, typically for defined tasks of collection, reuse, recycling, and storage and treatment.
6. The informal sector (kabadi system or scrap dealer) is largely involved in collection of recyclables and material recovery. The policy encourages informal sector participation in collection of recyclables from consumers.
7. This policy has proposed source reduction and reuse through IEC/ BCC strategies that shall be adopted by the local bodies to their source reduction and reuse programmes.

3.3.2 Recycling

As per SWM Rules 2016 – "Recycling means the process of transforming segregated non-biodegradable solid waste into new material or product or as raw material for manufacturing new products which may or may not be similar to the original products". Recycling reduces volume of waste and saves cost in collection, transportation and disposal. It ensures longer life span for landfill. All local bodies should try and achieve the following in order to prioritize recycling of waste:

1. **Develop Recycled Products Market Linkages**: Local bodies must try to establish the linkages with market for the recyclable products. The products made from the recyclable material must also meet the market requirements. It will enhance the local economy by reduction in imports of raw materials, fertilizers, etc. and providing livelihood opportunities to recyclers in the recycling industry.
2. **Environment:** Recycling would signify sustainable use of resources. Less amount of waste goes to storage sites and less usage of land. It will also reduce environmental impacts and impacts of climate change which has become a critical challenge for any society.
3. **Involvement of Informal Sector:**The local bodies must involve the informal sector in recycling process as the informal sector aptly supplements the formal sector.

[18] Capable of being repaired or rectified

3.3.3 Composting

1. The SWM Rules, 2016 defines composting as a "controlled process involving microbial decomposition of organic matter. It results in the production of stable humus like product called as compost".
2. **Roles & Responsibilities**: The roles and responsibilities of local bodies (ULBs/GPs) and various state government departments for composting shall be in accordance to SWM Rules, 2016.
3. **Market Development:** State lays emphasis on promotion of city compost and market development of compost through appropriate mechanisms. The market development and promotion of city compost shall be done according to the policy on 'Promotion Of City Compost[19]' and 'Fertilizer Policy' provided by Ministry of Chemicals and Fertilizers and Department of Fertilizers, Government of India.
4. **Composting Technologies:** The major composting technologies that shall be used by the Local bodies and can be classified as follows[20]:
    a. Windrow composting;
    b. Aerated static pile composting;
    c. In-vessel composting;
    d. Decentralised composting (bin and box composting), composting machines; and
    e. Vermicomposting.

3.3.4 Waste to Energy

1. Waste to energy (WtE) refers to the process of generating energy in the form of heat or electricity from solid waste. It can be achieved through:
    a. thermal processes like incineration or combustion of refuse derived fuel (RDF); and
    b. biological processes like biomethanation and further conversion into electrical power or automotive fuel (compressed biogas).
2. **Roles & Responsibilities:**
    a. The duties and responsibilities of Local bodies for Waste to energy shall be as prescribed in the SWM Rules, 2016.
    b. The duties and responsibilities of the industrial units located within one hundred km from the RDF and WtE plants based on solid waste shall be as prescribed in the SWM Rules, 2016.
    c. The criteria for waste to energy process shall be as prescribed in the SWM Rules, 2016 and SWM Manual, 2016.
3. **Biomethanation**: Biomethanation is the anaerobic fermentation of biodegradable matter in an enclosed space under controlled conditions. The waste mass undergoes decomposition due to microbial activity, thereby generating biogas comprising mainly of methane and carbon dioxide (CO_2), and also digested sludge, which is almost stabilised but may contain some pathogens. Biomethanation like composting, is one of the most technically viable options for solid waste in Rajasthan State due to the presence of high organic and moisture content. The duties of waste generators and duties and responsibilities of local bodies for biomethanation shall be as prescribed in the SWM Rules, 2016 and SWM Manual, 2016.
4. **Refuse Derived Fuel (RDF)**: The SWM Rules, 2016 defines refuse derived fuel (RDF) as "fuel derived from combustible waste fraction of solid waste like plastic, wood, pulp or organic waste, other than chlorinated materials, in the form of pellets or fluff produced by drying,

[19] PIB notification on policy approval of 'Promotion of City Compost', Ministry of Chemicals and Fertilizers, Government of India, 2016
[20] For details on Technologies refer SWM Rules, 2016 and Solid Waste Management Manual, 2016

shredding, dehydrating and compacting of solid waste". It is used as a fuel for either steam or electricity generation or as an alternate fuel in industrial furnaces or boilers (co-processing or co-incineration of waste in cement, lime, and steel industry and for power generation). The duties and responsibilities of local bodies for RDF shall be as prescribed in the SWM Rules, 2016 and SWM Manual, 2016.

5. **Construction and Demolition Waste (C&D Waste)**: According to the Construction and Demolition Waste Rules, 2016, construction and demolition waste means "the waste comprising of building materials, debris and rubble resulting from construction, remodeling, repair and demolition of any civil structure". The duties of waste generators, duties and responsibilities of Local bodiesand duties of the State Pollution Control Board for management of C&D Waste shall be as prescribed in the Construction and Demolition Waste Management Rules, 2016.

3.3.5 Disposal of Waste

1. The Local bodies shall strive towards achieving the goal of zero waste disposal in the sanitary landfill[21] or only inert[22] waste and rejection of processing should go in the sanitary landfills.
2. The duties and responsibilities of Local bodies for landfilling shall be as prescribed in the SWM Rules, 2016 and SWM Manual, 2016.
3. The criteria and actions to be taken for construction of sanitary landfills for disposal of inert and residual waste in hilly and other areas shall be as prescribed in the SWM Rules, 2016 and SWM Manual, 2016.
4. Waste categories suitable for sanitary landfills are the following:
    a. non-biodegradable and inert waste by nature or through pretreatment;
    b. commingled waste (mixed waste) not found suitable for waste processing;
    c. pre-processing and post-processing rejects from waste processing sites; and
    d. non-hazardous waste not being processed or recycled.
5. Sanitary landfilling is not mandated or required for the following solid wastes:
    a. biodegradable waste or garden waste,
    b. dry recyclables, and
    c. hazardous waste or industrial waste (to be disposed in hazardous waste sites with special containment).
6. The Local bodies shall use the Solid Waste Appropriate Technologies (SW-APT) Tool provided by MoHUA to aid the decision making process in processing and disposal technologies.

3.4 Legacy Waste

According to CPCB guidelines for 'Disposal of Legacy Waste, 2019', uncontrolled and continuous dumping of solid waste lead to mountains of legacy waste. There are two major challenges of solid waste management in cities/towns:

1. Managing the continuous flow of solid waste on a daily basis, and
2. Dealing with the legacy of neglect which has resulted in garbage heaps having been built up at dumpsites that were meant for waste processing and landfills.

[21] Sanitary land filling means the final and safe disposal of residual solid waste and inert wastes on land in a facility designed with protective measures against pollution of ground water, surface water and fugitive air dust, wind-blown litter, bad odour, fire hazard, animal menace, bird menace, pests or rodents, greenhouse gas emissions, persistent organic pollutants slope instability and erosion. (SWM Rules, 2016)
[22] Inerts means wastes which are not bio-degradable, recyclable or combustible street sweeping or dust and silt removed from the surface drains. (SWM Rules, 2016)

The treatment and disposal of Legacy waste can be done by the process of Bio-remediation and Bio-mining. Before starting the process of Bio-remediation and Bio-mining, a survey or mapping of the site must be done. Local bodies shall follow the CPCB guidelines 'Disposal of Legacy Waste, 2019' for disposal of the accumulated legacy waste.

3.5 Special Wastes

i. **Plastic Waste Management:** Plastic waste management shall be the responsibility of the local bodies and stakeholders. The local bodies must make necessary provisions to manage its plastic waste in accordance with the Plastic waste management (amendment) rules 2018 or other rules or guidelines as issued by competent authorities.

ii. **E-Waste Management**: E-waste means any waste from electrical or electronic equipment, whole or in parts, or rejects from their manufacturing and repair processes, which are intended to be discarded. E-waste is currently covered under the E-Waste Management Rules, 2016 and all E-Waste management shall be in compliance with these rules and any other rules as notified.

iii. **Industrial Waste:** Industrial waste refers to waste generated by processing activities of different industries like thermal power plants producing coal ash, steel industries and mills producing blast furnace slag, steel melting slag, etc. Industrial waste can be solid, liquid and gas and may be hazardous or non-hazardous. These wastes shall be managed in accordance with the acts, rules, guidelines and notifications as issued by competent authorities, such as CPCB, RSPCB and RIICO from time to time.

iv. **Bio-Medical Waste**: Bio-medical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production of testing of biological or in health camps. The Medical & Health Department must make necessary provisions to manage the bio-medical waste in accordance with the Bio-Medical Waste Management Rules, 2016. Local bodies ensure Bio- Medical Waste not to mix in solid waste for it proper measure shall be taken by Local bodies.

v. **Hazardous Waste**: "Hazardous waste[23] means any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances, and shall include -

   a) waste specified under column (3) of Schedule I of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016;
   b) waste having equal to or more than the concentration limits specified for the constituents in class A and class B of Schedule II or any of the characteristics as specified in class C of Schedule II of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016; and
   c) wastes specified in Part A of Schedule III in respect of import or export of such wastes or the wastes not specified in Part A but exhibit hazardous characteristics specified in Part C of Schedule III of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016".

[23] Hazardous and other Waste (Management and Trans-boundary Movement) Rules, 2016

The local bodies must make necessary provisions to manage their hazardous waste in accordance with the Hazardous and other Waste (Management and Trans-boundary Movement) Rules, 2016 or other acts, guidelines or rules issued by competent authorities from time to time.

vi. **Sanitary Waste:** "Sanitary waste means wastes comprising of used diapers, sanitary towels or napkins, tampons, condoms, incontinence sheets and any other similar waste[24]". According to the Rule No. 17 of SWM Rules, 2016, the duties **of manufacturers or brand owners for disposal of sanitary waste are provided in Section 4.1.4 of the policy.**

[24] SWM Rules, 2016

4. Frameworks for Enabling Solid Waste Management System

4.1 Regulatory Framework

Regulatory framework for Rajasthan's SWM Policy consists of the various legal and regulatory roles and responsibilities outlined for the various organizations, institutions and local bodies under the various waste management rules and regulations. These provide a framework for solid waste management across the state.

The duties and responsibilities to be carried out by various institutions, bodies, groups and individuals shall be in accordance with the below rules and guidelines or any other waste management rules notified from time to time:

i. Solid Waste Management Rules, 2016
ii. Construction and Demolition Waste Management Rules, 2016
iii. E-Waste (Management) Amendment Rules, 2016
iv. Plastic Waste Management (Amendment) Rules, 2018
v. Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016
vi. Bio-Medical Waste Management Rules, 2016
vii. Directives of Hon. Supreme Court of India and High Courts of India
viii. Directive of Hon. National Green Tribunal and its committees
ix. Guidelines of CPCB
x. Rajasthan State Bye Laws and Regulations related to Solid Waste Management for ULBs (Urban), 2019
xi. Rajasthan State Bye Laws and Regulations related to Solid Waste Management for Panchayati Raj Department (Rural), 2019
xii. Rajasthan Municipalities Act, 2009
xiii. Any other waste management rules/ guidelines provided by any authorized and competent authority from time to time

Enforcing Authorities

According to the Solid Waste Management Rules, 2016 (Rule 16. a) prescribed by Ministry of Environment, Forest and Climate Change (MoEF & CC), Rajasthan State Pollution Control Board (RSPCB) will be the enforcing authority of these rules in the State through local bodies in their respective jurisdiction and review implementation of these rules at least twice a year in close coordination with concerned Directorate of Local Bodies or Secretary-in-charge of State Urban Development Department. The implementation of these rules will be performed by the ULBs in urban areas and GPs in rural areas.

4.1.1 Duties and Responsibilities of Stakeholders

The various stakeholders involved for Solid Waste Management are:

1) Government Departments
2) Duties of Waste Generators (Residential and Bulk Waste Generators)
3) Producers Manufacturers &Brand Owners
4) Industrial Units

4.1.2 Government Departments

According to Solid Waste Management Rules, 2016 the duties of various stakeholders are as follows:

A. Duties of Ministry of Urban Development
B. Duties of Department of Fertilisers, Ministry of Chemicals and Fertilisers
C. Duties of Ministry of Agriculture
D. Duties of the Ministry of Power
E. Duties of Ministry of New and Renewable Energy Sources
F. Duties of the Secretary-in-charge, LSG and Duties of the Secretary-in-charge of Gram Panchayats or Rural Development Department in the State
G. Duties of District Magistrate or District Collector
H. Duties and Responsibilities or Local bodies and Gram Panchayats
I. Duties of State Pollution Control Board

A. Duties of Ministry of Urban Development

1. The Ministry of Urban Development shall coordinate with State Government Administrations to-
    a. take periodic review of the measures taken by the states and local bodies for improving solid waste management practices and execution of solid waste management projects funded by the Ministry and external agencies at least once in a year and give advice on taking corrective measures;
    b. formulate national policy and strategy on solid waste management including policy on waste to energy in consultation with stakeholders within six months from the date of notification of these rules;
    c. facilitate States and Union Territories in formulation of state policy and strategy on solid management based on national solid waste management policy and national urban sanitation policy;
    d. promote research and development in solid waste management sector and disseminate information to States and local bodies;
    e. undertake training and capacity building of local bodies and other stakeholders; and
    f. provide technical guidelines and project finance to states and local bodies on solid waste management to facilitate meeting timelines and standards.

B. Duties of Department of Fertilisers, Ministry of Chemicals and Fertilisers

1. The Department of Fertilisers through appropriate mechanisms shall,
    a. provide market development assistance on city compost; and
    b. ensure promotion of co-marketing of compost with chemical fertilisers in the ratio of 3 to 4 bags: 6 to 7 bags by the fertiliser companies to the extent compost is made available for marketing to the companies.

C. Duties of Ministry of Agriculture

The Ministry of Agriculture through appropriate mechanisms shall,

a. provide flexibility in Fertiliser Control Order for manufacturing and sale of compost;
b. propagate utilisation of compost on farm land;
c. set up laboratories to test quality of compost produced by local authorities or their authorised agencies; and

d. issue suitable guidelines for maintaining the quality of compost and ratio of use of compost vis-a-vis chemical fertilizers while applying compost to farmland.

D. Duties of the Ministry of Power

The Ministry of Power through appropriate mechanisms shall,

a. decide tariff or charges for the power generated from the waste to energy plants based on solid waste.
b. compulsory purchase power generated from such waste to energy plants by distribution company.

E. Duties of Ministry of New and Renewable Energy Sources

The Ministry of New and Renewable Energy Sources through appropriate mechanisms shall,

a. facilitate infrastructure creation for waste to energy plants; and
b. provide appropriate subsidy or incentives for such waste to energy plants.

F. Duties of the Secretary-in-charge, LSG or Local Self Government Department and the Secretary-in-charge of Gram Panchayats or Rural Development Department

1. The Secretary, LSG in the State through the Commissioner or Director of Municipal Administration or Director of local bodies or the Secretary-in-charge of Gram Panchayats or Rural Development Department in the state shall,
    a. prepare a state policy and solid waste management strategy for the state or the union territory in consultation with stakeholders including representative of waste pickers, self-help group and similar groups working in the field of waste management consistent with these rules, national policy on solid waste management and national urban sanitation policy of the ministry of urban development, in a period not later than one year from the date of notification of these rules;
    b. while preparing State policy and strategy to solid waste management, lay emphasis to waste reduction, reuse, recycling, recovery and optimum utilisation of various components of solid waste to ensure minimisation of waste going to the landfill and minimise impact of solid waste on human health and environment;
    c. state policies and strategies should acknowledge the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste and provide broad guidelines regarding integration of waste picker or informal waste collectors in the waste management system.
    d. ensure implementation of provisions of these rules by all local authorities;
    e. direct the town planning department of the State to ensure that master plan of every city in the State or Union territory provisions for setting up of solid waste processing and disposal facilities except for the cities who are members of common waste processing facility or regional sanitary landfill for a group of cities; and
    f. ensure identification and allocation of suitable land to the local bodies within one year for setting up of processing and disposal facilities for solid wastes and incorporate them in the master plans (land use plan) of the State or as the case may be, cities through metropolitan and district planning communities or town and country planning department;
    g. direct the town planning department of the State and local bodies to ensure that a separate space for segregation, storage, decentralised processing of solid waste is

demarcated in the development plan for group housing or commercial, institutional or any other non-residential complex exceeding 200 dwelling or having a plot area exceeding 5,000 square meters;

h. direct the developers of Special Economic Zone, Industrial Estate, Industrial Park to earmark at least five percent of the total area of the plot or minimum five plots or sheds for recovery and recycling facility.
i. facilitate establishment of common regional sanitary land fill for a group of cities and towns falling within a distance of 50 km (or more) from the regional facility on a cost sharing basis and ensure professional management of such sanitary landfills;
j. arrange for capacity building of local bodies in managing solid waste, segregation and transportation or processing of such waste at source;
k. notify buffer zone for the solid waste processing and disposal facilities of more than five tons per day in consultation with the State Pollution Control Board; and
l. start a scheme to registration of waste pickers and waste dealers.
m. To conduct regular meetings of State Level Advisory Body (SLAB), as constituted through Administrative Reforms Department through Environment Department.

G. Duties of District Magistrate or District Collector

The District Magistrate or District Collector shall,

a. facilitate identification and allocation of suitable land as per clause (f) of rules 11 for setting up solid waste processing and disposal facilities to local authorities in his district in close coordination with the Secretary-in-charge of State Urban Development Department within one year from the date of notification of these rules;
b. review the performance of local bodies, at least once in a quarter on waste segregation, processing, treatment and disposal and take corrective measures in consultation with the Commissioner or Director of Municipal Administration or Director of local bodies and secretary-in-charge of the State Urban Development.
c. Constitution of District Level Committee and Special Task Force for SWM, as per NGT Order

H. Duties and Responsibilities or Local bodies and Gram Panchayats

Apart from the duties and responsibilities prescribed for gram panchayats, the priority/ key duties are given below.

1. Prepare a Solid and Liquid Resource Management (SLRM) Plan, as per state policy and strategy within 6 months from the date of notification and submit to state government
2. Arrange for door to door collection of segregated solid waste from all households
3. Set up material recovery facility, i.e. Resource recovery centres (RRC) with sufficient space for sorting of recyclable materials
4. Educate workers, including contract workers and supervisors for door to door collection of segregated waste and transporting the unmixed waste during primary and secondary transportation to processing or disposal facilities
5. Ensure that the operator of a facility provides personal protection equipment. Establish waste deposition centers for domestic hazardous waste.
6. Provide training on SLRM to waste-pickers, waste collectors and labours. Establish decentralized composed plant or bio-methanation for vegetable, fruit, flower, meat, fish market.

7. Involve communities in waste management and promotion of home composting, bio-gas generation, segregation of waste and maintenance of hygienic conditions around the facility, etc.
8. Facilitate formation of Self Help Groups, provide identity cards and thereafter encourage integration in SLRM including door to door collection of waste
9. Promote community to retrofit toilets into twin pit toilets and soak pits in septic tank toilets. Give proposals for to the State Government for framing bye-laws for waste management and the staff engaged for the purpose.
10. Make arrangement for transport of horticulture, parks and garden waste, segregated bio-degradable waste to the respective processing units.

The local bodies and gram panchayats shall,

a. prepare a solid waste management plan as per state policy and strategy on solid waste management within six months from the date of notification of state policy and strategy and submit a copy to respective departments of State Government or Union territory Administration or agency authorised by the State Government or Union territory Administration;
b. arrange for door to door collection of segregated solid waste from all households including slums and informal settlements, commercial, institutional and other non-residential premises. From multi-storage buildings, large commercial complexes, malls, housing complexes, etc., this may be collected from the entry gate or any other designated location;
c. establish a system to recognise organisations of waste pickers or informal waste collectors and promote and establish a system for integration of these authorised waste-pickers and waste collectors to facilitate their participation in solid waste management including door to door collection of waste;
d. facilitate formation of Self Help Groups, provide identity cards and thereafter encourage integration in solid waste management including door to door collection of waste;
e. frame bye-laws incorporating the provisions of these rules within one year from the date of notification of these rules and ensure timely implementation;
f. prescribe from time to time user fee as deemed appropriate and collect the fee from the waste generators on its own or through authorised agency;
g. direct waste generators not to litter i.e. throw or dispose of any waste such as paper, water bottles, liquor bottles, soft drink canes, tetra packs, fruit peel, wrappers, etc., or burn or hurry waste on streets, open public spaces, drains, waste bodies and to segregate the waste at source as prescribed under these rules and hand over the segregated waste to authorised the waste pickers or waste collectors authorised by the local body;
h. setup material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorised waste pickers and waste collectors to separate recyclables from the waste and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste such as paper, plastic, metal, glass, textile from the source of generation or from material recovery facilities; Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be printed white and those for storage of other wastes shall be printed black;
i. establish waste deposition centres for domestic hazardous waste and give direction for waste generators to deposit domestic hazardous wastes at this centre for its safe disposal. Such facility shall be established in a city or town in a manner that one centre is set up for the area

of twenty square kilometers or part thereof and notify the timings of receiving domestic hazardous waste at such centres;

j. ensure safe storage and transportation of the domestic hazardous waste to the hazardous waste disposal facility or as may be directed by the State Pollution Control Board or the Pollution Control Committee;

k. direct street sweepers not to burn tree leaves collected from street sweeping and store them separately and handover to the waste collectors or agency authorised by local body;

l. provide training on solid waste management to waste-pickers and waste collectors;

m. collect waste from vegetable, fruit, flower, meat, poultry and fish market on day to day basis and promote setting up of decentralised compost plant or bio-methanation plant at suitable locations in the markets or in the vicinity of markets ensuring hygienic conditions;

n. collect separately waste from sweeping of streets, lanes and by-lanes daily, or on alternate days or twice a week depending on the density of population, commercial activity and local situation;

o. set up covered secondary storage facility for temporary storage of street sweepings and silt removed from surface drains in cases where direct collection of such waste into transport vehicles is not convenient. Waste so collected shall be collected and disposed of at regular intervals as decided by the local body;

p. collect horticulture, parks and garden waste separately and process in the parks and gardens, as far as possible;

q. transport segregated bio-degradable waste to the processing facilities like compost plant, bio-methanation plant or any such facility. Preference shall be given for onsite processing of such waste;

r. transport non-bio-degradable waste to the respective processing facility or material recovery facilities or secondary storage facility;

s. transport construction and demolition waste as per the provisions of the Construction and Demolition Waste management Rules, 2016;

t. involve communities in waste management and promotion of home composting, bio-gas generation, decentralised processing of waste at community level subject to control of odour and maintenance of hygienic conditions around the facility;

u. phase out the use of chemical fertilizer in two years and use compost in all parks, gardens maintained by the local body and wherever possible in other places under its jurisdiction. Incentives may be provided to recycling initiatives by informal waste recycling sector.

v. facilitate construction, operation and maintenance of solid waste processing facilities and associated infrastructure on their own or with private sector participation or through any agency for optimum utilisation of various components of solid waste adopting suitable technology including the following technologies and adhering to the guidelines issued by the Ministry of Urban Development from time to time and standards prescribed by the Central Pollution Control Board. Preference shall be given to decentralised processing to minimize transportation cost and environmental impacts such as-

    a. bio-methanation, microbial composting, vermi-composting, anaerobic digestion or any other appropriate processing for bio-stabilisation of biodegradable wastes;

    b. waste to energy processes including refused derived fuel for combustible fraction of waste or supply as feedstock to solid waste based power plants or cement kilns;

w. undertake on their own or through any other agency construction, operation and maintenance of sanitary landfill and associated infrastructure as per Schedule 1for disposal of residual wastes in a manner prescribed under these rules;

x. make adequate provision of funds for capital investments as well as operation and maintenance of solid waste management services in the annual budget ensuring that funds for discretionary functions of the local body have been allocated only after meeting the requirement of necessary funds for solid waste management and other obligatory functions of the local body as per these rules;

y. make an application in Form-I for grant of authorisation for setting up waste processing, treatment or disposal facility, if the volume of waste is exceeding five metric tons per day including sanitary landfills from the State Pollution Control Board or the Pollution Control Committee, as the case may be;

z. submit application for renewal of authorisation at least sixty days before the expiry of the validity of authorisation;

aa. prepare and submit annual report in Form IV[25] on or before the 30th April of the succeeding year to the Commissioner or Director, Municipal Administration or designated Officer;

bb. the annual report shall then be sent to the Secretary-in-Charge of the State Urban Development Department or village panchayat or rural development department and to the respective State Pollution Control Board or Pollution Control Committee by the 31st May of every year;

cc. educate workers including contract workers and supervisors for door to door collection of segregated waste and transporting the unmixed waste during primary and secondary transportation to processing or disposal facility;

dd. ensure that the operator of a facility provides personal protection equipment including uniform, fluorescent jacket, band gloves, raincoats, appropriate foot wear and masks to all workers handling solid waste and the same are used by the workforce;

ee. ensure that provisions for setting up of centers for collection, segregation and storage of segregated wastes, are incorporated in building plan while granting approval of building plan of a group housing society or market complex; and

ff. frame bye-laws and prescribe criteria for levying of spot fine for persons who litters or fails to comply with the provisions of these rules and delegate powers to officers or local bodies to levy spot fines as per the bye laws framed; and

gg. create public awareness through information, education and communication campaign and educate the waste generators on the following; namely:-

   a. not to litter;
   b. minimise generation of waste;
   c. reuse the waste to the extent possible;
   d. practice segregation of waste into bio-degradable, non-biodegradable (recyclable and combustible), sanitary waste and domestic hazardous wastes at source;
   e. practice home composting, vermi-composting, bio-gas generation or community level composting;
   f. wrap securely used sanitary waste as and when generated in the pouches provided by the brand owners or a suitable wrapping as prescribed by the local body and place the same in the bin meant for non- biodegradable waste;
   g. storage of segregated waste at source in different bins;
   h. handover segregated waste to waste pickers, waste collectors, recyclers or waste collection agencies; and
   i. pay monthly user fee or charges to waste collectors or local bodies or any other person authorised by the local body for sustainability of solid waste management.

[25] As provided in SWM Rules, 2016

hh. stop land filling or dumping of mixed waste soon after the timeline as specified in rule 23 for setting up and operationalisation of sanitary landfill is over;

ii. allow only the non-usable, non-recyclable, non-biodegradable, non-combustible and non-reactive inert waste and pre-processing rejects and residues from waste processing facilities to go to sanitary landfill and the sanitary landfill sites shall meet the specifications as given in Schedule-I, however, every effort shall be made to recycle or reuse the rejects to achieve the desired objective of zero waste going to landfill;

jj. investigate and analyse all old open dumpsites and existing operational dumpsites for their potential of bio-mining and bio-remediation and wheresoever feasible, take necessary actions to bio-mine or bio-remediate the sites;

kk. in absence of the potential of bio-mining and bio-remediation of dumpsite, it shall be scientifically capped as per landfill capping norms to prevent further damage to the environment.

I. Duties of State Pollution Control Board

1. The State Pollution Control Board shall,
   a. enforce these rules in their State through local bodies in their respective jurisdiction and review implementation of these rules at least twice a year in close coordination with concerned Directorate of Municipal Administration or Secretary-in-charge of LSG;
   b. monitor environmental standards and adherence to conditions as specified under the Schedule I and Schedule II for waste processing and disposal sites;
   c. examine the proposal for authorisation and make such inquiries as deemed fit, after the receipt of the application for the same in Form I[26] from the local body or any other agency authorised by the local body;
   d. while examining the proposal for authorisation, the requirement of consents under respective enactments and views of other agencies like the State Urban Development Department, the Town and Country Planning Department, District Planning Committee or Metropolitan Area Planning Committee, as may be applicable, Airport or Airbase Authority, the Ground Water Board, Railways, power distribution companies, highway department and other relevant agencies shall be taken into consideration and they shall be given four weeks' time to give their views, if any;
   e. issue authorisation within a period of sixty days in Form II[27] to the local body or an operator of a facility or any other agency authorised by local body stipulating compliance criteria and environmental standards as specified in Schedules[28] I and II including other conditions, as may be necessary;
   f. synchronise the validity of said authorisation with the validity of the consents;
   g. suspend or cancel the authorization issued under clause (a) any time, if the local body or operator of the facility fails to operate the facility as per the conditions stipulated: provided that no such authorization shall be suspended or cancelled without giving notice to the local body or operator, as the case may be; and
   h. on receipt of application for renewal, renew the authorisation for next five years, after examining every application on merit and subject to the condition that the operator of the facility has fulfilled all the provisions of the rules, standards or conditions specified in the authorisation, consents or environment clearance.

[26] As provided in SWM Rules, 2016

[27] ibid

[28] ibid

2. The State Pollution Control Board shall, after giving reasonable opportunity of being heard to the applicant and for reasons thereof to be recorded in writing, refuse to grant or renew an authorisation.
3. In case of new technologies, where no standards have been prescribed by the Central Pollution Control Board, State Pollution Control Board, shall approach Central Pollution Control Board for getting standards specified.
4. The State Pollution Control Board, shall monitor the compliance of the standards as prescribed or laid down and treatment technology as approved and the conditions stipulated in the authorisation and the standards specified in Schedules I and II under these rules as and when deemed appropriate but not less than once in a year.
5. The State Pollution Control Board may give directions to local bodies for safe handling and disposal of domestic hazardous waste deposited by the waste generators at hazardous waste deposition facilities.
6. The State Pollution Control Board shall regulate Inter-State movement of waste.
7. Preparation of IEC/ BCC plan and its implementation in various districts involving ULBs/ GPs & other stake-holders.

4.1.3 Duties of Waste Generators (Residential and Bulk 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, bum or hurry 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 State SWM Bye-laws, 2019 as amended from time to time.
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 sq. m. 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 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.
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.

4.1.4 Duties of Manufacturers or Brand Owners

1. All manufacturers of disposable products such as tin, glass, plastics packaging, etc., or brand owners who introduce such products in the market shall provide necessary financial assistance to local authorities for establishment of waste management system.
2. All such brand owners who sell or market their products in such packaging material which are non- biodegradable shall put in place a system to collect back the packaging waste generated due to their production.
3. Manufacturers or brand owners or marketing companies of sanitary napkins and diapers shall explore the possibility of using all recyclable materials in their products or they shall provide a pouch or wrapper for disposal of each napkin or diapers along with the packet of their sanitary products.
4. All such manufacturers, brand owners or marketing companies shall educate the masses for wrapping and disposal of their products.

4.1.5 Duties of Industrial Units

1. All industrial units using fuel and located within one hundred km from a solid waste based refused derived fuel plant shall make arrangements within six months from the date of notification of Solid Waste Management Rules 2016 to replace at least five percent of their fuel requirement by refuse derived fuel (RDF) so produced.

4.2 Institutional Framework

The institutional framework consists of state, municipalities (Municipal Corporation, Municipal Council and Municipal Board) level institutions as per Rajasthan Municipalities Act, 2009. The framework also consists of the three tier structure of Panchayati Raj Department, i.e. Gram

Panchayats at the village level as key units, Panchayat Samitis at the block (middle) level and Zila Parishad at the apex level, as per The Rajasthan Panchayati Raj (Amendment) Act, 2019 and Rajasthan Panchayati Raj Rules and Amendments.

Dovetailing or Convergence of funds with other schemes at GP level:

As per MDWS, GoI, guidelines for ODF; GPs will be provided Rs. 7 to 20 Lakhs from SBM (G). Besides, GPs may dovetail the project through MGNREGA, FFC, SFC and other schemes for improved results.

4.2.1 Current Institutional Structure

The current institutional structure of state, ULBs and Panchayati Raj Department, which includes administrative department for ULBs Local Self Government Department Headed by Addl. Chief Secretary/ PS/ Secretary and Director & Joint Secretary LSG and Director at Local bodies of Rajasthan &Administrative Department for Panchayati Raj Department Headed by Addl. Chief Secretary/ Secretary and Commissioner, Director and Addl. Director and the three tier structure of Panchayati Raj System.

4.2.2 Steps for Strengthening Existing Institutional Framework

Although the State Government dealing with issues related to solid waste management however, there are large gaps for which mandatory steps to be taken and constant new approach solutions are to be explored in order to have robust SWM mechanism in place. Rajasthan as a state has adopted two step approach to strengthen the existing framework:

i. Creation of Solid waste management (SWM) cell at State, ULB and Panchayati Raj Department level
ii. Manpower enhancement to meet requirements

4.2.2.1 Creation of Solid Waste Management (SWM) Cell (At state, ULBs and Panchayati Raj Department level)

It is recommended that SWM Cell should be established at State, local body and Panchayati Raj Department level. SWM cell, or responsible staff should be made accountable for SWM and implementation of the SWM plan in the local bodies. Duties of the responsible staff should be detailed out and disclosed to the general public. Capacity building needs of staff must be addressed. Cell should be constituted with staff with technical and managerial skills specific to solid waste management.

4.2.2.2 Functions of SWM Cell

The broad functions of the SWM cell at **State level** to assist the following duties as per rule 11 of SWM rules 2016 are as mentioned below:

a) prepare solid waste management policy and strategy for the state based on the ISWM/ 5R approach in consultation with stakeholders including representative of waste pickers, self-help group and similar groups working in the field of waste management consistent with these rules, national policy on solid waste management and national urban sanitation policy of the ministry of urban development, in a period not later than one year from the date of notification of these rules;
b) while preparing State policy and strategy on solid waste management, lay emphasis on waste reduction, reuse, recycling, recovery and optimum utilization of various components of solid waste to ensure minimization of waste going to the landfill and minimize impact of

solid waste on human health and environment;

c) State policies and strategies should acknowledge the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste and provide broad guidelines regarding integration of waste picker or informal waste collectors in the waste management system.
d) ensure implementation of provisions of these rules by all local authorities;
e) ensure identification and allocation of suitable land to the local bodies for setting up of processing and disposal facilities for solid wastes;
f) direct the town planning department of the State and local bodies to ensure that a separate space for segregation, storage, decentralized processing of solid waste is demarcated in the development plan for group housing or commercial, institutional or any other non-residential complex exceeding 200 dwelling or having a plot area exceeding 5,000 square meters;
g) direct the developers of Special Economic Zone, Industrial Estate, Industrial Park to earmark at least five percent of the total area of the plot or minimum five plots or sheds for recovery and recycling facility.
h) facilitate establishment of common regional sanitary land fill for a group of cities and towns falling within a distance of 50 km (or more) from the regional facility on a cost sharing basis and ensure professional management of such sanitary landfills;
i) arrange for capacity building of local bodies in managing solid waste, segregation and transportation or processing of such waste at source;
j) notify buffer zone for the solid waste processing and disposal facilities of more than five tons per day in consultation with the State Pollution Control Board; and
k) Start a scheme on registration of waste pickers and waste dealers.

The broad functions of the SWM cell at **urban local bodies (ULBs) and gram panchayats (GPs)** level would be on following SWM aspects:

- **Compliance of SWM Rules 2016**
- **Compliance of direction given by State**
- **Perform duties and responsibilities as prescribed in Solid Waste management Rules 2016**

Some specific task of SWM cell at ULBs and GPs level

1. **Quantification of Waste**
   i. Waste generation
   ii. Waste segregation
   iii. Waste Collection
   iv. Waste processing
2. **SWM process designing in city**
   i. Complete end to end value chain designing of SWM and monitoring.
   ii. Procurement of Services required for effective management of SWM
3. **Transportation of solid waste**
   i. Requirement & availability Analysis of Infrastructure
   ii. 100% collection of SWM in city
   iii. Procurement of transportation Services for operation or maintenance.
   iv. Synchronization of Primary and Secondary Transportation
   v. Route Planning of Vehicles
   vi. Information Technology aspects for Vehicle Monitoring

4. **Technological Aspects**
    i. Development of Dashboard and Designing Control room for Monitoring
    ii. Development of monitoring Modules involved in SWM
    iii. Procurement of Services/ software product
    iv. SWM city app enablement for monitoring.
    v. IT enablement of Vehicles, Transfer Stations, processing plants and landfills.
    vi. Effective resolution of Grievances and handling.
5. **IEC / BCC/ Capacity Building:**
    i. Spreading awareness among the users and bringing about a behavioral change through strong and continuous IEC and BCC practices
    ii. Regular capacity building of manpower involved in SWM
    iii. Development of Course content
    iv. Arranging Workshops and Seminars
    v. Provisioning of Online Training Courses
    vi. Effective Usage of Social Media
    vii. Enabling platforms for transparent information exchange for citizens
6. **Knowledge Hub**: The Cell shall act as a knowledge repository for Solid Waste Management and work towards strengthening and development of the mechanism by establishment of Centers of Excellence for SWM with the support of other stakeholders, creation of Knowledge Papers, promoting techniques on waste management, etc.
7. **Environment Conservation:** shall work towards the conservation of the environment against the ill effects of waste generated in the State thus aiming towards promoting sustainable development in the State besides taking adequate health and safety measures for the citizens as well as the sanitary workers and related stakeholders.
8. **Planning**: Shall ensure that the planning process is in line with policies and strategies of the state, and to ensure the potential of exploring opportunities for regional level planning for SWM service provision.
9. **Monitoring & Evaluation:** The SWM Cell shall focus on Intensive monitoring and providing necessary advice on up scaling by formulating different techniques such as Centralized complaint redressal system with a 24-hour helpline to clear any uncollected or unattended garbage, Quick response vehicle, besides provide necessary
10. **Miscellaneous Activities:**
    i. Effective participation of Private sector
    ii. Deployment of Manpower for effective implementation of SWM in city.
    iii. Procurement of Plant & Machinery for complete Waste processing and its smooth operation & Management along with Maintenance.
    iv. Scientific management of complete Waste Disposal
    v. Integration of Informal Sector to formal Sector
    vi. Effective implementation of Bye Laws and any other court order as the case may be.

4.2.2.3 Schedule of Power (SoP)

The powers of the SWM Cell members shall be according to the revised SoP released by the Local Self Government (LSG) and Commissioner, Panchayati Raj Department, Rajasthan from time to time.

4.2.3 Manpower Enhancement to meet Requirement

The State should add more resources basis the SWM Rules 2016 mentioned here as under:

a. Towns below 1 Lakh Population:

1. One experienced Junior Engineer, if the population is more than 50,000 or in places with high floating population.
2. One qualified sanitation diploma holder or Chief Sanitary Inspector or as Sanitary Officer if the population is more than 50,000.
3. One qualified Sanitary Inspector per 50,000 population
4. One qualified Sanitary Sub-inspector per 25,000 population
5. One Sanitary Supervisor per 12,500 population

b. Cities between 1 and 2.5 Lakh Population:

1. One experienced graduate engineer.
2. One experienced Junior Engineer per 1 lakh population.
3. Qualified sanitation diploma holder, Chief Sanitary Inspector or Sanitation Officer to look after the collection, transportation, processing and disposal of waste: 1 per 1 lakh population or part thereof; or 1 per 2 Sanitary Inspectors, whichever is less.
4. Qualified sanitation diploma holder Sanitary Inspector: 1 per 50,000 population or part thereof; or 1 per 80 sweepers, whichever is less.
5. Qualified sanitation diploma holder Sanitary Sub-inspector: 1 per 25,000 population or part thereof; or 1 per 40 sweepers, whichever is less.
6. Sanitary Supervisors (a person who can read, write, and report): 1 per 12,500 population or part thereof; or 1 per 20 sweepers, whichever is less.

c. Cities between 2.5 and 5 Lakh Population

1. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering in the Grade of Assistant Executive Engineer to be in charge of SWM department.
2. Public Health or Environmental Engineer in the grade of Assistant Engineer to look after the transportation, processing and disposal of waste
3. One experienced Junior Engineer, per 2.5 lakh population.
4. Chief Sanitary Inspector or Sanitary Officers to supervise storage, street sweeping, and primary collection of waste per 1 lakh population.
5. Sanitary Supervisors (a person who can read, write, and report): 1 per 12,500 population or part thereof; or 1 per 20 sweepers, whichever is less

d. Cities between 5 and 20 Lakh Population

1. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Executive Engineer to be in-charge of SWM department.
2. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Assistant Executive Engineer per 5 lakh population.
3. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Assistant Engineer per 2.5 lakh population.
4. One experienced Junior Engineer, per 2.5 lakh population.

5. Chief Sanitary Inspector or Sanitary Officers to supervise storage, street sweeping, and primary collection of waste per 1 lakh population.
6. Sanitary Supervisors (a person who can read, write, and report): 1 per 12,500 population or part thereof; or 1 per 20 sweepers, whichever is less

e. Cities between 20 and 50 Lakh Population:

1. Public Health Engineer or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Superintending Engineer to be the Head of SWM Department.
2. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Executive Engineer. One Executive Engineer per 20 lakh population or part thereof.
3. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Assistant Executive Engineer per 5 lakh population.
4. Public Health or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Assistant Engineer per 2.5 lakh population.
5. One experienced Junior Engineer, per 2.5 lakh population.
6. Chief Sanitary Inspector or Sanitary Officers to supervise storage, street sweeping, and primary collection of waste per 1 lakh population.
7. Sanitary Supervisors (a person who can read, write, and report): 1 per 12,500 population or part thereof; or 1 per 20 sweepers, whichever is less.

f. Cities More than 50 Lakh Population:

1. Public Health Engineer or Environmental Engineer or Civil Engineer having training in environmental or public health engineering of the level of Chief Engineer to be in charge of SWM department.
2. Superintending Engineer per 40 lakh population or part thereof.
3. Rest of the officers, supervisor's etc. as per yardsticks already indicated in sections a. to e. mentioned above.

As per the SWM Rules 2016, the State should add more resources for gram panchayats (GPs) as given below:

a. Gram panchayats below 3000 population:

1. One qualified sanitary inspector
2. One sanitary supervisor or Swachhata Sakhi

b. Gram panchayats between 3000 to 5000 population:

1. One qualified sanitary inspector
2. Two sanitary supervisors or Swachhata Sakhi

c. Gram panchayats between 5000 to 10000 population:

1. One Junior Engineer
2. One qualified sanitary inspector
3. Three sanitary supervisors or Swachhata Sakhi

d. Gram panchayats more than 10000 population:

1. One SLRM consultant having degree in Civil or Agricultural Engineering
2. Two qualified sanitary inspectors

3. Four sanitary supervisors or Swachhata Sakhi

e. At Block level or Panchayat Samiti level:

1. One SLRM consultant
2. One Assistant Engineer
3. Two Junior Engineers

f. At District or Zila Parishad level:

1. SLRM cell having sufficient staff
2. One Executive Engineer

4.3 Legal Framework

One of the basic responsibilities of the Local bodies is to manage their solid waste to keep the environment clean. The Government of India in 2016, proposed the SWM Rules for managing solid waste and the Local bodies shall abide by the Legal Framework provided in the SWM Rules, 2016 for managing their solid waste in a sustainable manner.

4.3.1 Major Legal Landmarks for SWM

The section on major legal landmarks outlines the significant features and evolution of Rules, Acts, Policies, Laws and Guidelines for SWM in India and in Rajasthan State.

Rules/ Laws	Significant Features
Solid Waste Management Rules, 2016	The Union Ministry of Environment, Forest and Climate Change (MoEF & CC) revised Solid Waste (Management and Handling) Rules in 2016. The jurisdiction of the rules have been extended beyond Municipal area to cover, outgrowths in urban agglomerations, census towns, notified industrial townships, areas under the control of Indian Railways, airports, airbase, Port and harbors, defense establishments, special economic zones, State and Central government organizations, places of pilgrims, religious and historical importance; hence the word 'municipal has been removed'. Some significant facets of these rules are: • **Source segregation of waste and Duties of waste generator** The SWM rules, 2016 emphasizes source segregation of waste, a basic need for channelizing the waste to wealth by recovery, reuse and recycle. Waste generator have to segregate waste into three streams- Biodegradable, Dry (plastic, paper, metal, wood, etc.) and domestic Hazardous Waste (diapers, napkins, mosquito repellents, etc.) before handing it to authorized rag pickers or waste collectors or local bodies. • **Introduction of the concept of partnership in Swachh Bharat** The concept of partnership in Swachh Bharat has been introduced. Bulk and institutional generators, market associations, event organizers and hotels and restaurants have been made directly responsible for segregation and sorting the waste and manage in partnership with local bodies. • **Collection and disposal of sanitary waste** The manufacturers or brand owners of sanitary napkins and diapers shall provide a pouch or wrapper for disposal of each napkin or diapers along with the packet of their sanitary products. • **Collect back scheme for packaging waste**

Rules/ Laws	Significant Features
	As per the rules, all brand owners who sale or market their products in such packaging material which are non-biodegradable should put in place a system to collect back the packaging waste generated due to their production. • **User fee and spot fine** The new rules have given power to the local bodies across India to decide the user fees. Generator will have to pay 'user fee' to waste collector and a 'spot fine' for littering and non-segregation. The rules also stipulate zero tolerance for throwing; burning, or burying the solid waste generated on streets, open public spaces outside the generator's premises, or in the drain, or water bodies. • **Promotion of marketing and utilization of compost** The Department of Fertilizers, Ministry of Chemicals and Fertilizers shall provide market development assistance on city compost and ensure promotion of co-marketing of compost with chemical fertilizers in the ratio of 3 to 4 bags: 6 to 7 bags by the fertilizer companies to the extent compost is made available for marketing to the companies. The Ministry of Agriculture shall provide flexibility in fertilizer control order for manufacturing and sale of compost, propagating utilization of compost on farm land set up laboratories to test quality of compost produced by local authorities or their authorized agencies. This will make the compost plants economically viable and improve the gainful utilization of waste. • **Promotion of waste to energy** Ministry of Power shall fix tariff or charges for the power generated from the waste to energy plants based on solid waste and ensure compulsory purchase of power generated from such waste to energy plants by DISCOMs. The Ministry of New and Renewable Energy Sources shall facilitate infrastructure creation for waste to energy plants and provide appropriate subsidy or incentives for such waste to energy plants. • **Criteria and standards for waste treatment facility and pollution control** As per the new rules, the landfill site shall be 100 meters away from a river, 200 meters from a pond, 500, 200 meters away from highways, habitations, public parks and water supply wells and 20 km away from airports/airbase. Emission standards are completely amended and include parameters for dioxins, furans, reduced limits for particulate matters from 150 to 100 and now 50. Also, the compost standards have been amended to align with Fertilizer Control Order. • **Management of waste in hilly areas** Construction of landfill on the hill shall be avoided.
The Rajasthan Municipalities Act, 2009	The Rajasthan Municipalities Act has defined the Municipal Solid Waste in Chapter 2 under clause 41. Under chapter 12 for Municipal powers and offences, from clauses 226 to 235, the following points are elaborated regarding solid waste, viz.- • Duty of municipality in respect of solid waste management and handling

Rules/ Laws	Significant Features
	• Management of solid wastes billing and collection of user charges • Solid waste to be the property of municipality • Places for disposal and final disposal • Duty of owners of solid waste • Duty of cooperatives • Prohibitions • Punishments • Bio medical Waste • Hazardous Waste The act also provides power to municipalities for drafting bye laws.
Rajasthan State Pollution Control Board (RSPCB)	To enforce these rules in their State through local bodies in their respective jurisdiction and review implementation of these rules at least twice a year in close coordination with concerned directorate of Municipal Administration or Secretary-in-charge of State Urban Development Department; To monitor environmental standards and adherence to conditions as specified under the Schedule I and Schedule II for waste processing and disposal sites; To examine the proposal for authorization and make such inquiries as deemed fit, after the receipt of the application for the same in Form I from the local body or any other agency authorized by the local body; issue authorization renewal/cancel authorization. The State Pollution Control Board or the Pollution Control Committee may give directions to local bodies for safe handling and disposal of domestic hazardous waste deposited by the waste generators at hazardous waste deposition facilities. The State Pollution Control Board or the Pollution Control Committee shall regulate Inter-State movement of waste.
The Rajasthan State Panchayati Raj (Amendment) Act 2019	The Rajasthan Panchayati Raj Act came into existence in year 1994 that extends to the whole state of Rajasthan. The act presents the rural administrative hierarchy (i.e. Gram Panchayat, Panchayat Samiti and Zila Parishad), their functions, powers and duties and responsibilities along with state functions, powers and duties and responsibilities. The act is amended from time to time and the latest amendment came in year 2019.
Rajasthan Panchayati Raj Rules and Amendments	The Rajasthan Panchayati Raj Rules came into existence in year 1996. These rules are prescribed to the members of Gram Panchayat, Panchayat Samiti and Zila Parishad; for their functions, powers, duties and responsibilities in service provision and collection of taxes.
SWM Bye Laws for ULBs in Rajasthan, 2019	The Rajasthan State formulated the bye laws for SWM in 2019. The bye laws presents the holistic picture of SWM and includes duties and responsibilities of the officers, departments, ULBs and Industries. It also includes user charges and penalties.

4.3.2 Penalties and Mechanism for Recovery of SWM User Charges

1. The penalties and notices for offenders, fines for violations and for repetitions shall be governed as prescribed in the Solid Waste Management Bye Laws, 2019 for ULBs and Panchayati Raj Department. Other Department shall also notify their bye laws as per the requirement of SWM Rules 2016.

2. Presently, the use of economic instruments for recovery of SWM costs are not well established, although some instruments are used to a limited extent. However, the use of environmental fiscal reform through appropriate economic instruments for financing SWM can fill some of the gaps that can be identified by the Local bodies.

4.4 Procurement Framework

Public procurement involves purchasing of goods or services by different entities such as ministries and departments of the government for public service delivery, and it encompasses activities ranging from assessment of procurement needs to awards of contract and final payment. Rajasthan state provides comprehensive procurement legislation, i.e. **The Rajasthan Transparency in Public Procurement (RTPP) Act 2012 and Rules, 2013** as amended time to time.

4.4.1 Risk Management

Risk is the chance of an event occurring which would cause actual project circumstances to differ from those assumed while forecasting project benefit and costs. Management of risks holds the key to project success or failure. The typical approach to management of risks involves the following activities:

a. Identification: determining what risks exist during the project lifecycle
b. Evaluation: assessing potential impact of the risks identified
c. Mitigation: addressing the risks/uncertainties identified by way of contract, insurance, etc., to the extent possible
d. Allocation: the remaining risks are allocated to the entity most suitable to manage the risks

Local bodies should comprehensively identify all risks inherent in the project and the principle should then be to allocate the risks to the entity that is best equipped to deal with them.

4.4.2 Engagement Modes

The modes of engagement or partnerships between the private players and the government, asset ownership, duration of the project, capital investment, roles of private players and their relevance are given below. The Local bodies can use the engagement models provided for procurement in SWM.

Mode\ Features	Asset Ownership	Duration	Capital Investment	Private Player Roles	Relevance
Management Contracts/ Concession Agreements	Public	Short to medium (3-7 years)	Public	Management of all aspects of operation & maintenance	Contracting to the private sector most or all of the operations and maintenance of a public facility or service. Ultimate obligation of service provision remains with the public entity, the day-to-day management control is vested with the private sector. Usually the private sector is not required to make capital investments.
BOT (Build-Operate-	Private	Long (20-30 years)	Private	Design, finance,	Responsibility for construction and

Mode\ Features	Asset Ownership	Duration	Capital Investment	Private Player Roles	Relevance
Transfer) / DBFOT (Design-Build-Finance-Operate Transfer) /				construct, manage and maintain	operations with the private partner while ownership is retained by the public entity.
BOOT (Build-own-Operate-Transfer) DBOOT (Design-Build own-Operate-Transfer)	Private	Long (20-30 years)	Private	Design, construct, own, manage, maintain and transfer	Private partner has the responsibility for construction and operations. Ownership is with the private partner for the duration of the concession.
EPC (Engineering-Procurement-Construction)	Public	Short (2-3 years)	Public	Engineering, purchase and construct	Private developer has the responsibility of detailed design of project, procurement of all the equipment and materials required and construction of functioning facility prescribed by the client within stipulated time period.

Table 1: Engagement Modes and Features

For the projects on SWM, the engagement mode of private players, especially in mechanical sweeping, waste to energy plants, waste processing and disposal and landfill remediation, construction & post-closure are as provided in table below.

Scope	Mechanical Sweeping / Collection & Transportation	Solid Waste Processing facility (Waste to Energy)	Solid Waste Processing & Disposal Facility	Solid Waste Integrated Management System	Landfill remediation, construction & post- closure of landfill
Engagement Modes & Example Case Studies	▪ Management Contract: Guwahati ▪ Concession Agreement: Noida, South Delhi, Indore ▪ BOOT: Noida	▪ BOOT: North Delhi ▪ DBFOT: South Delhi ▪ Separate EPC and O&M Contract	▪ BOOT: Nanded ▪ DBFOT: Kadapa ▪ Separate EPC and O&M Contract	▪ DBFOT: Faridabad Cluster ▪ DpFBOT: Bhopal and Katni Cluster ▪ BOOT: Noida ▪ BOT ▪ Separate EPC and O&M Contract	▪ DBOT: Bengaluru ▪ DBOO: Noida ▪ BOT ▪ Separate EPC and O&M Contract

Table 2: Engagement Modes in SWM Projects

4.5 Information Technology Framework

Solid Waste Management (SWM) is the most important activity that the local bodies delivers for its residents as the most significant municipal service and a prerequisite for other complicated municipal services. The overall target of SWM is to monitor, collect, treat, and dispose solid waste generated by the residents, in a cost effective, environmentally and socially satisfactory manner.

The information technology plays critical role in monitoring and evaluation activities related to solid waste management and involves design, development, installation, operation and maintenance of the system for pan city.

All Local bodies should design and develop the system have at least the following functionalities categorized under 4 Modules:

1. Module 1 - Intelligent Fleet Management System and Household Tracking System
2. Module 2 - Mobile Application for Officials and Citizen
3. Module 3 - Smart Waste Management System
4. Module 4- Grievance Redressal System

4.5.1 Module 1 – Intelligent Fleet Management System

Advanced Vehicle Tracking and Monitoring:

- System should be able to deliver VTMS (Vehicle Tracking & Monitoring System) functionalities.
- System should allow monitoring of each and every vehicle and provide its real time status. It should be able to correlate & co-ordinate with the preceding and succeeding coordinates, speed of the vehicle and time.
- System should have inbuilt engines of maps and should be able to store scalable vector data.
- System should be able to show the Scheduled Time of Arrival (STA) of garbage collection vehicles at each lane based on what is expected as per ideal conditions as well as the Estimated Time of Arrival (ETA) based on the actual ground conditions (traffic, collection delays, and any other factor).
- System should be able to monitor the entry and exit of the vehicles in any facility such that:
  - I. It should be able to calculate the average time that the vehicle spends in each lane.
  - II. System should be able to ensure that geo-fences are enabled on routes of all vehicles (esp. those of SWM), administrative boundaries, transfer stations, workshop, landfill and other features/locations as and when defined upon requirement.
- The system should be able to prioritize the route/s which the vehicle usually takes to reach the transfer station. There could be more than one route that the vehicle takes (in order to avoid congestion on road). These will need to be marked as authorized routes.
- System will need to generate alert if the vehicle spends more than the usual time required to traverse the route from its waste pickup point to the transfer station and back. (This analysis will need to be done using the traffic congestion data like those available on Google maps or other similar platforms/applications).
- Geo Fencing should be re-configurable based on the route changes/Requirements/Route optimization which will be undertaken every 3-6 months on the basis of Historical Data Analysis. The system should be able to change existing geo-fences based on specific requirement, or when the routes of the vehicles undergo any changes after route optimization process

- Based on data availability for number of households in each lane; the time spent in each lane, stoppage time should be defined and an evaluation beyond permissible limits either side should be alerted.
- System should be able to record intermittent stoppages along a particular lane, so that it can be used for indirect inference that time was provided for the residents to deposit their garbage and accordingly it can be deduced that waste has been collected from each and every household of every lane.
- Queue Management on the basis of nearby vehicles and estimated time to reach. This will help in infer which vehicle should reach the transfer station first to unload the waste.
    - The prioritization of who will be first unloading the vehicle at transfer station should be based on:
        - Who fills first
        - Distance to Transfer Station
        - Estimated time to reach
    - If the vehicle takes more than 10% of its total allocated time at a particular lane/area according to the route guide (pre-defined), then immediate alert should be raised.

Waste Collection Tracking System: This shall be based on the 'Sikar Model' of Rajasthan it involves RFID tagging of all gated communities/ HH and other places from where collection of waste is done.

Fuel Management and Diagnostics:

1. Fuel Efficiency Data to be captured in the system. This can comprise of usual mileage (to be provided by workshop for individual vehicles), actual mileage calculated on the basis of fuel intake, distance travelled.
2. Integration with fuel card- Each vehicle will be associated with a fuel card, this will help in monitoring fuel consumption of the vehicle.
3. System should be able to fetch data (Fuel dispensed per vehicle, amount topped and used from the card).
4. The fuel card should be tagged to a registration number of a specific vehicle and there should be mechanism to ensure that fuel card of one vehicle can't be used to fill fuel for another vehicle.
5. System should be able to extract basic information of vehicle based on its RTO number which is a prerequisite to allot fuel like total distance traversed and fuel allocated on the previous day.
6. System should be able to automatically record vehicle and driver fuel economy, efficiency and monitor useful data such as but not limited to mileage, speed, rash driving and fuel consumption etc.

Waste collection route optimization:

1. System should have functionality to optimize garbage collection route, which can be based on following (but not limited to) parameters:
    i. Dynamic creation of geofence
    ii. Dynamic allocation of collection points raised by citizens
    iii. Shortest route
    iv. Shortest time
    v. Speed limit restriction
    vi. Traffic volume at different times of the day,
    vii. One-way streets,
    viii. Turn restrictions,
    ix. Obstacles,

2. System should have tools for planning and allocating resources (manpower, vehicle and inventory) in place that will function in tandem with the fleet management system.
3. System should have alert generation facility against delays or other issues during solid waste pickup duties
4. CCTV cameras to be installed at transfer stations to provide video feed (24x7)
   • It needs to be used to monitor unauthorized entry of vehicles and people;
   • To monitor and ensure, use of safety equipment (like gloves, boot and mask) amongst sanitation workers/authorized rag pickers.
5. System should be able to store recording for an entire week locally, while there should be a mechanism to store data for a fortnight at the control centre.
6. System should provide automated traffic analysis involving during following scenarios:
   i. Vehicles on their way to transfer station to unload garbage
   ii. Vehicles already unloading at transfer station
   iii. Optimized route from the point the vehicle gets filled, to the transfer station, and back to the same spot to continue collection of waste. Vehicular traffic and congestion that may be faced by the vehicle on its way to the transfer station (as available in applications like Google Maps)
   iv. Speed limit restrictions in place along the route

4.5.2 Module 2 – Mobile Application for Officials and Citizen's

Key scenarios are being covered below but not limited to:

For Citizen:

1. The app should be able to provide the live location feed of 'door-to-door' vehicle in charge of specific ward and route.
2. The app should be able to locate the user location and show the concerned vehicles designated for his route/ward
3. It should be able to show the route which has been covered as well as the route that is pending
4. It should be able to show the time at which the vehicle passed by user location.
5. It should provide an interface through which Citizen can register self by giving his/her mobile number (mandatorily) and Email ID (optional).

For Municipal Corporation, Administrators and Workers:

1. App should provide a consolidated view of the VTMS dashboard with important features and also provide alerts regarding pendency.
   a. Basic details (view mode) of all modules must be made available
   b. System should be able to generate an alert in case attendance has not been marked.
   c. System should be able to broadcast messages from senior officials (as Text/Multimedia)
2. The App should have bi-Lingual Interface. (Hindi/English)
3. The app in this mode should be able to track the location of the user (i.e. the GPS should be on and set to high accuracy level where it gets the coordinates based on mobile tower and GPS satellite, so that approximate location can be traced even if the user is inside a building)
4. System should be able to push notifications and bulk SMS's to citizen (if Elected representatives/Senior officials want to communicate any important matter)
5. System should be able to generate alerts whenever the end date of lease of any particular vehicle is nearing.

4.5.3 Module 3 – Smart Waste Management System (SWMS)

Driver management:

1. **Scheduling Jobs:** Allocation and Re-Allocation of jobs and time frame definition for manpower and vehicles.
2. **Driver Performance Management** – System should be able to track performance data related to individual drivers and compare them to overall driver results, route results and time based comparisons.
    a. The system should allow driver behavior to be closely monitored by gathering data such as mileage, speed, rash driving, and fuel consumption.
    b. System should be able to compare performance of drivers among ward/zone/entire municipal limits. The consistent performers (drivers with good driving habits, punctuality and zero complaints can be incentivized based on this system.
3. The system should have role based view for viewing the dashboard and reports.
4. System should have Bilingual interface (English & Hindi).

Centralized Control Room and Communication System:

1. Local bodies to setup a control centre at a central location with TV screens (one for each zone) having one operator each to monitor the system on a continuous basis and coordinate with Drivers / CSIs / other concerned officials.
2. Two way ruggedized Push to Talk (PTT) Radio Frequency based communication device (with microphone and speaker) to be fixed on the dashboard of vehicles).
    a. Sturdy models that can withstand tampering or physical abuses are required.
    b. System should be able to capture voice of driver clearly (ambient noise interference should not be there) as well as speakers should be loud and clear for enabling comfortable hearing (even in the presence of other ambient noise including that of engine).
    c. System should enable the operators at control center to communicate with vehicles/ CSI of their respective zones with ease and vice versa.
    d. Drivers must be able to contact only their specific operator (on need basis) and must be able to speak to concerned CSI through the operator
3. System should be able to keep details of logs and audio recordings of all communications happening between operators and end users for a month. (Where it needs to be stored optimally and should be easily retrievable). Call recordings should be available for individual user.

MIS Report Generation (Customizable):

1. System should be able to create a Master Data Management module (Any kind of report based on the proposed solution should be customizable using this module)
2. MIS should be able to generate revenue reports Citizen wise, zone wise, ward-wise, vehicle wise, time series wise, transfer station wise, route wise. Comparative analysis and reports between above mentioned data points.
3. MIS should be able to pull critical information pertaining to workshop and vehicles to generate customizable reports or for mobile viewing.
4. MIS should be able to generate the amount of waste collected Citizen-wise, zone wise, ward wise, vehicle wise, time series wise, transfer station wise, route wise. Comparative analysis and reports between above mentioned data points.
5. MIS should be able to generate reports w.r.t. driver/ agency attendance, performance, Comparative analysis and reports between above mentioned data points.

4.5.4 Module 4 – Grievance Redressal System

A grievance/ complaint redressal system is an effective tool which facilitates effective complaint management and expedites the redressal process in a transparent manner[29]. It creates a platform for citizens to voice their complaints regarding services provided for SWM and helps in promoting efficiency and transparency at local bodies' level.

All Local bodies shall have an effective grievance/ complaint redressal system in place that is managed electronically by MIS, i.e. through computer or mobile applications.

Elements of Grievance/ Complaint Redressal System[30]:

1. Complaint Management System
2. Medium of Complaint Registration
3. Complaint Registration and Recording System
4. Resolution Certificate
5. Complaint Resolution and Feedback
6. Pending Complaints
7. Reporting and Complaint Analysis

Monitoring and Public Interface:

The significant feature of information technology is to ensure the availability of data in public domain for citizens. For better accountability and transparency, Local bodies shall publish the data in public domain at their own website.

[29] Refer Solid Waste Management Manual, 2016
[30] Refer Section 6.4 of Solid Waste Management Manual, 2016

5 Sustainable Solid Waste Management

Sustainability can be defined as 'meeting the needs of the present generation without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987). In order to achieve sustainability in solid waste management, the three pillars of sustainable development, environmental, economic and social sustainability must be met. The State shall work towards improving the sustainability of waste management in Rajasthan as per the rules and guidelines issued by CPCB, MoHUA, CPHEEO, MoEF & CC, and any other guidelines as issued by competent authority.

5.1 Environmental Sustainability

Environmental Sustainability is the ability to maintain things or qualities that are valued in the physical environment[31]. The physical environment includes the natural and biological environments. The practice of sustainable solid waste management shall include environmental sustainability to value our physical environment.

To achieve environmental sustainability, the policy proposes a multipronged approach that includes the 5Rs[32] principle to Reduce, Reuse, Recycle, Recover and Remove.

1. **Reduce**: The first choice of measures in waste management, is avoidance and waste reduction. This step aims for goods to be designed in a manner that minimises their waste components. Also, the reduction of the quantity and toxicity of waste generated during the production process is important.
2. **Reuse**: Re-using an article removes it from the waste stream for use in a similar or different purpose without changing its form or properties. The recycling of waste, which involves separating articles from the waste stream and processing them as products or raw materials. This approach seeks to recycle a product when it reaches the end of its life span.
3. **Recycle**: Recycling is process of transforming materials into secondary resources for manufacturing new products. Promotion of waste recycling sector and providing with an institutional support and motivating all the stakeholders to segregate at source of generation.
4. **Recover**: Recovery involves reclaiming particular components or materials, or using the waste as a fuel. Material recovery involves a variety of mechanical or biological processes that remove a variety of materials from the waste stream.
5. **Remove**: Remove refers to residuals management or the management of materials which remain after the previous 4Rs have been applied. The last step of the waste management where the quantity of waste cannot be reduced during production, the purpose of implementing the waste management hierarchy is to use waste as a resource and divert these potential resources from dumpsites/ landfill.

5.2 Economic Sustainability

Economic sustainability broadly comprises of equitable allocation of resources, sustained levels of growth and consumption, optimum utilisation of natural resources and the belief that the economic

[31] Sutton P., A Perspective on Environmental Sustainability, 2004

[32] SWM Manual (Part III), CPHEEO, MoUD, 2016

growth trickles down to the poorest[33]. Economic sustainability can be achieved when the waste sector generates secondary material in a cost-effective manner, establishes new enterprises, provides more jobs, supplies affordable carbon neutral energy and minimises the amount of residual waste disposed. Funds and investments need to be directed to appropriate practices, infrastructure, equipment and services that are affordable to operate and maintain over their lifetime. Wherever possible, economic investments should encourage the financing of local technologies and enterprises[34].

5.2.1 Sources of Revenue

1. User fees as an option for sustenance of waste collection and waste management processes to be adopted.
2. Detailed cost benefit analysis may be performed to test the model for feasibility and sustenance. Cost Benefit Analysis and feasibility study to be approved by state level committee to ensure financial sustainability and sharing of knowledge and best practices.
3. Those manufacturing high waste potential products to switch to more eco-friendly and low waste residue resources. Alternatively, a waste management tax / levy may be collected in order to cover the cost of managing waste so generated
4. Extension of producer responsibility may be enforced with the view of transferring the costs and efforts of waste management to the producer of such goods that lead to generation of waste. (reduce costs of collection)
5. Local bodies to be encouraged to generate revenues from value added activities and products from waste streams such as sale of manure/compost, sale of treated sewerage water, sale of recyclables, RDF etc.
6. Sources of funding includes, FFC, SFC, Grants/VGF from GoI/ GoR, Local bodies own resources, etc. Alternative sources of financing such as raising municipal bonds, Corporate Social Responsibility funds and funds/grants from development agencies such as World Bank Group, ADB, USAID etc. to be explored.
7. A state level knowledge and facilitation cell may be set up to support and guide such financing activities.
8. State to facilitate implementation of innovative and financially sustainable waste management projects that seek to increase revenues for waste management projects such as branding of compost, flower to incense etc. through knowledge support and technical expertise

5.2.2 Planning and Accounting

1. All Local bodies to maintain separate books of accounts for managing SWM related activities. A separate annual budget is to be prepared for SWM related activities to enable data insights and decision making for sustainable waste management.
2. All revenues from SWM activities to be utilised only for SWM related expenses for improving sustainability
3. Annual action plans to be prepared by Local bodies to focus on strategies to improve revenue generation and cost reduction. State to review the implementation of these action plans and facilitate funds and budgeting for waste management activities

[33]Basiago, A.D. Economic, social, and environmental sustainability in development theory and urban planning practice, The Environmentalist 19, (145-161), 1999.

[34]Elagroudy, et al, Municipal Solid Waste Management and Green Economy, Global Young Academy, 2016

4. Funds to be earmarked for development of waste management infrastructure and remediation of dumpsites.
5. Special focus to create plans and mechanisms for conversion of current loss making waste management facilities, projects and institutions and improve the financial strength

5.2.3 Development of Waste Management Economy and Industry Promotion

1. Rajasthan to consider waste management as an industry and promote investment in waste recovery economy – industries involved in repair, recycling and remanufacturing of products using waste material
2. State level SWM cell to be formed to facilitate MSME's investment in waste management value chains to create a future proof model of waste management and circular economy
3. Promotion of entrepreneurship in waste management solutions and services through start-ups and social entrepreneurs through various other policies (industrial, MSME etc.)

5.3 Social Sustainability

Social Sustainability establishes the nexus between social conditions and environmental decay[35]. Social sustainability encompasses notions of equity, empowerment, accessibility, participation, sharing, cultural identity, and institutional stability. It seeks to preserve the environment through economic growth and the alleviation of poverty. It ensures that development in waste management lays down the foundation for clean environment and improved public health.

5.3.1 SWM as a Basic Service

1. SWM to be prioritized as a basic service and strategy to be developed to implement service delivery guarantee guidelines with service level agreements defined and notified
2. Provision to be made for receiving complaints, feedbacks and grievances through mechanisms such as toll free numbers, SWM apps etc.
3. Response and solutions to be provided within the notified SLAs

5.3.2 Integration of Informal Waste Pickers and Employment Generation

1. Employment generation opportunity in solid waste management through creation of new infrastructure projects and waste management sector
2. Local bodies to develop mechanisms to integrate informal waste pickers, slum dwellers and unemployed into formal waste management sector
3. Annual action plans to be created by Local bodies with specifying the strategies to promote inclusion and formalization of SHGs and Waste pickers into the solid waste management through partnerships with NGOs, Private sector and any other suitable manner
4. All Local bodies shall provide a separate clinic at the project site where people can approach for primary health advice.

[35] Basiago, A.D. Economic, social, and environmental sustainability in development theory and urban planning practice, The Environmentalist 19, (145-161), 1999.

5. All Local bodies shall provide community and training center with in the project site wherein multiple employments related capacity building and training activities shall be undertaken and necessary skills shall be imparted.
6. All Local bodies are supposed to provide employment opportunity based on training and skill assessment. The secondary employment and/or business opportunity shall be created through the facility operator or support services.
7. All Local bodies shall provide training and awareness to labors at plant, which should be a continuous activity.
8. The concessionaire shall set up SWM and innovation center for every one which will be useful to locals, students and others who would wish to work in this field.
9. The concessionaire shall give prior importance to nearby population to get involved in the activities of horticulture, garden maintenance, energy management etc. at the project facilities.

5.3.3 Waste Management Industry

State to focus on promoting and facilitating in setting up of waste recycling / recovery industry zones that focus on conversion of waste through value addition, recycling and reengineering. Focus of waste management industries to improve employment and income generation level for marginalized communities.

6 Operational Excellence

In order to achieve operational excellence in the area of waste management, a detailed plan has been provided covering all aspects of waste management including segregation, collection, transportation, processing and disposal. The detailed plan includes various methodologies that can be adopted by Local bodies for selection of equipment and technologies and replication of proven case studies and best practices across India.

6.1 Achieving Excellence in Segregation of Waste

Segregating waste at source ensures that waste is less contaminated and can be collected and transported for further processing. Segregation of waste also optimizes waste processing and treatment technologies. It results in high proportion of segregated material that could be reused and recycled, leading to less consumption of virgin material. To increase the effectiveness and achieve operational excellence the Local bodies have to adopt the following steps:

a) **Achieving Excellence in Behavioural Change Communication and IEC:** This would include Local bodies to follow the following steps:

i. Preparation Phase:

1. Selection of an IEC and BCC in-charge for the municipality, who will directly report to the SWM in-charge of the municipality
2. Engagement of NGOs, SHGs, RWAs and CBOs for IEC and BCC activities in the municipality
3. Conducting a baseline survey for identification of waste generation pattern, income groups, nature and behaviour of citizens for SWM
4. Identification of stakeholders in each of the areas
5. Identification of Resident Welfare Associations (RWAs) whose members can contribute expertise or resources and can share the responsibilities of planning and implementing the program
6. Identification of areas of SWM where community participation is stimulated, like schools, institutions, offices, commercial areas, common community areas (parks), etc.
7. Development of customized IEC & BCC strategy focused on each area, behavior, income and waste generation pattern
8. The resourcing pattern shall be one IEC person per ward and should report to a Circle officer which will be responsible for handling 5 wards in a municipality. The persons can be engaged through NGOs, SHGs, RWAs and CBOs

ii. Awareness Creation Phase:

1. The awareness creation can be done through direct outreach to the identified stakeholders including the housewives and school children at the outset
2. Sanitation campaigns to be conducted at school and make children understand the importance of sanitation and solid waste management
3. Orient the citizens, key personalities, social activists, politicians and local corporators towards environmental education and solid waste management
4. It is also important to identify areas where the active involvement of community participation is elicited and work out the modalities of the same. Some of the areas that have emerged from experience elsewhere in the country, in which the community can contribute to waste management, are:

a. Avoid indiscriminate throwing of waste by residents, shop keepers, etc., on the streets
b. Segregate and store the waste at source
c. Hand over the waste to the sanitary workers
d. Understanding the importance of dumper bins at various localities of the city and their criticality in the efficient management of waste and therefore co-operating while the shifting of dumper bins
e. Understanding the importance of Reduce, Reuse, Recycle and Recovering of various recyclables in the waste and their utility

5. Once the above is conveyed to the community representatives, such as RWA's, etc., the same will be conveyed to the community directly or through various means of technology, so that a sense of community 'ownership' is developed. People involved in planning and implementing a project will feel that the program belongs to them. Community ownership helps to ensure greater participation on collection day as well as community pride about the outcome of the program
6. Involvement of local influencers, youth for dissemination of the idea about segregation of waste
7. Involvement of mass media in creating awareness on segregation of waste and sanitation
8. Preparation of IEC calendar by local bodies for the complete year and executing it

iii. Sustenance of Awareness Phase:

1. Nominating RWAs for doing audits and provide feedback on the progress of the segregation
2. Award functions and rankings to be organized by the Local bodies for RWAs and communities
3. Development of a monitoring mechanism to evaluate the progress of segregation and also to identify barriers
4. Ward officers or NGOs must continuously monitor the progress of segregation of each wards and provide feedback on a daily basis
5. SWM in-charge or Head of the municipality should be responsible in providing support for eliminating barriers in the process of segregation

6.2 Achieving Excellence in Collection and Transportation

Local bodies can achieve the excellence in Collection and Transportation through the following steps:

a. Through 100% Household Coverage of Solid Waste Management Services:

100% household coverage is an essential and critical starting point in the entire chain of SWM services. Waste-free city, clean roads and drains, scientific treatment of waste to maximize treatment, recycling and disposal can all be achieved in a sustainable manner only if regular door-to-door collection of waste is sustained. To achieve 100% Household coverage the following steps can be followed:

i. Collection of waste through either the ULB/ GP or by selecting an agency for collection and transportation of waste
ii. Baseline survey to be completed for all residential waste generators
iii. Coverage should be done including all households especially the household in the slum areas
iv. Bulk waste generators can be included if the waste generators are interested in providing dry waste

The household coverage of SWM services through door to door collection can be measured as described under:

Data required for Measurement of the Performance Indicator			
#	Data required for Calculation	Unit	Remarks
a.	Total number of households and establishments in the service area	Number of HHs	The total number of households and establishments (not properties) in the service area should be calculated. The service area refers to either the ward or the local body limits.
b.	Total number of households and establishments with daily doorstep collection	Number of HHs	Include doorstep collection by the local body itself or local bodies approved service providers. This can even include door-to-door collection systems operated by RWAs, etc.
Coverage		%	Coverage = [(b/a)*100]

Table 3: Household coverage of SWM services

6.3 100% Efficiency for Collection and Transportation of Solid Waste

The 100% efficiency of collection of solid waste can be achieved through following steps:

a. Fleet planning to be done based on the actual no. of households and type of geographical areas. Individual households to be covered with auto tippers or cycle rickshaws depending upon nature and accessibility of the areas. An indicative plan for selection of vehicles for primary and secondary collection is provided in previous sections.
b. Slum areas to be covered by cycle rickshaws due narrow lanes and other such issues of accessibility.
c. Route planning of the vehicles must be done and the citizens should be informed of their collection schedule. In case of any change in the schedule citizens should be informed on priority basis.
d. Waste collection to be done in a compartmentalized vehicle and should be divided in a ratio of 60:40 where 60% for dry waste and 40% for wet waste; after due characterization of solid waste generated in the local body.
e. Waste collection vehicles shall be equipped with jingles so as to make citizens aware and ready when the vehicle is approaching.
f. Collection of construction & demolition waste and garden waste to be done on weekly basis or on request.
g. Monitoring of vehicles to be done through GPS based tracking systems. The same needs to be included in the scope of work of the collection agency.
h. Data collection shall be done on a daily basis and the collection agency shall provide data in prescribed format as provided by the local bodies.
i. Vehicle shall be weighed on a daily/ per trip basis and hence waste management facility shall have the provision of weighbridges.
j. Weighing can be done at the household level and the information can be collected by use of waste collection apps. Local body can develop applications for collection of data at the household level. This data can be used for various analysis, monitoring and development of payment mechanisms (user fees).
k. The primary waste collectors shall deposit the waste at the designated secondary collection points. These secondary collection points shall have adequate number of covered bins. For larger cities, it is important to have fixed transfer stations in the secondary collection points. This will increase the efficiency of secondary transportation of waste.

l. The informal sector, comprising of kabadi system and waste pickers, plays an important role in the SWM value chain by recovering valuable material from waste. It helps to reduce environmental impacts by improving resource recovery and reducing disposal requirements. The integration of the informal sector into the formal SWM system will contribute to the reduction of the overall system costs, provide support to the local recycling industry, and create new job opportunities. The waste pickers have significant expertise in sorting solid waste and are an asset for processing and material recovery facilities. The initiatives that can be taken are as follows:
    a. Organizing informal sector into recognized membership-based associations or cooperatives with true representation of women as part of their leaders and members;
    b. Recognizing these associations for SWM service delivery
    c. Promoting social security and health benefits to members of these associations
    d. Encouraging informal sectors through NGOs, CBO, SHGs, etc. to link with National Urban Livelihood Mission (NULM)
    e. Providing low-interest loans to organizations of waste pickers seeking to bid for tenders and contracts
    f. Providing exemptions on fees and deposits for participation of informal sector associations in bidding for SWM contracts
    g. Providing basic amenities and facilities for the informal workers to work effectively such as timely wages and bonuses, proper facilities for women to be able to leave their children during work and linkages with community centres or anganwadis, safety and security including PPE, proper redressal mechanisms (for formal complaints, sexual harassment, etc.)

This indicator is relatively easy to measure, and has been used for a long time as an indicator of efficiency in collection of waste. Therefore, collection efficiency is a key performance indicator.

Data required for Measurement of the Performance Indicator			
#	**Data required for Calculation**	**Unit**	**Remarks**
a.	Total waste that is generated and which needs to be collected	Tonne per month	The total waste generated excluding waste processed or recycled at the generation point. This would depend on the population of the city, and the composition of economic activities.
b.	Total quantum of waste that is collected by the local bodies or authorized service providers	Tonne per month	The total waste collected from households, establishments and common collection points. This should be based on actual weighing of the collected waste. Daily generation should be aggregated to calculate the total monthly quantum. This should exclude any special drives for waste collection, and waste generated from one-off activities such as demolitions, desilting of canals, etc.
Collection efficiency		%	Collection efficiency = [(b/a)*100]

Table 4: Collection efficiency for SWM

6.4 Achieving Excellence in Processing of Waste

Through 100% recovery of solid waste: 100% recovery of solid waste can be achieved through the following:

a. **Decentralized Material Recovery:** Setting up of decentralized material recovery facilities for processing of the dry waste. The dry waste collected from the households must be segregated into various categories. The decentralized units can be maximum of 5 Tonne and should cover 2-3 wards depending upon the volume of waste. The MRF units are less cost intensive and would require equipment like sorting tables, balers, shredders and for larger Local bodies innovative technologies like plastic granulation units can be established. The recyclable percentage present in the waste is about 15%, which can sorted and sold to various recyclers. The recyclables fetches good prices which can make the business sustainable on its own. This will also help reducing the operating costs of Local bodies in processing the waste. Setting up of decentralized composting units for processing of the wet waste.
b. **Plastic Waste:** Plastics waste recovered from the MRF facilities can be used for production of fuel, road constructions, pavement blocks and alternate fuel. The orders/ regulations have made it mandatory for all road developers to use plastic waste with bituminous mix for road construction. MoRTH has also issued a direction to all states to use bituminous mix with the plastic waste for atleast a 10 Km stretch.
c. **Wet Waste:** The decentralized units of processing of wet waste shall be either based on small scale composting or small scale bio-methanization techniques. Each unit shall have the maximum capacity of 5 Tonne and should cover 2-3 wards depending upon the volume of waste. Wet waste generally constitutes 45-55% of the waste and decentralized units can reduce the transportation costs and other issues related to the transportation. Less quantity of wet waste can be easily managed and handled and it becomes easier to produce better quality yields. Also, the transportation costs of finished goods can be saved as these units can find customers within the locality.
d. **Setting up of RDF Units for the combustibles and non-recyclable waste:** Nearly, 30% of the total waste includes combustibles and non-recyclable waste, which can be used for production of RDF. The RDF units consists of a ballistic separator and a shredding unit which will help in production of RDF of different grades (i.e. grade I, II or III). The RDF can be used in the cement industries and used as fuel in the production of cement. The produced RDF can be sold to nearby cement industries for revenue generation.
e. **Land Issues:** In case, if the local bodies are facing the issues of land availability and procurement of finance, centralized solutions can be taken into consideration where a cluster based model can be adopted. In a cluster based model, few numbers of Local bodies can be associated together to develop centralized solutions on waste management.
f. **Waste To Energy**: Larger local bodies, especially the Municipal Corporations where waste generation is more than 550 TPD, can look for options like waste to energy through technologies, such as incineration, gasification, large scale bio-methanization or integrated waste management facilities with segregation, RDF generation, Composting and Waste to Energy. The tariffs decided by RERC for RDF must also be taken into due consideration.

Extent of recovery of waste collected is an indicator for the quantum of waste collected, which is either recycled or processed. This is expressed in terms of percentage of waste collected. Environmental sustainability demands that the maximum amount of waste should be recycled, reused or processed. While the processing, recycling and reuse should be carried out without creating any health and

environmental hazards, the total quantum of waste recovered is in itself a key performance parameter. Therefore, measurement of this indicator is critical.

Data required for Measurement of the Performance Indicator			
#	**Data required for Calculation**	**Unit**	**Remarks**
a.	Amount of waste that is processed or recycled	Tonne per month	The total quantum of waste intake by waste processing/recycling facilities operated by the local bodies or operator at a city/ward/locality level. Inert matter, and other material refused by the Processing / recycling facilities, which will go back to the dumping sites/landfills, should be deducted from the intake quantities. Waste collected at intermediate points by informal mechanisms (rag pickers, etc.) and fed back into the recycling chain should be included in this quantity. This can be accessed through data from wholesale traders of such waste at the city level. Typically, there would be a few wholesalers at the city level from whom data can be collected.
b.	Total quantum of waste that is collected by the local bodies or authorized service providers	Tonne per month	The total waste collected from households, establishments and common collection points. This should be based on actual weighing of the collected waste. This should exclude any special drives for waste collection, and waste generated from one-off activities such as demolitions, desilting of canals, etc.
Recovery		%	Extent of recovery = [a/b]*100

Table 5: Extent of Recovery

6.5 Achieving Excellence in Scientific Disposal of Waste

Local bodies can achieve excellence in scientific disposal of waste with the help of following steps:

a. Construction of scientific landfills as recommended in the SWM Rules 2016 and designs prescribed by CPCB
b. Only 5-10% of the waste material should go to scientific landfills. After processing of the waste, the residue left in the processes which is not useful and do not have any value shall only be disposed to scientific landfills
c. Local bodies should focus on creating an environment where there is less dependency on the scientific landfills
d. The landfill should meet all provisions as prescribed by CPCB including leachate collection system, proper sealing of the landfill site as per prescribed design, should meet all norms provided in the SWM manual for selection of site for landfills
e. The legacy waste can be biomined and the waste can be segregated to form RDF and good earth/compost. The land under the existing legacy waste can be reclaimed using the technology of bio-mining.

Inert waste should finally be disposed at landfill sites, which are designed, built, operated and maintained according to standards laid down in prevailing laws and manuals of nodal agencies. This includes collection and treatment of leachate at the landfill site. The extent of compliance should be

evaluated against the total quantum of waste disposed at landfills. This is a critical performance parameter from an environmental sustainability perspective.

Data required for Measurement of the Performance Indicator			
#	Data required for Calculation	Unit	Remarks
a.	Total waste disposed in landfills every month	Tonne per month	A daily log of waste being disposed at landfill sites should be maintained, based on actual measurement at weighbridges that are preferably located at the entrance to such sites. The monthly total should be the sum of daily totals in the month.
b.	Total waste disposed in all landfills every month	Tonne per month	The total waste disposed after collection and recovery (if any) at landfills (including landfills and open dumpsites). This quantity should be based on actual measurement at weighbridges that are preferably located at the entrance to such sites. The monthly total should be the sum of daily totals in the month.
Extent of scientific disposal		%	Extent of scientific disposal = [a/b]*100

Table 6: Extent of scientific disposal

6.6 Achieving Excellence in Redressal of Customer Complaints

Customer complaints are one of the best indicator for ascertaining the efficiency of SWM in local bodies. Thus it is very important to have a robust system for managing customer complaints. The following steps can be followed by Local bodies to achieve excellence in redressal of customer complaints:

a. For smaller local bodies, a dedicated helpline number (phone number) system with complaint log book can work better
b. For each local bodies, escalation matrix should be developed starting from sanitary inspector to the commissioner
c. The local bodies should have a dedicated toll-free helpline number and email address for registration of complaints
d. Resolution time for each complaint shall be less than 24 hours and after that it should be escalated to the next officer in hierarchy
e. Local bodies can develop mobile applications for citizens to log their complaints or can use Swachhata App for the same purpose. Swachhata App has three versions, i.e. one interface to be used by the citizens, one at the engineer level and one at the supervisor/SWM in charge/Commissioner level
f. It is important that for essential services such as SWM, the local body must have effective system to address customer complaints/ grievances, to escalate them internally for remedial action and their timely resolution. While many local bodies have put in systems to capture complaints, much more work needs to be done to put in place back-end systems for satisfactorily resolving such complaints on time. As SWM is an essential service, the benchmark time for complaint redressal is 24 hours or the next working day. It is therefore important to monitor this indicator. The value for this indicator will depend on a number of factors such as the size of the city, manpower, institutional network, etc.

Data required for Measurement of the Performance Indicator			
#	Data required for Calculation	Unit	Remarks
a.	Total number of SWM-related complaints received per month	Number of Complaints	The total number of all SWM-related complaints received during the month from consumers. Systems for receiving and logging of complaints should be effective and easily accessible to the citizens. Points of customer contact will include common helpline numbers, written complaints at ward offices, collection centres, drop boxes, online complaints on the website or mobile applications, etc.
b.	Total number of complaints redressed within the month	Number of Complaints	The total number of SWM-related complaints that are satisfactorily redressed within 24 hours or the next working day, within that particular month. Satisfactory resolution of the complaints should be endorsed by the person making the complaint in writing, as part of any format / proforma that is used to track complaints.
c.	Efficiency in redressal of complaints	%	Efficiency in redressal of complaints = [a/b]*100

Table 7: Efficiency in redressal of complaints

6.7 Achieving Excellence in Collection Efficiency of SWM Charges

In order to increase the efficiency of SWM Charges, local bodies can follow the following steps:

a. Notification of user fees in the byelaws. User fee is an important source of revenue for local bodies and would make the operations and maintenance financially sustainable. As per SWM Rules 2016, user fee is to be collected by local bodies for making their operations sustainable.
b. The user fee collection can be done directly by the local body through door to door collection or inclusion of the Solid Waste Management user fee with the property tax or other taxes as deemed appropriate. The collection of user fee can also be done through the collection agency as selected by the municipality which may include engagement of third party in collection or transportation.
c. Penalties for non-compliances under solid waste management including non-segregation of waste by waste generators and open dumping shall be incorporated as specified under the byelaws.
d. Local bodies shall focus on revenue generation through sale of products derived from waste including composts, RDF, electricity, recyclables, etc.
e. Efficiency in collection is defined as current year revenues collected, expressed as a percentage of the total operating revenues for the corresponding time period. It is also important that the revenues are collected in the same financial year, without allowing for dues to get accumulated as arrears. It is therefore critical to monitor this indicator.

Data required for Measurement of the Performance Indicator			
#	**Data required for Calculation**	**Unit**	**Remarks**
a.	Current revenues collected in the given year	Rs. crore per annum	Revenues collected for bills raised during the year. This should exclude collection of arrears as inclusion of arrears will skew the performance reflected. Collection efficiency is in fact an indicator of how many arrears are being built up, and therefore only current revenues should be considered.
b.	Total operating revenues billed during the given year	Rs. crore per annum	The total quantum of revenues related to SWM services that are billed during the year. This should include revenues from all sources related to SWM such as taxes, charges, cess, surcharges, etc.
c.	Cost recovery	%	Cost recovery = [(a/b)*100]

Table 8: Cost recovery in SMW

7 Information Education and Communication (IEC)/ Behaviour Change Communication (BCC)

The core objectives of the Information Education Communication/ Behaviour Change Communication (IEC/ BCC) strategy is to introduce 5Rs (Reduce, Reuse, Recycle, Recover and Remove) and segregation of Solid Waste. IEC and BCC strategy to be based on the Solid Waste Management Rules 2016 issued by the Ministry of Environment Forest and Climate Change and any other guidelines as issued by competent authority from time to time.

The IEC/ BCC campaign shall look to change the behaviour and attitude of target audience through:

a. **Awareness**: Increased citizen awareness about waste generation, collection, transportation, processing and disposal.
b. **Behaviour change**: Disseminate information on segregation of waste at source into "wet, dry and domestic hazardous waste", door-to-door collection of waste, collection of user charges by Urban Local bodies, customer complaint redressal systems (CCRS), etc.
c. **Sensitization**: of communities, RWAs, Market/ Traders' Associations on importance of scientific waste management and negative effects of mismanagement. Creating a sense of ownership of the city among the residents by emotional aspects.
d. **Sustainability**: To increase the reach of the IEC/ BCC activities and campaign to reach economies of scale and make the IEC/ BCC financially sustainable. Raising awareness on-site composting will make the entire activity environmentally sustainable.

The above-mentioned objectives will be achieved by IEC/ BCC strategies as prescribed in the SBM (Urban) Guidelines.

To increase the effectiveness of the IEC/ BCC campaigns, incentives and disincentives mechanism needs to be put in place:

i. Awards or felicitation for RWAs, Market Association, Commercial Places, Educational Institution, and individuals and make them model citizens, colonies, markets, etc.
ii. Recognition of best sanitary workers
iii. Felicitation of NGOs, SHGs, CBOs
iv. Penalties on Individuals, RWAs, Market Associations for garbage mismanagement

IEC/ BCC & Capacity Building in Rural Areas:

1. Intensive IEC/ BCC activities to be organised by various means to generate awareness amongst rural communities about the importance of Solid & Liquid Resource Management (SLRM).
2. Orientation of employees of Panchayat Samitis & GPs
3. Organise Swachhata Shram-Daan Divas/ Utsav
4. Showing films on SLRM
5. Nukkad Natak, Rallies, etc.
6. Rath yatra
7. Slogan writings on walls through wall-paintings
8. Distribution of posters on SLRM component and MHM
9. Printing resource material on SLRM, integration of MHM
10. Training for technical staff, field functionaries, PRI members
11. Capacity building of Swachhagrahis on IEC
12. Exposure visit to other state for good SLRM works

Plan for IEC/ BCC & Capacity Building for GPs at State level (FY 2018-19):

#	IEC/ BCC & Capacity Building Tools	Activities/ Specification
IEC/ BCC Activities		
1.	Portable exhibition panels/ Bus/ Train panel/ on Ticket Printing	Roadways Bus Ticketing
2.	Radio spots (Developing & Transmission), AIR, Community Radio	Radio spots on DIPR/ DAVP approved rates
3.	TV spots (Developing & Telecasting) Documentaries, short films, TV discussion	TV spots on DIPR/ DAVP approved rates
4.	Distribution of IEC material	Distribution of IEC materials for MHM demanded by Mahila Adhikarita Vibhag and SUN boards, booklets, FAQ, etc. to all districts (List attached)
5.	Advt. in News Paper, Magazines, Newsletters & Journals	Advt. in Newspaper, Magazines, Newsletters & Journals (List attached)
6.	Press Conferences	For briefing activities of SBM to media
7.	Newsletter	State SBM Magazine
8.	Print media (designing and printing of IEC material)	As needed
9.	Social media SBM Rajasthan website	
10.	State level swachhata chetna rally/ drawing & painting/ speech competition	Onetime
11.	State level ODF + Olympics at Udaipur	Onetime
12.	State level IEC campaign for ODF +S and publicity of benefits of sanitation and government scheme to beneficiaries of state (through mobile vans)	State level IEC campaign for ODF +S at SLWM and IGPRS co-operative management institute
13.	Making of documentary film and other films/ best practices documentary (hiring of experts, designing, formatting, printing, etc.)	Based on best practices, outstanding work done in the scheme and for training purposes
14.	Developing of folk media for exhibition and awareness campaigning, video show	
15.	Miscellaneous expenses (SRG honorarium, National level campaigns, etc.)	For carrying out state and central govt. initiatives
16.	State level sanitation champion awards	For facilitating champions
17.	IEC for Menstrual Hygiene Management	IEC for MHM in work shop/ training
Capacity Building/ Training Activities		
1.	State level workshops of collectors/ CEOs Zila Pramukh, DPC	SBM – ODF S/Retro.
2.	Gram Sewak/ ANM/ ASHA/ DPC/ BC/ ToT Trainings	Trainings at IGPRS
3.	Training & Workshop of PRI members	Trainings at Dehradun by KRC approved by MDWS
4.	Technical trainings of AEN, JEN, MASON	On toilet technology
5.	Training & Orientation for GOBARDHAN	On GOBARDHAN Technology
6.	ODF sustainability/ SLWM workshops	On toilet technology
7.	Workshops & Orientation for Menstrual Hygiene Management	RD & PR, NIIM, WE, PHED, Edu, UNICEF, ICDS & all DM/ ADM, ZP/ UP ZP, CEO/ ACEO, DPC/ OIC SBM

#	IEC/ BCC & Capacity Building Tools	Activities/ Specification
8.	Workshops & Orientation for Menstrual Hygiene Management & Supply of model incineration & pad vending machines to selected GPs	Dist. & Blocks (33+295)
9.	Knowledge training of good practices of SLWM, SLRM (Inter, Intra state visit)	Inter/ Intra state visits
10.	Training of Swachhagrahis	ToT
11.	Training of District SBM team on IEC	ToT
12.	IEC impact assessment Study	Survey/ assessment
13.	State level ODF cultural OLYMPIC	On ODF sustainability Themes
14.	Student meet on sanitation (Youth Festival)	On ODF sustainability Themes
15.	State level campaign/ drive directed by MDWS time to time/ state ODF celebration	As needed

Table 9: IEC/ BCC & Capacity Building Plan for GPs

8 Capacity Building

Proper management of waste in our country is today limited by two key factors, lack of budget and lack of well equipped, trained staff. Capacity building addresses the second problem by providing up-to-date skills, and knowledge to the stakeholders involved directly in management of the waste.

i. Capacity Building for SWM will be a long-term, perpetual and continuous process that will cater in developing human resources, organisational strength, technology know-how etc. involving all stakeholders, primarily local bodies employees at all level.
ii. One of the key lacunas in SWM implementation has been lack of capacity of in-house capability to effectively handle waste where Local bodies do not have adequate trained manpower as well technical know-how to manage waste generated within its territorial limits.
iii. Concrete efforts have to be put in to capacitate stakeholders at all levels as developments in infrastructure and processes would not yield expected results.
iv. Knowledge of new technology and methods coupled with training at all levels is necessary. Short and medium term courses held at regular intervals should, therefore, be designed for the sanitation workers and supervisory staff.
v. In Solid Waste Management (SWM) the people, partnerships, coalitions, resources and skills are essential to its successful implementation. The foundation of any such program should be 5Rs of waste management viz. Reduce, Reuse, Recycle, Recover and Remove.

8.1 Strategic Framework for Capacity Building

The framework for capacity building is premised on four core areas:

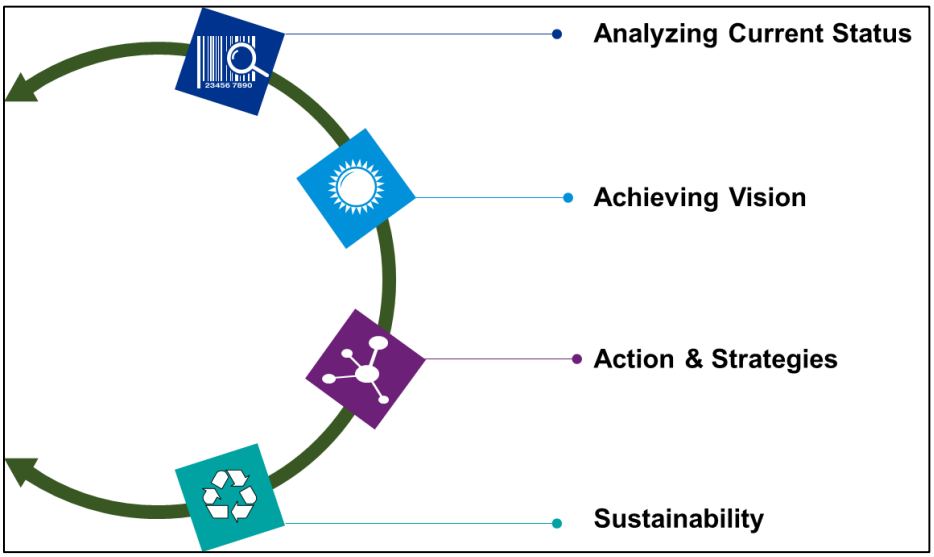

Figure 3: Strategic Framework for Capacity Building

i. To analyse the current situation at each local body.
ii. To achieve the mission and vision of the programme.
iii. To draft course of actions and strategies.
iv. To take necessary measures for sustainability.

8.2 Planning and Scheduling of Capacity Building

After understanding the existing SWM scenario in the local bodies and assessing the local bodies' organizational capacity to effectively manage the solid waste, a plan and schedule of capacity building activities could be prepared to fill the gap (between the present scenario and the vision plan). The plan can include both a short term plan (5 years), midterm plan (10 years) and a long term plan (20 years). The short term plan will focus on issues of immediate importance whereas the long term plan will have a holistic and comprehensive outlook making the initiatives sustainable.

The plan should invariably indicate the persons or agencies to be capacitated. The following representative diagram shows the various stakeholders for capacity building.

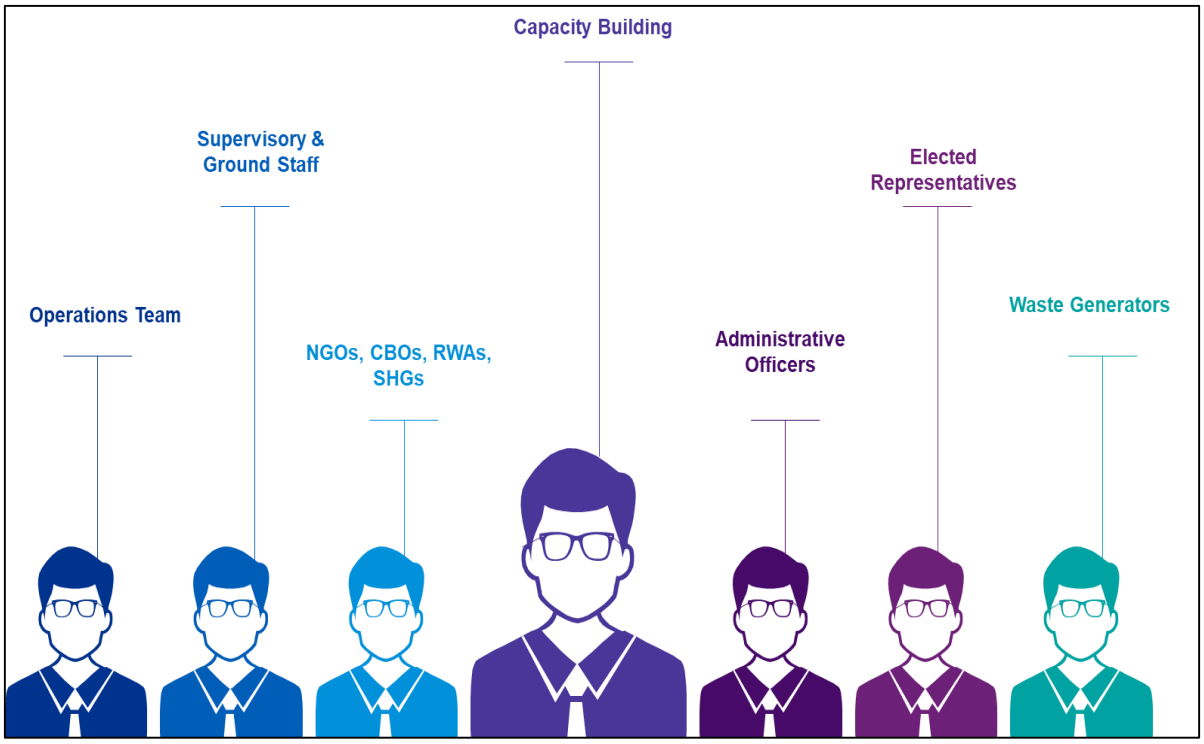

Figure 4: Stakeholders for Capacity Building

Capability-building of stakeholders in implementation of solid waste management cannot be treated as an isolated training exercise. The rightful position of SWM as a potent tool that reflects the culture of citizens and the administrative efficiency of the local bodies will need to permeate all capability building initiatives. This is particularly important as SWM is an important cornerstone of effective governance. Keeping this in mind, the capacity building strategy for SWM should aim at a holistic set of activities.

i. Capacity building and training involves various stakeholders from communities to decision makers to local body officials and waste handlers and operators. Each stakeholder has defined roles, responsibilities, and contribution toward waste management. Therefore, the training cannot be generalised; specific training should be designed to meet the need of different stakeholders.

ii. There are different levels of staff who are involved in solid waste management at the local bodies level i.e. (i) safai karmis/ swachhata mitra (including loaders, cleaners and helpers) and drivers, (ii) implementing officers like supervisors, sanitary inspectors, health inspectors and assistant engineers; and (iii) senior officials like chief engineers, executive engineers, health

officers and other management personnel supervising the SWM plan, (iv) NGOs/ CBOs, (v) elected representatives. They require specialized training that is different in scope, duration and specialization, vi) Master trainers have to be developed for each division of Local bodies who would serve as resource persons and capacitate the other team members of the division.

iii. For example, i) safai karmis should be trained about door-to-door collection, proper methods of waste management such as segregation and collection, use of tools and equipment, expectation of the public among others, ii) while the drivers should be trained about vehicle maintenance and preventive checks, iii) the supervisory staff should be given training regarding human resource development, rules and regulations relating to waste management, MIS systems and technologies involved in handling and management of waste, iv) the senior level officials should be kept updated on the latest developments and trends in the waste management sector, planning and processes around management of waste, rules and regulations around waste management.

Therefore, Local bodies must prepare different training modules for each level to ensure maximum productivity, efficient use of resources and high motivation among the workforce. The Local bodies should also consider measures such as deputation of personnel to larger Local bodies to gaining relevant experience. An action plan has to be formulated.

8.3 Formalizing the Informal Sector- Rag Pickers and SWM Workers

It is also important to develop and implement an integrated solid waste management approach taking advantages of existing unorganized sector (rag-pickers) for its cost effective and sustainable management. Unfortunately, role of rag-pickers in SWM has not been adequately recognized till now, who are one of the important stakeholders of the SWM. Their role needs to be accommodated in the proper system to upgrade and boost their morale. For improving solid waste collection efficiency and source segregations, rag-pickers can be engaged through organized sector.

To capacitate and to formalize the informal sector of rag pickers the following steps can be taken to strengthen them.

a) Increased cooperation with Local bodies.
b) Importance of segregation.
c) Use of PPEs and good practices while handling and transferring waste.
d) Organizing heath camps.
e) Advocacy for timely and regular collection of waste.
f) Organizing training under the supervision of Sanitation Superintendents.

It is important that the approach to capacity building in solid waste should not only focus on technology but also on different aspects including governance, financing, planning, and improved service delivery. Additionally,

a) Refresher courses for supervisory staff: Refresher courses should be conducted for officers and supervisors at least once every 1 year.
b) Field and Study visits: Learnings can be enhanced by visiting institutions or places where good practices have already been well established and also by attending seminars and workshops.

8.4 Implementation of Capacity Building Activities

Once the capacity building plan is finalized, the local bodies can proceed with implementing the plan. This requires careful consideration of many factors. These factors are:

a) Resources (money, facilities, equipment, expertise, skills, time etc.)
b) Readiness (ability to understand the issues properly, willingness of participants)
c) Scheduling of programmes (E Learning, Field Visits etc.)
d) Selection of Master Trainer

9 Strategy on Policy Implementation

Implementation Strategies: Policy will be implemented as per the action plan detailed out below for ULBs and GPs.

For ULBs: According to the Rule 22 of Solid Waste Management Rules, 2016, necessary infrastructure shall be created by the ULBs, by directly or engaging agencies within the timeframe suggested below:

Table 10: Action Plan for ULBs

#	Actionable Points	TimeLine			
		Time limit * from the date of notification	ULBs with population >5,00,000 (6 ULBs)	ULBs with population >1,00,000 (23 ULBs)	ULBs with population <1,00,000 (164 ULBs)
1.	Identification of suitable sites for setting up solid waste processing facilities	1 year	Compliance Done	Compliance Done	December 2019
2.	Identification of suitable sites for setting up common regional sanitary landfill facilities for suitable clusters of local authorities under 5,00,000 population	1 year	Compliance Done	Compliance Done	December 2019
3.	Procurement of suitable sites for setting up solid waste processing facility and sanitary landfill facilities	2 years	Compliance Done	Compliance Done	December 2020
4.	Enforcing waste generators to practice segregation of bio degradable, recyclable, combustible, sanitary waste domestic hazardous and inert solid wastes at source	2 years	December 2019	December 2019	December 2019
5.	Ensure door to door collection of segregated waste and its transportation in covered vehicles to processing or disposal facilities	2 years	December 2019	December 2019	December 2019
6.	Ensure separate storage, collection and transportation of construction and demolition wastes	2 years	December 2019	December 2019	December 2019
7.	Setting up solid waste processing facilities by all local bodies having 1,00,000 or more population	2 years	December 2019	December 2020	December 2020

#	Actionable Points	TimeLine			
		Time limit * from the date of notification	ULBs with population >5,00,000 (6 ULBs)	ULBs with population >1,00,000 (23 ULBs)	ULBs with population <1,00,000 (164 ULBs)
8.	Setting up solid waste processing facilities by local bodies and census towns below 1,00,000 population	3 years	NA	NA	December 2020
9.	Setting up common or stand-alone sanitary landfills by or for all local bodies having 5,00,000 or more population for the disposal of only such residual wastes from the processing facilities as well as untreatable inert wastes as permitted under the rules	3 years	December 2020	NA	NA
10.	Setting up common regional sanitary landfills by all local bodies and census towns under 5,00,000 population for the disposal of permitted waste under the rules	3 years	NA	December 2021	December 2022
11.	Bio remediation or capping of old and abandoned dump sites	5 years	December 2020	December 2021	December 2022

For GPs: According to the Rule 22 of Solid Waste Management Rules, 2016, necessary infrastructure shall be created by the GPs, by directly or engaging agencies within the timeframe suggested in table below or as decided by Panchayati Raj Department, Rajasthan.

Table 11: Action plan for GPs

#	Activities	Timeline (from the date of notification)
1.	Preparation of DPRs	6 months
2.	Identification of suitable sites for RRCs	1 year
3.	Construction of Resource Recovery Centres (RRCs)	2 years
4.	Landfill sites	1 year
5.	Procurement of community dustbins, tricycles, push carts, safety equipment, etc.	2 years
6.	Training and engaging Swachhata *Sakhis* and labours	1 year
7.	Construction of compost pits	1 year
8.	Construction of community leach pits	1 year

#	Activities	Timeline (from the date of notification)
9.	Construction of soak pits near hand-pumps	1 year
10.	Engaging labours to collect and transport and segregate waste from door to door	2 years
11.	Enforcing waste generators to practice segregation of bio degradable, recyclable, combustible, sanitary waste, domestic hazardous waste and inert solid waste at source	2 years

The timelines will be applicable with effect from the date of notification and are in accordance with the Hon'ble National Green Tribunal (NGT) judgments and rulings.