



पेयजल एवं स्वच्छता विभाग  
जल शक्ति मंत्रालय  
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DEPARTMENT OF DRINKING WATER AND SANITATION  
MINISTRY OF JAL SHAKTI  
GOVERNMENT OF INDIA

सत्यमेव जयते



# Manual: Plastic Waste Management

July 2021



# **Manual: Plastic Waste Management**



# CONTENTS

<b>Preface</b> .....	<b>v</b>
<b>Chapter - 1: Introduction to the Manual</b> .....	<b>1</b>
Background .....	1
<b>Chapter - 2: Need for Plastic Waste Management</b> .....	<b>3</b>
Principles of Plastic Waste Management: Refuse, Reduce, Reuse and Recycle (4Rs) .....	5
<b>Chapter - 3: Step by Step Guidance for PWM</b> .....	<b>9</b>
<b>Chapter - 4: How to Plan for PWM</b> .....	<b>10</b>
<b>Chapter - 5: How to Implement PWM</b> .....	<b>14</b>
Implementation Strategy .....	14
Case Study on Plastic Smart Aryad GP .....	18
Case Study: Plastic Ban in Sikkim .....	20
5.1 Segregation and Collection .....	21
5.2 Construction of a Village Level Shed and Transportation to Block Plastic Waste Management Unit .....	24
5.3 Recycling Plastics .....	27
Case Study: Sirmaur Leads the Way in Plastic Waste Management .....	29
<b>Chapter - 6: Setting up Plastic Waste Management Unit</b> .....	<b>31</b>
Principle of Establishing Plastic Waste Management Unit .....	31
Machines/Equipment Required at the Plastic Waste Management Unit .....	33
<b>Chapter - 7: Running of PWMU</b> .....	<b>39</b>
7.1 Establishing Forward Linkages for Recovery .....	41
<b>Chapter - 8: IEC</b> .....	<b>49</b>
Role of District in IEC on Plastic Waste Management .....	49
IEC Activities can be Done Around .....	50
8.1 Capacity Building .....	52
Case Study: Plastic Waste Management – A Focus Area in East Khasi Hills .....	56

<b>Chapter - 9: How to Maintain PWMU .....</b>	<b>58</b>
Functionality of the Plastic Waste Management Unit .....	58
Grievance Redressal Mechanism .....	59
Record Maintenance.....	59
Case Study: Working Model of Plastic Waste Management in Kerala .....	61
<b>Chapter - 10: Monitoring for PWM .....</b>	<b>67</b>
<b>Chapter - 11: Funding Provision.....</b>	<b>70</b>
Funding for Plastic Waste Management Under SBM (G) Phase-II .....	70
<b>Chapter - 12: Annexures .....</b>	<b>71</b>
12.1 Plastic Waste Management Rules, 2016 .....	71
12.2 Type of Plastic.....	74
12.3 Scrap Rates for Various Types of Plastic in India.....	75
12.4 Notification by Ministry of Road Transport and Highways (MORTH) for Using Plastic in Road Construction.....	76
12.5 Extended Producer’s Responsibility .....	77
12.6 References.....	77

# Preface

The Government of India, in February 2020, approved Phase-II of the Swachh Bharat Mission (Grameen) (SBM [G]) with a total outlay of Rs. 1,40,881 crores to focus on the sustainability of Open Defecation Free (ODF) status and Solid and Liquid Waste Management (SLWM). SBM (G) Phase-II is planned to be a novel model of convergence between different verticals of financing and various schemes of Central and State Governments. Apart from budgetary allocations from Department of Drinking Water and Sanitation (DDWS) and the corresponding state share, remaining funds will be dovetailed from 15<sup>th</sup> Finance Commission (FC) grants to rural local bodies, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Corporate Social Responsibility (CSR) funds, and revenue generation models, etc., particularly for SLWM.

SBM (G) Phase-II has been uniquely designed to leverage the capacity of individuals and communities in rural India to create a people's movement to ensure that the ODF status of rural areas is sustained, people continue to practice safe hygienic behaviour and that all villages have solid and liquid waste management arrangements.

This manual has been developed to support rural local bodies implement ODF Plus initiatives effectively and efficiently in their settings. It provides detailed information on various technologies, estimated cost, Operation and Maintenance (O&M) arrangements, etc. This manual should be able to provide comprehensive guidance to achieve effective solid and liquid waste management in rural areas.

It is hoped that all implementers of Swachh Bharat Mission (Grameen) Phase-II would find this manual useful and a good guide for achieving ODF Plus objectives in their villages.

Department of Drinking Water and Sanitation  
June, 2021





This manual has been developed to support Plastic Waste Management (PWM) in rural areas of India. It is advisory in nature and should be used as a support document. District shall take into account the local condition and requirements to implement plastic waste management.





# CHAPTER - 1

## Introduction to the Manual

### Background

Plastic products have become an integral part of our daily life which has resulted into increased plastic consumption even in rural areas. Plastic waste has emerged as an important environmental challenge which needs to be addressed on priority. SBM (G) Phase-II strives to improve rural cleanliness through solid and liquid waste management activities, plastic waste management is a critical criterion for declaring villages as ODF Plus.

This manual provides advice on



Ensuring that villagers are aware of the harmful effects of plastic waste



Develop systems for segregation of waste at source



Creation of facilities of storage of the collected plastic waste



Developing a transportation system for the collected waste to the Plastic Waste Management Unit (PWMU)



Setting up of plastic waste management unit



Establishing forward linkages



Roles and responsibilities of state/district/block/ Gram Panchayats (GPs)



Financial management of PWM





# CHAPTER - 2

## Need for Plastic Waste Management

Safe disposal of plastic waste is a serious environmental problem. Being a non-biodegradable material, it does not decay over time and even if dumped in landfills, finds its way back in the environment through air and water erosion. Plastics can contaminate the groundwater, choke the drainage channels and can be eaten by grazing animals causing them illness and death.

As per the Central Pollution Control Board (CPCB) annual report for the year 2018–19 estimated plastic waste generation across the country during the year 2018–19 was around 33,60,043 tonnes/Annum. One of the major reasons for this is that most of the plastic is discarded as waste after a single-use. This also adds to an increase in the carbon footprint since the single-use of plastic products increase the demand for virgin plastic products.

### DID YOU KNOW

- Plastic waste is one of the many types of wastes that take too long to decompose. Normally, plastic items take up to **1000 years to degrade** in landfills. Plastic bags we use in our everyday life take approx. 500 years to decompose. A single water bottle can take up to 1000 years to break down.



- Over **600 marine species** in the world are affected by plastics. Nearly **45,000 marine animals** have **ingested plastics** and **80 per cent were injured or killed**. Plastics can pierce animals from inside or cause starvation, entanglement, loss of body parts and suffocation.



*Source: Plastic Waste Management: Issues, Solutions & Case Studies; Ministry of Housing & Urban Affairs, Government of India;*





## Environmental impacts of plastic waste

- Littering of plastic waste is a major environmental issue. It makes the land infertile, choke the drains, causes death of cattle when ingested, and gives an ugly look to the area. Open burning of plastic waste is a major health and environmental issue, as it emits toxic gases such as dioxin, furan and phthalates
- Leaching impact on soil, underground water, etc. due to improper dumping of plastic waste (contains metals and phthalates)
- Release of harmful gases such as carbon monoxide, formaldehyde, etc. during product manufacturing
- Leaching of toxic metals into underground water such as lead and cadmium pigments due to indiscriminate dumping of plastic waste on land
- Sub-standard plastic carry bags, thin packaging films, etc. pose problem in collection, recycling and reuse.



The Plastic Waste Management Rules (2016) issued by the Ministry of Environment, Forest and Climate Change aim at reducing uncollected plastic waste generated in the country. The rules are extended to rural areas for the first time, with specific duties demarcated for GPs. All GPs, blocks and districts are expected to abide by these Plastic Waste Rules. Details of the Plastic Waste Rules (2016) are provided in Annexure 12.1.





## Principles of Plastic Waste Management: Refuse, Reduce, Reuse and Recycle (4 Rs)

To reduce the harmful impacts of plastic waste on the environment and human health, effective management of plastic waste is necessary. Actions need to be taken at the district, block and village level for plastic waste management. Four Rs are proposed for plastic waste management which is presented in the following schematic:

**Figure 1: 4 Rs of plastic waste management**



The first three Rs – Refuse, Reduce and Reuse – are responsibilities of the households. The GPs are responsible for door-to-door and street collection of waste and construction of sheds at village for segregation. For the fourth R – Recycle – the recyclable plastic will be handed over to scrap dealers for further recycling and non-recyclable waste having shredded/separated combustible fraction will be recovered at cement industry or used for road construction or any other recovery method.





Most of the plastic used in day-to-day lives is non-recyclable and creates environmental issues. Recycling, reusing, or alternatively using plastic waste can help reduce the amount of virgin plastic produced. GP can play an important role in motivating people to refuse, reduce or reuse plastics to control the entry of virgin plastic in the environment.

**Refuse and reduce:** The villagers can choose to refuse plastic products and shift to environmentally friendly alternatives. Following are how one can refuse and reduce plastic use:

- Say no to plastic bags, plastic bottles, plastic cutlery**
- Avoid buying over-packaged items**
- Use other alternatives like cloth bags, metal cutleries, etc.**
- Use of biodegradable plastic items**

**Reuse of plastic:** Rather than throwing out items, consumers can find new uses for them and thereby reduce the consumption of new resources, for eg., use of plastic bags repeatedly, refilling plastic bottles for repeated uses, reuse of plastic containers at household level, etc.

### Single-Use Plastics

Single-Use Plastics (SUPs) are primarily made from fossil fuel-based chemicals (petrochemicals). Single-use plastics are most commonly used for packaging and service ware, such as bottles, wrappers, straws, and bags. Reducing the single-use plastics can help in reducing the amount of non-recyclable plastic waste generated.









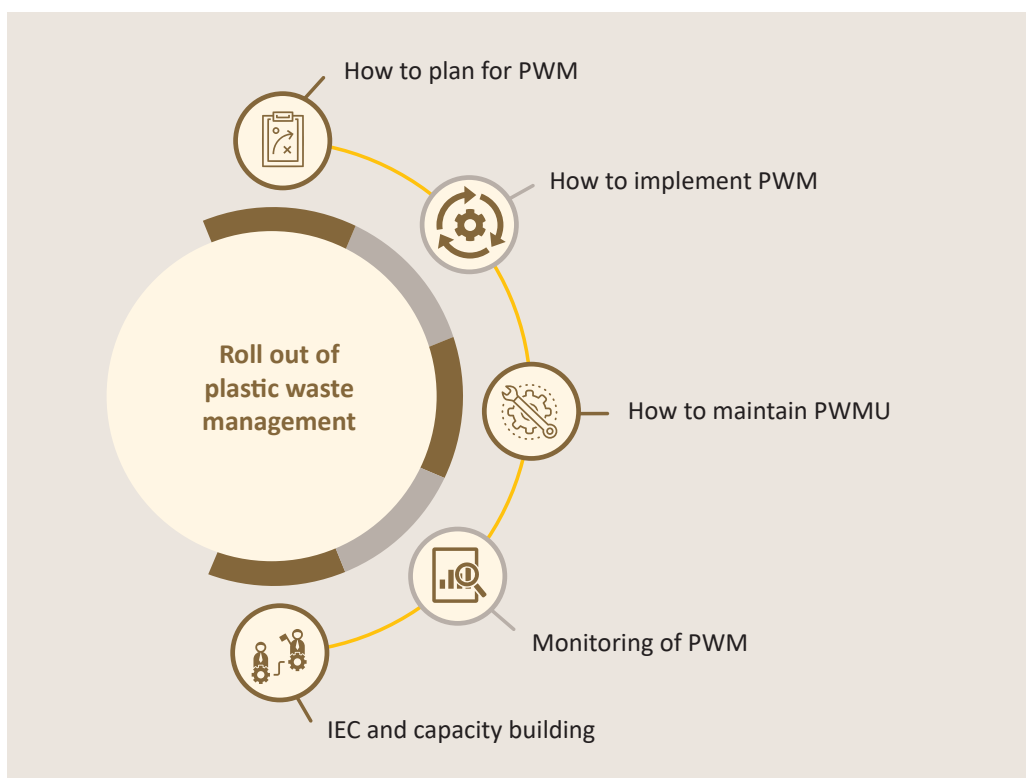
# CHAPTER - 3

## Step by Step Guidance for PWM

The overall objective of plastic waste management is to ensure the proper management of the plastic waste generated in the villages to protect both public health and the environment. For effective management of the plastic waste activities, planning, implementation, O&M and monitoring and evaluation of each step is required.

The proposed district/block level roll out of plastic waste management is therefore divided in five phases:

**Figure 2: Roll out of plastic waste management**



# CHAPTER - 4

## How to Plan for PWM

Planning is an important step for effective implementation of plastic waste management in the district. As per the SBM (G) Phase-II Guideline, plastic waste management should be part of the Village Action Plan (VAP)/Village Swachhata Plan (VSP). This will be included in the Gram Panchayat Development Plan (GPDP). The village level plans will be consolidated at block and district level and components regarding district-level activities will be added in the compilation to arrive at the district plan.

**Each village shall prepare a village action plan led by sarpanch/panchayat secretary and supported by VWSC for implementation of SLWM. Plastic waste management shall be a distinct component of this plan. Following shall be done as part of the PWMP:**

- Assessment of waste (type and quantity) generated at various levels viz. household level, institutions, health care centres, commercial areas and market areas
- Identification of persons for door-to-door collection for solid waste (plastic)
- Demarcation of place in a common village shed where collected plastic waste shall be stored
- Segregation of waste in every household, commercial centres, institutions, etc.
- To encourage individual household for aggregation of their plastic waste and sell it directly to the Kabadiwalas
- IEC activities to raise awareness regarding harmful impact of plastic waste and regarding roles and responsibilities of the stakeholders involved
- Identification of Kabadiwalas/plastic scrap dealers/recyclers
- Contact details of all Kabadiwalas should be pasted in a prominent location for easy access to all households and institutions, for e.g., all village panchayat offices, village shed schools, anganwadi centres, health centres, market places, etc.
- All forward linkages to be established for plastic recycling

**This plan shall be presented and adopted in Gram Sabha meeting and for integration in GPDP**





**Block level plan for plastic waste management needs to include the following:**

- Identification of site for setting up of plastic waste management unit
- Ensuring procurement of agencies and infrastructure/equipment
- Plan for transportation of plastic waste from the collection and aggregation centres (sheds at village level) to block management units based on the quantity of plastic waste generated, frequency of collection, capacity of the transporting vehicles, number of vehicle deployed, distance of the villages from the unit, etc.
- Block to ensure the disposal of aggregated plastics preferably at household level. Plastic aggregated collected from public places, markets, etc. and kept in village shed should also be linked to Kabadiwaals
- Plan for O&M of the centre
- IEC/IPC plan at block level
- Capacity building plan of key stakeholders
- Identification of plastic scrap dealers/recyclers





### District level plan for plastic waste management needs to include the following:

- Orientation of all block officials on PWM
- Agreement on implementation strategy
- Providing administrative sanction for setting up of PWMU
- Forward linkages for recovery at cement factories or use in road construction or any other appropriate technology as per proposed norms
- IEC/IPC plan
- Capacity building plan
- Monitoring of the O&M of the PWMU in the district
- Coordination meetings with other departments: Coordination meetings will be held with other departments for convergence of schemes
- Identification of plastic Kabadiwalas/ scrap dealers/recyclers
- A detail list of all existing Kawadawals with contact details be prepared by district. This shall be made available to all the GPs
- Progress reporting to centre and state





# CHAPTER - 5

## How to Implement PWM

District in consultation with block and GP should undertake a massive IEC campaign to generate plastic waste awareness. District Magistrate (DM)/District Water and Sanitation Committee (DWSC) shall convene a meeting of all Block Development Officers (BDOs) in the district and provide them with orientation and information of PWM work to be done in the district. Key activities to be undertaken at district, block and GPs shall be shared and roles and responsibilities informed. The district will also discuss the overall status and challenges of PWM and agree on an implementation strategy.

### Implementation Strategy

#### Phase-wise planning

The districts can take up plastic waste management in phases based on the status, size and topography of villages such as socio-economic status and availability of resources. Following are the probable options of phase wise planning which can be considered by the districts:

**Block saturation approach** – The district may consider saturation of one block at a time. In this approach, one block is targeted in one phase where plastic waste management activities are done in all GPs of the block and a cluster/block level management unit is set up and operationalized. This block will set an example for other blocks and the processes and activities will be up scaled in other blocks in phased manner.

**Low hanging fruits** – The district may consider targeting the low hanging fruits first. The GPs having collection vehicles, higher GP funds, progressive villages, etc. may be targeted first which may also set an example for other villages.

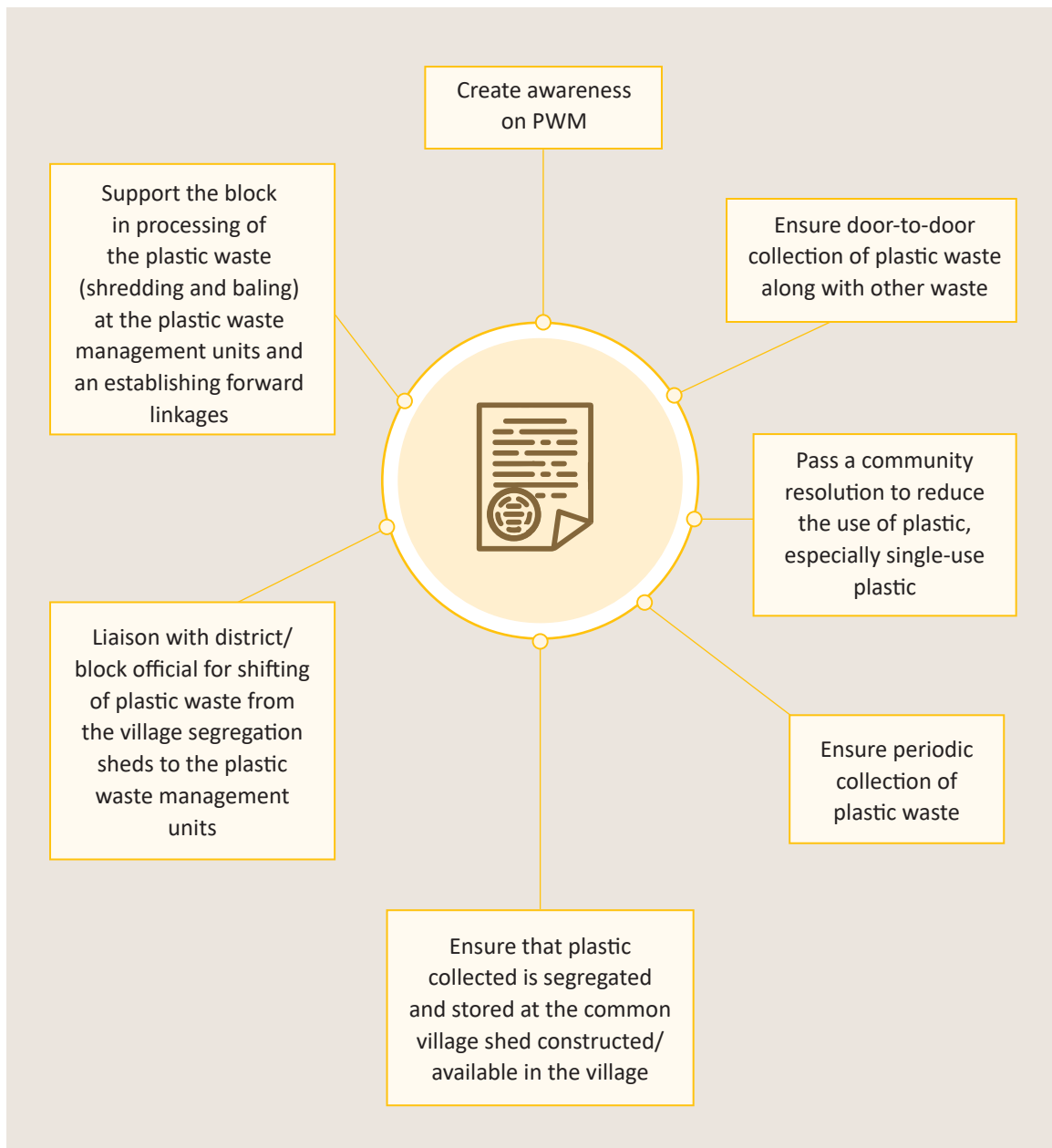
**Need based planning-** The GPs, where the need for plastic waste management is highest (e.g., LDVS, peri-urban GPs, census towns, etc.), may be targeted on priority.

**Involvement of BDOs**– All BDOs should organise a meeting with the sarpanches of all GPs to understand the challenges of plastic waste management. The BDO shall inform all GPs on the activities to be conducted at GP levels and financial provisions under SBM (G) and other sources. The BDO shall also orient GPs on developing their village plans and integration in the GPDP.





The GPs will lead the implementation of PWM at the village level. GPs shall be responsible for developing a village action plan on plastic waste management in consultation with community and integrate that with GPDP. Following specific activities shall be undertaken for PWM in the GP:

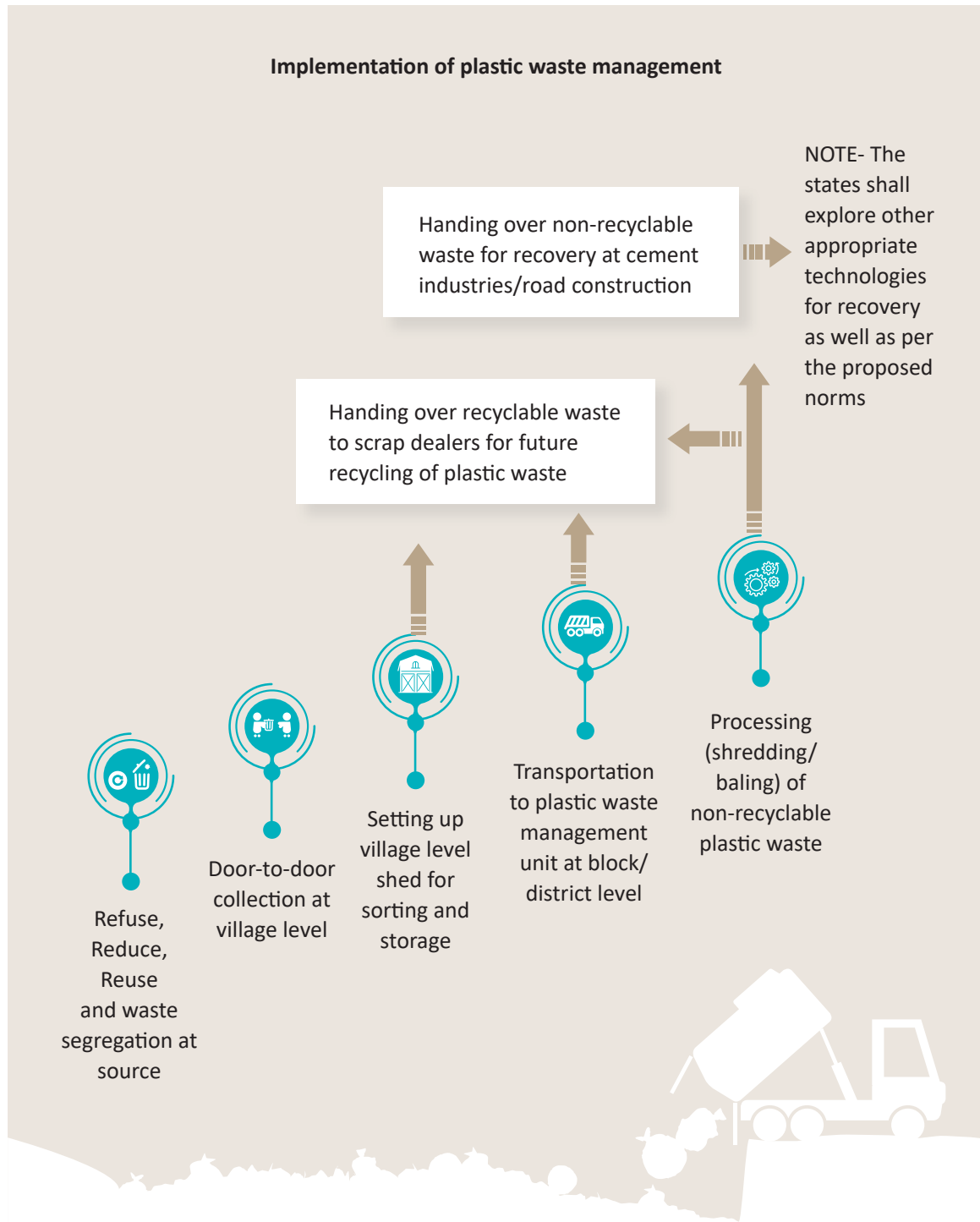


Block and district will support GPs in attainment of the above tasks.





**Figure 3: Implementation of plastic waste management**

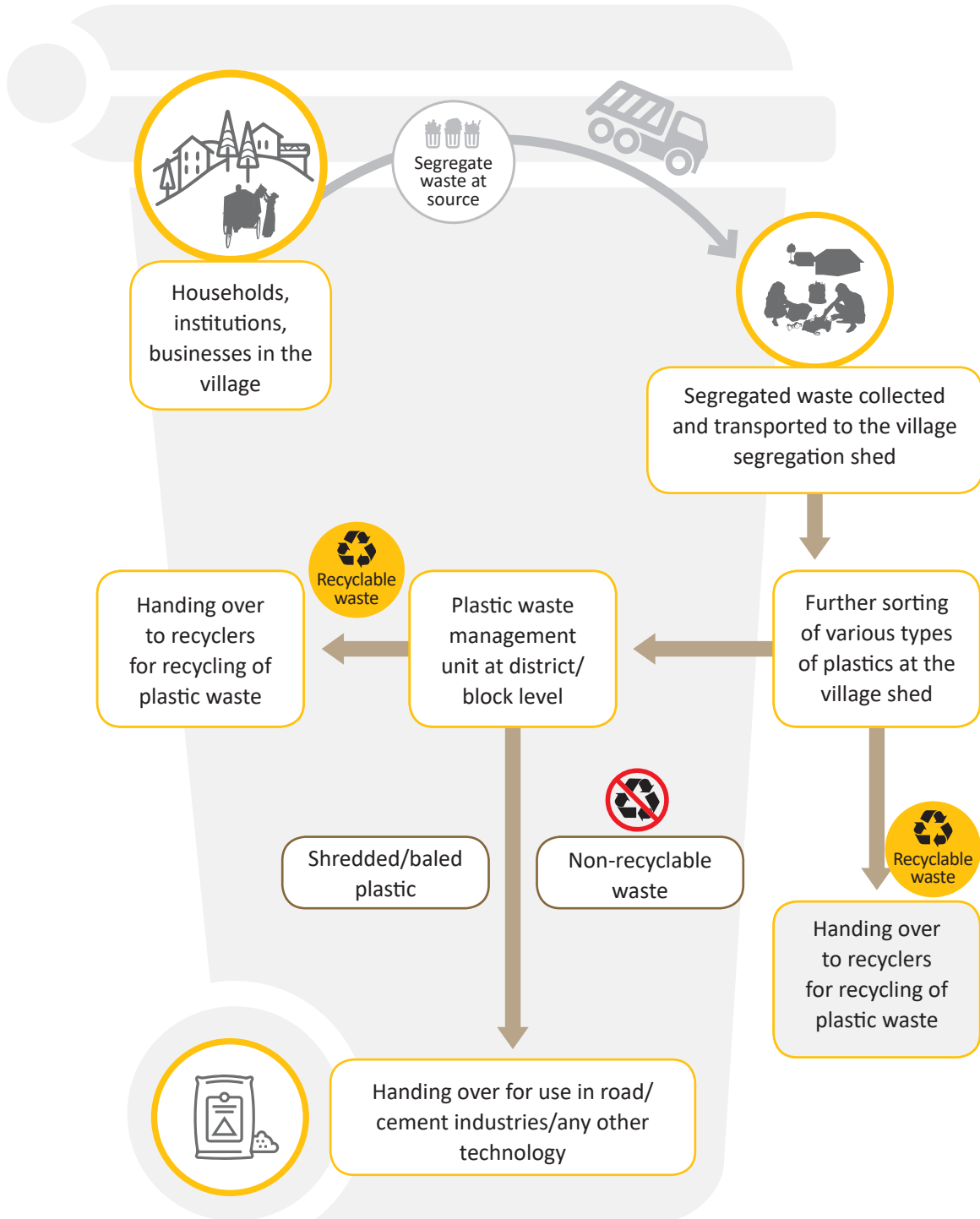






**Figure 4: Proposed process for plastic waste management**

These steps for implementation of plastic waste management are described below in detail:





## Case Study on Plastic Smart Aryad GP



*Inauguration of plastic shredding unit by Hon Finance Minister Dr. T.M Isaac*

Aryad Gram Panchayat, with a population of 30,983 and situated in Alappuzha district of Kerala, has found smart ways to use its plastic waste (below 50 microns) that were being littered and incinerated. The panchayat is all set to introduce recycled value-added products into the market and use shredded plastics for laying roads, under Suchitva Mission of Kerala Government.

Plastic from about 7000 homes and 500 mercantile institutions are collected by Green Force Volunteers (GFVs) and transported to plastic shredding unit near plasukulam in 6<sup>th</sup> ward where it is being shredded are being sold to clean Kerala company and other private agencies. A total of 36 Green Force Volunteers, are working in the panchayat where they visit the houses twice in a month and collect the waste. The quantity of waste material collected by GFV is recorded in the computer, through which the source of highest quantity of waste is monitored so that further steps can be taken.





## Monitoring system

A key highlight of this system is that monitoring based on QR code is done where carry bags are kept in each household to store plastic waste. A centralized mobile-web monitoring system is used for this purpose.

One room attached with the shredding is equipped with Wi-Fi. Each GFV is given an android smart phone. Collection bin materials with QR code are given to each house. The GFV, while making home visit, scans the collection bin using android phone which enables the shredding unit to record the same. A colour coded monitoring system is in place. Green colour indicates



User App Manual

regular home visits and yellow indicates one-time visit. Red colour signifies the reluctance by the resident to participate in this venture or GFV not visiting the area. Based on the visits, an exhaustive report is given to each GFV. Review meetings are convened every month where drawbacks are discussed and remedied in the presence of local body representatives and GFV.

## User fee system

An amount of Rs. 6,000/- is paid as monthly emolument to each GFV and 5 employees at the shredding unit. An amount of Rs. 30 from each household and Rs 100 from each institution is being collected each month. "One day One Rupee" campaign has also been launched by the panchayat to change the reluctant households.





## Case Study: Plastic Ban in Sikkim

Sikkim is a state ahead in green polices. Being a tourist place, waste generation is an important issue. Hence for the state, managing waste becomes an important task. In 1998, Sikkim became the first Indian state to ban disposable plastic bags and target single-use plastic bottles. In 2016 Sikkim banned the use of packaged drinking water in government offices and government events to reduce unnecessary burdens on dumping grounds. It also banned the use of styrofoam and thermocol disposable plates and cutlery in the entire state, in a move to cut down toxic plastic pollution and tackle its ever-increasing garbage problem.

With massive awareness drives and penalties, this ban has been impactful. Now the government is considering banning plastic bottles in the entire state. Various local NGOs are collaborating with various national and international organizations to find appropriate solutions for waste management in the Himalaya.

After Sikkim, 17 other states and union territories have also taken initiatives for plastic ban. Andhra Pradesh, Arunachal Pradesh, Assam, Chandigarh, Chhattisgarh, Delhi, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, Odisha, Tamil Nadu, Uttar Pradesh, Uttarakhand and West Bengal are states who currently impose plastic ban.





## 5.1 Segregation and Collection

### Segregation at source

Segregation of waste at source and its timely collection ensures proper utilization and cleanliness of the village. However, to ensure source segregation proper awareness activities, and strict compliance systems on the part of the GPs is necessary.

As per the Plastic Waste Management Rules 2016, it is the responsibility of the GP to ensure segregation and collection of plastic waste. However, the block and district level officials will support and guide the GPs in carrying out the segregation and collection process.

The households, institutions and commercial centres needs to segregate the non-biodegradable waste at source. They are expected to keep all types of plastic waste separately and provide it to the collector. The collected plastic waste will be further segregated in various types of plastics at the unit.

**The GPs can encourage effective segregation at source in following ways:**

- Different coloured bins in households/commercial institutions
- IEC/IPC on benefits and procedure of segregation
- Regular monitoring of percentage of segregation in each habitation/ward





**Figure 5: Plastic waste being collected from households**



### **Collection:**

The GP/village to look after the door to door collection of plastic waste from households, commercial areas, restaurants, markets, etc. and its transportation to the village segregation shed. The collection can be done by authorized collectors. Following points may be taken into consideration while collecting waste from the source:

- For collection and transportation of plastic waste, the existing vehicles may be redesigned with a partition of biodegradable and non-biodegradable waste
- Collectors to be given protective equipment such as gloves and appropriate tools for ensuring their safety while handling waste

**Note – Village level waste collectors should not collect those medical plastic waste, generated in the hospitals, as this needs to be treated as the bio-medical waste as per the norms set by the Government of India.**





### The district officials play an important role in collection of plastic waste:



Registration and certification to the local Kabadiwalas/waste collectors



Encouraging local individuals, SHGs, youth groups, etc. for plastic waste collection



Capacity building of waste collectors to collect and transport segregated waste in collection vehicles



Guidance to the GPs for implementation of the collection process and formal contracting



Regular monitoring during review meetings and sample field visit



### Prevention of open dumping of waste

Open dumping of waste is a common practice for waste disposal in the villages of India. The chemicals and non-biodegradable materials in the waste affect the physical environment and the waterways by contaminating groundwater and soil. The wastes can also spread weeds and pests, therefore, affecting agriculture and wildlife.

It is the responsibility of the GP to collect waste generated at source and prevent open dumping of waste.





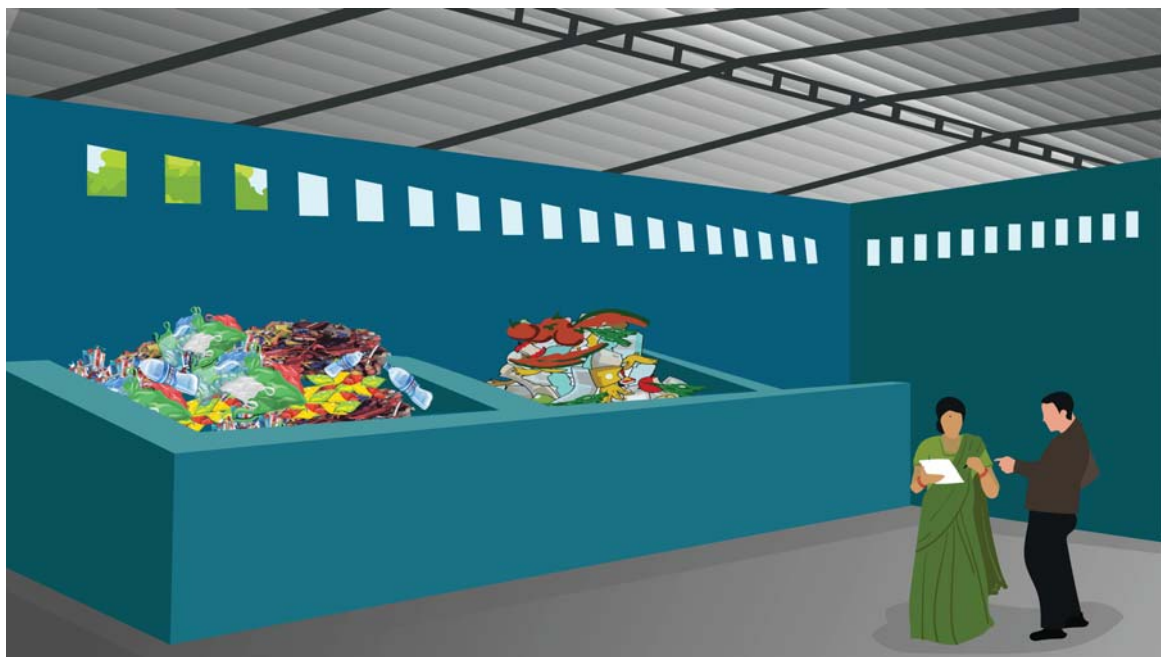
## 5.2 Construction of a Village Level Shed and Transportation to Block Plastic Waste Management Unit

### Construction of a shed

A common shed for bio degradable and non-biodegradable waste will be constructed in all Villages if not already existing. The village shed can be simple and can be made with locally available materials. The shed should be well ventilated, can have a roof and space for segregation. District/Block shall ensure timely transportation of the collected plastic waste from the village level shed to the plastic waste management unit.

### Secondary segregation and storage of plastic waste

The plastic waste collected from the households, institutions, businesses and public places can be further segregated into various types of plastics for its further processing and disposal. Different categories of recyclable dry waste can be handed over to the appropriately authorized recycler.







**Table 1: Types of plastics (Details can be seen in Annexure 12.2)**

Pictorial Representation	Type of recycling
	<p>Converted back to polymer and used for making apparel</p>
	<p>Converted to pellets and used to produce new HDPE</p>
	<p>These are used to produce new PVC or as feed for other manufacturing processes or as fuel for energy recovery</p>
	<p>Converted to pellets and used to produce new LDPE</p>
	<p>Converted to pellets and used to produce new pp</p>
	<p>Not recyclable</p>
	<p>Not recyclable – However, multilayer packaging could be crushed and turned into sheets and boards for roofing, using adhesives</p>

Currently only PET, HDPE and PVC plastics are recycled. Lids and bottle tops are not recyclable.

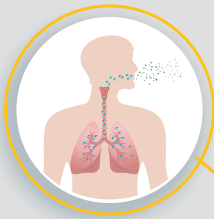




## Hazards of burning garbage

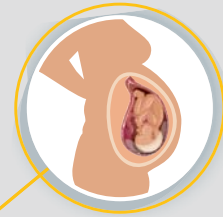
### Particle pollution

- \* Can aggravate asthma and bronchitis
- \* Have been associated with heart attacks



### Dioxins

- \* Are highly toxic
- \* Cause reproductive and developmental problems
- \* Damage the immune system
- \* Cause cancer



### Carbon monoxide and volatile organic compounds (VOCs)

- \* Cause headache, fatigue, nausea and vomiting
- \* VOCs cause damage to liver, kidney and central nervous system

### Ash

- \* Contains toxic metals such as mercury, lead, chromium and arsenic
- \* Rain can wash the ash into the ground and surface water, contaminating drinking water and food





## 5.3 Recycling Plastics

Plastic recycling is one of the most important actions currently available to make waste plastic into a useful product. Recycling helps to reduce the amount of waste sent to landfills. Plastics are inexpensive, lightweight and durable materials, which can readily be moulded into a variety of products that find use in a wide range of applications. The goal of recycling plastic is to reduce high rates of plastic pollution while putting less pressure on virgin materials to produce brand new plastic products. However, plastics have fibres which shorten every time it is recycled. Thus, there is often a finite number of times that plastic is recycled.

**Figure 6: Recycling of plastic**





### Role of district in ensuring plastic waste recycling

- ▶ Ensure enlisting of scrap dealers/recycler at all appropriate levels
- ▶ Capacity building of the scrap dealers regarding environment friendly collection, transport and recycling of plastic waste
- ▶ Efforts for promoting new vendors
- ▶ Guidance to the GPs for implementation of the process
- ▶ Regular monitoring during review meetings and sample field visit

### Benefits of recycling

- ▶ Reduces the amount of waste sent to landfills and incinerators
- ▶ Conserves natural resources such as timber, water and minerals
- ▶ Increases economic security by tapping a domestic source of materials
- ▶ Prevents pollution by reducing the need to collect new raw materials
- ▶ Saves energy
- ▶ Reduction of carbon dioxide emissions
- ▶ Generates employment

Plastic waste like bottles, broken plastic buckets, etc. that can be recycled, can also be sold to the scrap dealers/recyclers. The village can earn income through this. Same can be done at the block/district where the scrap dealers will get a maximum quantity of recyclable materials.

Annexure 12.3 indicates the scrap rates for various types of plastic in India.





## Case Study: Sirmaur Leads the Way in Plastic Waste Management

To address disposable plastic products, Mr. R K Pruthi, Deputy Commissioner (DC) of Sirmaur district in Himachal Pradesh has found novel ways of utilising non-biodegradable waste that is being accumulated in the district.

Plastic waste in the form of polythene bags, wrappers and bottles is now used to make poly benches, poly toilets and in road building. A ban on single-use plastics across the State certainly helped in this regard.

Thereafter, a machine was designed to compress waste into empty plastic bottles making them like bricks for use in construction.

Such poly bricks were distributed in all 2500 schools and 1862 Self Help Groups (SHGs) and 2330 Mahila Mandals and in 228 Gram Panchayats. At the Shillai block, models of protection walls and flowerpots made of poly bricks were displayed for people to replicate; demonstrating that plastic can be used in constructive ways.

In addition, the DC got a poly toilet constructed with waste plastic bottles; and a poly bench which is placed at the DC's office in Nahan. In addition, the Public Works Department (PWD) is constructing a one-km stretch of the Dhimki Mandir-Bonndpur Koon Road in Nahan using plastic waste.



(Source: <https://sbmgramin.wordpress.com>)





# CHAPTER - 6

## Setting up Plastic Waste Management Unit

A Plastic waste management unit/materials recovery facility, materials reclamation facility, materials recycling facility or Multi Re-use Facility (MRF) is a specialized plant that receives and segregates recyclable materials which may be marketed to end-user manufacturers.

Plastic waste management unit shall ideally be set up at Block level and shall cater to all GPs within the Block. District/Block shall identify an appropriate location for setting up of plastic waste management unit and shall hire an agency for its O&M. The plastic waste management unit operating agency could be SHG/NGOs/Private enterprises. Plastic waste management unit should have storage facilities of plastic received from GPs, the unit shall have a dust remover, a shredding machine and a bailing machine, among other necessary items.

### Principle of Establishing Plastic Waste Management Unit

- ▶ **Clustering of GPs:** Clustering of GPs which will transport their plastic waste to the unit
- ▶ **Selection of appropriate site:** Site that is centrally located, closer to the cement factories if possible, away from drinking water sources, having uninterrupted electricity supply, etc.
- ▶ **Procurement of appropriate plastic dust remover/baler and shredder:** As per the applicable financial rules Block/District shall procure the appropriate dust remover/baler/shredder of required capacity based on the quantity of plastic waste to be processed and quality of processing required by the recovery units
- ▶ **Management of the collection and transportation process:** Communication with concerned villages, listing and empanelment of transport facility providers, agreement/contracts with them, scheduling the transportation process, managing its implementation





- ▶ **Empanelment of O&M agency/service provider:** Empanelment of agency/service provider for regular O&M of the unit through finalization of scope of work, empanelment process, entering into a formal contract, etc.
- ▶ **Identification of recyclers for recyclable plastic**
- ▶ **Regular monitoring of O&M:** District Water and Sanitation Mission/Committee (DWSM/DWSC) to do regular monitoring of O&M

## Functions

- ▶ **Transportation** – PWMU will ensure transportation of collected plastic Waste from all GPs
- ▶ **Baling** – The baling technology can ‘press’ material such as a plastic films or PET bottles into neat cube-like bundles – with ease – so that they can then be sent for recycling/recovery. With the help of this technology, waste is compacted and stored in a safe and clean manner. Research has also shown that compacted bales pose less of a fire risk

**Figure 7: Plastic management unit in Kerala**







- ▶ **Shredding** – It is an efficient and effective solution for turning scrap materials into valuable resources no matter the size and shape of plastic. Shredders are extremely useful when working with plastic products, vinyl materials and PVC pipes. Plastic in any unwanted form can be transformed into manageable and useful material that can be used for making various products
- ▶ **Forward linkage** – Establishing linkage with recyclers, scrap dealers and for recovery at cement factories, road constructions and other
- ▶ **IEC** – Providing information on plastic waste management

## Machines/Equipment Required at the Plastic Waste Management Unit

### 1. Dust remover machine

Plastic dust remover is very useful to remove dust and mud from the collected plastic waste and PET before recycling/recovery process.

**Figure 8: Dust remover machine**





## 2. Plastic shredder

A plastic shredder is a machine used for cutting the plastic in small pieces to make waste management easier. Shredded plastic can be used in road construction.

**Figure 9: Plastic shredder**



The internal mechanical process of shredders includes, grinding, cutting, hammering, compression and more. There are also shredders incorporating sorting and shaking mechanisms. Plastic shredders are designed for shredding a wide variety of plastics and so, they vary from low speed to moderate speed with high torque and come in varying specifications and blade sizes. Output plastic can be designed as per the final processing unit it can range from 1 inch up to 3 mm.

Available in different makes and models, plastic shredders typically range from single shaft machines to an advanced four-shaft mechanism that includes grinders, granulators, hammers and cutters along with sorting and shaking functionality.

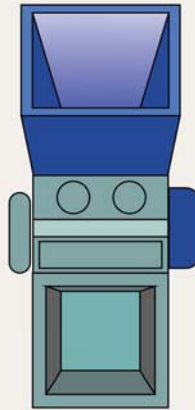
Depending on the size and type of plastic scrap to be processed, different industrial shredders are available for plastic shredding. The internal mechanism of a plastic shredder typically travels in lateral, vertical or rotary directions and the speed also varies depending on the material.





### Key considerations while selecting the appropriate shredding machine

- ▶ Quantity and characteristics of plastic waste to be processed
- ▶ Desired particle size and output requirement by the recovery facility
- ▶ Space needed for the machine set up and operations
- ▶ The life span of the equipment
- ▶ Easy to operate and maintain
- ▶ Manpower requirement
- ▶ Safety considerations
- ▶ Cost of the machine



### 3. Plastic baler

Balers are primarily used for compressing plastic materials into small and manageable blocks (bales) thereby reducing transportation and expenses incurred in storage of waste material. There are two major types of baler based on their motion – vertical and horizontal balers.

In the horizontal baling machine, the balers are larger machines loaded from the top of the conveyor belt, allowing large quantities of junk to be crushed. It can reach an output ranging 1 ton to 15 tons per hour. This automatic horizontal baling machine helps in dealing more efficiently from packing to transporting.





**Figure 10: (From left to right) Plastic baler; plastic waste being baled, ready bales of plastic stacked**



The vertical baler machines use the compressing force of the hydraulic cylinder to reduce the size of various waste materials and turn them into regular shape dense bales. The vertical baler machine can be loaded from the front. They are smaller and manually strapped and compressors from top to down.

Plastic balers can be operated manually or automatically. Many manufacturers offer a range of baler models and options which include mini balers, medium- to high-volume balers, etc. it is important to select the appropriate baler for specific requirements.





### Key considerations while selecting the appropriate baler machine

- ▶ Quantity and characteristics of plastic waste which needs to be baled. It is often recommended to plan on a minimum of 25 per cent growth when sizing the proper baler
- ▶ Space needed for the machine set up and operations
- ▶ Baler size and output requirement by the recovery facility
- ▶ Required size of bales/blocks considering the transportation chain
- ▶ The life span of the equipment
- ▶ Easy to operate and maintain
- ▶ Manpower requirement
- ▶ Safety considerations
- ▶ Cost of the machine





# CHAPTER - 7

## Running of PWMU

The collected plastic waste has its value which is well known to all. Collected plastic can be sold to the scrap dealers/recyclers at all levels. Linking private business entities/SHGs/NGOs can be a viable option in the entire value chain of plastic waste management (Segregation, collection, transportation and processing). In addition, this will result in revenue generation opportunities for community organizations. Cost recovery and revenue generation may be promoted.

**Figure 11: Schematic representing revenue generation models**



### Establishing partnerships

**Infrastructure creation:** Technical assistance can be sought for construction and operations of district/block level plastic management units





**Operation and maintenance:** Private organizations/waste collectors can be engaged in collection and transportation of waste. Also, service providers can be involved for O&M of the plastic waste management units for sorting waste

**Establishing linkages:** District/block level officers may establish linkages with registered local recyclers/aggregators to collect the dry waste from plastic waste management units periodically. District/block officials would facilitate the buy-back arrangements with road contractors for utilizing plastics in ongoing road construction projects in their district. DWSM/DWSC may also tie-up with cement companies present near their district for utilizing plastic in cement kilns.

### Benefits of engaging with the private sector

- I. Expertise in service delivery
- II. On-time services
- III. Transfer of technology
- IV. Innovative practices

### Indicative business models

- ▶ Entire GP level plastic waste management including village level waste collection, transportation to the village level shed and its further sorting at the shed may be outsourced to a single private operator
- ▶ Outsourcing O&M of plastic waste management unit at district/block level
- ▶ Involvement of Self Help Groups (SHGs), NGOs, etc. wherever feasible in O&M of PWMU along with the collection of plastic waste from the village shed. Also establishing forward linkages in a revenue generation model







## 7.1 Establishing Forward Linkages for Recovery

One of the important parts of the entire value chain of plastic waste management is to establish a proper forward linkage of the non-recyclable plastic collected baled and shredded plastics. As per the SBM (G) Phase-II guideline, the non-recyclable plastic which is processed in the Plastic waste management unit will be further sent for road construction/co-processing in cement industries or any other appropriate technology as per the norms.

The integration of mixed plastic waste for bitumen road is becoming an attractive and accessible option for authorities owing to the unsegregated nature of waste, improved quality of roads, and pothole filling. Co-processing of plastic in cement kilns offers a sound, environmentally viable mechanism to process non-recyclable, combustible plastic waste and simultaneously addresses the perennial challenge of waste management.

### Use of plastics in road construction

Plastic roads mainly use non-biodegradable material such as carry-bags, disposable cups, etc. that are collected from various sources as an important ingredient of the road construction material. When mixed with hot aggregates plastics melt to form an oily coat over the aggregate and the mixture is laid on the road surface like a normal tar road.

**There are four steps of using plastic in road construction:**



**Segregation:** Plastic waste collected from various sources is separated from other waste



**Cleaning:** Segregated non-biodegradable plastic waste gets cleaned and dried



**Shredding:** Different types of plastic wastes are mixed which gets shredded or cut into small pieces



**Collection and mixing:** Plastic waste of size 2.36 mm is used for this process. This shredded plastic waste is added in equal proportion to the aggregate mix which forms a coat over the aggregate particles. After which bitumen is added to this mixture and this can be used for road laying process (Vasudevan, 2018)





The details of the process are given below:

**Figure 12: Plastic waste being used in road construction**



This innovative technology has not only strengthened the road construction but also increased the strength and performance of the road. It has also reduced the need for bitumen making it an eco-friendly process.





## Government order for the Use of Plastics in Road construction



The Ministry of Road Transport & Highways, Government of India has made it mandatory for road developers to use waste plastic along with bituminous mixes for road construction to overcome the problem of disposal of plastic waste.

## Co-processing of plastic in cement kilns

Co-processing refers to the use of waste materials in industrial processes as Alternative Fuels or Raw Material (AFR) to recover energy and material from them. Due to the high temperature in cement kiln, different types of wastes can be effectively disposed without harmful emissions.

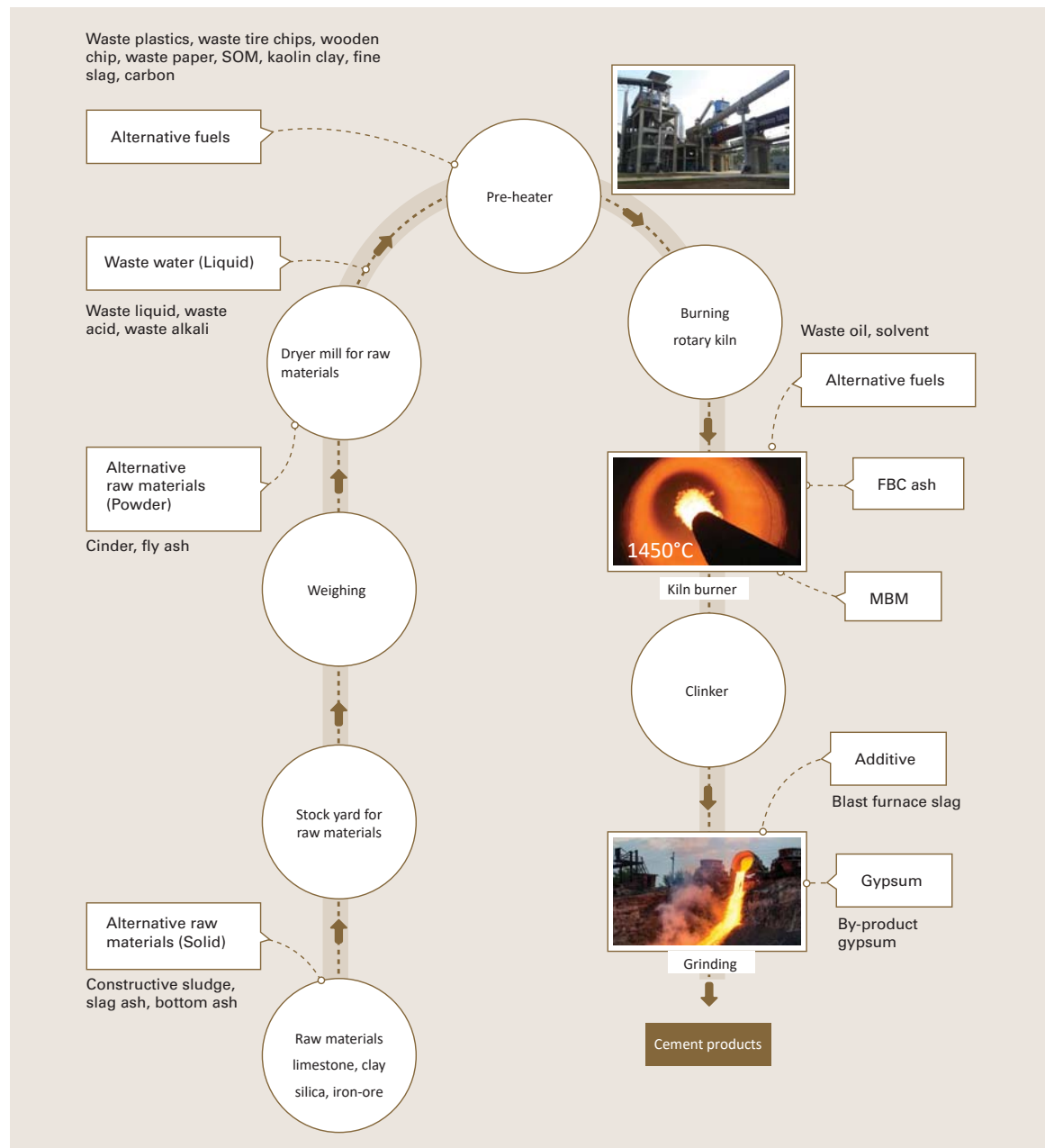
Usually, plastic wastes, that are contaminated with toxic components such as pesticides, etc., should be fed to the main burner to ensure its complete combustion in the high temperature and long retention time. For this, the plastics may need to be shredded to less than 20 mm size. The non-recyclable plastic wastes, that is not contaminated with toxic components, can be fed at the other feed points such as calciner, kiln inlet or mid kiln depending upon its size (CPCB, 2017).

Process flow diagram for co-processing of plastic waste in cement kilns along with the points of feeding of plastic waste is shown in the figure given below.





**Figure 13: Coprocessing of plastic in cement industry**



To get rid of plastic waste disposal problems, Central Pollution Control Board (CPCB) in association with MP Pollution Control Board has taken initiative to use the plastic waste in cement plant at ACC Kymore (Katni, MP). The stack monitoring result revealed that emission values are found below the standard set for Common Hazardous Waste Incinerators. After getting encouraging results CPCB has granted permission to many cement plants to co-process the hazardous and non-hazardous (including plastic) waste in their kilns after trial burns.





**Figure 14: Tiles made from recycled plastic**



The states/districts can explore appropriate technologies for recovery apart from road and cement industries as well, as per the proposed norms. Indicative list of technologies is provided below:

**1. Technology options for plastic waste recovery:**

Tiles (Re-tiles): Conversion of discarded plastic waste and convert it into tiles

**2. Irrigation pipes and tarpaulins:**

Ahmedabad Municipal Corporation (AMC) plans to manufacture irrigation pipes and tarpaulins from the used plastic. The authorities have set up a plant of 50 metric ton (MT) capacity for shredding of plastic and paper.

**3. Traffic cones:**

There are manufacturers that convert used PVC plastic into traffic cones, thus reducing the requirement on virgin plastic

**4. Recycled bottles for cleaners:**

High density polyethylene can be recycled to form the raw material for plastic bottles for household cleaners and shampoos

**Figure 15: Traffic cones made of recycled PVC plastic**



Ref: <https://www.civilsocietyonline.com/business/tiles-from-plastic-for-paths-and-roads/>; <https://www.dnaindia.com/ahmedabad/report-amc-six-tonnes-of-seized-plastic-to-be-recycled-into-irrigation-pipes-2638115>





## Best practices: Examples of use of plastics for road construction in India

- ▶ In Tamil Nadu, length of roads around 1000 m in various stretches were constructed using waste plastic as an additive in bituminous mix under the scheme “1000 km Plastic Road”, and found that, the performance of all the road stretches are satisfactory
- ▶ The performance of the road stretches constructed using waste plastic in Bangalore (Karnataka) is found to be satisfactory. More than 2000 km have been laid so far
- ▶ In Delhi a number of test sections about 50 km were laid and most of them are performing well
- ▶ In Himachal Pradesh, The DEST and PWD jointly conducted a pilot project in Shimla to test the use of plastic waste in road construction. The pilot demonstrated that the technology was cost effective and replicable, and provided a solution to utilize plastic waste in an innovative and prudent manner. Typically, each kilometre of road consumes a tonne of plastic, used directly without cleaning. This cost effective technology allows savings of approximately Rs. 35,000–40,000 per kilometre through reduced bitumen use



### OUTER RING ROAD

Stretch from Mysore road junction to silk board junction  
laid in year 2009 - 28 km using 66 tons of plastic waste



### BANGALORE UNIVERSITY ROAD

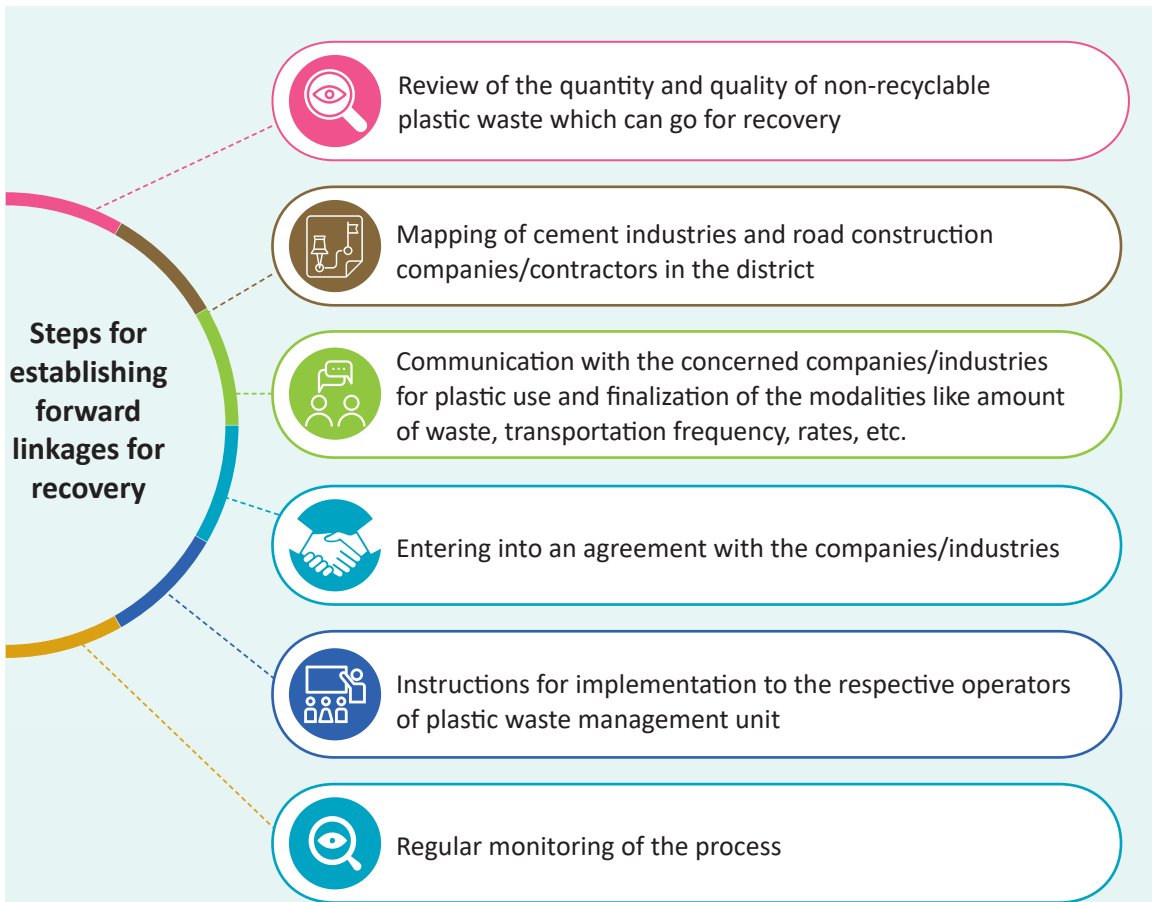
Roads inside Bangalore University laid in 2012 - 10 km  
using 23 tons of plastic waste



### PATTALAMMA ROAD

Pattalamma road laid in the year 2009 - 2 km using  
4 tons of plastic waste







01 Use a reusable produce bag --  
Give up gum...  
02 Buy boxes instead of bottles...  
03 Purchase food, like cereal, pasta,  
and rice from bulk bins and fill a  
reusable bag or cone  
04 Reuse containers for  
or the produce in bulk





# CHAPTER - 8

## IEC

Along with the creation of infrastructure for ODF Plus villages, SBM (G) Phase-II aims at behaviour change of the masses to adopt better sanitation and hygiene practices. Developing (IEC) strategies, planning and effective implementation is the key to the success of the Mission. In the case of plastic waste management, IEC is extremely crucial to achieve the first three Rs of the plastic management chain- refuse, reduce and reuse. IEC activities will be targeted at ensuring that the village has a minimal plastic litter and household adopts segregation of waste. Creating awareness among the villagers, their orientation and behaviour change is necessary.

### Role of District in IEC on Plastic Waste Management

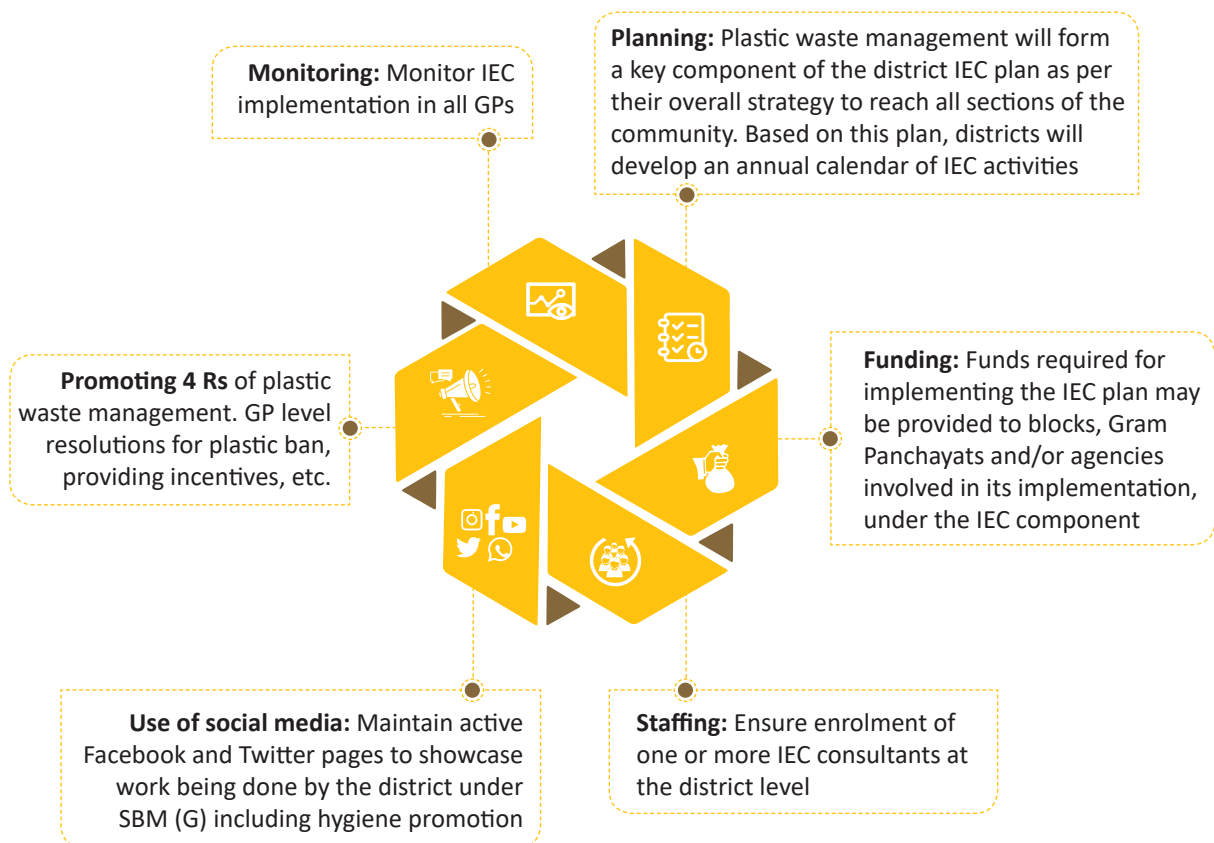




Figure 16: IEC messages



## IEC activities can be done around

- Curbing the use of single-use plastic
- Harmful impacts of plastic waste and its importance
- Segregation of waste at source
- Harmful effects of burning plastic waste
- 4Rs of plastic waste management – Reduce, Reuse, Refuse, Recycle
- Ways to minimize the plastic waste generated by homes and villages
- Alternatives to plastic
- Do's and Don'ts regarding plastic waste management





Figure 17: Segregation at village level





## 8.1 Capacity Building

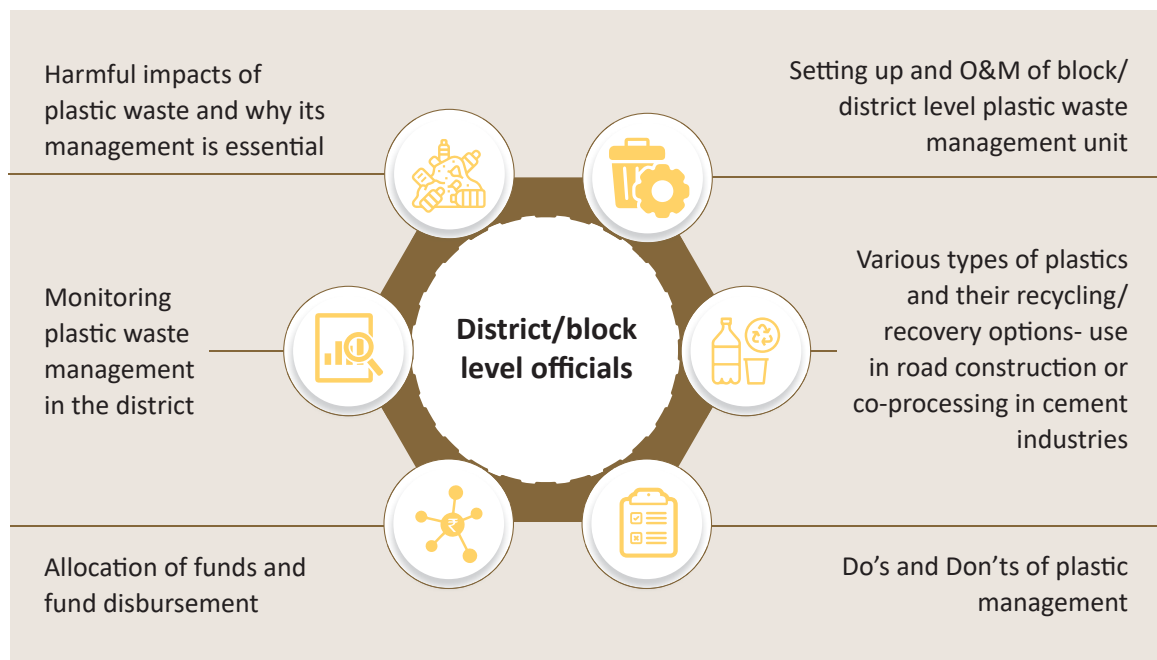
Building capacity of key stakeholders is necessary to plan, implement and monitor ODF Plus activities. The key stakeholders need to be trained on different aspects including promoting behavioural change through IEC, construction activities, quality supervision, operation and maintenance, retrofitting, etc.

Apart from the district/block and PRI officials, capacity building of swachhagrahis – who will be the frontline human resource for taking forward the ODF Plus initiatives – is also crucial, which was evident in SBM (G) Phase-I

### Topics for capacity building of stakeholders

The schematic below provides a list of topics that should be covered in trainings of various stakeholders (Indicative list).

**Figure 18: CB topics for district/block level officials**





**Figure 19: CB topics for PRIs and swachhagrahis**

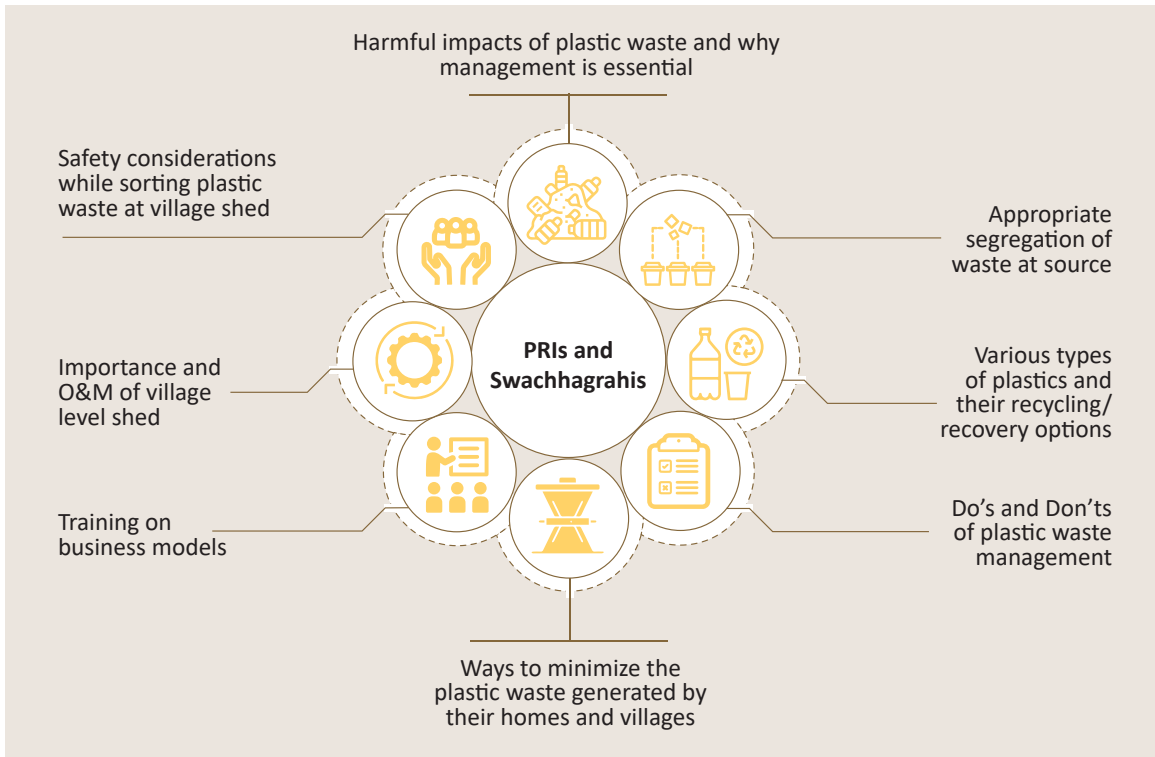




Figure 20: Do's and Don'ts of plastic waste management

### Do's and Don'ts of Plastic Waste Management for the Community

#### Do's

- Use jute bags, paper bags, cloth bags, glass jars for storage
- Segregate the plastic waste
- Make sure that the bottles, food containers or cans are all free from food residue before disposing them
- Stuff multiple plastic bags into one to prevent them from flying away and causing litter

#### Don'ts

- Use single-use plastic
- Dump plastic waste in open/litter public places
- Indulge in open burning of plastic waste
- Send non-recyclable plastic for recycling
- Recycle toxic plastic material such as paint cans, pesticide containers, etc.
- Mix e-waste, glass, metal, etc. with plastic waste





## Steps for capacity building of stakeholders

Schematic below provides the steps that should be taken up by the district to deliver trainings on plastic waste management to various stakeholders

Preparation of calendar of events for plastic waste management at district and block levels including the topics of CB initiatives, target stakeholders, tentative dates and venue of the training, etc. and its implementation

Identification and empanelment of resource persons for various topics regarding plastic waste management

Monitoring of the trainings and other CB events through sample visits, reports and review meetings

**Figure 21: Training programmes for various stakeholders**





## Case Study: Plastic Waste Management – A Focus Area in East Khasi Hills

East Khasi Hills is the first district in Meghalaya to take up initiatives for plastic waste management as a part of its ODF Plus activities commenced on a trial basis in a few villages on 12th July 2019.



Following the identification of cluster villages in 11 blocks as well as pickup and exit points for movement of plastic waste; segregation of waste at source, collection and transportation of waste to designated centres began in earnest.

While the collected waste was transported to a common stock yard at the district headquarters and rest given to a scrap dealer for onward transportation to cement companies to be used as fuel and also to other sites for use in construction of roads.

Of the 16.955 metric tons of waste collected, 10.000 metric tons was used for road construction (Internal Road in Sohra, East Khasi Hills District); 4.000 metric tons in cement factory (Star Cements, Lumshnong, East Jaintia Hills District); and 2.955 metric tons was sold to scrap dealers; the total financial transaction amounting to Rs. 5,08,650 and income generated standing at Rs. 2,54,325.



The PWM exercise if standardized could be upscaled to become a source of regular monetary incentives to sustain the swachhagrahis who are primarily involved in the collection, sorting and transportation of plastic waste. To ensure sustainability of the efforts undertaken under PWM, the district has come up with a ‘Block-level PWM model’ under which all organizational and functional requirements are standardized.







# CHAPTER - 9

## How to Maintain PWMU

The operations and maintenance of plastic waste management services includes aspects like O&M of the plastic waste management unit, grievance redressal mechanism and record maintenance protocol. These are elaborated below:

### Functionality of the Plastic Waste Management Unit

**Followings need to be done to keep the PWMU functional:**

- Ensuring timely collection of Plastic Waste from the village sheds
- Operation of the units as per specifications
- Daily maintenance like disinfection, lubrication, cleaning of the screens and the shredding/grinding surfaces, checking air filters, etc.
- Periodic maintenance of all the components in the unit
- Sharpening, adjusting, or eventually replacing of shredding/grinding surfaces (cutters, blades, or hammers)
- Maintaining sanitary conditions in the premises
- Ensuring safety procedures and use of safety gears to protect against sharp surfaces and edges and potentially infectious waste
- Checking and replacement of fire extinguishers as required
- Identifying recyclers for recyclable plastic
- Establishing sustainable forward linkages

The list of service providers for repairing needs to be maintained at the unit to ensure timely repairs and maintenance of the parts.





## Grievance Redressal Mechanism

A mechanism needs to be set up through which the consumers can raise their complaints or grievances regarding plastic waste management services. The maximum time within which the complaint needs to be addressed has to be pre-decided. Following options can be considered by the district for grievance redressal:

- Keeping a register at GP/block/district offices wherein complaints can be registered
- Establishing a helpline number where the consumers can register their complaints
- Use of online platforms like the creation of social media groups, setting up dedicated email ids, establishing portals, etc. where complaints can be registered

The responsibility of grievance redressal will be as follows:

- Complaints regarding door to door collection, transportation and operation of the village level shed: Village secretary, GP members
- Complaints regarding district/block level plastic waste management units: Concerned operators; monitored by the block and district

## Record Maintenance

The records that need to be periodically maintained by the concerned operators are given in Table 2.





**Table 2: Records needed for plastic waste management**

<b>Door-to-door collection, transportation of plastic waste</b>	<ul style="list-style-type: none"> <li>▶ Amount of waste collected</li> <li>▶ Frequency of collection</li> <li>▶ Mode of collection</li> <li>▶ Status of segregation at source transportation of the waste to the village shed</li> </ul>	GP level official
<b>Operations of the village level segregation shed</b>	<ul style="list-style-type: none"> <li>▶ O&amp;M of the village shed</li> <li>▶ Amount of plastic waste handed over to scrap dealers</li> <li>▶ Amount of plastic waste transported to the district/block level plastic waste management unit</li> <li>▶ Complaints received and their redressal</li> <li>▶ Financial records</li> </ul>	GP level official
<b>Operations of the plastic waste management unit</b>	<ul style="list-style-type: none"> <li>▶ Amount of waste received from the villages</li> <li>▶ Amount of plastic waste shredded and bailed</li> <li>▶ Amount of recyclable and non-recyclable plastic waste sent for recycling and recovery</li> <li>▶ O&amp;M of the machines</li> <li>▶ Maintenance log of the machines with work carried out, break down and scheduled maintenance, defects or abnormalities noticed financial records</li> </ul>	Block/district level official
<b>Handing over to road/cement industries</b>	<ul style="list-style-type: none"> <li>▶ Amount of plastic waste sent to cement industries</li> <li>▶ Amount of plastic waste sent for road construction</li> <li>▶ Type of the plastic sent</li> <li>▶ Detail of transport such as date, time and vehicle no.</li> <li>▶ Record of revenue generated</li> </ul>	Block/district level official
<b>IEC activities</b>	<ul style="list-style-type: none"> <li>▶ No. of IEC activities conducted</li> <li>▶ No. of beneficiaries</li> <li>▶ No. of villages covered</li> </ul>	IEC specialist, M&E cum MIS consultant at district level
<b>CB activities</b>	<ul style="list-style-type: none"> <li>▶ No. of CB activities conducted</li> <li>▶ Type of activities</li> <li>▶ No. of beneficiaries</li> <li>▶ No. of villages covered</li> </ul>	HRD and capacity building specialist, M&E cum MIS consultant at district level
<b>Financial records</b>	<ul style="list-style-type: none"> <li>▶ Amount of funds utilized for PWM under various schemes</li> <li>▶ Amount of funds disbursed to blocks</li> <li>▶ Revenue generated from PWM</li> </ul>	M&E cum MIS consultant at district level





## Case Study: Working Model of Plastic Waste Management in Kerala

### About the state

Kerala has 14 administrative districts, 6 Municipal corporations, 87 Municipalities 941 Gram Panchayats. Total waste production is 10044 MT/day. About 402 TPD of plastic gets generated in Kerala.

### Who all were the stakeholders

An enterprise group named as Haritha Karma Sena (HKS) was entrusted with non-biodegradable waste collection wherein 2 persons per ward were deployed. They were organized & trained by the State Poverty Eradication Mission (Kudumbasree)

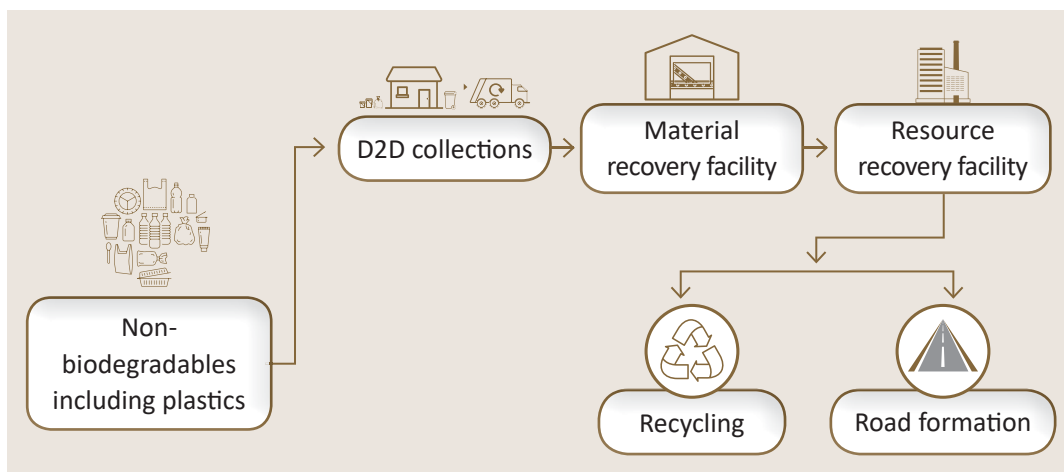
### How did they accomplish this?

This system has become financial viable due to the support provided by the consumers in the form of a user fee. The leftover financial assistance is provided by the GP fund. Rs.23,175/- for 6 months and Rs. 11,600/- for next 6 months

### Monthly user fee: Community approach to waste management

A monthly user fee is collected from the consumers on the basis of the services used by them. The charges ranged from Rs. 60 to Rs. 800 per household per month depending upon the type and frequency of waste collection

### System design: How did they do it?



*\*One MCF is required for a GP with a population size of 20,000*





## Infrastructure development

### Step 1: Construction of a Material Collection Facility

This facility helps implement secondary segregation and also acts as a storage unit.



Currently, 354 MCF Operational with a storage capacity of 620 TPD and about 107 MCF under construction. The storage capacity will increase to 770 TPD





## Step 2: Construction of a Resource recovery facility



**Plinth area:** 1000 sq.ft (92.80 sq.m)

**Land required:** 5.00 cent

**Estimated cost:** Rs. 8.80 lakh

This facility helps in segregation, storage and recycling of non-biodegradable waste brought from Material Recovery Facility (MRF). One RRF for one Block Panchayat (with a population size of 1.4 lakh) have been constructed. The facility has been provided with shredding machine, bailing machine and dust remover. Currently 81 RRF are operational and 62 are under construction.





## Understanding the expenses

### MCF & RRF — Capital expenses & O&M

#### For One Block with 7 GPs

MCF building (7 Nos x Rs.5.25 L)	Rs. 37.70 Lakh
RRF building (1 No)	Rs. 8.80 Lakh RRF-
Plastic shredder (1 No)	Rs. 5.20 Lakh
RRF- bailing machine (1 No)	Rs. 5.30 Lakh
RRF- dust remover machine	Rs. 4.29 Lakh
<b>Total for 35000 HH</b>	<b>Rs. 60.34 Lakh</b>
Investment per HH-I- Rs. 174/-	

#### Tentative income (Monthly)

Selling price for slu-edded plastics (Rs. 181- per kg)	Rs. 6,04,800/-
Selling price for e-waste (Rs. 321- per kg)	Rs. 16,000/-
Selling price of glass (Rs. 1150 per kg)	Rs. 12,600/-
<b>VGf support</b>	Rs. 17,000/-
<b>TOTAL</b>	Rs. 6,50,400/-

#### O&M cost (Monthly)

Transportation from MCF to RRF	Rs. 25000/-
Salary to HKS for O&M of RRF (4 No. x Rs.10000/-)	Rs. 40000/-
Plastic procurement cost (Rs. 15 x 33600 Kg)	Rs.504000/-
E-waste procurement a (Rs. 10 x 500 kg)	Rs. 5000/-
Glass procurement (Rs.1 x 8400 kg)	Rs. 8400/-
<b>Total</b>	<b>Rs. 5,82,400/-</b>

Selling price for LD plastics	Rs. 15/— per kg
PET bottles	Rs. 18/- per kg
Mixed plastics	Rs. 15/- per kg
Paper cup	Rs. 5/- per kg
Aluminium foil	Rs. 34/- per kg







### Establishing forward linkages

The forward linking of non-bio waste is undertaken through Clean Kerala Company Ltd, a company formed under Local Self Government Department, Govt. of Kerala. The details are given below.

Item	Forward linking
Clean, dry, shredded recyclable plastics	Handed over for recycling
Clean, dry, shredded non-recyclable plastics	Used in road preparation
Glass & broken glass	Handed over for recycling
Used bags/chappals	Handed over for recycling
E-waste	Handed over for recycling
Medicine strips	Handed over for recycling

During 2018–19, the state supplied 395 ton of shredded plastics for mixing with bitumen to PWD for road construction

### Behaviour change communication using green protocol

Green protocol is a unique programme which was successfully introduced in National Games 2015. Green protocol is now being followed in various events and functions (both Gov and Pvt).



#### Key initiatives undertaken in this:

- ▶ Disposable free: No plastic bottles, cups, plates, etc. used at any event
- ▶ Currently, 215 state level offices out of 399, 756 district level offices out of 1114 and 190 block level offices out of 358 have completed first level activities in green office campaign
- ▶ 17 major festivals and all the state level functions by Govt departments observe green protocol thereby waste generation is reduced



Source: <http://sujal-swachhsangraha.gov.in/sites/default/files/Story%20-%20PWM%20initiatives%20in%20Kerala.pdf>





# CHAPTER - 10

## Monitoring for PWM

In order to keep things on track, a robust monitoring system needs to be in place. This helps to measure overall implementation quality, progress, and output of plastic waste management activities in the district. District officials are responsible for regularly monitoring these activities.

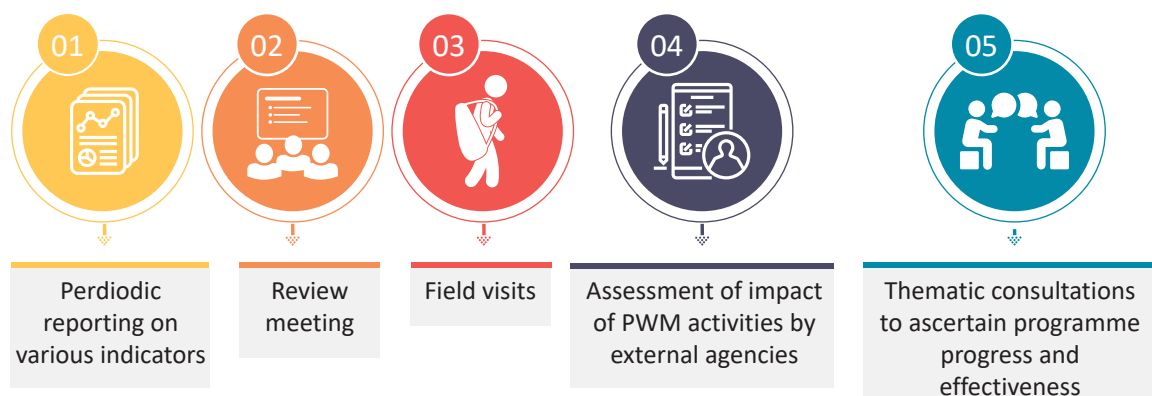
### For PWM to happen district/block/GP to ensure the following:

- ▶ District to regularly monitor the functioning of PWMUs in the blocks and plastic waste management activities in GPs
- ▶ Block to regularly monitor the functioning of PWMUs and plastic waste management activities in GPs
- ▶ GPs to manage plastic waste management activities in the villages

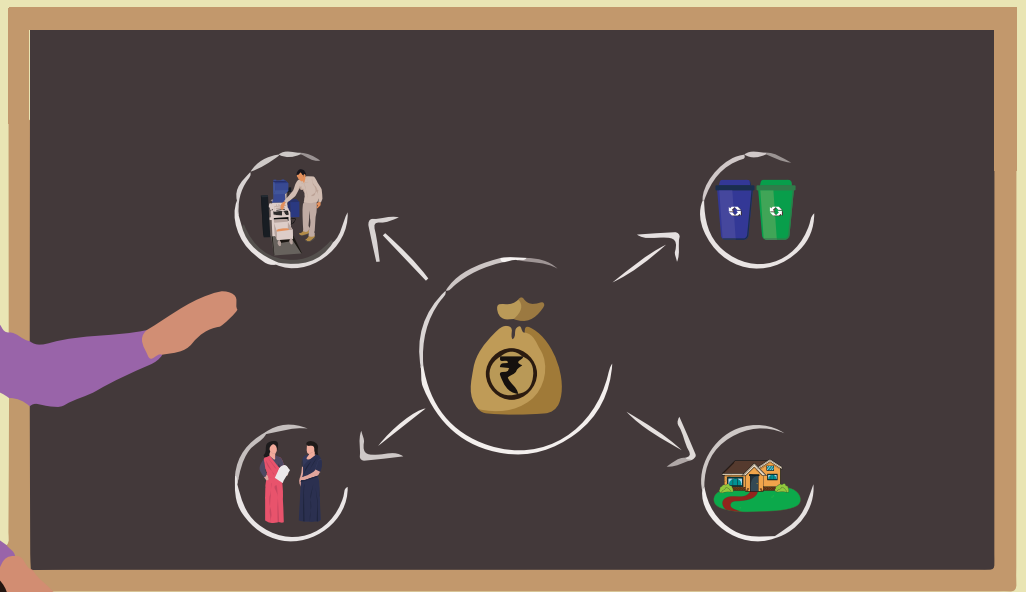
### What to monitor?

- ▶ Process and protocol of ODF Plus verification and declaration
- ▶ No. of villages with regular door-to-door collection of waste
- ▶ No. of villages with village-level sheds for sorting waste
- ▶ No. of district/blocks with plastic waste management units
- ▶ Timely collection of plastic waste from village sheds
- ▶ Amount of plastic waste sold to scrap dealers/recyclers, amount of plastic waste handed over for recovery in road and cement industries, etc.
- ▶ O&M of the district/block level plastic waste management units

### How to monitor indicative methods for monitoring







# CHAPTER - 11

## Funding Provision

For successful implementation of SBM (G) Phase-II, robust financial planning, timely funding, mobilization of adequate resources and prudent utilization of funds are extremely important. The possible funding resources for plastic waste management activities are:

### Funding for Plastic Waste Management Under SBM (G) Phase-II

Based on the convergence a comprehensive plan for Plastic Waste Management as a part of GPDP shall be prepared.

Available financial assistance for SWM under SBM (G) is as mentioned below:

Upto 5000 population	Solid waste management upto Rs. 60 per capita
Above 5000 population	Solid waste management upto Rs. 45 per capita
<b>Note:</b> <ul style="list-style-type: none"><li>30 per cent of this amount will be borne by the GPs from their 15<sup>th</sup> FC grants. Each village can utilise a minimum of total Rs. 1 Lakh based on their requirements for both solid waste and greywater management</li></ul>	
Plastic waste management unit (one in each block/district)	Upto Rs. 16 lakh per unit

GPs can source additional fund from other sources besides SBM (G) Phase-II such as 15<sup>th</sup> FC grants MPLAD/MLALAD/CSR funds or through convergence with MGNREGS or other schemes of the state or Central Government, etc.

Wages, where needed to be paid for collection of waste from the household, can be sourced from 15<sup>th</sup> FC and construction of shed from SBM (G), 15<sup>th</sup> FC, SFC or other sources.



# CHAPTER - 12

## Annexures

12.1 Plastic Waste Management Rules, 2016

12.2 Type of Plastics

12.3 Scrap Rates for Various Types of Plastic in India

12.4 Notification by Ministry of Road Transport and Highways (MORTH) for Using Plastic in Road Construction

12.5 Extended Producer Responsibility

12.6 References

## 12.1 Plastic Waste Management Rules, 2016

The Plastic waste (Management and Handling) Rules were first notified in 2011 to address the issue of scientific plastic waste management. In 2016, the by the Ministry of Environment and Forest & Climate Change (MoEFCC), Government of India notified the Plastic Waste Management Rules, 2016, in suppression of the earlier Plastic Waste (Management and Handling) Rules, 2011.

### Aim

**The Plastic Waste Management Rules, 2016 aim to:**

- ▶ Increase minimum thickness of plastic carry bags from 40 to 50 microns and stipulate minimum thickness of 50 micron for plastic sheets also to facilitate collection and recycle of plastic waste
- ▶ Expand the jurisdiction of applicability from the municipal area to rural areas, because plastic has reached rural areas also
- ▶ To bring in the responsibilities of producers and generators, both in plastic waste management system and to introduce collect back system of plastic waste by the producers/brand owners, as per extended producers responsibility
- ▶ Introduce collection of plastic waste management fee through pre-registration of the producers, importers of plastic carry bags/multi layered packaging and vendors selling the same for establishing the waste management system





- ▶ Promote use of plastic waste for road construction as per Indian Road Congress guidelines or energy recovery, or waste to oil, etc. for gainful utilization of waste and also address the waste disposal issue; to entrust more responsibility on waste generators, namely payment of user charge as prescribed by local authority, collection and handing over of waste by the institutional generator, event organizers
- ▶ An eco-friendly product, which is a complete substitute of the plastic in all uses, has not been found till date. In the absence of a suitable alternative, it is impractical and undesirable to impose a blanket ban on the use of plastic all over the country. The real challenge is to improve plastic waste management systems

### **About the Plastic Waste Management Rules, 2016**

- ▶ Rural areas have been brought in ambit of these Rules since plastic has reached to rural areas also. Responsibility for implementation of the rules is given to Gram Panchayat
- ▶ For the first time, responsibility of waste generators is being introduced. Individual and bulk generators like offices, commercial establishments, industries are to segregate the plastic waste at source, handover segregated waste, pay user fee as per bye-laws of the local bodies
- ▶ Plastic products are left littered after the public events (marriage functions, religious gatherings, public meetings, etc.) held in open spaces. First time, persons organising such events have been made responsible for management of waste generated from these events
- ▶ Use of plastic sheet for packaging, wrapping the commodity except those plastic sheet's thickness, which will impair the functionality of the product are brought under the ambit of these rules. A large number of commodities are being packed/wrapped in to plastic sheets and thereafter such sheets are left for littered. Provisions have been introduced to ensure their collection and channelization to authorised recycling facilities
- ▶ Extended Producer's Responsibility (ERF): Earlier, EPR was left to the discretion of the local bodies. First time, the producers (i.e. persons engaged in manufacture, or import of carry bags, multi-layered packaging and sheets or like and the persons using these for packaging or wrapping their products) and brand owners have been made responsible for collecting waste generated from their products. They have to approach local bodies for formulation of plan/system for the plastic waste management within the prescribed timeframe
- ▶ State Pollution Control Board (SPCBs) will not grant/renew registration of plastic bags, or multi-layered packaging unless the producer proposes the action plan endorsed by the concerned State Development Department
- ▶ Producers to keep a record of their vendors to whom they have supplied raw materials for manufacturing carry bags, plastic sheets, and multi-layered packaging. This is to curb manufacturing of these products in unorganised sector
- ▶ The entry points of plastic bags/plastic sheets/multi-layered packaging in to commodity supply chain are primarily the retailers and street vendors. They have been assigned the responsibility of not to provide the commodities in plastic bags/plastic sheets/multi-layered packaging which do not conform to these rules. Otherwise, they will have to pay the fine







- ▶ Plastic carry bag will be available only with shopkeepers/street vendors pre-registered with local bodies on payment of certain registration fee. The amount collected as registration fee by local bodies is to be used for waste management
- ▶ CPCB has been mandated to formulate the guidelines for thermoset plastic (plastic difficult to recycle). In the earlier Rules, there was no specific provision for such type of plastic
- ▶ Manufacturing and use of non-recyclable multi-layered plastic to be phased in two years

### Plastic Waste Management (Amendment) Rules 2018

The Ministry of Environment, Forest and Climate Change has notified the Plastic Waste Management (Amendment) Rules 2018 on March 27, 2018.

- ▶ The amended Rules lay down that the phasing out of Multi layered Plastic (MLP) is now applicable to MLP, which are “non-recyclable, or non-energy recoverable, or with no alternate use.”
- ▶ The amended Rules also prescribe a central registration system for the registration of the producer/importer/brand owner. The Rules also lay down that any mechanism for the registration should be automated and should take into account ease of doing business for producers, recyclers and manufacturers. The centralised registration system will be evolved by Central Pollution Control Board (CPCB) for the registration of the producer/importer/brand owner. While a national registry has been prescribed for producers with presence in more than two states, a state-level registration has been prescribed for smaller producers/brand owners operating within one or two states
- ▶ In addition, Rule 15 of the Plastic Waste Management (Amendment) Rules 2018 on “explicit pricing of carry bags” has been omitted

### Responsibilities of GP






Every Gram Panchayat either on its own or by engaging an agency shall set up, operationalize and co-ordinate for waste management in the rural area under their control and for performing the associated functions, namely:

- Ensuring segregation, collection, storage, transportation, plastic waste and channelization of recyclable plastic waste fraction to recyclers having valid registration; ensuring that no damage is caused to the environment during this process;
- Creating awareness among all stakeholders about their responsibilities; and
- Ensuring that open burning of plastic waste does not take place







## 12.2 Type of Plastic

	<b>Polyethylene terephthalate</b>	1	Yes	Water bottles, soft drink bottles, food jars, films, sheets, furniture, carpets, panelling	Converted back to polymer and used for making apparel
	<b>High-density Polyethylene (HDPE)</b>	2	Yes	Milk pouches, bottles, carry, base cups	Converted to pellets and used to produce new HDPE
	<b>Polyvinyl Chloride (PVC)</b>	3	Yes	Pipes, hoses, sheets, wire cable insulations, multilayer tubes, window profile, fencing, lawn chairs	Pyrolysis, hydrolysis and heating are used to convert PVC waste into calcium chloride, hydrocarbon products and heavy metals. These are used to produce new PVC or as feed for other manufacturing processes or as fuel for energy recovery
	<b>Low-density polyethylene (LDPE)</b>	4	Maybe recycled (depends upon recycler)	Plastic bags, various containers, dispensing bottles, wash bottles	Converted to pellets and used to produce new LDPE
	<b>Polypropylene (PP)</b>	5	Maybe recycled (depends upon recycler)	Disposable cups, bottle caps, straws, auto parts, industrial fibres	Converted to pellets and used to produce new pp





Pictorial Representation	Name of plastic	Code	Recyclable or not	Few applications	Type of recycling
	<b>Polystyrene (PS)</b>	6	No	Disposable cups, glasses, plates, spoons, trays, CD covers, cassette boxes, foams	Not recyclable
	<b>Others (O)</b>	7	No	Thermoset plastics, multilayer and laminates, nylon SMC, FRP, CD, melamine plates, helmets, shoe soles	Not recyclable – however, multilayer packaging could be crushed and turned into sheets and boards for roofing, using adhesives

## 12.3 Scrap Rates for Various Types of Plastic in India

Sr. no.	Types of Plastic scrap	Rate in Rs/Kg (indicative) as on 04.11.2020
1.	ABS (bayr)	127
2.	Acrylic	127
3.	API	134
4.	C.PW	41
5.	HD blowing	84
6.	HD moulding (Colour)	98
7.	Hips (Baff)	99
8.	LLDP blowing	102
9.	PVC pest grade	92
10.	PVC resin desi	73
11.	PET bottles baled	13
12.	Plastic PVC	22
13.	No.1 plastic (PET)	17
14.	No.2 plastic (HDPE)	14
15.	No.3 plastic (PVC)	20
16.	PET flakes hot washed	44
17.	PET bottle scrap	29

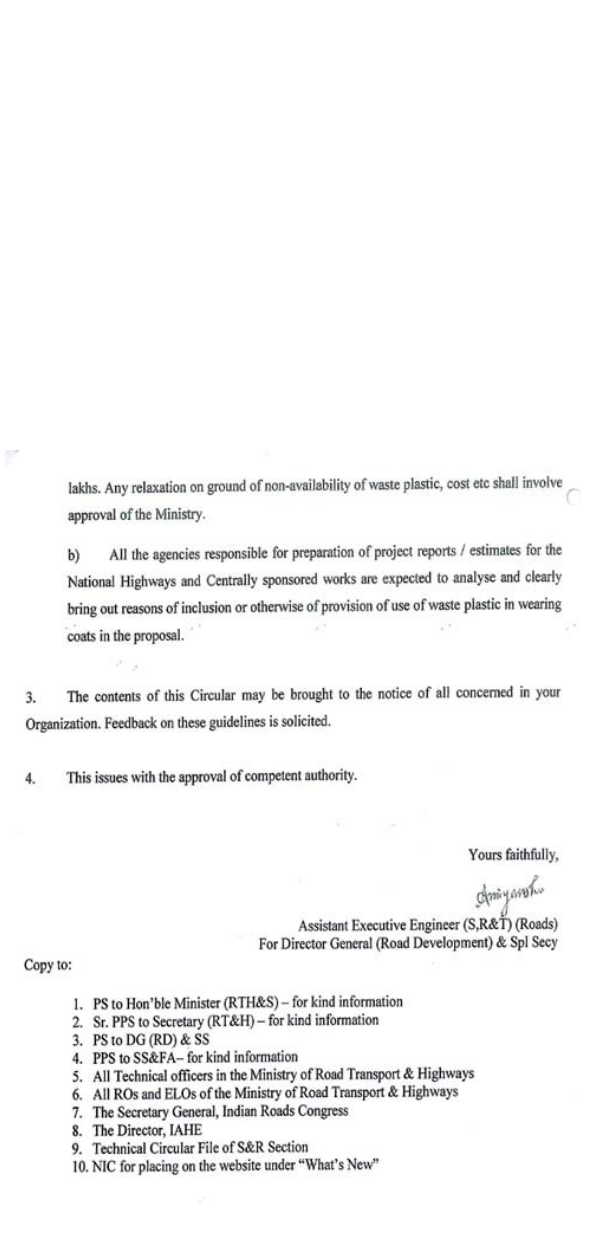
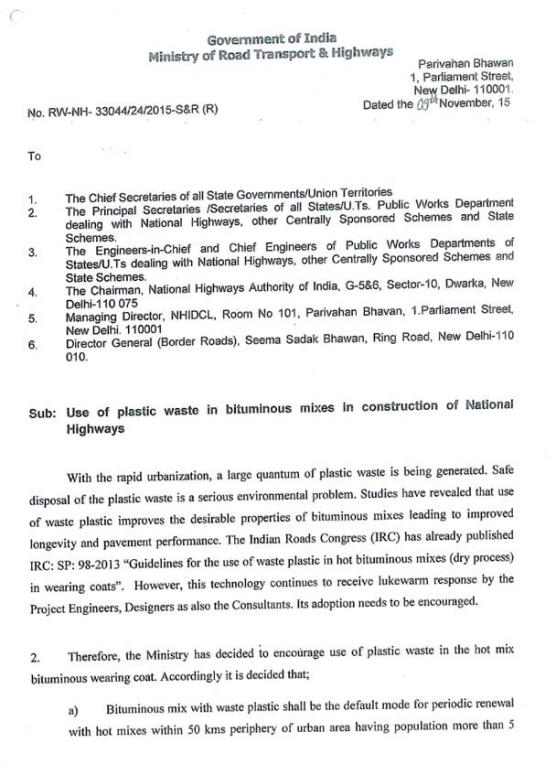
*Note: These are indicative rates and may vary from place to place*

*Sources : <http://www.scrapregister.com/scrap-prices/india/13> and [https://www.recycleinme.com/scrapresources/india\\_scrap\\_prices](https://www.recycleinme.com/scrapresources/india_scrap_prices)*





## 12.4 Notification by Ministry of Road Transport and Highways (MORTH) for Using Plastic in Road Construction





## 12.5 Extended Producer's Responsibility

### Extended Producers' Responsibility

As per the EPR under PWM Rules, 2016, producers, importers and brand owners of multi-layered plastic sachets, pouches or packaging material need to establish a system for collecting back the plastic waste generated by their products. This simply means that you take care of the waste you produce.

**There are 3 options for producers:**

1. Pay a fee into a central fund that would be spent towards managing the waste;
2. Offset the plastic waste generated through credit system which would be established; or
3. Participate in and pay for establishing producer responsibility organisations (PROs) to collect and manage plastic waste generated by consumers

## 12.6 References

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### Plastic waste management at GP level



Source-segregation



Segregation waste collection



Secondary segregation at village level shed

Segregated plastic packed and transported to the plastic waste management unit





## Plastic waste management at district level

Plastic waste management unit at district/block level



Shredding of plastic



Shredded plastic



Shredded plastic being used in road making



Baling of plastic



Baled plastic



Baled plastic being used in cement making













पेयजल एवं स्वच्छता विभाग  
जल शक्ति मंत्रालय  
भारत सरकार

DEPARTMENT OF DRINKING WATER AND SANITATION  
MINISTRY OF JAL SHAKTI  
GOVERNMENT OF INDIA

सत्यमेव जयते



एक कदम स्वच्छता की ओर