



GOVERNMENT OF KERALA

Abstract

Local Self Government Department - Integrated Solid Waste Management - Strategy document - Approved -Orders issued.

LOCAL SELF GOVERNMENT (DC) DEPARTMENT

G.O.(Rt)No.811/2020/LSGD Dated,Thiruvananthapuram, 01/05/2020

Read 1 The Solid Waste Management Rules, 2016

2 The Construction & Demolition Waste Management Rules, 2016

3 Kerala State Policy on Solid Waste Management, 2018 published in the Kerala Gazette Extraordinary No.2332 dated 13th September, 2018

ORDER

One of the primary responsibilities of local self governments with regard to civic services is the management of solid waste. The Solid Waste Management Rules 2016 lays out a blue print of the activities and practices to be followed by local governments in this regard. Increasing urbanisation and changes in consumption practice have resulted in the challenges in the management of solid waste increasing manifold, with the addition of new categories, new technologies and myriad management methods, as well as increased reluctance of communities to allow setting up of facilities on account of fears over possible negative impact on their local environments. It is therefore the need of the hour to support local self governments with a comprehensive strategy framework and road map in line with the Solid Waste Management Rules and State Policy, which would enable satisfactory and sustainable management of solid waste under their leadership.

Government are therefore pleased to approve and publish the Integrated Solid Waste Management Strategy, Kerala, appended to this Order. The Executive Director, Suchitwa Mission shall take necessary action to translate the document into Malayalam and to share the same with Local

Self Government Associations and other stakeholders for their inputs. The strategy will be supplemented and fine tuned by Government in due course, incorporating pertinent suggestions put forth by the stakeholders.

(By order of the Governor)
SARADA MURALEEDHARAN IAS
PRINCIPAL SECRETARY

To:

Executive Vice Chairperson, Haritha Keralam Mission.
Executive Director, Suchitwa Mission.
Managing Director, IMPACT Kerala Ltd.
Director of Panchayats, Thiruvananthapuram
Director of Urban Affairs, Thiruvananthapuram.
Commissioner for Rural Development, Thiruvananthapuram.
Managing Director, Clean Kerala Company Ltd.
Executive Director, Kudumbashree.
Chief Town Planner, Thiruvananthapuram.
Executive Director, Information Kerala Mission.
CEO, Kerala State Disaster Management Authority.
Principal Accountant General (A&E), Kerala, Thiruvananthapuram.
Accountant General (G&SSA/E&RSA), Kerala, Thiruvananthapuram.
Stock File/Office Copy.

Forwarded /By order

Section Officer



*Integrated
Solid Waste
Management
Kerala*

An end to end solution for collection, processing and disposal of various types of Solid waste generated in the state of Kerala

Contents

1 Preamble..... 4

2 Solid Waste Management..... 7

 2.1 Classification of Solid Waste..... 8

 2.2 Plastic Waste..... 9

 2.2.1 Definition..... 9

 2.2.2 Solutions..... 10

 2.2.3 Strategy..... 10

 2.3 Non-biodegradable waste (other than plastics)..... 12

 2.3.1 Definition..... 12

 2.3.2 Solutions..... 12

 2.3.3 Strategy..... 13

 2.4 Construction and Demolition Waste..... 14

 2.4.1 Definition..... 14

 2.4.2 Solutions..... 14

 2.4.3 Strategy..... 15

 2.5 Biodegradable waste including Kitchen waste..... 17

 2.5.1 Definition..... 17

 2.5.2 Solutions..... 17

 2.5.3 Strategy..... 18

 2.6 Slaughterhouse Waste..... 20

 2.6.1 Definition..... 20

 2.6.2 Solutions..... 21

 2.6.3 Strategy..... 21

 2.7 Household Hazardous Waste..... 22

 2.7.1 Definition..... 22

 2.7.2 Solutions..... 23

 2.7.3 Strategy..... 23

Annexure..... 24

List of Table

List of acronyms

BDW	Biodegradable waste
CKCL	Clean Kerala Company Limited
C&D	Construction and Demolition
C&T	Collection and Transfer
CDWM	Construction and Demolition Waste Management Rules, 2016
EPR	Extended Producer Responsibility
GoI	Government of India
HH	Household
HOWM	Hazardous and Other Waste Management Rules, 2016
IEC	Information, education and communication
IMAGE	IMA Goes Eco-friendly
KEIL	Kerala Enviro Infrastructure Limited
KSDMA	Kerala State Disaster Management Authority
KSPCB	Kerala State Pollution Control Board
LSG	Local Self Government
MCF	Material Collection facility
NBDW	Non-biodegradable waste
PWM	Plastic Waste Management
RDF	Refuse Derived Fuel
RRF	Resource recovery facility
SLF	Sanitary Landfill
SWM	Solid Waste Management
SWMR	Solid Waste Management Rules, 2016
ULB	Urban Local Body

1 Preamble

Kerala has 6 Municipal Corporations, 87 municipalities, 77 Taluks, 14 District Panchayats, 152 Block Panchayats and 941 Grama Panchayats¹. The total generation of solid waste in Kerala is 3.7 million tons annually¹. The total share of biodegradable and non-biodegradable waste are at 69% and 31 % respectively². The biodegradable waste has a moisture content of about 70%. Combustible and non-combustible fraction of waste in non-biodegradable category are at 79.2% and 20.8% respectively.

The current waste management system in the state focuses on the citizen responsibility of managing biodegradable waste at source. The '**My waste, My responsibility**' approach was initiated to instill a sense of ownership and duty among citizens to reduce waste and handle Bio degradable waste (BDW) at source by composting within their yards. The local government's involvement in handling of waste is restricted in mostto collection and recycling of non-biodegradable waste and collection of biodegradable waste from bulk generators. A recent survey conducted in 12 ULBs in the state indicated that about 10% Households are practicing source treatment.

¹Local Self Governance, Kerala- website

² World Bank Waste Characterisation survey conducted in 12 cities across the state

The efficiency of waste segregation the state has achieved in bringing a striking behavioral change and sense of responsibility among citizens regarding the need and methods of efficient and effective segregation is remarkable.

The major challenges and issues observed in the existing waste management practices are

- Restrictive policy which promotes source treatment³for household biodegradable waste;
- Low adoption of good quality source treatment;
- Limited collection of waste- largely restricted to Non BDW while some Non BDW waste types not collected;
- Unstructured contracting terms for private engagement;
- Inadequate audit and monitoring of waste management practices;
- Inadequate processing and disposal of waste;
- Offtake of shredded plastic is minimal owing to technology related issues in using them for road construction.
- Large quantities of the collected NBDW is either dumped in poorly maintained dump sites or are accumulating at the existing RRF/MCFs, which are not designed or equipped to handle the load efficiently;
- BDW collection and treatment is infrequent at most ULBs;
- For ULBs that collect and treat BDW, low off take of finished compost (poor quality or inconsistent quality/ demand) and accumulation of compost at treatment plants is an issue;
- The state notably lacks disposal sites complying to environmental regulations, with adequate leachate treatment/ gas collection facilities.

Public protests against SWM projects due to poor implementation of existing projects, potential for water contamination, presence of odour and disease vectors and relatively poor involvement of stakeholders in designing and explaining the project and its benefits has resulted in nearly no new project developments in Kerala state. Disaster management plans and climate resilience planning also have only limited SWM inclusions and proper vulnerability assessments have not been carried out on existing sites.

The state in its efforts to build and support a better waste management system created multiple organisations at various times to fix a specific issue or aspect. However, this has interfered with the primary responsibility of waste management being with the local self governments and resulted in the sector getting neglected. The superimposition of state agencies and their non-accountability to the local self governments has led to overlapping mandates lacking synchronized vision. The local self government itself is not adequately staffed (without a dedicated solid waste management team) to deal with SWM in an efficient, systematic and planned manner.

As for the regulatory framework for SWM in the state, existence of multiple laws, rules and acts relating to SWM and imprecise direction lead to lack of clarity among LSG staff on planning and needs in SWM sector. The state regulation and rules have noticeable inconsistencies with the National policies/ rules which requires immediate attention and alignment to the national policies.

Taking cognizance of the above-mentioned issues and the vision, the following guiding principles are formulated. The strategy is grounded with a combination of decentralization and centralization initiatives. The Government of Kerala would promote source treatment at generator level for biodegradable waste and at the same time offer to provide safe Non Bio degradable waste collection and transportation services to all the citizens.

³This has practically discouraged ULB level collection by practice leading to unscientific methods

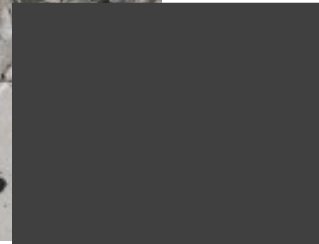
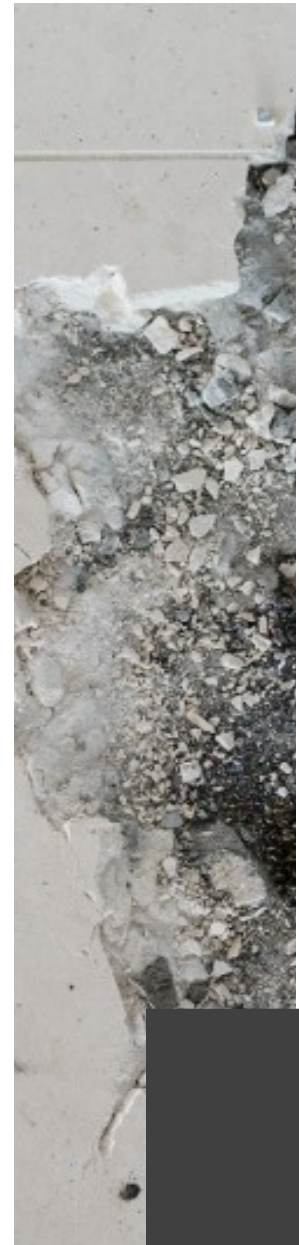
S. No.	Principles	Description
1	Demonstrate government leadership in waste management,	To champion and demonstrate leadership for waste management and diversion, Government of Kerala will accept the new waste management strategy and adopt it through its constitutional channels, develop funding mechanisms on an on-going basis to support investment in the sector and develop mechanisms for local self governments to increase own source revenues, develop the State Sanitation Mission as the SWM nodal agency in the state to lead, plan and monitor SWM sector across the state (detailed under Annexure A1), and create a dedicated SWM wing in ULBs headed by an experienced environmental engineer and supported by sanitary inspectors and engineers.
2	Provide modern, efficient, consistent and effective regulatory and monitoring system for waste management	<p>After careful analysis of state and central rules/regulations, state policies would be aligned with the national policies and rules. Based on the State strategy for SWM, the state policies would clearly draw out distinct roles and responsibilities of all state level institutions with special focus on roles and responsibilities of the Sanitation Mission for SWM.</p> <p>In line with the State Policy, all local self governments shall prepare SWM plans specific to the local self governments and submit the same to the DPC for approval. Technical approval of the projects will be given by the Sanitation Mission (at the State or district level as the case may be depending on the size and complexity of the project). The local self governments, subsequent to approval of SWM plans, shall issue and circulate bylaws, and guidelines for SWM in accordance with the respective SWM plans, with the approval of the State Government.</p>
3	Provide an innovative, sustainable and cost-efficient waste management system at the local level or regional level	<p>To foster innovative and sustainable solutions for waste diversion, processing, treatment and disposal, the government through the state level institutions like the Haritha Kerala Mission and the Clean Kerala Company in collaboration with local self governments, will develop plans for 100% collection and transportation of waste (except for the source treated BDW), create transfer stations (Material collection Facilities) and other secondary segregation locations (Resource Recovery Facilities), develop innovative recycling initiatives, implement Extended Producer Responsibilities (EPRs), buyback programmes etc., and identify and plan SWM processing and disposal facilities within the respective local self governments or come together to participate in regional facilities.</p> <p>The local self governments are encouraged to collect and treat waste local level. Outsourcing to community based service providers like the Haritha Karma Sena will be strongly encouraged. The State Government will develop a policy template for community based outsourced services under the aegis of the Local Self Government. It is preferable and advised that local self governments shall develop multiple facilities within their jurisdiction to create appropriate segregation, NBDW storage, BDW treatment, and storage of inert or non-saleable waste. Local self governments having appropriate and sufficient land for creating scientific landfills (SLF) for disposal, shall design and build landfills for final disposal of waste.</p>
		<p>When appropriate and sufficient land for disposal is unavailable at LSGs, local self governments shall come together and participate in development of regional waste disposal facilities for treatment and disposal, under the guidance and leadership of the State Government</p>

S. No.	Principles	Description
		or the state Sanitation Mission.
4	Develop mechanism for funding and devolution mechanisms for SWM projects	The State Government or LSGD shall carry out the planning and development of regional facilities. The State Government would own the identified land ⁴ for regional facilities (for treatment and disposal or for disposal alone). The State Government will commission the study for the developing the cluster of LSGs for a regional level Integrated Solid Waste Management facility after creating an appropriate cluster of LSGs and forming a stakeholder group. The Government will find external sources of funds, especially grant funds to make bigger projects possible and create mechanisms for easy access to longer term funding for multiyear projects over and above yearly budgets and also support Local Self Governments. The LSGs may levy appropriate user fees for waste management services from households and business.
5	Enhance education, awareness and technical understanding of waste management among waste practitioners, stakeholders and residents	To enhance education and awareness, the State Government will lead and collaborate with institutional, non government and community stakeholders to develop a comprehensive communications strategy regarding waste management, dispel existing misunderstandings and scientific untruths, create an atmosphere of harmony and collaboration among citizens, local self governments and the State Government to foster local, regional, and cluster projects, ensure local self governments deliver IEC programmes on an ongoing basis to keep the citizens involved in the waste management practices and their improvements, develop and arrange for delivering technical programmes, short courses on waste management and related technical areas for all state level institutions related to SWM sector, local self governments and other appropriate staff at agencies responsible for delivering waste projects.

In addition, the State Government shall develop performance measures to monitor and control the SWM practices in the state. The various monitoring parameters shall include audit of amount of waste generated in Kerala, coverage and frequency of collection and transportation services, efficacy of processing, recycling and safe disposal in the state and overall adherence to various policies and rules.

⁴ Subject to siting criteria as per the SWM rules and vulnerability assessment in the context of disaster management and climate resilience.

2 Solid Waste Management



2.1 Classification of Solid Waste

Municipal solid wastes are broadly categorized under three broad categories:

Biodegradable waste (BDW): any waste that can be degraded into simpler stable compounds by the action of microorganisms

Non – biodegradable waste (NBDW): any waste that cannot be degraded by microorganisms into simpler and stable compounds

Construction and demolition waste(CDW): any waste generated due to construction or demolition of buildings, roads, bridges or any other structures.

Biodegradable waste	Non-biodegradable waste	Construction and demolition waste
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> kitchen/garden waste	<input type="checkbox"/> Plastic waste	<input type="checkbox"/> cement & concrete
<input type="checkbox"/> slaughter house waste	<input type="checkbox"/> domestic hazardous waste	<input type="checkbox"/> steel
	<input type="checkbox"/> sanitary waste	<input type="checkbox"/> conduits and pipes
	<input type="checkbox"/> glass	<input type="checkbox"/> electrical fixtures
	<input type="checkbox"/> metal	<input type="checkbox"/> glazings, ceramics etc.
	<input type="checkbox"/> leather	
	<input type="checkbox"/> other inert waste	

The subsequent sections discuss the strategies for managing the following types of waste:

1. Plastic Waste
2. Non-biodegradable waste (other than plastics)
3. Construction and Demolition Waste
4. Biodegradable Kitchen Waste
5. Slaughterhouse Waste
6. Household Hazardous Waste



2.2 Plastic Waste

2.2.1 Definition

Any plastic product or part of product or packaging material discarded after use, comprising of plastic wrappers, bottles, food container, ropes, parts of electronic items, bags, jars, etc.

Plastic waste categories

Recyclable plastic waste:

Comprises of plastic waste that can be recycled as raw material in production of other plastic products. Normally, a plastic product that is recyclable has a number on it to indicate its potential for recycling⁵. Recyclable plastics can be dissolved and reprocessed.

Non-recyclable plastic waste:

Comprises of plastic waste that cannot be recycled and are generally treated as inert. This is because it has reached its end of life use. Such Products include trash bags, ziplock bags, inside cereal box plastic, bubble

⁵Resin codes identify plastic type but not recyclability -Plastic containers are made of different types of plastic resin identified by resin codes- numbers inside a triangle - on the bottom of each container. The containers look alike but they re not because each resin consists of very specific chemical molecules. Some resins mix well together, but for those that don't, recycling them together is like oil and water and the resulting resin can't be used.

wrap, clear plastic wrap, some department store bags, potato chip bags, single cheese wrappers, 6-pack plastic and candy wrappers. Non recyclables fall into two categories - “unable to be dissolved” and “used to hold food and can't be recertified as sterile”.

2.2.2 Solutions

Reduction of plastic consumption and generation of waste: Ban of single use plastic has been enforced by the State Government with effect from January 1, 2020. Use of products made of alternative biodegradable and environment friendly non-plastic material shall be promoted to reduce consumption of single use plastic. In addition, Extended Producer Responsibility (EPR) Scheme shall be introduced in the state to promote resource efficiency and sustainable consumption by producers, brand owners, importers and manufacturers of plastic products and packaging. Reuse of plastic shall be promoted by the State Government, if no health hazard is associated with its use.

Recycling of plastic waste: The plastic waste collected shall be sorted based on recycling potential, type, colour and other characteristics of the material into different categories. The recyclable plastics shall be channeled to the recyclers empaneled with The State Government. Use of recycled plastic in manufacturing of plastic or other products shall be promoted.

Resource recovery: Nonrecyclable plastic shall be sent for co-processing at cement manufacturing units for use as alternative fuel. Plastic mixed with solid waste shall be converted to RDF along with other flammable wastes and sold as fuel to industrial units using them.

Use as alternative raw material: Non recyclable plastic shall also be used as alternative raw material for road construction. Shredded plastic shall be used along with bituminous mixes for tarring of roads.

2.2.3 Strategy

Segregation at source: As per clause 4(a) of SWM Rules 2016, households, institutions and commercial establishments shall ensure 100% segregation of cleaned plastic waste (as part of non-biodegradable waste) at source based on the guidelines issued (from time to time) by the State Government regarding segregation and storage of plastic waste.

Collection and transportation: Households, institutions and commercial establishments must not burn or litter plastic waste and shall ensure disposal of waste through formal channels only. As per clause 15 (b) of SWM Rules 2016, 100% daily collection of plastic waste shall be undertaken by waste collection and transportation agencies or community enterprise groups/service providers (including Haritha karma sena) engaged by local self governments along with all other NBDW. The generators will be charged (by the local self governments) for the services provided by waste collection and transportation agencies as notified by the bylaws or guidelines issued by the local self government or the State Government. The collected waste is to be transported safely to the transfer stations by these agencies.

Secondary Segregation: As per Clause 15 (h) of SWM Rules 2016, the recyclable portion of the NBDW shall be segregated at the Material collection facilities (MCFs)/secondary storage facilities to be setup by the local self governments. The collected waste should undergo secondary segregation and cleaning (if required) at the transfer stations. The incoming waste and outgoing waste to different channel of processing and disposal are to be weighed and segregated at the transfer stations. If need be, mini MCFs will also be set up in appropriate locations by the LSG to ensure smooth and efficient collection and transfer, depending on the terrain, the demography and the per capita generation of waste. LSGs shall ensure compliance of these activities by the collection and transportation agencies and shall report the same to the State Government on a quarterly basis. The LSGs shall also ensure that the user fees are collected and transferred to the agencies or community groups at regular intervals and that the remuneration of the collection groups is such as to be an economically viable activity.

Processing: The non recyclable plastic waste from the transfer stations shall either be shredded and used for road construction or be bailed and sent to cement plants as for heat recovery or be converted to RDF along with other flammable wastes and sold to cement plants or such other places for use as alternative fuel. The approach for the same needs to be considered by the LSGs as part of their SWM plan and shall be mirrored in contractual arrangements to be entered into by the LSGs for this purpose.

For using shredded plastics in road building, the State Government shall empanel or certify contractors based on their technical capacity and in compliance with the GoI norms. The validity of such certification or empanelment shall be periodically reviewed based on a monitoring mechanism to be notified by The State Government. The local self governments shall sell shredded plastics only to such certified contractors.

Disposal: As per Clause 15 (zi) of the SWM Rules 2016, plastic inert waste that is not recyclable or cannot be processed/treated/is a residue of a recycling or treatment process shall be deposited in a SLF. The SLF should meet the regulatory requirements of SWM 2016 Rules and guidelines for siting, design, construction and operations.

The SLF shall be developed by the local self governments if they can safely and adequately meet the regulatory requirements and develop a disposal facility within their jurisdiction, provided they have adequate and appropriate land.

If the local self governments do not have adequate and appropriate land, they shall approach The State Government and The State Government shall lead the efforts to develop a regional or cluster landfill development by identifying the land and designing and constructing a landfill in accordance with the regulations. This landfill shall serve the local self governments that have participated in its establishment and whose waste quantities have been considered in the design of the facility. These facilities shall be owned and operated by The State Government.

Regulatory interventions:

- The State Government shall prepare a policy at state level for plastic waste management.
- As per Clause 6(4) of PWM Rules 2016, bylaws incorporating provisions of PWM rules 2016 shall be prepared.
- As per Clause 13 (1) of PWM 2016 Rules, guidelines on EPR shall be developed and implemented.

2.3 Non-biodegradable waste (other than plastics)

2.3.1 Definition

As per clause 3 (32) of the Solid Waste Management Rules 2016, non-biodegradable waste is defined as *any waste that cannot be degraded by microorganisms into simpler stable compounds*. This section deals with NBDW that is not plastic waste. Such waste typically include metals, cloth, paper, glass, and other inert non-recyclables.

2.3.2 Solutions

Recycle and Reuse: As per Clause 15 (h) of SWM Rules 2016, the recyclable portion of the NBDW shall be segregated at the Material recovery facilities/secondary storage facilities to be setup by the local self Governments and access shall be provided to recyclers/waste pickers empanelled with The State Government to collect such sorted recyclables. Local self governments (as per clause 15(u) of SWM Rules 2016) shall roll out *incentives scheme for recycling initiatives by informal waste recycling sectors (which shall be formalized through empanelment of these recyclers with The State Government progressively)*.

The amount of incoming waste and out-going materials shall be weighed, and data recorded digitally at the material recovery facilities/secondary segregation facilities. LSGs shall ensure compliance with respect to segregated waste collection, transportation, material recoveries and sale of recyclables etc. as per the guidelines to be prescribed by The State Government and shall report data periodically or online as per the digital system to be created and enforced by The State Government.

Processing: As per clause 18 of SWM Rules 2016, all industrial units using fuel and located within 100 km from a solid waste based refuse derived fuel plant shall make arrangements to replace at least 5% of their fuel requirement by refuse derived fuel or so produced. As such, NBDW (other than plastic) that are flammable may be disposed as RDF and sold to cement plants or other industries for heat recovery. The approach for the same needs to be considered by the LSGs as part of their SWM plan and shall mirror the same in contractual arrangements to be entered into by the LSGs for this purpose.

Disposal: As per Clause 15 (zi) of the SWM Rules 2016, treated NBDW that is not recyclable or cannot be processed/ is a residue of a recycling or treatment process shall be deposited in a SLF. The SLF should meet the regulatory requirements as per Schedule I of SWM 2016 Rules and guidelines for siting, design, construction and operation.

The SLF shall be developed by the local self governments if they can safely and adequately meet the regulatory requirements and develop a disposal facility within their jurisdiction, provided they have adequate and appropriate land.

If the local self governments do not have adequate and appropriate land, they shall approach The State Government and The State Government through an appropriate state level agency (which is adequately empowered by it) shall lead the efforts to develop a regional or cluster landfill development by identifying the land and designing and constructing a landfill in accordance with the regulations. This landfill shall serve the local self governments that have participated in its establishment and whose waste quantities have been considered in the design of the facility. These facilities shall be owned (by LSGSD, The State Government) and operated by the aforementioned state level agency or a contractor engaged for this purpose.

2.3.3 Strategy

Segregation of waste: As per clause 4(a) of SWM Rules 2016, all non-biodegradable waste shall be mandatorily segregated at source from other waste and stored in designated bins distributed by the local self governments to generators. The funds for provision of these bins shall be made available by The State Government.

Collection and transportation: As per clause 15 (b) of SWM Rules 2016, the segregated and stored non-biodegradable waste from all generators shall be collected daily by the collection and transportation workers engaged by the local self governments on payment of a monthly user charge as notified by the local self government or any other agency empowered by The State Government. The collected waste shall be transported to transfer stations for secondary segregation, weighing and recording.

Secondary segregation: The waste brought to the transfer station shall be segregated so as to get optimum value from recycling of waste. The segregated waste shall be weighed and stored in designated containers or demarcated areas within the transfer stations or designated warehouses.

Processing and Disposal: As per Clause 15 (h) of SWM Rules 2016, the sorted recyclable waste shall be stored and sold to empaneled recyclers/waste pickers with The State Government. The non-recyclable waste shall be disposed as RDF (described above) or disposed at the local or regional landfills. The local self governments shall strictly monitor and penalize residents/ institutions or private waste haulers for burning or open dumping of waste.

Regulatory Interventions:

- As per Clause 15 (e) of SWM Rules 2016, the Local Self Governments shall issue bylaws or guidelines for segregation, storage and handover of non-biodegradable waste

A detailed monitoring and surveillance mechanism and related fine structure (as per clause 15(zf) of SWM Rules 2016) should be developed by Local Self Governments to restrict and reverse the practice of unscientific methods (like burning and open dumping) of NBDW disposal.



2.4 Construction and Demolition Wasteⁱⁱ

2.4.1 Definition

As per Clause 3 (c) of Construction and Demolition Waste Management (CDWM) Rules, Construction and demolition wastes comprise of building materials, debris, and rubble resulting from construction, remodeling, repair and demolition of any civil structure.

C&D waste consists primarily of inert and recyclable materials such as concrete, plaster, metal, wood, plastics etc. Major Components: Cement concrete, bricks, cement plaster, steel, rubble, stone, timber/wood, conduits, pipes, electrical fixtures, glass, ceramics etc.ⁱⁱⁱ

2.4.2 Solutions

Storage facilities required at site: Bins and bags at homes/construction sites. Skips, tipper trucks for transport. Open grounds for segregated storage of different materials.

Reuse and recycling facilities: G.S.R. 317 (E) of CDWM Rules 2016, lays thrust on segregation, recovery, reuse and recycle of C&D waste. The C&D waste shall be reused or recycled based on the nature and degradation of the materials by following means:

Table 1: Managing C&D waste

C&D Waste	Recycle / reuse potential	Biodegradable	Potential for landfilling
Concrete	Recycled aggregate for road use; for new concrete	No	Yes
Steel	Recyclable as steel	No	No
Bricks and blocks	Backfilling, recycled aggregate	No	Yes
Glass	Finer glass as pozzolans in cement	No	Yes
Ceramic	Filling material as coarse aggregate for concrete	No	Yes
Aluminium	Recycle as Al	No	No
Plastic	Recycle to another product	No	No
Paint	Reusable as paint/ concrete admixture	Yes (some types)	No
Wood	As wood chips, fibre board, paper pulp	Yes	No
Cardboard	Composting, paper recycling	Yes	Yes

Recycling: Development of different types of C&D waste recycling facilities shall be promoted by the State Government (as per Schedule I of CDWM Rules 2016) and local self governments through private sector involvement. Potential facilities promoted shall include recycling of:

- Wood and wood products
- Cement and concrete recycling facilities
- Metal recycling

Disposal options shall be prescribed for disposal of non-recyclable or non-reusable C&D waste and they shall be destined to the local or regional landfills to be developed under the waste programme.

2.4.3 Strategy

C&D Waste guidelines: The State Government (on behalf of LSGs to ensure consistency) shall develop C&D waste reuses, recycle and disposal guidelines to be followed, after proper consultation and inputs from various stakeholders including from the building materials manufacturers and building contractors and in line with the national rules for management of construction and demolition waste (in line with Clause 6 (1) of CDWM Rules 2016). Guidelines for implementation of a public-private partnership model to provide for the contractors/ manufacturers to play a part in C&D waste management will also be framed.

Appointment of Companies for C&D waste management: As per Clause 4(4), generators shall keep the construction and demolition waste within the premise or get the waste deposited at collection centres so designated by the local self government or hand it over to the authorised processing facilities of construction and demolition waste. The State Government, through a transparent process, shall authorize sufficient number of C&D waste management agencies who can provide the services based on the guidelines provided. The State Government or the SWM technical staff of the Sanitation Mission will evaluate the capacity of these companies to provide the services based on the submission. The State Government shall also specify the rates for various materials; some will be collected for a fee or payment and others for free. It shall continually evaluate and specify rates based on supply and demand situation in the market for various recyclable materials.

Prior Authorization: All building construction or renovation or demolition activity shall need prior authorization under the revised guidelines⁶. The authorization request shall be accompanied with information on estimated quantities of construction or demolition waste generation, estimated timelines, contractors or agents who shall be appointed for picking up the materials and strategies for reuse, recycle, and/or disposal. These authorizations will approval at LSG level and need inspection, surprise site audits and post completion report. Daily volume of waste generated shall be reported to the local self governments or to state data repository.

Collection and Transportation: Based on list of authorized C&D waste management companies, all intending waste generators including contractors, builders and home owners shall contract out this service for an agreed fees (as per clause 4 (5) of CDWM Rules 2016) and should seek approval from the LSG of the plan as discussed under pre-authorization. Only such pre-approved Contractors shall be retained for removal of C&D waste as per the approvals provided by the local self governments.

Recycling: As per Clause 6 (11) of CDWM Rules 2016, the State Government shall develop an incentives provision for promoting recycling of C&D waste in situ or for use of materials made out of construction and demolition waste. The State Government, in cooperation with the state level nodal agency for SWM, shall ensure adequate numbers of various types of recyclers are promoted and transportation of waste for long distances are not undertaken. The scope for using the C&D waste mandatorily in road works will be examined, and appropriate instructions issued to all concerned, taking into consideration the Construction and Demolition Waste Management Rules 2016 which states that 10-20% materials made from construction and demolition waste shall be procured and utilized in municipal and Government contracts.

Disposal: The non-recyclable and non-reusable inert C&D waste shall be disposed safely in local SLF (managed by local self governments) or regional landfills (as per clause 3 of Schedule I of CDWM Rules 2016) developed and managed by The State Government. If the local self governments do not have adequate and appropriate land, they shall approach the State Government and the State Government through an appropriate state level agency (which is adequately empowered by it) shall lead the efforts to develop a regional or cluster landfill development by identifying the land and designing and constructing a landfill in accordance with the regulations. This landfill shall serve the local self governments that have participated in its establishment and whose waste quantities have been considered in the design of the facility. These facilities shall be owned (State Government) and operated by the aforementioned state level agency or a contractor engaged for this purpose. This land filling shall meet the requirements of SWM 2016 rules and guidelines for siting, design, construction and operations of SLF.

If there are hazardous materials or wastes (paint/ tube-lights/ batteries/ asbestos/ lead or other hazardous wastes) in C&D waste, the same shall be segregated and shall be sent to KEIL for treatment and disposal.

⁶ Clause 4(3) of CDWM Rules provides for waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis. The State Government would take a more prudent approach by bringing in approval process for all kinds of construction and demolition activities irrespective of the quantity of waste.



2.5 Biodegradable waste including Kitchen waste

2.5.1 Definition

Clause 3 (4) of SWM Rules 2016 define biodegradable waste as *all kinds of organic material that can be degraded by microorganisms into simpler stable compounds*. In the context of Municipal Solid Waste, food leftovers, vegetable peelings, expired food etc., or any biodegradable items discarded by households and commercial establishments/institutions such as restaurants, catering services, hotels, resorts, auditoriums, lodgings, etc. fall under this type.

Other wastes: In addition to food waste, biodegradable garden waste shall also be a part of this category.

2.5.2 Solutions

Source Treatment: Any or a combination of the following methods of source treatment are to be used by the generators who practice source treatment.

- Biogas plants
- Aerobins
- Biobins
- Pot compost
- Covered vermi-composting
- Biodigestors

LSG level or regional processing: The biodegradable waste/kitchen waste collected by the local self government or agencies engaged by local self governments require processing using any of the following technologies at LSG level of regional facilities.

- Anaerobic composting
- Aerated static piles
- In vessel composting with rotary drum
- Bio-methanation (preferred in regional level processing)
- Biogas to CBG (preferred in regional level processing)
- Thermophilic high-speed AD (preferred in regional level processing)
- Electricity, co-processing of BDW with septage (preferred in regional level processing)
- Feed for animal farms (LSG level)

2.5.3 Strategy

Segregation: As per clause 4(a) of SWM Rules 2016, all biodegradable kitchen waste should be mandatorily segregated at source from other waste and stored in designated closed bins (only) distributed by the local self governments to generators. The funds for provision of these bins shall be made available by the State Government.

Source Treatment: As per clause 15 (t) of SWM Rules 2016, treatment of biodegradable waste at source would be promoted by the state. The generators would be provided an option to opt in for source treatment and opt out from the collection services for BDW. However, in case of opting in for source treatment, the generator is bound to practice the same for at least a period of 6 months before they want to opt in for the collection system. Beyond 6 months of source treatment, any generator willing to switch to using the collection services by the local self governments shall be permitted to do so.

The current coverage of source treatment at 10% of the generators⁷ will be increased up to at least 20% of the generators (in next three years) through various schemes, programmes and IEC activities. The source treatment practiced by the opting generators must be strictly monitored by the SWM wing of the local self governments and reported to the Sanitation Mission (at the district level). The local self government should create and circulate a detailed guideline for source treatment aligned with its SWM plan and provide adequate handholding support to the generators choosing the same.

Collection: Clause 15 (b) of SWM rules 2016 mentions that the segregated and stored biodegradable waste from all generators (except the source treated waste) should be collected daily by the collection and transportation workers engaged by the local self governments on payment of a monthly user charge as notified by the local self government or any other agency empowered by the State Government. Daily collection can be undertaken as an outsourced service through a service provider or community enterprise, like the Haritha Karma Sena. The collected biodegradable waste should be strictly transported in closed vehicles to avoid spread of bad odour and accidental spilling of waste.

Where the collection services are outsourced to a community based network like the Haritha Karma sena , the LSG will be responsible for ensuring financially and demographically viable collection systems, provision of protective gear, functional systems of timely transfer of waste and other attendant matters, which would require that there is dedicated set up within the LSG to interface and coordinate with the community collection mechanism and the generator communities.

Transfer Stations: As per Clause 15 (h) of SWM Rules 2016, the local self governments shall identify land and develop fully equipped transfer stations/secondary segregation locations for segregation of collected NBDW into recyclables, non-recyclables, bio medical waste, E- waste and other hazardous waste, weighing and recording of collected BDW and intermediate storage of waste (if required). Transfer

⁷ As per the sample survey conducted across 12 ULBs in the state.

stations/secondary segregation locations shall have adequate space based on the incoming waste quantities and shall be equipped with necessary equipment or machineries. The local self governments should ensure that such transfer stations are located away from residential areas without causing any public nuisance.

All the collected waste is to be brought to the transfer stations (by the collection and transfer agency) for weighing and recording and intermediate storage (if required).

Processing: The biodegradable waste will be either treated at source or at the local self government level or regional level processing facility based on the system that has been built under the larger waste management plan for the local self government and the region. The local self governments as far as possible should drive efforts to identify and develop treatment/disposal facilities within the local self government jurisdiction (As per clause 15(v (a)) of SWM Rules 2016). Only when such facilities are not possible, will the local self governments (with the support of the State Government) try developing new regional facilities or participate in the existing facilities open for regional participation.

Sale or Removal of compost: The entity (local self government or regional waste agency) that is operating the BDW treatment facility will arrange for sale and removal of compost produced at these facilities for a fee or for free, based on the demand and supply situation, quality of compost and other market conditions. As per Clause 7 of SWM rules 2016, Department of Fertilisers (Ministry of Chemicals and Fertilisers, GoI) shall provide market development assistance and promote co-marketing of compost with chemical fertilizers. The Ministry of Agriculture, GoI as per Clause 8 of SWM Rules 2016, shall provide flexibility in Fertiliser Control Order for manufacturing and sale of compost, propagate utilization of compost in farms, set up labs to test quality of compost and issue suitable guidelines to maintain quality of compost.

Clause 15 (u) of SWM Rules 2016 directs local self governments to use compost in all parks, gardens maintained by the local self government and wherever possible in other places under its jurisdiction.

Disposal: Compost inert that cannot be processed or treated shall be deposited in a SLF (as per clause 15 (zi) of SWM Rules meeting the regulatory requirements of SWM 2016 Rules and guidelines for siting, design, construction and operations of a SLF (as per Schedule I of SWM Rules 2016). The SLF shall be developed by the local self governments if they can safely and adequately meet the regulatory requirements and develop a disposal facility within their jurisdiction, provided they have adequate and appropriate land.

If the local self governments do not have adequate and appropriate land, they shall approach the State Government and the State Government through an appropriate state level agency (which is adequately empowered by it) shall lead the efforts to develop a regional or cluster landfill development by identifying the land and designing and constructing a landfill in accordance with the regulations. This landfill shall serve the local self governments that have participated in its establishment and whose waste quantities have been considered in the design of the facility. These facilities shall be owned (by the LSGs in accordance with the guidelines on joint projects) and operated by the aforementioned state level agency or a contractor engaged for this purpose.

Open dumping of waste or inert material after treatment shall not be permitted and appropriate penal provisions shall be incorporated in local bylaws.

Regulatory Interventions:

- The state policies and guidelines would be streamlined and realigned to accommodate and ensure 100% daily collection and transportation of both BDW and NBDW (all NBDW types without exception). Exception for collection is limited only to the BDW that is to be source treated.
- While promoting source treatment, the state rules/policies/guidelines would not enforce the same upon any category of generators based on availability of space, quantity of waste etc. Kerala

Solid Waste Management – Construction and Demolition Waste

State Policy 2018 mentions a need for only collection of 'residual biodegradable waste'; this would be suitably modified.

- The state policies would clearly highlight the need for development of transfer stations or secondary segregation locations and specify the responsibilities of the local self governments regarding the same.
- The regulatory framework would provide for structured contracting terms and engagement models for the involvement of private agencies in SWM. The structural framework of engagement of community based service providers or entrepreneurs such as the Haritha karma sena should also be clearly stipulated and updated at regular intervals.
- Local Self Governments should issue and circulate by laws for SWM in line with the approved respective SWM plan (As per Clause 15 (e) of SWM Rules 2016).
- The bylaws or guideline for user fees determination must provide distinct criteria or rate slabs for household level and commercial/institutional level waste collection user fees relating it to the waste quantity or volume of business by suitable means (As per Clause 15 (f) of SWM Rules 2016).



2.6 Slaughterhouse Waste⁸

2.6.1 Definition

Any kind of discarded solid or liquid waste generated during production or processing of meat from live animals.^{iv} This type of wastes falls under the broad category of biodegradable waste as discussed before and are generated in large quantities at the various slaughterhouses.

The various types of waste generated from a slaughterhouse includes, animal hair, blood, flesh, stomach contents, various body parts, fecal discharge, etc.

⁸ Though Slaughterhouse Waste comprises of both solid and liquid waste, this strategy is only about management of solid slaughterhouse waste (and not the liquid waste).

2.6.2 Solutions

The slaughter waste can be handled in any of or a combination of the following methods.

- Biogas production
- Composting
- Rendering

2.6.3 Strategy

Storage: The slaughterhouse solid waste shall be stored in closed refrigerated containers at the slaughterhouses in the state.

Collection: The collection and transportation staff engaged by the local self government must collect the slaughterhouse waste daily from the licensed slaughterhouses. The slaughterhouse owners are required to pay user fees for the collection and disposal services for the waste as notified by the local self governments or the State Government, as the case may be. Any new slaughter houses developed subsequent to the issue of this strategy shall be subject to the same collection and transportation system prevailing in the LSG at that point in time. The LSGs shall ensure that their C&T arrangements prospectively cover new slaughterhouses as well.

Processing: The collected solid slaughterhouse waste should be processed using any of the methods discussed under 'solutions' section or may be co-processed with the BDW processing based on the quantity and quality of slaughterhouse waste and the treatment technology capability.

Disposal: Residue or inert after processing of slaughter waste shall be deposited in a SLF meeting the regulatory requirements of SWM 2016 Rules and guidelines for siting, design, construction and operations of a SLF.

The SLF shall be developed by the local self governments if they can safely and adequately meet the regulatory requirements and develop a disposal facility within their jurisdiction, provided they have adequate and appropriate land.

If the local self governments do not have adequate and appropriate land, they shall approach the State Government and the State Government through an appropriate state level agency (which is adequately empowered by it) shall lead the efforts to develop a regional or cluster landfill development by identifying the land and designing and constructing a landfill in accordance with the regulations. This landfill shall serve the local self governments that have participated in its establishment and whose waste quantities have been considered in the design of the facility. These facilities shall be owned (by the LSGs concerned as per the guidelines for joint projects) and operated by the aforementioned state level agency or a contractor engaged for this purpose.

The management of slaughterhouse waste (from collection to disposal) shall be as per the provisions of Chapter 5.4 of "Revised Comprehensive Industry Document on Slaughterhouses" issued by Central Pollution Control Board, MoEFCC, Govt in October 2017.

Regulatory Interventions:

- The local self governments should issue and circulate guideline for hygienic segregation, storage practices and overall management of slaughterhouse waste
- A clear guideline/by law issued at local self government level or by The State Government should clearly specify the criteria for determining user fee for collection of slaughterhouse waste.

2.7 Household Hazardous Waste^v

2.7.1 Definition

Household hazardous waste comprises of waste generated at household level which are hazardous due to physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive characteristics of such waste and is likely to cause danger to health and environment (either alone or in contact with other substances). Examples of household hazardous waste as per Clause 3(17) of SWM Rules 2016, are discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes, and contaminated gauge, etc. that are generated at household level^{vi}.

2.7.2 Solutions

Clause 15 (j) of SWM Rules lays upon the local self governments to carry out and 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. At the same time Clause A(x) of Schedule I of SWM Rules refers to the Hazardous and Other Waste Management Rules, 2016 for management of hazardous waste. Disposal in the context of hazardous waste management (as per clause 3 (10) of HOWM Rules 2016) includes only physio-chemical treatment, biological treatment, incineration and disposal in secured landfill.

2.7.3 Strategy

Segregation: Due to the hazardous nature of these waste, households should segregate and store HH hazardous waste (as per clause 4 (a) of SWM Rules 2016) for pick-up on specified dates (once or twice a month) or drop-off at the designated hazardous waste collection locations/kiosks set up by the local self governments. Bio medical and other hazardous waste should not be combined.

Collection and Transportation: The household hazardous waste shall be collected once or maybe twice a month (LSGs to indicate in their plans) on pre-announced dates by C&T workers or deposited at the deposition centres set up by the local self governments. Clause 15 (i) of the SWM Rules 2016 holds local self governments responsible for establishing deposition centres for domestic hazardous waste and give direction for waste generators to deposit domestic hazardous wastes at this centre for its safe disposal. and the waste so collected or received at deposition centres shall be transported to designated transfer station or secondary segregation locations for weighing, recording, safe storage (if required) and further transportation to disposal facility.

Secondary Segregation: At the transfer stations/secondary segregation location, the household hazardous waste shall be segregated by the deployed workers into biomedical waste and other hazardous waste. Personal protection equipment as mandated should be used by all persons coming into contact with the waste. It should be ensured that there is no direct manual handling. The segregated hazardous waste shall be weighed, recorded and stored.

Processing/Disposal: The secondary segregated bio medical waste should be handed over to IMAGE or other approved agency for processing biomedical waste for further processing and disposal. The LSGs should make necessary contractual arrangements for effective implementation of the same

Other hazardous wastes are to be safely transported and disposed through the hazardous waste management agencies, which appropriately treat and dispose the waste safely in hazardous waste landfill at KEIL. The LSGs should make necessary contractual arrangements for effective implementation of the same.

Regulatory Interventions:

- Household hazardous waste policy would be developed by the State Government after due consultation with the stakeholders and disseminated to the larger population through IEC activities.
- The definition and composition of hazardous waste would be clearly mentioned in the hazardous waste management policies of the state in line with the national policies. Government of Kerala would issue clear directions the LSGs in this regard.

Annexure

A1. Proposed Institutional Strengthening

The SWM Rules 2016 and subsequent NGT rulings have made MSW management an urgent environment issue. An end to end management of Municipal Solid Waste requires additional capabilities. In many instances, the State government is held accountable for implementation of rules and directions of NGT and other bodies. In these circumstances, The State Government shall empower the Sanitation Mission to integrate the functions of Environment and LSG Department to direct investments, develop regional projects, provide technical support and effectively monitor implementation by LSGs is essential. The roles and responsibilities would be as follows.

- Be the nodal waste management organization for the state to deliver the State's Solid Waste Management mission
- Develop cluster/ regional projects on PPP mode;
- Provide technical support and technical approvals to LSGs in Integrated Solid Waste Management
- Assist with financial approvals
- Audits/ performance reviews in the area of solid waste management
- Technical, regulatory, policy and guideline support in the waste sector.
- Provide digital and IT leadership for project management and data collection and analysis

The Sanitation Mission would coordinate and monitor the SWM related activities through district teams. Each of the district teams should coordinate, handhold and monitor the LSGs in the district in the management of solid waste.

The various parameters of monitoring shall be:

- Utilization of funds for SWM
- Achievement of service delivery benchmarks
- Condition of processing/treatment facilities
- Open dumping and burning of waste (site visits)
- Audit of source treatment
- Waste Generation Estimation by LSG

The Sanitation Mission will broadly have four major divisions relevant to Solid Waste Management:- Solid Waste Management, Special Waste Management, Finance and Capacity building. Each of the four divisions should be appropriately staffed with experienced professionals in the field of solid waste management.

The district teams of the nodal agency shall monitor and supervise service delivery and project implementation, assist project planning, facilitate cluster projects, and provide guidance on fund utilization. The district team shall be headed by district coordinators (Senior District Level Officers of LSGD). The district team shall include experienced Environmental Engineers or Solid Waste Management Experts and assisted by a team of assistant coordinators and programme officers corresponding to the State divisions.

References

i Kerala State Policy on Solid Waste Management 2018

ii Construction and Demolition Waste Management Rules, 2016

iii CPHEEO

iv Malav OP, Birla R, Virk KS, Sandhu HS, Mehta N, Kumar P, Wagh RV, Safe Disposal of Slaughterhouse Waste, Crimson Publishers, January 24, 2018.

v Hazardous and Other Waste Management Rules

vi Solid Waste Management Rules, 2016