REDUCING PLASTICS IN RURAL AREAS

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1. Introduction

Key highlights

- Plastic waste has become a major hindrance in managing rural drains.
- Finding no disposal, multi-layered packaging materials such as wrappers and low-value plastics such as polythene are either burnt or end up clogging the drains and waterbodies in villages.
- Swachh Bharat Mission-Grameen 2.0, launched in the year 2019, focuses on managing plastic waste to make villages clean.
- Reports from the field and interactions with the communities clearly indicate lack of data on plastic disposal, lack of institutional framework, and lack of area-specific disposal and recycling solutions.

Plastic packets and sachets have become a major ecological concern in rural India, where more than 60 per cent of India's population resides.[1] Management of liquid waste—which is one of the key goals of Swachh Bharat Mission-Grameen 2.0 (SBM-G 2.0)—becomes increasingly difficult without reducing plastic waste. This is because plastics clog the drains and lead to waterlogging, even after light showers. For example, when Devkevadi village in Kolhapur district, Maharashtra faced problems of waterlogging due to blockage of greywater in open drains, reduction of plastic waste was found to be one of the key solutions.

Non-recyclable plastics are the main concern as they are not even purchased by scrap dealers in most cases. These are technically single-use plastics but they have not been included in the single-use plastic ban notified by the union government.[2] They are not only seen in heaps at street corners but also find their way into ponds, water channels, waterlogged areas and even mounds of cow dung.

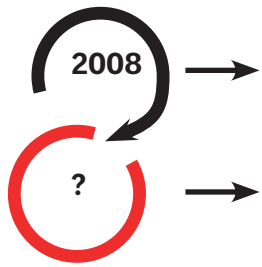
Despite the country-wide ban on single-use plastics since 2021, its enforcement remains a challenge. Polythene bags, wrappers, sachets, disposable cups and plates are the different types of single-use plastics which are of concern. These are often ingested by animals, blocking the airways and stomachs of ruminants and thus leading to choking and death. Being clueless about how to manage these plastics, villagers often end up burning them. This causes the release of toxic fumes.

It is in this context that SBM-G was launched with the aim of achieving cleanliness in villages through the scientific management of solid waste. In most of the rural areas, the organic component of waste is taken care of at the household level through age-old practices of composting for agricultural use. Disposal of dry or

inorganic waste is a matter of bigger concern. Studies have indicated that plastic generally, and non-recyclable plastic specifically, is the most problematic.[3] Hence, Phase II of SBM-G specially focuses on managing plastic waste. The SBM-G 2.0 dashboard shows the development of infrastructure in rural villages to manage plastic waste. But reality is far from what it appears to be.

As per the 2011 Census, roughly 833 million people live in rural areas.[4] Each person produces an average of 50–250 grams of solid waste per day.[5] According to the calculation done by the Centre for Science and Environment (CSE), if we consider per capita per day solid waste generation to be 100 grams, then we would get a total 0.84 lakh tonnes of solid waste being generated per day. If we consider that roughly 60 per cent of that is organic waste, then 0.33 lakh tonnes remain as inorganic waste. This is just based on the principal calculation scenario and may not always be the same. Waste quantum estimation is needed to get more exact figures for area-wise waste generation. Further, if the 60 per cent organic waste is managed at source—at the household or community level—then the remaining quantum can be managed at the community/panchayat level.

As per the survey conducted by Department of Drinking Water and Sanitation (DDWS) in 2008, total waste generated is about 0.3–0.4 million metric tonnes per day in the rural areas.[6] This data does not specify the quantity of plastic waste generated.



Post 2008, no such data collection has been reported. Various other attempts show a lot of discrepancies, as will be highlighted later in the report.

It is important to estimate the quantum of waste being generated to be able to plan and manage it better. In some villages where urbanization has dawned, waste is not segregated and even organic waste becomes a bigger problem than it is in traditional villages. Proper surveys and studies are required to gather information on the situation.

At present, very few studies have been conducted regarding rural solid waste. CSE's experience shows that some states like Tamil Nadu have started waste auditing. Madurai from Tamil Nadu reports per capita per day waste generation as roughly 70 grams, of which 90 per cent is organic waste and only 2–3 grams is plastic waste. Similar is the case in Nawan Gram Panchayat, Gaya, Bihar which reported 1 gram per capita per day production of plastic waste (average 14 kg plastic waste per day collected from 12 wards with roughly 15,000 population).

A few officials from Kullu in Himachal Pradesh told us that even though segregated waste from panchayats and villages is collected to be taken to a waste to energy plant named Rangri set up between Kullu and Manali, it is often disposed and dumped on highways or roads late at night due to the long hauling distance.

This happens due to lack of proper planning which does not consider the cost of hauling waste for long distances. Due to low bulk density, plastic takes up a lot of space, thus increasing the cost of transportation. As for the plant, it is also receiving more waste than it can accommodate. Hence, the size of the waste dump is increasing and leachate is flowing into the river. This is also a result of faulty planning and implementation, wherein the quantum of waste and availability of market buyers have not been mapped. But the actual root cause of all this is improper management of the solid waste value chain.

In 2022, Pratham education foundation, a not-for-profit based in Delhi, conducted a random sampling survey and study across 15 states in 70 districts and 700 villages to understand the issues related to plastic waste management in rural India.[7] The study surveyed households, general and medical stores, snack stalls, tea stalls, *dhabas*, clinics and hospitals, scrap dealers and *kabadiwalas*, and the heads of panchayats. Among many other important findings, the study highlighted that plastic waste was dominant in rural solid waste and a shocking three-quarters of the respondents in their survey were found to be burning plastics. This highlights the gravity of the situation and the urgency to tackle the same.

But all is not lost. Districts like Madurai in Tamil Nadu have taken up best practices such as using plastic waste to make road pavement bricks; Dindigul in Tamil Nadu is also shredding plastic waste and selling it for road construction; Kelwara Gram Panchayat in Kelwara district, Rajasthan is sending plastic waste off to cement plants for free. Though much more still needs to be done, these are important first steps.

The SBM-G dashboard highlights the infrastructure being created, as a result of which litter is reducing in villages. However, this study shall show how all that glitters is not gold. A lot of challenges and gaps remain unaddressed by SBM-G, like lack of mapped data; the mad rush to construct plastic waste management units without thinking about the post-construction operation and maintenance; lack of access to markets and availability of suitable buyers, etc.

Apart from this, we also need to think about the technical, institutional and sustainability aspects. There is very little focus on the complete plastic waste value

"We do not need to be warned about the problem. We live it every day. Our cities are littered with non-biodegradable plastic material, and it is greatly adding to environmental stress and degradation." Sunita Narain, Director General of CSE on World Environment Day, 2022, while outlining the three-pronged strategy to tackle plastics.[8]

chain from household segregation to disposal. Communities are not ready to pay the user tax, plastic waste buyers are not available, reporting mechanism is not clear and is not adhered to, and much more.

The initiative to manage plastics in rural areas has just begun and the task will only get tougher. This scoping paper is an attempt to dive deeper into the issue in order to identify challenges and find the solutions.

2. State of plastic waste management in rural India

Key highlights

- Lack of clarity on the quantum of waste generated in rural areas.
- Challenges include lack of awareness among different stakeholders, lack of clarity on the roles of different stakeholders and low levels of source-segregation.
- Many gram panchayats have managed their recyclable plastics but remain clueless about the non-recyclable plastic waste. Currently, it is either dumped openly or burnt.

CSE researchers travelled to eight states in north, central and south India. Even as most gram panchayats have figured out how to manage organic and recyclable waste, they were found struggling with non-recyclable solid waste. While organic waste is composted and recyclable waste is sold to scrap dealers, non-recyclable waste—which consists primarily of single-use plastics—pollutes soil and water as it is dumped indiscriminately on open grounds or in ponds.

The waste clogs drains leading to water logging. Leachate from these waterlogged drains contaminates ground water. For example, plastic packets, pouches and polythene bags clog the drains connecting the villages Lakadwas and Kaladwas to Udaisagar Lake in Udaipur, Rajasthan. Nimli village in Tijara block, Alwar district is also in a bad shape as plastics clog drains and waterbodies or lie abandoned on the roads resulting in waterlogging and adverse health conditions. To get rid of these single-use plastics, communities opt for burning them, completely unaware of the toxic fumes produced.

Based on the interaction with officials of 12 states responsible for implementing SBM-G, researchers from CSE observed that most of the states are not working towards sustainable plastic waste management (see *Table 1: Issues and challenges faced at district and state level by SBM-G officials working towards safe management of plastics*). Their focus is instead on building sheds for segregation of plastic waste. Among these states, Tamil Nadu stands out, as the state has not only been successful at segregating plastic waste but has also moved towards establishing successful waste management models which are economically viable.

Table 1: Issues and challenges faced at district and state levels by SBM-G officials working towards safe management of plastics

State/UT - Districts	Challenges/Issues
Assam - Kamrup	• Sustainability of infrastructure • The community is not cooperating as they find burning plastics to be the easier option • Unclear about where and how ragpickers or the informal sector is to fit into the value chain
Himachal Pradesh - Totu, Nurpur, Nagrota, Bhawana	• Lack of awareness • Solutions are not available for non-recyclable waste • Scattered topography makes the entire value chain difficult to sustain
Ladakh - Leh and Kargil	• Travel distances and low temperatures make the value chain unsustainable and uneconomical • Low levels of source segregation • Problems with managing non-recyclable waste • High floating population and scattered topography • Lack of labourers and low quantum of dry waste collected • Solid waste obtained is often mixed with dust
Uttar Pradesh	• Lack of proper legal framework • Availability of cheap single-use plastics and lack of available alternatives make it difficult to implement the ban • Lack of awareness • Plastics being dumped and burnt openly
Rajasthan	• Administrative challenges • Lack of awareness • Unclear about how to integrate the informal sector • Lack of ways to dispose of non-recyclable waste
Chhattisgarh	• Urban influence in rural areas makes IEC challenging • Reduced funding for IEC • Low bulk density of plastics makes their management uneconomical
Bihar	• Collection of mixed waste • Every district is planning a plastic waste management unit where O&M is likely to be an issue • As per SBM-G Guidelines, 2022, each block in the district is allowed funding of Rs 16 lakh for a plastic waste management unit—but the breakup of how to use these funds is not clear • Lack of revenue generation models to make waste management economically sustainable
Madhya Pradesh	• Planning is needed to manage different quantum of waste produced in big and small villages • Lack of source segregation • Lack of awareness and IEC activities • Lack of manpower to operate the value chain properly • Plastic waste management units have been set up but no clarity on revenue generation
Tamil Nadu	• Unavailability of adequate manpower • Marketing of reuse products • Establishing an economically sustainable business supply chain
Kerala	• Plastic waste management units have been set up but only 60 per cent are operational • Lack of enforcement • Unequal wages for workers in different gram panchayats • Lack of IEC activities • Lack of funding from O&M
Sikkim	• Collection and transportation
Karnataka	• Lack of IEC activities • Low availability of land

Source: Data compiled by CSE based on interaction with SBM-G officials from different states

The primary challenge faced by most states is the lack of understanding about quantifying and mapping plastic waste. Understanding of the roles and responsibilities of various stakeholders is also deficient. Officials from abovementioned states pointed towards the need for capacity building programmes to develop economically sustainable models for plastic waste management.

To further understand these issues and get a fuller picture of the state of plastic management in rural areas, data from the Central Pollution Control Board, National Annual Rural Sanitation Survey (NARSS), SBM-G 2.0 dashboard, studies by non-profits, and a few independent studies and surveys has been analysed (see *Table 2: Source of data used to understand the state of plastics in the country*). Except the SBM-G dashboard, all other reports are based on time-bound surveys for specific states.

Table 2: Sources of data used to understand the state of plastics in the country

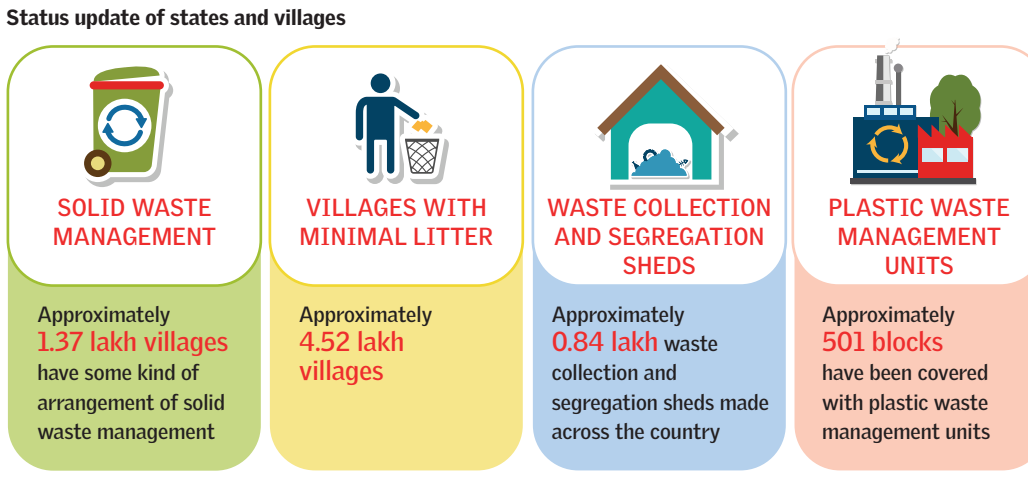
The data source used in the study	Year	Basis of the data source	Targeted states and districts for study	Type of survey	Type of source	Remarks	Missing points
Central Pollution Control Board (CPCB)	2019–20	SPCB annual returns compiled for different states	35 states and Union Territories of India	Specific	Government	It is a compilation of the data submitted by states from urban and rural areas to respective SPCBs in the process of annual returns.	Only Lakshadweep, Pondicherry and Tripura have submitted complete data from all gram panchayats. Andaman and Nicobar Islands has submitted data from 46 gram panchayats out of 70 in the UT.
National Annual Rural Sanitation Survey (NARSS)	2019–20	Random sampling survey	6,000+ villages in 32 states and Union Territories of India	Random	Government	Third party survey conducted by the Department of Drinking Water and Sanitation (DDWS) to assess the progress of states on sanitation indicators (reduction in open defecation, sustaining ODF status, increase in access to solid and liquid waste management, etc.)	Only 1 per cent of total villages have been surveyed (there are more 600,000 villages in India). Data has been cross-checked by officials under DDWS only in 50 randomly selected villages.

The data source used in the study	Year	Basis of the data source	Targeted states and districts for study	Type of survey	Type of source	Remarks	Missing points
SBM-G	Ongoing	Data provided by state MIS	All the states and Union Territories of India	Specific	Government	Live dashboard maintained by DDWS to show the progress of states, districts and villages.	• Based on self-declaration by the states and districts. • No on-ground verification of the actual scenario.
Swachh Survekshan Survey - Grameen Report	Yearly survey since 2018	Swachh Survekshan Assessment Report, 2022	17,559 villages in 33 states and Union Territories of India considered for the 2022 survey report	Random	Government	Third-party survey conducted by DDWS to assess the progress of states on sanitation indicators, evaluation of self-declaration done by states by site verification, and citizen feedback aiming to evolve a community-led sanitation process.	Only 3 per cent of the total villages in the country have been surveyed. The capacity of the surveyor has not been up to the mark in most cases.
Pratham Foundation	2022	Random sampling survey	700 villages in 70 districts of 15 states	Random	Independent	An independent study conducted due to lack of data in rural domain to establish the need to focus on rural plastic waste.	Only 0.1 per cent of the total villages in India have been surveyed. The villages chosen are at the periphery of urban areas. The situation in more interior parts is completely missing.
Research papers	2021	Independent study	Himachal Pradesh - Indupur Village	Independent	Independent	Study of waste management practices in a village in Himachal. Methodology can be used to conduct more such studies to establish data for decision making.	A pilot study which does not give a broader perspective.

Source: Compiled by CSE

The SBM-G 2.0 dashboard shows the work done in districts and villages with regard to solid and liquid waste management.[9] At present, it is the primary source of information regarding waste management in the country.

Figure 1: SBM-G Phase II dashboard details as on 27 January 2023



Source: SBM G Phase II dashboard

Out of roughly six lakh villages in the country, 4.52 lakh villages report that no waste is being dumped openly. About 1.37 lakh villages claim to have a system for solid waste management. This data is based on self-declaration by the states. Its authenticity is verified by Swachh Survekshan, a third-party annual survey conducted by the Department of Drinking Water and Sanitation (DDWS), Ministry of Jal Shakti to verify the claims made by states and districts. However, this method of survey and verification has its own shortcomings. It is done in the form of a competition which incentivizes states and districts to inflate the work they have done. The sample size for the survey is very small, which can sometimes result in missing out on villages which are not performing well.

Another source of data is the CPCB which prepares a consolidated report of the information submitted by local bodies to their respective State Pollution Control Boards (SPCBs) as per the Plastic Waste Management Rules, 2016.[10] The CPCB submits this report to the Government of India by 31 August every year. As per the latest available annual report of 2019–20, most of the rural local bodies have not submitted annual reports to SPCBs. Only four states/UTs seem to have submitted these reports.

Table 3: States/UTs from which SPCBs have received annual returns for plastic waste management in gram panchayats

State	Total number of gram panchayats	Number of submitted annual returns
Andaman and Nicobar Islands	70	46
Lakshadweep	10	10
Pondicherry	10	10
Tripura	591	591

Source: CPCB annual report on plastic waste management, 2019-20

Under the direction of National Green Tribunal (NGT) vide order dated 26/09/2019 in O.A. No. 360 of 2018 filed by Shree Nath Sharma vs Union of India and others, CPCB was asked to make a model action plan and facilitate district magistrates in preparation of district environmental plans.[11]

The model action plan was based on seven thematic areas including waste management but it only took urban local bodies into account. However, the 2019–20 annual report by CPCB mentioned action plans established by some states/UTs which also considered gram panchayats. Kerala, Lakshadweep, Madhya Pradesh, Puducherry, Punjab, Telangana, Tripura and West Bengal have developed action plans and targets for gram panchayats to manage plastic waste in their villages (see *Table 4: Data from CPCB annual report 2019–20 of action plans shared by states*).

Table 4: Data from CPCB annual report 2019–20 of action plans shared by states

State	Total number of gram panchayats	Gram panchayats with plastic waste management systems as per rule number 7.	Gram panchayats with collection and segregation sheds	Gram panchayats with material collection facilities
Kerala	941	31.24%	91.6%	59%
Lakshdweep	10	100%	100%	0
Madhya Pradesh	22,814	1.18%	1.18%	1.18%
Puducherry	10	65%	65%	100%
Punjab	12,500	0.0053%	0.0053%	0.0053%
Telangana	12,770	98%	98%	98.3%
Tripura	591	0	0	4%
West Bengal	3,354	0.02%	0.02%	0

Source: CPCB annual report on plastic waste management, 2019–20

Odisha, Bihar, Andaman and Nicobar Islands[12], West Bengal[13] and Karnataka have developed bye-laws, policies and guidelines on solid waste management for rural areas. Even though Rajasthan has not developed bye-laws or policies, it has developed a strategy which considers both rural and urban areas.[14]

Observations from the ground

Observations from the field often differ from what we see on the SBM dashboard. For example, even if a village claims to be litter-free, that does not necessarily mean that a proper collection and disposal mechanism is in place. Quite often, litter is just burnt.

Further, many villages are thoughtlessly acquiring waste collection and segregation sheds and plastic waste management units to be certified ODF plus (ODF plus certificates are given to villages which declare that they can ensure proper management of solid and liquid waste). However, the need is to understand whether such infrastructure is even needed at the village level. For instance, will there be enough quantum of waste at that level to ensure proper capacity utilization and generate enough revenue to meet the expenses?

SWATI BHATIA

Photograph 1: A girl in Nimli village tries to collect sellables from the inorganic waste dumped around the village

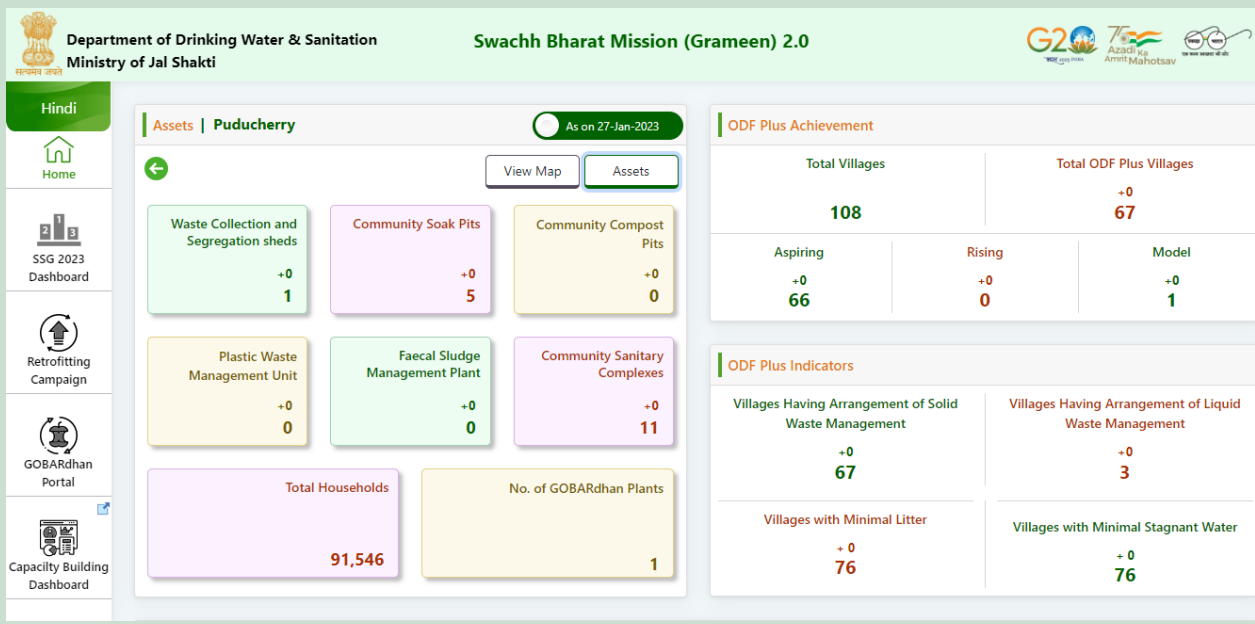
A STORY OF DATA CONFUSION

Puducherry is a classic example of conflicting data, even between different government agencies. According to CPCB's report published in 2019–20, 100 per cent of the gram panchayats in Puducherry have material recycling facilities (MRFs) and 65 per cent have segregation sheds.[15] The SBM 2.0 dashboard (live dashboard displaying status of waste management, as viewed up to February 2023) does not mention any such facilities in Puducherry. Only one waste collection and segregation shed for solid waste is mentioned in the portal for Puducherry.[16] The NARSS data—a third-party survey report cross-checked (randomly) by DDWS in the year 2019–20—details out the management of solid waste as a whole without mentioning plastic waste in particular. The report says that 83 per cent of total solid waste is safely disposed (or managed) but does not mention plastic waste separately. The report also mentions that 70 per cent of the villages show minimal littering.[17]

The data from the SBM dashboard does not mention the MRFs mentioned by CPCB, which could be explained away by saying that these MRFs were not built using SBM funds, hence the mismatch. On the other hand, the NARSS data cannot be compared to the CPCB data because the former talks about solid waste as a whole and the latter talks about plastic waste specifically. While the NARSS report was prepared by surveying around 26 of the 265 villages of Puducherry, the CPCB report was prepared based on self-declared data by districts. If we go by CPCB's data that 100 per cent of the gram panchayats have material recycling facilities, then why do 30 per cent of the villages surveyed under NARSS show littering? Does this mean that the litter is due to other kind of wastes and not plastics? This is difficult to understand.

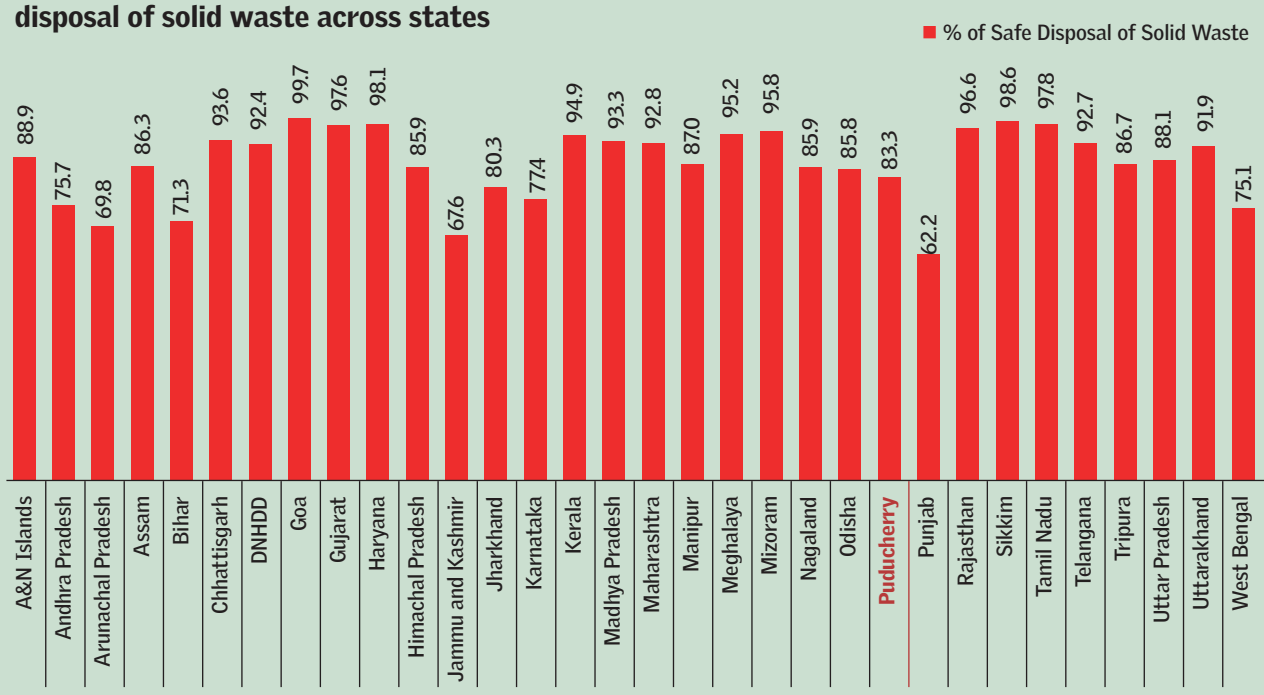
Small sample size and incomplete data from different government sources do not give a complete picture of the management of plastics in villages. This is not only the story of Puducherry but of many other states and UTs as well.

Figure 2: Screenshot of the status of solid and plastic waste in rural Puducherry from SBM-G dashboard as on 27 January 2023



Source: https://sbm.gov.in/sbmgdashboard/statesdashboard.aspx

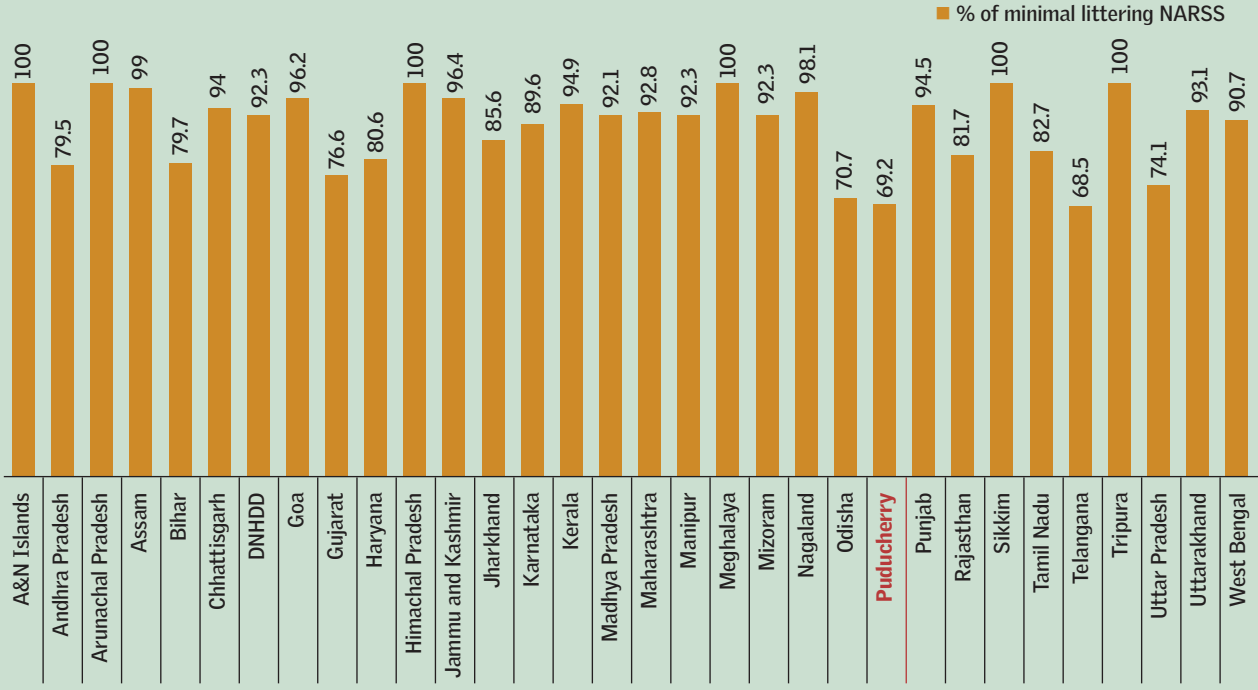
Graph 1: National Annual Rural Sanitation Survey (NARSS)-3 (2019–20) data showing safe disposal of solid waste across states



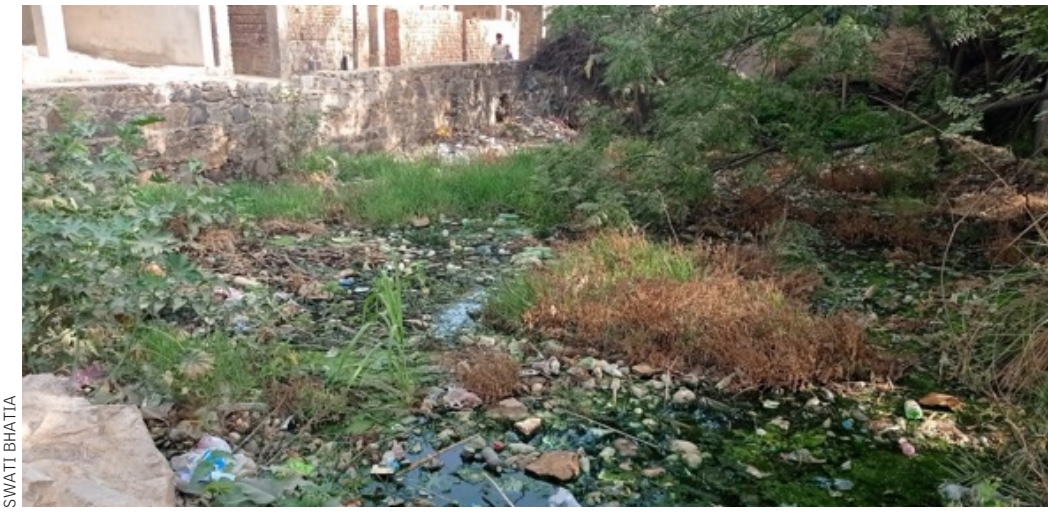
DNHDD: Dadra and Nagar Haveli and Daman & Diu

Source: https://jalshakti-ddws.gov.in/sites/default/files/NARSS_Round_3_2019_20_Report.pdf

Graph 2: NARSS-3 (2019–20) data showing minimal littering in villages across states



Source: https://jalshakti-ddws.gov.in/sites/default/files/NARSS_Round_3_2019_20_Report.pdf



SWATI BHATIA

Photograph 2: A waterbody near a mosque in Nimli village is clogged with plastics and algae

SWATI BHATIA

Photograph 3: Plastic waste is burnt by households in Nimli village

SWATI BHATIA

Photograph 4: Waterlogging in Nimli village due to plastics and faulty drains

SWATI BHATIA

Photograph 5: Plastics and other non-recyclable waste dumped near grey water collection pond in Khori village, Haryana

SHIVANGI AGARWAL

Photograph 6: Burning of dumped plastic waste in Meetuneerathan village, Tamil Nadu

The dashboard also does not show the quantum of waste being produced in these villages. It is important to ensure that such data is generated to enable better planning. At times, work is done under other funding programmes available with the panchayat and not necessarily with SBM-G funds. That is often not represented on the dashboard.

CSE had similar findings across states. Nimli village in Rajasthan, Khori village in Haryana and Meetuneerathan village in Tamil Nadu had no solutions for plastic waste, which was found littered all around the village, in drains, water bodies, etc. (*see Photographs 1–6*).

Gaya district in Bihar has started household waste collection and segregation, but they lack a weighing facility and are not sure about how to manage the non-recyclable fraction of waste. Nawan Gram Panchayat shared its waste collection register with CSE (see *Table 5: Total waste generated in Nawan gram panchayat, Gaya district, Bihar*). In it, they mention the weight of the collected waste from 11–12 wards (15,000 population) out of 19 wards (20,000 population). The organic waste collected was only 30 per cent of the total mix. They have waste collection vehicles and have started waste segregation. They sell recyclable plastic to the scrap dealer and compost the organic waste (*see Photographs 7–10*). The officials plan to have a baling facility soon.

Table 5: Total waste generated in Nawan gram panchayat, Gaya district, Bihar

Classification	Waste collected	What is done with the waste
Non-recyclable: plastic bags, wrappers, etc.	7–8 kg/day	Dumped
Plastic bottles	5–6 kg/day	Sold to scrap dealer. MoU with a plastic recycler.
Paper	1–1.5 kg/day	Sold to scrap dealer
Cardboards	3–4 kg/day	Sold to scrap dealer
Glass	1–2 kg/day	Sold to scrap dealer
Metal	0.5 kg/day	Sold to scrap dealer
Medical waste	3–4 kg/day	Dumped
Wet waste	10–12 kg/day	Composted
Shoes	2–3 kg/day	Dumped

Source: Nawan gram panchayat

Sahibganj district in Jharkhand has identified land and funding for a plastic waste management unit. They are trying to establish a public-private partnership model where they shall tag Jal Sahiyas (active women members of sanitation committee in the villages) to the scrap dealers to ensure proper management of plastics.

NAWAN GRAM PANCHAYAT

Photograph 7: Waste is weighed in waste segregation shed at Nawan Gram Panchayat

NAWAN GRAM PANCHAYAT

Photograph 8: Waste segregation shed at Nawan gram panchayat.

NAWAN GRAM PANCHAYAT

Photograph 9 (a & b): Door-to-door waste collection in villages of Gaya district

NAWAN GRAM PANCHAYAT

Photograph 10: The carts collect waste from households and put it in the main collection vehicle in villages of Gaya district

KALADWAS AND LAKADWAS VILLAGES, KALADWAS GRAM PANCHAYATS, GIRVA BLOCK OF UDAIPUR DISTRICT: LACK OF COMMUNITY INVOLVEMENT AND AWARENESS

Kaladwas panchayat in Rajasthan has a population of 3,500 people in 710 households. Households face problems in managing solid waste due to which they end up burning the waste. There are also issues of waterlogging due to floating solid waste ending up in the river. No fines have been imposed by the panchayat for dumping or burning waste.

The panchayat has deployed two waste collectors with three iron carts for free daily door-to-door collection of waste. They are also responsible for sweeping the streets. They are paid Rs 8,000 per month as per the 6th State Finance Commission (SFC).

Due to lack of awareness of households,

- Majority of the households handover mixed waste to the waste collectors.
- Despite daily waste collection, households are practicing open dumping and burning of the waste, unaware about its after effects.
- Open dumping of waste is leading to choking of drains and waterbodies.
- This waste is being ingested by the animals, and harming them.

Foul smell and odour are ever-present in the village vicinity.

Despite knowing this, the officials have been unable to establish a strict monitoring mechanism or implement fines to keep a check on the defaulters.

The panchayat has made a detailed project report to avail funding for a material recycling facility. However, there is no discussion on dumping and burning of solid waste. Officials attribute it to lack of staff. However, lack of awareness is evident due to which the Gram Panchayat struggles with proper implementation of the waste management system.

SHIVANGI AGARWAL

Photograph 11: Dry waste for curbside collection

SHIVANGI AGARWAL

Photograph 12: Open dumping of waste

AYYANKOTTAI VILLAGE, ALANGANALLUR BLOCK, VADIPATTI TOWN PANCHAYAT OF MADURAI DISTRICT - INTERACTION WITH FORMAL WASTE COLLECTORS

The village has a population of 150 households. The panchayat has deployed 4–5 waste workers in the village for waste management. The workers are responsible for waste collection, waste segregation and safe management of waste. The workers are provided with a non-motorized waste collection push cart. It has no compartment for collection of segregated waste. The workers collect mixed waste from the households and dump it in the open, usually on highways and roadsides. They charge Rs 20 per month to pick up unsegregated waste from households.

After dumping, workers segregate waste based on its economic value. Glass, bottles, recyclable plastics, metal and cardboard is pulled out by workers. The waste is then sold to junk dealers based on the informal connections that workers have made. The workers get paid Rs 3,500 per month by the gram panchayat for their waste collection duty. A worker who did not wish to be named says, "We are not able to meet the needs of our families. We are paid very little. By selling the segregated waste to dealers, we generate extra income and buy food for our family." It is clear that either the gram panchayat is unsure of what is to be done with the waste or they are still waiting for the material recycling facility to be made.

Regular dumping of mixed waste has led to the problem of solid waste heaps. Within a week, the heap starts to smell and leads to breeding of mosquitoes and insects. To get rid of the problem, waste workers burn the waste during the early morning or late evening hours. Workers and households have complained about it to the authorities but no solution has been given so far.

SHIVANGI AGARWAL

Photograph 13: Open dumping and burning of waste

SHIVANGI AGARWAL

Photograph 14: Formal waste collectors segregating sellable from mixed waste dumped on the highway

To conclude and sum up, these have been CSE's findings from the field:

1. There is a serious lack of data on quantum of waste.
2. Confusing data from different available sources makes decision making and enforcement difficult.
3. Clarity on what can be recycled and what cannot be recycled is clearly lacking. Segregation of waste is generally driven by market demand.
4. Lack of available solutions leads to open dumping in villages, with plastics being burnt or found clogging drains and waterbodies.
5. Lack of awareness among stakeholders and lack of cooperation from communities due to lack of targeted IEC.
6. A lack of focus on household-level segregation and reluctance to pay taxes by the communities.
7. Ambiguity on operational informal sector network leading to improper wage distribution and income for self-help groups.
8. States and districts have speeded up infrastructure creation but they are unsure about how to manage non-recyclable waste.
9. Lack of weighing facilities at the already established waste collection and segregation sheds. Operation and maintenance will also be an issue in the future if proper fund sources are not identified.
10. Difficult to establish forward linkages for proper reuse and disposal of plastic waste as cost of transportation is high owing to lower bulk density of plastics and ambiguity of available markets in the vicinity.

3. Understanding existing policies and strategies for reducing plastic waste in rural India

Key highlights

- Rural plastic waste brought under the ambit of Plastic Waste Amendment Rules for the first time in 2016.
- Role of EPR not clear in rural scenarios.
- Swachh Bharat Mission-Grameen has released guidelines and toolkit for management of plastics in rural areas.
- Different government agencies are looking after plastic waste management but are working in silos both at central and state levels. This has led to weak policies and even weaker enforcement.

Policies and strategies significantly affect the management of any issue in an administrative polity like India. With regard to waste management in rural areas, we find a very scattered policy system. While plastics became a topic of focus in urban areas some time back, rural plastic waste remained out of focus until quite recently.

Plastic Waste (Handling and Management) Rules, 2011

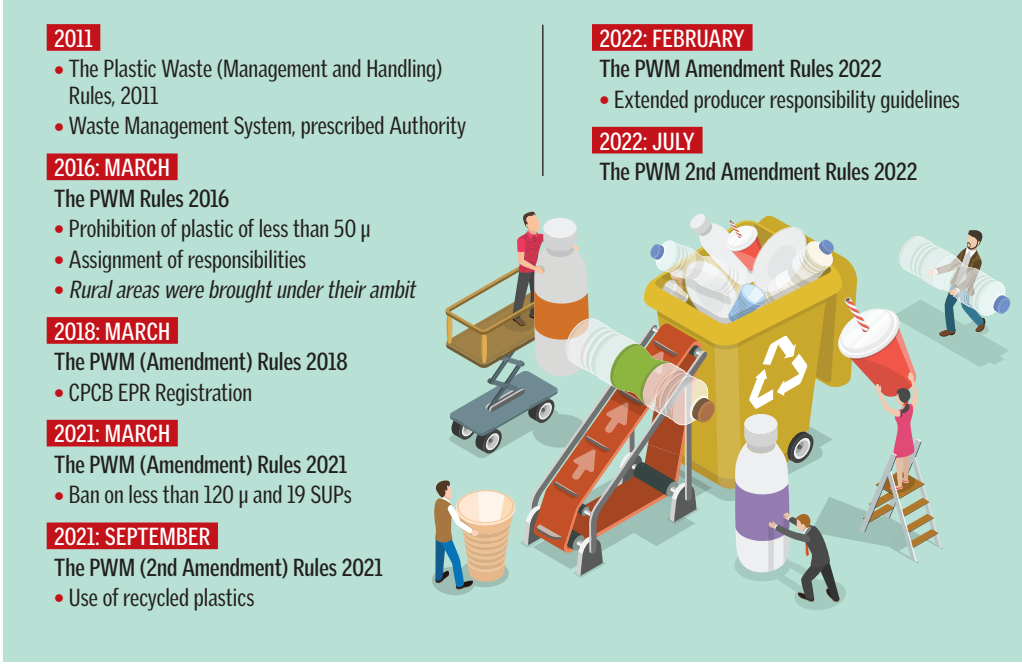
Plastic waste (Handling and Management) Rules[18] were notified by Ministry of Environment Forest and Climate Change (MoEFCC) in 2011 but rural areas were only brought under their purview in 2016, when for the first time they became binding on rural local bodies.

These are the clauses with a bearing on plastic waste management in rural areas:

Clause 6.1: *"Local body shall be responsible for segregation, collection, storage, transportation, processing and disposal of the plastic waste either on its own or by engaging agencies or producers."*

Clause 6.2: *"The local body shall be responsible for setting up, operationalization and coordination of the waste management system and for performing the associated functions, namely:-*

Figure 3: Plastic Waste Management Rules timeline



Source: https://cdn.cseindia.org/attachments/0.10814400_1669106087_implementation-of-epr-and-sup-ban--challenges-and-agenda.pdf

- *Ensuring segregation, collection, storage, transportation, processing and disposal of plastic waste;*
- *Ensuring that no damage is caused to the environment during this process;*
- *Ensuring channelization of recyclable plastic waste fraction to recyclers;*
- *Ensuring processing and disposal of non-recyclable fraction of plastic waste in accordance with the guidelines issued by the Central Pollution Control Board;*
- *Creating awareness among all stakeholders about their responsibilities;*
- *Engaging civil societies or groups working with waste pickers; and*
- *Ensuring that open burning of plastic waste does not take place."*

Clause 7: *"Responsibility of Gram Panchayat-*
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"*

The rules have decentralized the power of allocating lands for setting up recycling facilities to the respective departments in state governments. They prohibit street vendors from using plastic packaging which is not as per prescribed norms. They suggest reuse of plastic for roads, co-processing in cement plants and usage of waste for energy generation to ensure it is not dumped in landfills or openly burnt. Gram panchayats have been allocated the responsibility to regulate households and institutions in villages by preparing bye-laws, enforcing taxes for waste management and imposing fines on defaulters.

Clause 8 makes households and institutions generating plastic waste responsible for minimizing waste generation, segregating plastic at source, not littering, storing the waste and handing it over to the gram panchayat or authorized waste pickers, paying user fees as specified in the bye-laws, and managing any gatherings or events involving plastic waste as prescribed by the rules.

These clauses specify the roles of different authorities:

Clause 12.1: *"The State Pollution Control Board and Pollution Control Committee in respect of a Union territory shall be the authority for enforcement of the provisions of these rules relating to registration, manufacture of plastic products and multilayered packaging, processing and disposal of plastic wastes."*

Clause 12.3: *"The concerned Gram Panchayat shall be the authority for enforcement of the provisions of these rules relating to waste management by the waste generator, use of plastic carry bags, plastic sheets or like, covers made of plastic sheets and multilayered packaging in the rural area of the State or a Union Territory."*

Under the guidance of the district magistrate or the deputy commissioner, block and district level authorities shall assist gram panchayats in enforcing the rules. Gram panchayats are responsible for increasing awareness in the community. They have to create a village-level action plan along with communities, ensure minimum waste generation and discourage open burning of plastic waste. Gram panchayats also have to map and register recyclers for better management of the entire solid waste value chain.

The rules have brought the producer into their purview. Extended Producer Responsibility (EPR) makes the producer responsible up to the end of the plastic lifecycle. The rules also specify the monitoring mechanism wherein local bodies must submit annual returns to SPCBs, which shall compile the information in Form VI and submit it to CPCB to be published in the annual report.

Clause 17.2 *– "Every local body shall prepare and submit an annual report in Form –V to the concerned Secretary-in-charge of the Urban Development Department under intimation to the concerned State Pollution Control Board or Pollution Control Committee by the 30th June, every year.*

Having noted the clauses, a question is worth asking: *Are the gram panchayats or the block/district level officials aware of the procedure?*

The section above on the state of information on rural plastics in the annual reports published by CPCB answers this question. The plastics are still being burnt and unregistered informal recyclers are still operating in the rural periphery. This shows that the rules are not adhered to irrespective of the existence of bye-laws, because their enforcement is clearly lacking. State pollution control boards are still to exercise jurisdiction on rural areas and a gap in awareness is evident among the stakeholders at various levels. CSE's interaction with various gram panchayats has shown that they lack information on what to do with the waste collected despite availability of lands and funds.

Various amendments have been made to the rules since 2016.

Table 6: Highlights of the Plastic Waste Management Rules and various amendments since 2016

Year	Highlights and amendments	Remarks
2016	Gram panchayats brought in to the purview of the Rules. Extended producer responsibility (EPR) included as a part of the Rules.	Lack of enforcement on the ground and lack of accountability by SPCB and gram panchayats. EPR did not clarify the role and position of gram panchayats.
2018 amendment	Inclusion of concept of resource efficiency and use of plastics as alternate material and for energy recovery. Phasing out of multi-layered plastic manufacture and reuse in two years. Producers and brand-owners shall apply for registration or renewal of registration to CPCB through forms 1 and 2. Form 3 has to be submitted to both the respective state's SPCB and CPCB.	A lack of awareness and unavailable chain of linkages in rural areas is evident. Lack of accountability for information exchange between CPCB/SPCB and registered bodies about registered producers, recyclers, brand-owners and manufactures operating in the rural periphery. Lack of guidelines to establish communication between local bodies and SPCB/CPCB for better linkages and information exchange.
2021 Rules and amendment	CPCB shall lay guidelines for imposition of environmental compensation based upon polluter pays principle.	No regulation of gram panchayat by CPCB for allocation of responsibilities for imposition of compensation.

Source: Compiled by CSE

What is extended producer responsibility (EPR) and why is it important in rural areas?

Under EPR, producers are supposed to ensure that plastic usage is minimized and proper measures are taken to recycle and dispose of plastic waste. The responsibility for proper implementation of EPR extends to the producer, importers, brand owners, CPCB, SPCBs/PCCs, recyclers and waste processors.

The new guidelines on EPR for plastic packaging clearly state the roles and responsibilities of all the entities that are involved in the implementation of EPR. They were released in 2016 but enforced in 2018. But a question of concern is: *How practical will it be to implement EPR in rural areas?*

The market for consumer products is still very small in rural areas. Therefore, establishing a collection chain to manage plastic waste in rural areas involves a high cost which may not be acceptable to the producers or importers. Along with this, there are other challenges such as lack of data of waste volumes, inadequate infrastructure, etc.

Further, gram panchayats, which will only act as waste collectors, find no mention in the EPR guidelines by CPCB. At the same time, there is doubt regarding the feasibility of registering the lakhs of material recycling facilities and plastic waste management units being built in the EPR portal. Few points to consider from the EPR guidelines are:

- **Under clause 6**, gram panchayats find no mention as they will only operate as waste collectors. They will not operate as recyclers, producers, importers and brand owners as the village collection centre will only be involved in collection and baling/shredding. How feasible it is to register approximately 90,000 waste management sheds which have come up in villages? Are CPCB or various SPCBs/PCCs making a strategy to deal with the same?

- **Clause 7** mentions yearly targets for recyclers, producers, importers and brand owners. However, there is no enforceable mandate to make sure a certain percentage comes from rural areas or to submit a registration list of gram panchayats the recycler is dealing with.

- **As per clause 14,** producers, importers and brand owners shall establish waste collection points or material recycling facilities at certain collection points. No mandate has been set on the number of units to be set up in rural

areas. However, this can be an opportunity which can be leveraged to adopt and support struggling MRFs or establish MRFs where waste quantum is sufficient. Although, this may not be possible for all the villages in the country.

- **Clauses 16 and 17** on centralized online portal and monitoring ask for maintaining a dashboard for existing gram panchayats. State pollution control boards should consider collecting annual information from rural areas.

Apart from this, roles need to be clearly defined for responsibilities like connecting with registered recyclers or other producer organizations. A certification mechanism has been started which can also help SPCBs/PCCs regulate gram panchayats. One important aspect neglected in the guidelines is the informal sector.

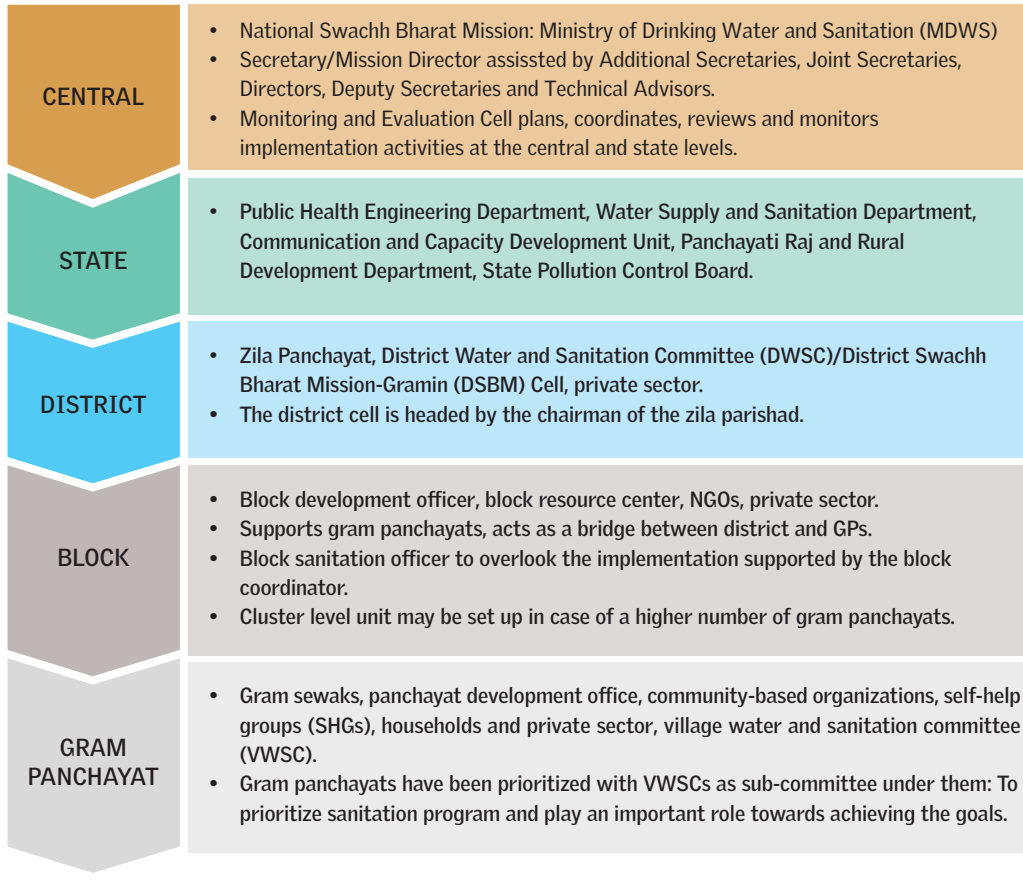
SAAHAS: A KARNATAKA BASED NOT-FOR-PROFIT

According to SAAHAS, EPR is only acting as a certification mechanism at present. A mandate must be set for recyclers to receive a certain percentage of waste from rural areas, without which the targets set can be achieved only from urban areas. Besides this, a lot of funding sources will be available under EPR rules which need to be leveraged well for rural areas.

Swachh Bharat Mission

Swachh Bharat Mission-Grameen was launched in the year 2014 with the aim of constructing toilets. To sustain the progress and ensure proper solid waste management, Phase II of the mission was launched in the year 2019. As per the SBM-G guidelines, a solid and liquid waste management team acting through state, district, block and gram panchayat levels shall be responsible for looking into the implementation of various indicators of solid and liquid waste management.

Figure 4: Flow of roles and responsibilities at different tiers of the hierarchy



Source: Compiled by CSE

The guidelines also talk about various sources of funding available at the village and district levels to implement the initiatives for managing rural plastic waste. Apart from that, the guidelines also encourage convergence.

Table 7: Various sources of funding to manage plastic waste in rural areas.

Sources	Available funding
Government financing	**SBM-Grameen funds** **Village level activities** - Up to 5,000 population: Rs 60 per capita - Above 5,000 population: Rs 45 per capita - 30 per cent of the total expenditure has to be borne from 15th Finance Commission. - Each village can utilize a minimum of Rs 1 lakh based on their requirements for solid waste and greywater management. Savings from either component can be used for other components also. **District level activities** - Plastic waste management unit (one per block): Up to Rs 16 lakh per unit. **Provision for IEC** will be 5 per cent of total project cost, with 2 per cent to be utilized at the central level and 3 per cent at the state/district level. **Provision for administrative cost** will be 1 per cent of the project cost. **Revolving funds:** Up to 5 per cent of project cost to a maximum of Rs 1.5 crore per district.
Financing through convergence	- MGNREGS: Funds from the scheme can be used for solid and liquid waste management. - 14th and 15th Finance Commission: Construction and maintenance of village infrastructure can be done from these funds. - State Finance Commission - MP/MLA local area development fund - Department of Drinking Water and Sanitation is collaborating with various other ministries such as Ministry of Rural Development and Ministry of Panchayati Raj for the sanitation mission. - A provision of critical gap funding is available under Shyama Prasad Mukherji Rurban Mission (SPMRM) (Ministry of Rural Development) which aims to strengthen rural clusters with required amenities by provision of convergence funds through various schemes.
Swachhta action plans of 76 central ministries	- 76 central ministries have earmarked Swachhta funds in their annual action plans.
Alternative financing	- **Swachh Bharat Kosh (SBK)** has been made to channelize corporate and philanthropic contributions for the Swacch Bharat Mission. - **Corporate Social Responsibility (CSR):** Through this, corporates contribute towards the mission by conducting behaviour change campaigns, capacity building initiatives, construction of toilets in community places, cleaning places of importance such as tourist places, etc. - **Credit financing:** Disbursement of funds by means of loans for mission activities through channels such as o **Self-help groups** wherein women members pool own funds and lend money to group members. o **Crowd funding** o **Microfinance institutions** o **National Bank for Agriculture and Rural Development (NABARD)** o **Commercial banks** providing loans at cheaper rates to households and self-help groups in villages.

Plastic waste management manual and toolkit: Swachh Bharat Mission-Grameen has published a toolkit[19] and manual[20] on plastic waste management for rural areas, and also suggested steps for implementation of the plastic waste management value chain. The manual and toolkit establish the need for plastic waste management through source segregation, collection, setting up secondary storage for collected plastic waste, setting up of a plastic waste management unit and then transporting the collected plastics for appropriate reuse such as recycling or reuse in cement kilns or for construction of roads.

The manual also talks about various machines that need to be set up, operated, maintained and monitored for a plastic waste management unit and the available funding to manage the plastic waste value chain. It also talks about the roles and responsibilities of various stakeholders and establishes gram panchayats as important stakeholders leading the entire mission. These can be used as guidance tools to prepare a district-level plan for managing plastic waste. However, it is important to understand the requirements as addressed above in the previous sections and not try and ape readily available solutions.

Swachh Survekshan Grameen is a third-party annual assessment conducted by the Department of Drinking Water and Sanitation, Ministry of Jal Shakti, since 2018.[21] This survey is conducted to encourage and spread awareness among the residents of rural areas towards sanitation and hygiene through healthy competition between districts. The evaluation and marking are conducted on three components:

a) Service-level progress which involves self-reporting by districts on planning aspects such as preparation of annual implementation plan, spreading awareness about the guidelines, preparation of gram panchayat development plans, fund allocation and activities undertaken, and capacity building activities.
b) Direct observation of households, village-level waste management assets and IEC activities undertaken. The investigation team observes public places, schools, households, etc. and reports the findings.
c) Citizen feedback is taken via face-to-face interactions and mobile questionnaires from the general population, SHG members, panchayat members, etc.

The data collected is kept confidential. As per the survey report of the year 2022, roughly 88 per cent districts had developed an integrated plan for end-to-end management of plastics, 35 per cent villages had arranged a space for segregation and 32.9 per cent villages had instituted a door-to-door collection facility. Roughly

60 per cent of the citizens interviewed confirmed that their villages have initiated work related to solid waste management and they are satisfied with the same.

Other rules and guidelines

- The 2017 CPCB guidelines for co-processing of plastic waste in cement kilns talk about collaboration of urban municipalities with cement plants. However, no guidelines have been laid for gram panchayats.
- To support the Plastic Waste Management Rules, the Ministry of Road Transport & Highways (MoRTH) made it mandatory in March 2021 for road developers to use waste plastic along with bituminous mixes for road construction to overcome the problem of disposal of plastic waste.[22]
- Framework for preparation of plans for rural areas by the Ministry of Panchayati Raj gives detailed step-by-step instructions for development of a gram panchayat development plan. It also talks about managing plastic waste under the Swachh Bharat Mission.[23]

Lack of sufficient enforcement is evident despite having strategies and policies in place. Plastic Waste Management Rules, 2016 have defined responsibilities for gram panchayats and all the local bodies are required to submit data to SPCBs and CPCB. However, the CPCB annual report shows that gram panchayats have not been doing so. In lieu of the same, strict auditing and actions are not being taken by the CPCB.

Swachh Survekshan has been initiated to make states and districts compete amongst each other for attaining cleanliness standards to achieve ODF status. However, it is not binding. It is important to create a binding regulation and reporting mechanism at different tiers of the hierarchy. This shall help create reliable data to improve plastic management in rural areas. An ecosystem for better interaction is needed between gram panchayats, Department of Drinking Water and Sanitation, and various pollution control boards to establish better enforcement, reporting mechanisms and decision making.

4. Impact of unsafe management of plastics

Key highlights

- Mismanagement of plastics leads to clogging of drains.
- Reports from the field clearly indicate leachate from solid waste results in pollution of waterbodies and ground water.
- Openly dumped waste also serves as a breeding ground for mosquitoes and other vector borne diseases.
- Ingestion of plastic waste is proving to be a silent killer for ruminants.
- Adequate knowledge about plastic categories will help communities manage plastics better.

The previous section talked about how non-recyclable plastic waste is burnt or dumped in the open while recyclables are sold to scrap dealers. Before we understand their impacts, we need to understand the classification of plastics. Plastics are classified on the basis of three criteria[24]:

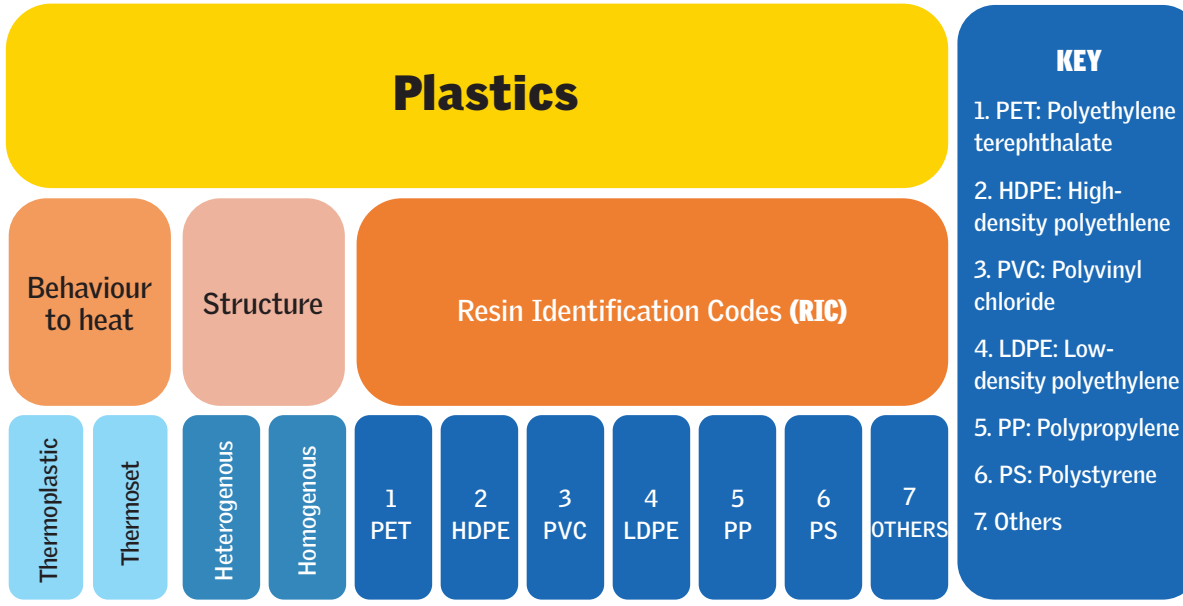
Behaviour to heat

- The way a certain type of plastic physically reacts to heat—i.e., melts or becomes irreversibly rigid—and based on whether it can be further remoulded into a desired shape, it is classified into thermo-plastic or thermoset.
- Out of the total plastic waste generated, around 94 per cent comprises of thermoplastic content (such as PET, LDPE, HDPE, PVC, etc.) which is recyclable (see *Figure 5: Classification of plastics*). The remaining 6 per cent belongs to a family of thermoset and other categories of plastics (such as sheet moulding compound—SMC, fibre reinforced plastic—FRP, etc.) which are non-recyclable.

Chemical structure

- The types of monomers in a certain polymer (plastic) can be used to categorize a polymer as homo-polymer (same monomer running across the polymeric chain) or hetero-polymer (more than one monomer running across the polymeric chain).
- Theoretically and practically, if a plastic is made up of a single type of monomer, it would be much easier to process and recycle (assuming that it is not contaminated). Presence of more than one type of monomer in a plastic make the process of recycling difficult.

Figure 5: Classification of plastics



Source: CSE 2021

Resin Identification Codes (RIC)

- In 1988, the USA Society of the Plastic Industry developed Resin Identification Codes (RIC) for rigid packaging which has become mandatory in many US states, has been adopted in Canada, Japan and Australia, and has also been endorsed by many organizations across Europe for the identification of plastic packaging materials. Its use has been extended beyond rigid plastic packaging.
- Most widely used plastic identification codes which can be found on most packaging products sold in the market.

Thermoplastic is a generic category, within which different types of plastic materials are manufactured for different uses. It is important to understand which plastic material is used for what purpose and whether it can be recycled. It is also important to understand what recycling entails and what the recycled product is used for. Unfortunately, there is little information available on these aspects since most of the recycling happens in the informal and small-scale industrial segment, which works 'invisibly'. What is generally understood is that polystyrene (PP and PS) and low-density polystyrene (LDPE) are only partially recyclable; and most of the time, they are not recycled due to their economic unviability. A 2015 CPCB study noted that 94 per cent of total plastic waste consists of thermoplastics, which is recyclable; only 6 per cent was thermoset plastic which could not be recycled.[25]

Table 8: Types of plastics and their recyclability

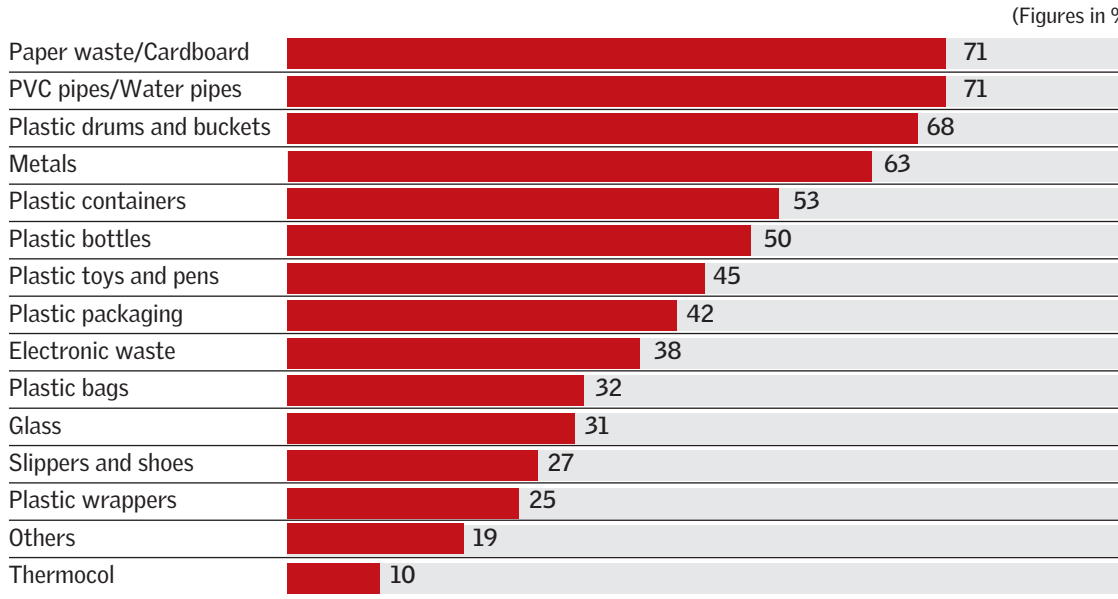
Name of plastic	Recyclable or not	Few applications	Type of recycling
Polyethylene Terephthalate (PET)	Yes	Water bottles, soft drink bottles, food jars, films, sheets, furniture, carpets, panelling	Converted back to polymer and used for making apparel
High-density Polyethylene (HDPE)	Yes	Milk pouches, bottles, carry bags, recycling bins, base cups	Converted to pellets and used to produce new HDPE
Polyvinyl Chloride (PVC)	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
Low-density Polyethylene (LDPE)	Yes	Plastic bags, various containers, dispensing bottles, wash bottles	Converted to pellets and used to produce new LDPE
Polypropylene (PP)	Yes	Disposable cups, bottle caps, straws, auto parts, industrial fibres	Converted to pellets and used to produce new PP
Polystyrene (PS)	No	Disposable cups, glasses, plates, spoons, trays, CD covers, cassette boxes, foams	Not recyclable
Others (O)	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.

Source: Anon 2020. *Managing Plastic Waste in India: Challenges and Agenda*, Centre for Science and Environment, New Delhi

The study tried to explore whether there is any available information on categories of plastics in the rural space and what happens to them. CSE's experience shows that recycling of plastic is majorly driven by market demand. Informal scrap dealers collect what can be sold further into the market and leave the rest, which is dumped or burnt. This is not driven by the knowledge of plastic categories.

A 2022 study conducted by Pratham Education Foundation, a not-for-profit based in Delhi, tried to assess what happens to each of the categories of plastics. They also interacted with *kabadiwallahs* or informal scrap dealers. The study concluded that plastic waste such as bottles, oil cans, shampoo bottles, broken pens, PVC pipes and broken toys are most often given to the *kabadiwallahs*. However, plastic such as polythene bags, wrappers and sachets are mostly burnt by the households.[26]

Graph 3: Kinds of plastics bought by *kabadiwallahs* from rural households



Source: Study by Pratham Education Foundation

About 35 per cent of the 467 *kabadiwallahs* interviewed said that they also accept single-use plastics such as wrappers and sachets. Most of them reject single-use plastics owing to low market value and no demand in the market. Lack of substantial quantity and storage space also inform their decision.

The study mostly considered villages near the urban periphery i.e., within a 20 km distance of an urban area. In the interiors, the cost of transportation may go up even further, while there is no clarity on who is responsible for bearing the cost of transportation.

The problem becomes worse with non-recyclable plastics. Since these have low to no reselling value, rag pickers are not interested in them. These end up getting burnt or openly dumped, contributing to choked drains and treatment systems.

It is important to explore and understand these market-driven aspects to ensure proper management of plastic waste and maximize revenue generation. Due to lack of awareness, some of the recyclables may also end up being dumped. Therefore, there is a need for IEC activities and capacity building programmes.

A vast majority of monomers used to make plastics, such as ethylene and propylene, are derived from fossil hydrocarbons. None of the commonly used plastics are

biodegradable. As a result, they accumulate, rather than decompose, in landfills or the natural environment.[27] The impacts of plastic are far and wide, very much like its use.

A lot of mismanaged plastic waste ends up becoming marine pollution, which is a growing concern due to a variety of reasons. Plastic pollution costs US $13 billion per year as economic damage to the marine ecosystem.[28]

A study conducted in 2015 in rural and urban Kolkata concluded that household wastes like plastic and glass serve as breeding grounds for Aedes mosquitoes (a vector for dengue).[29]

A 2012 review study conducted in rural areas of Tirupati concluded that the presence of rubber, plastics, leather materials, ropes, cement bags, etc. in animal feed is silently killing livestock, mostly bovines (cattle and buffalo) followed by sheep and goats.[30] The cases were higher in animals fed with poor quality feed. This can be reduced by sensitizing communities to not dispose of kitchen waste in plastic bags.

Incineration of plastic waste in open fields is a major source of air pollution. The burning of plastic releases toxic gases like Dioxins, Furans, Mercury and Polychlorinated Biphenyls into the atmosphere. Further, the burning of Poly Vinyl Chloride (PVC) liberates hazardous halogens and other pollutants into the air, contributing to long-term climate change. The toxic substances thus released are posing a threat to vegetation, human and animal health, and the environment. They can lead to aggravated heart disease, respiratory illnesses, emphysema and can also have negative impacts on the central nervous system.

A 2020 study conducted to assess the knowledge of rural residents of coastal Karnataka concluded that 90 per cent of the respondents were not aware of the effect of plastic burning on global warming and climate change, while 70 per cent of them knew that it causes health effects.[31] This is similar to CSE's findings in Nimli and Assam. The scenario would be the same at many other places in the country as well.

A 2021 study has also indicated that traces of plastics have been found in groundwater which is in use for drinking purposes in Tamil Nadu. Plastic debris less than 5 mm, known as micro plastic, was found at the target zone (below the ground surface). These have mainly resulted from anthropogenic sources.[32]

Micro plastics also cause soil degradation and thus threaten farming. As per the Lok Sabha question number 3,468, the minister of agriculture and farmers welfare was asked about the presence of microplastics in agricultural produce and the measures being taken to protect agricultural land from plastic pollution. To this the minister Sh. Narendra Singh Tomar replied that no instance of microplastics in fertilizers and pesticides have been brought forward and no study has been conducted on the matter. He said that the fertilizers and pesticide industry has been adhering to all the norms, and this has been verified by regular inspection processes so far.[33] A few studies do address the presence of micro plastics in water bodies[34] but, overall, lack of studies and lack of attention towards the invisible will cripple generations to come if not looked into on an urgent basis.

Chapter 5. How are rural areas in India managing their plastic waste?

Key highlights

- Himachal Pradesh has integrated the informal sector and developed a policy framework.
- Rajasthan has used CSR funds to establish a working model of plastic waste management.
- Tamil Nadu has started waste audits and recycling of plastics using an economically sustainable model of plastic waste collection, segregation and shredding.
- Odisha has successfully used its urban facilities to manage plastic waste in rural areas.

In the previous chapters, the report portrays the gaps and challenges in plastic management in rural areas. The existing funds and the role of the stakeholders to reduce plastic dumping in rural areas have been discussed in Chapter 2. Few villages and gram panchayats from different parts of the country have showcased best practices in plastic waste management. This chapter elaborates on a few of those success stories.

Ajouli gram panchayat, Una block, Una district, Himachal Pradesh: Integrating the informal sector to reduce plastic waste

Before 2013, the gram panchayat (consisting of one village with 565 households) was struggling with waterborne diseases. *Safai karmcharis*, paid a monthly salary of Rs 8,000, used to collect solid waste from households and dump it near the panchayat office.

During heavy rains, the leachates from this dump flowed unabated into the nearby village pond. The villagers used to visit doctors regularly, spending a major part of their earnings on health. The children also missed school as they suffered from diarrhoea and malaria.

In 2013, the sarpanch of the village, Sandeep Kumar, got an opportunity to visit villages around Kurukshetra town. He was impressed by their management of organic waste using vermicomposting. Sandeep Kumar came back to his village and decided to get rid of the solid waste dump near the panchayat office.

A material recovery facility (MRF) was set up after clearing the dump. Every household was made aware about source segregation of dry and wet waste. They were provided with two dustbins—one for wet and the other for dry waste. The *mahila mandal*, consisting of 25 members, played a big role in making villagers aware about the importance of source segregation. Four *safai karmcharis* went door-to-door collecting segregated waste and brought it to the MRF.

Secondary segregation was done at the MRF. Organic waste was composted in the composting machine which was procured via a bidding process. The contract for operation and maintenance was given to the company from which the machine was bought. The gram panchayat started generating revenue from the compost.

Dry waste was segregated into seven categories and recyclables—like cardboard, paper, glass, metal and rubber—were directly sold to private recyclers. The MRF was also equipped with a small plastic unit consisting of a dust remover to clean the plastic and a shredder to dice the plastic into equal-sized pieces. Plastic was further compressed using a baler to reduce its volume.

The gram panchayat decided to tie-up with a private plastic recycling company M/s Chabba Polymers situated around 5 km away from the village. The company collected and processed plastic, converting it into PVC pipes or other plastic materials. The company would purchase plastic waste at Rs 36 per kg, and the gram panchayat planned to use the income for operation and maintenance of the MRF.

Around the end of 2022, the *safai karamcharis* became disinterested in collecting waste due to low wages. As a result, the amount of waste received by the MRF gradually decreased and the village was again seen to be littered with all sorts of solid waste.

So, the gram panchayat came up with an alternate plan. It decided to hand over the management of the entire value chain to the identified informal sector, who would now be responsible for collection of segregated waste and user charges. Now the *safai karamcharis* directly collect Rs 50 from each household per month and they sell the recyclable waste for extra income.

Non-recyclables and organic waste are brought to the MRF while recyclables are sold to informal recyclers operating in the region. The gram panchayat earns revenue by selling compost at Rs 15 per kg. The facility now plans to sell non-recyclable plastic at Rs 70 per kg to the public works department for road construction, as per the guidelines.

SHIVANGI AGARWAL

Photograph 15: Waste segregation shed

SHIVANGI AGARWAL

Photograph 16: Clean roads

The plastic waste management system in Ajouli gram panchayat was the first to have a system in place for collection, segregation and transportation of waste, while making maximum utilization of available resources. Initially, people would not segregate waste properly. However, after consistent interpersonal communication, almost all of households took their role seriously and were linked to the system.

Table 9: Ajouli gram panchayat's plastic waste management model

User fee collected	Sale of plastic waste	Panchayat role and funding
Rs 50 per month per household collected by formalized former informal waste collectors	Waste collectors sell it to informal recyclers and keep the profit	· The plastic waste management unit is on panchayat land. · A third party installed the compost machine and is responsible for its O&M. · Compost is sold at Rs 15 per kg · The plan is to sell non-recyclable plastic to public works departments at Rs 70 per kg.

Source: Compiled by CSE

QUOTE FROM THE GROUND

Sandeep Kumar, 54, has been the sarpach of Ajouli gram panchayat for 13 years. He explains "Since the inception of the waste management centre in our panchayat, we had four workers collect, segregate and transport the waste to a segregation shed located near the panchayat office. The panchayat was paying them Rs 8,000 per month. Due to issues of waste quantum and low wages of workers, the panchayat decided that workers would work autonomously with the household user fee and revenue from the sale of recyclables as their sources of income. With ownership of work, the workers are motivated and work efficiently. The workers have also been able to send their children to schools and they take part in social and cultural gatherings without the feeling of discrimination from the village households."

Kelwara village, Kumbhalgarh block, Rajsamand district, Rajasthan: Using CSR funds for waste management

Kelwara village is located approximately 6 km before Kumbhalgarh (a popular tourist destination) and 75 km from Udaipur. The gram panchayat was facing issues in managing its solid waste. The road to Kumbhalgarh has a market within the boundaries of the village which stretches over 2 km. Before 2018, the roadsides were filled with huge dumps of solid waste, mainly single-use plastic like bottles and wrappers due to heavy tourist footfall.

Problems like clogged drains and wastewater overflow on roads and streets had become common. This led to health problems with breeding of mosquitoes and insects. The dumped solid waste also led to foul smells and leachate discharge into the hills. Conditions used to worsen during heavy monsoons and the peak tourist seasons.

In 2018, Seva Mandir, an Udaipur-based non-profit working in Kelwara since 2002, interacted with households to understand the situation of solid waste management. Post interaction, Seva Mandir created the Kelwara Vikas Samiti with support from the gram panchayat. It is a community-based apex body consisting of seven members with representatives from hotels, wards, local community, traders association, etc. The main aim of creating it was to ensure community involvement and participation. It is responsible for overall monitoring of the waste management system. Seva Mandir, along with the panchayat, decided to conduct a preliminary pilot survey through the Samiti.

The survey intended to map 400 houses, hotels and commercial shops on the main market road. For the survey, the market area was divided into six zones. Shops and houses were individually mapped. A team of six *aarogya mitras* (sanitation workers) were deployed by the NGO to conduct the survey over a span of seven days with an objective to understand the existing waste management practices, challenges faced by households, and the quantum and composition of waste generated. Three *aarogya mitras* were paid Rs 2,000 from the CSR fund by Seva Mandir and three by convergence of gram panchayat and CSR funds.

Solid waste samples were collected from each zone and classified into seven broad groups: organic, plastic, paper and cardboard, textile, glass, metal and mixed residue. The management of non-recyclables like single-use plastics, cloth, thermocol, etc. was a major challenge that had to be resolved.

Seva Mandir met the challenge with technical and implementation assistance from New Delhi-based non-profit Saahas which prepared a detailed waste management plan in the first year (2018). After that, Seva Mandir has been responsible for all the tasks. A material recycling facilities to manage solid waste was set up with the help and support of the Kelwara Panchayat Vikas Samiti. The centre was set up in 2020 on panchayat land using CSR funds procured from the Interglobe Foundation based in Gurugram.

Soon after the pilot survey, six *aarogya mitras* deployed in each of the six zones were trained and capacitated to ensure collection of segregated solid waste from the 400 households. *Aarogya mitras* are also responsible for street sweeping, drain cleaning and IEC activities. The waste collected from sweeping is collected in a sack and kept at a waste collection point. The waste collected from households and drain/street cleaning is transported in a waste collection mini-compartment truck to the material recycling facilities.

The waste is then weighed and unloaded at the MRF to be further classified into six categories—paper, glass, plastics, metal, plastic bottles, and others (inert/cloth, etc.).

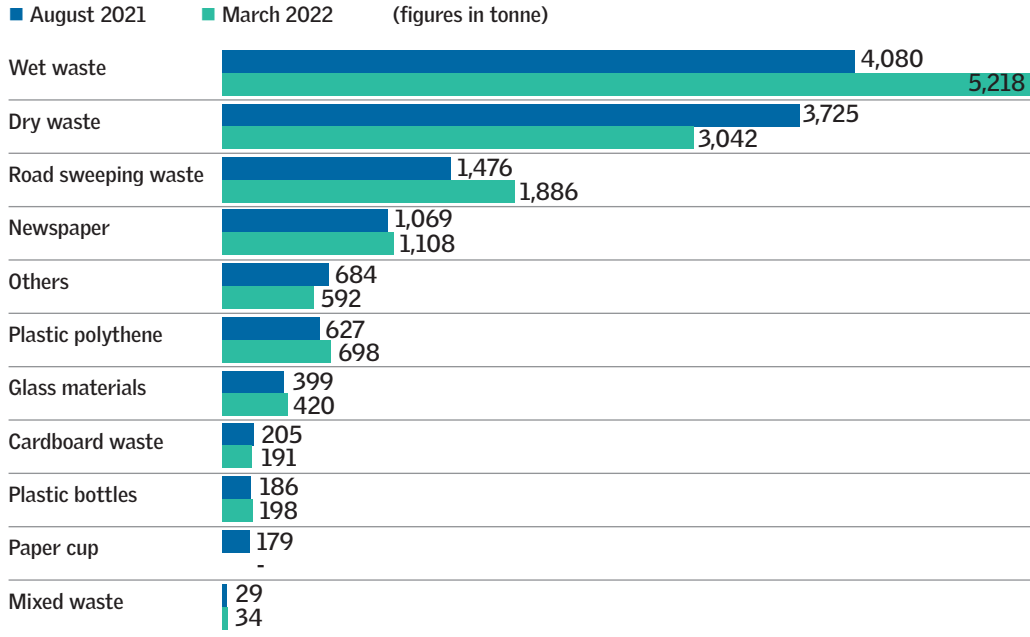
Table 10: Details of installation and operation & maintenance cost

Operational cost per month		
	Particular	**Estimated Cost (Rs)**
Manpower	Supervisor	10,000
	Arogya Mitra for door-to-door waste collection (2 for collection + 2 for drain cleaning and street sweeping + 2 for material recycling facilities) (2,000*6)	12,000
	Arogya Mitra for waste segregation (3,500 *2, for 15 days)	7,500
Transport	Waste collection vehicle (maintenance, fuel and rent of vehicle)	15,000
	Transport to factories (borne by buyer)	0
Others	Electricity (Temporarily provided by PWD, applied for connection)	0
	Packaging material, safety gears and miscellaneous	2,500
	Total	**47,000**
	Annual operating cost (47,000*12)	**5,64,000**
One time installation cost		
	Particular	**Estimated cost (Rs)**
Land	Land allotted by Panchayat Samiti	0
Construction	Covered Store/Segregation Sheds/Nadeps	15,00,000
Machinery	Baling machine	2,30,000
	Total	**17,30,000**

Table 11: Total revenue generation up to January 2023

Components	Revenue (till date-Jan'2023)
Plastic sale	95,000/-
Compost	Nil
Households - User Charges	0
Shops- User Charges	0
Hotel- User Charges	0
Total	95,000/-
Total Revenue	95,000 (in 1.6 years) 63,334 per annum
Annual Expenditure	**47,000 x 12 = 5,64,000 /annum**
Shortfall	**5,64,000 - 63,334 = 5,00,666/annum** **Additional cost is being borne by CSR funds**

Graph 4: Data of total waste received category-wise in the months of August 2021 and March 2022



Source: Data shared by Seva Mandir

Recyclables are sold to junk dealers and the income generated is used to pay salaries of Aarogya Mitras and for operation and management of the plant. Non-recyclable plastic was compressed in a hydraulic machine to form a briefcase like structure to save storage space while transporting to the nearby Birla cement factory in Rajasmand. For the first two years, the cost of transportation was borne by the

Jetha Lal, 34, project associate, Seva Mandir, Kelwara gram panchayat explains, "This is a community led waste management initiative where households, non-profits, government and CSR have come together to manage their waste. This was the first panchayat to become ODF+ certified under Swachh Bharat Mission - Grameen in the year 2021."

gram panchayat but owing to funding issues, this has stopped and the waste is just being dumped. The overall ownership of the machinery and material recycling facilities is with the Kelwara panchayat. The repairing and maintenance of drains in the area is undertaken by Kelwara Vikas Samiti using panchayat funds.

The samiti along with the panchayat and Seva Mandir representatives conducted interactions with *vyapar mandals* (traders association) and various children's groups. To ensure a behavioural change in citizens, several wall paintings and street plays were commissioned. The panchayat was able to secure Open Defecation Free - Plus certification in 2021. Later, the material recovery centre in the village was also declared Rajasthan's first waste management centre. This pilot has now become a successful intervention that is being replicated throughout Rajasthan.

SHIVANGI AGARWAL

Photograph 17: MRF at Kelwara

SHIVANGI AGARWAL

Photograph 18: Segregated waste collection vehicle in Kelwara gram panchayat

Urban-rural convergence for managing plastic waste in rural areas of Odisha

Prior to 2020, recyclables in the state were being sold to informal scrap dealers and non-recyclables ended up being dumped in the open. Due to low economic prosperity, waste generation was comparatively lower in rural areas. Scrap dealers also did not bother to go to the interior villages owing to the low quantum of waste and logistical issues.

After the start of SBM Phase-II, the state issued a notification (Letter Number PR-PS-POLICY-0007-2020/3564/PR&DW) in February 2021 asking all the villages to make action plans using a common format provided by the state for strengthening of waste collection and development of market for processing of plastic waste. The Block Development Officers (BDOs) were ordered to tag gram panchayats to urban MRFs for managing rural non-biodegradable waste.

To achieve this, an essential step was to create basic infrastructure. As per the guidelines, door-to-door equipment has to be purchased and storage areas have to be set up. This was to be managed from the SBM grant and state/central finance commission grant in a 70:30 ratio. The guidelines allowed tagging of gram panchayats to urban MRFs only on the condition that households will give out dry waste separately. Wet solid waste must be managed at the household level to the maximum possible extent in household compost pits or community compost pits in dense areas.

Odisha had already successfully demonstrated an urban-rural convergence model for faecal sludge management. Following the learnings of that, the state tagged all the gram panchayats to their neighbouring ULBs. The cost of collection and transportation would be entirely borne by the gram panchayats which would transport the waste to urban MRFs after collection of a substantial quantity. The state also focused on creating a local market led mechanism where it permitted plastic aggregators to set up plastic waste processing units in or near rural areas.

The state has successfully led convergence with 219 urban MRFs. All of the gram panchayats are tagged with existing functional MRFs for processing recyclable waste. SBM-G funds are utilized, as per requirements of individual ULBs, to augment capacities of the urban MRFs and provide for necessary weighing bridges and conveyor belts. Approximately Rs 70 crores have been allocated for this.

Gram panchayats have initiated door-to-door collection of dry waste by engaging self-help groups. Waste has to be collected at least once per week. The frequency can be increased to two or three times per week depending on the size of the locality as per the notification issued by the state in September 2021 (PR-RS-POLICY-0007-2020/14503/PR&DW). About 13,300 tricycles for collection and 13,700 waste segregation sheds for storage of collected waste have been facilitated across the state. Each village will have a very rudimentary waste shed to ensure protection from rain and for temporary storage of waste.

Incentives to SHGs for waste collection and management are provided through:

- SFC and FFC grants: Rs 5 per household per month for collection once a week.
- User fee is to be collected from localities with households requiring more than one visit per week as per SWM bye-laws adopted by gram panchayats. The villages have village water and sanitation committees (VWSCs) which collect Rs 30 per household per month from SC/ST/BPL households and Rs 60 from other households and establishments. So far, collection is not up to the mark but VWSCs are encouraging households regarding the same.

Segregated waste is stored in the shed. Informal scrap dealers have been tagged with the SHGs but they do not reach interiors owing to distance and logistics. They buy recyclable materials from SHGs while non-recyclables are transported periodically to the tagged MRF for further processing. ULBs receive dry waste without any charges.

Since the inception of this convergence, approximately 86 tonne of waste has been transferred from rural areas to neighbouring ULBs in about 620 trips. MoUs have been signed with 110 ULBs. If volumes increase in the future, Odisha plans to establish rural MRFs.

PD, DRDA GOVT. OF ODISHA

Photograph 19: Dustbins given to communities in Odisha

PD, DRDA GOVT. OF ODISHA

Photograph 20: SHG members involved in door-to-door waste collection

PD, DRDA GOVT. OF ODISHA

Photograph 21: Rudimentary waste segregation shed in Odisha

PARMESWARAN B: DIRECTOR AND JOINT SECRETARY, DRINKING WATER AND SANITATION, PANCHAYATI RAJ & DRINKING WATER DEPARTMENT, GOVERNMENT OF ODISHA

Waste generation is Odisha is less becuase it has many areas with low low economic prosperity. So, we have ensured that very rudimentary waste segregation sheds are made available to all the villages and are made such that they are accepted by the community. At present, we have tied with the urban material recycling facilities and have given them Rs 70 lakh from SBM funds to develop the requirements to cater to rural waste. They have agreed to take the waste on no cost sharing basis. Whatever revenue is generated by selling the non-recyclables will be kept by them. However, the same may be negligible. The entire cost of transportation is borne by the gram panchayats on an as and when basis. We shall develop rural MRFs in the future if the quantum of waste increases.

Tamil Nadu conducts waste auditing to enable better decision making for step-by-step management of plastic waste

Prior to 2015, the state did not have any systems for solid waste management. As a result, plastic would remain lying around in the open or was being burnt. To manage the same, approximately 60 plastic waste management units in 37 districts were constructed and the state started earning revenue by sale of recyclable plastic.

The state realized that if the entire plastic waste value chain is channelized and mapped, they can increase revenue generation and reduce the plastic waste menace at the same time. To increase revenue, they would need more plastic segregation and management units. They would also need more manpower and equipment to ensure every bit of plastic reaches the waste management unit which would ensure maximum sale of recyclable plastics and hence more revenue generation.

So, in 2019, the state decided to conduct a waste audit to map the available quantum of waste in the state. This would also help them understand the per capita generation of waste. The state also banned the sale and use of single-use plastics and those found using it were fined. Rigorous IEC activities were conducted with help of SHGs and panchayats. Each village identified 5–10 women SHG group members who would now act as the main operators of the value chain.

The state initially mapped the stakeholders in the entire solid waste value chain. The primary objective of the entire exercise was to map all the solid waste which exists as legacy waste and which circulated in the village vicinity formally and informally. This would help plan the plastic waste management chain better.

Households were given dustbins from the SFC fund. Segregated solid waste was collected by SHG members using tricycles and pushcarts and brought to the segregation shed. The amount of solid waste being generated daily was weighed and sorted into different categories. SHG teams maintained daily waste collection registers. They had to mark attendance and get signatures from at least 10 households daily to ensure they are working properly.

Initially, the state faced challenges regarding availability of labourers. So, the MGNREGA scheme was used to provide 100 days of assured employment to SHGs and salary for 200 days was given from SFC funds. Each SHG, known as *Thooimai Kavalar* (Environment Protectors), was given 150 households for survey and waste collection. Segregation sheds were made using SFC funds. Tricycles/ pushcarts, safety gear such as gloves, whistles, baskets, jackets, and first aid kits were also purchased using SFC funds.

Each village collected the data and filled it in the specified format. The survey was based on the methodology of time motion studies which consider various routes of operation of the solid waste management system to determine the most efficient route. Each SHG member was paid Rs 2,600 per month, which has been increased to Rs 3,600 from 2022 onwards. A total of 80 per cent of the income generated from sale of recyclables was distributed among SHG members and the rest 20 per cent went towards the O&M of the plastic waste management unit and vehicles. Organic waste was made into compost in a vermicomposting shed made using MGNREGA funds.

Table 14: Waste audit conducted in all the 12,525 village panchayats of Tamil Nadu

Type of waste	Quantum of waste generated per day in tonnes	Per capita waste generated per day in grams
Biodegradable waste	1,905	45.00
Plastic waste	155	04.00
Recyclable waste	126	03.60
Non-recyclable waste	123	03.40
Hazardous waste	25	0.30
Construction waste	14	0.10
Total waste generated	**2,348**	**56.40**

Source: DRDA Tamil Nadu

DRDA Madurai presents an example of plastic waste utilization

Madurai District in Tamil Nadu initially started managing waste using MGNREGA funds in 2015 after the release of an order by the Environment and Forest Department of Tamil Nadu regarding utilization of plastic waste for road construction. Now the waste is being managed using SFC funds.

The district started a trial wherein recyclables plastics such as HDPE, LDPE and reusable plastic are being used to make interlocking bricks for pavements. Plastic waste was shredded, directly added to the concrete mix and placed inside a mould. Different plastic mix ratios were experimented with. The compressive strength of 35 gram plastic paver blocks was as per the Indian standard code (IS-1565 (2006)) and bondage with concrete was also better than with other ratios.

Table 15: Sample waste audit report (Madurai district)

Swachh Bharat Mission-Grameen										
Solid waste management - Outcomes of waste audit conducted										
Name of the district: Madurai										
Sr. no.	Name of the Block	Number of Village Panchayats	Total no. of villages in the village panchayat	Total no. of house-holds in the village panchayat	Population of the village panchayat	Quantity of waste collect-ed and weighed (in kg/ day)	Biode-gradable waste weighed (in kg/ day)	Non-biodegradable waste		
								Plastic waste weighed (in kg/ day)	Recy-clable Waste weighed (in kg/ day)	Non-re-cyclable waste weighed (in kg/ day)
1	Madurai east	36	246	53,481	139,025	5,499.00	4,996.00	195.00	131.00	168.00
2	Madurai west	29	93	32,000	85,771	6,114.70	4,843.50	309.00	316.00	358.70
3	Thirupparankundram	38	139	59,453	231,679	13,186.00	12,720.00	387.00	42.00	27.00
4	Melur	36	231	52,645	154,063	6,920.00	6,395.00	256.60	186.40	64.00
5	Kottampatti	27	206	43,694	114,339	5,551.00	4,872.00	246.00	193.00	240.00
6	Vadipatti	23	68	23,018	21,878	4,852.00	4,594.00	129.00	59.00	39.00
7	Alanganallur	37	116	29,677	88,785	3,028.00	2,712.00	88.80	39.70	19.85
8	Usilampatti	18	150	27,950	93,108	4,471.00	3,826.00	330.50	185.00	129.50
9	Chellampatti	29	229	32,329	100,666	4,595.00	4,294.00	130.00	22.00	142.00
10	Sedapatti	31	118	43,561	96,630	4,120.00	3,253.00	526.00	135.00	199.00
11	Thirumangalam	38	155	39,827	104,163	9,225.00	8,898.00	147.00	55.50	114.00
12	T.kallupatti	42	118	27,739	76,152	8,299.00	7,295.00	305.00	407.50	291.50
13	Kallikudi	36	77	32,310	96,741	2,611.00	2,322.00	137.00	77.00	75.50
Grand total		420	1,946	497,684	1,403,000	78,472	71,020.50	3,186.90	1,849.10	1,868.05

Source: DRDA Madurai

Table 16: Compressive strength of paver blocks at different plastic mix ratios

Description	Traditional paver block			Green paver block with 35 grams plastic			Green paver block with 50 grams plastic		
	Weight of blocks in grams	Failure load in KN	Compressive strength in N/sqmm	Weight of blocks in grams	Failure load in KN	Compressive strength in N/sqmm	Weight of blocks in grams	Failure load in KN	Compressive strength in N/sqmm
7 days strength	5,740	440	15.75	5,440	420	15.03	5,350	370	13.24
	5,710	520	18.61	5,470	395	14.13	5,310	320	11.45
	5,760	495	17.71	5,490	410	14.67	5,390	350	12.52
		Average	17.36		Average	14.61		Average	12.4
28 days strength	5,720	680	24.33	5,410	400	14.31	5,360	340	12.17
	5,700	740	26.48	5,450	420	15.03	5,370	320	11.45
	5,740	720	25.76	5,460	480	17.18	5,370	360	12.88
		Average	25.52		Average	15.51		Average	12.17

Source: DRDA Madurai

DRDA&PR, GOVT. OF TAMIL NADU

Photograph 22: Plastics are shredded and used in paver blocks

DRDA&PR, GOVT. OF TAMIL NADU

Photograph 23: Some plastics are visible in the paver blocks

However, 5 per cent plastics were visible in visual inspection. Hence, they recommended usage of 25 grams of plastics. The district and the state have conducted a waste management audit in the district where they have estimated the generation of different types of waste on weight basis in all the villages. The district is now using shredded plastic waste to produce the paver blocks used in road pavements. Non-recyclable plastics are sent to cement plants.

N.Panjampatti Gram Panchayat in Dindigul district showcases a revenue generation model by selling shredded recyclable plastics

Waste is collected by six SHG members and segregated in a separate shed. Plastic carry bags are transported in an electric vehicle and sold at Rs 10/kg to the plastic waste management unit (PWMU), set up on N.Panjampatti gram panchayat land using Rs 8.5 lakh from DRDA and bank loans.

In the PWMU, dust is removed using a dust remover and plastics are shredded into tiny pieces. These are collected in bags and sold at Rs 30/kg to road construction departments and private players who make bitplast bitumin cakes for roads.

The PWMU has earned approximately Rs 22 lakh in the last ten years. In January and February of 2022, roughly 5,510 kg of carry bags were purchased from 62 gram panchayats at Rs 10/kg. Approximately 1,000 and 3,000 kg of shredded plastics have been sold to government and private players respectively, yielding a revenue of Rs 1,20,000 in 2 months.

About 3,054 kg of plastics were collected from 306 village panchayats in Dindigul up to January 2022, as per an audit conducted in the district. This can be sold at Rs 10/kg to PWMUs under the plastic buy back policy of the state. After the dust removal process, a weight reduction of 25 per cent is observed. The remaining plastic can be sold at Rs 30/kg.

DRDA&PR, GOVT. OF TAMIL NADU

Photograph 25 a & b: SHG group members segregating and shredding plastic waste, which is packed and sold for revenue

SUNDARESAN. A, EXECUTIVE ENGINEER, RURAL DEVELOPMENT AND PANCHAYATI RAJ DEPARTMENT, DRDA, RAMANATHAPURAM

Waste auditing has helped us categorize and quantify the waste to spell out an action plan and link it to a formal supply chain for more economic benefits. The collected plastics are then used to make paver blocks as per the Indian standard specifications. They are effective and shall easily serve a service period of 15–20 years.

Himachal Pradesh issued plastic buy back policy guidelines for non-recyclable and single-use plastics

Plastic menace haunts the state owing to high tourist footfall. Soil and water in the valleys are often found littered with plastics. To deal with this, Himachal Pradesh has imposed a complete ban on single-use plastics in the state. It also started the "Polythene Hatao Paryavaran Bachao Abhiyan" in 2009.

The state collected plastic waste through the campaign and ensured its disposal by recycling and use in road construction and cement kilns as a source of energy. Eventually, the campaign lost its momentum and the state has attempted to revive it from time to time. High collection time and low wages were two of the main reasons that plastic was not reaching collection points. The informal sector was only interested in plastic that was easy to collect and could generate revenue for them. Single-use plastics take time to collect and also generate lesser revenue than other kinds of plastics.

The state realized the need to develop guidelines and standardize revenue for the informal sector, accounting for the time spent collecting plastics. Himachal Pradesh Department of Environment Science and Technology notified a policy and guidelines in October 2019 regarding buy-back of non-recyclable and single-use plastics, including plastic bags from rag pickers and households. The state shall collect the plastic and deposit it at the collection centres of urban local bodies.

The rural development department and cement companies have also been brought under the ambit of the policy. As per the policy, the workers will be paid an average minimum support price (MSP) of Rs 75 per kg of plastics. For eight hours of working time and the fact that they collect about 1 kg of plastics in 2–3 hours, we can estimate that they will make about Rs 225 per day. This was done under the EPR act, which would make it easier to collect segregated plastics and other non-recyclables, thus making it easier for cement plants and waste-to-energy plants as they operate on different requirements.

KIRTI CHANDEL, ADDITIONAL MISSION DIRECTOR SBM-G, RURAL DEVELOPMENT DEPARTMENT, HIMACHAL PRADESH

The state aims to have at least one operational plastic waste management unit in each block. Each unit will aim to collect, process, and recycle and reuse plastic in collaboration with ragpickers, cement plants, public works department (road construction), etc. Plants are central to the government's vision of clean and green villages. The Rs 75 per kg plastic buy-back policy will make these units sustainable.

As per the estimates in the policy, 1,000 kg of plastic can replace 1,000 kg of bitumen, saving Rs 35–50 per kg of bitumen to be used. The MSP is only applicable to non-recyclable and single-use plastics. To meet the costs, the state policy has made a budgetary allocation of Rs 2.81 crore for a period of five years, estimating collection of 75 tonnes of plastics per year. The proposed budget shall be met in the following phases:

Table 14: Budget sharing by different departments

Timeframe	Budget sharing
First year	50% (Department of Environment Science and Technology - DEST) + 50% (State Pollution Control Board - SPCB)
2nd & 3rd year	10% (DEST) + 20% (SPCB) + 20% (Rural Development-RD) + 30% (Urban Development-UD) + 20% (EPR)
4th & 5th year	10% (DEST) + 20% (SPCB) + 20% (RD) + 30% (UD) + 20% (EPR)
6th year onwards	100% (UD & EPR)

Source: Compiled by CSE

5. Conclusion: Suggested actions for sustainable plastic waste management in rural India

Swachh Bharat Mission (Grameen) identifies management of plastics as one of the key pillars for reaching the Sustainable Development Goal on water and sanitation. Version 2.0 of this mission launched in 2019 talks about the management of solid waste including plastics. In rural areas, organic waste is traditionally composted, but the major concern is plastics which clog drains and waterbodies, leading to waterlogging, mosquito breeding and increased health cost in the villages.

The first and most glaring hurdle in managing plastic waste is the unavailability of data on the quantum of waste generated. Different government departments dealing with Swachh Bharat Mission and pollution control boards work in silos. The pollution control boards do not even talk about the sample size while the sample size used by the NARSS data published lately is very small. This makes the data from the government very confusing and difficult to analyse. Other data from NGOs and research studies is very site-specific.

The second challenge is the lack of awareness among different stakeholders about their roles and responsibilities. In the Plastic Waste Management Rules, 2016, the Ministry of Environment, Forest and Climate Change (MoEFCC) included rural areas as well but weak implementation on the ground has stalled any improvement.

Funding for managing plastic waste in rural areas can be sourced from SBM (G), Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), State Finance Commission (SFC), Fifteenth Finance Commission (FFC), Member of Parliament (MP)/Member of Legislative Assembly Local Area Development Fund (MLALAD), Micro-Financing Institutions (MFIs), Swachhta Funds from different ministries, Swachh Bharat Kosh, and Corporate Social Responsibility (CSR) funds. But lack of understanding of the plastic value chain in most of the cases leads only to the creation of material recovery facilities. Segregation at household level is very rare and reuse of recyclable plastics is rarely seen. Non-recyclable plastics are dumped openly in most cases. MRFs and waste segregation

sheds might not actually be required or they might not be required at the capacity at which they are being built, but these questions have not been asked.

States like Bihar have built the infrastructure but lack any facilities to weigh the waste. They sell recyclable waste but have no plan in place for non-recyclable waste. Tamil Nadu has realized the need of assessing the available waste quantum to be able to manage it better and earn more revenue. This model of waste auditing can easily be learnt and replicated in other states. Odisha has realized that the available quantum of plastic waste does not require creation of infrastructure and they can manage the existing quantum in coordination with urban facilities. Himachal Pradesh is facing issues with wrong planning of infrastructure owing to more waste being received by plants than planned.

From the existing examples, it becomes clear that plastic management is quantum, region and terrain specific. A one-size-fits-all solution does not exist. Sikkim, Leh and Ladakh have scattered topography while Rajasthan and Uttar Pradesh have cluttered habitations. The solutions in these cases have to be customized accordingly. Logistical issues owing to different terrains and low bulk density of plastic waste are a cause of concern as this increases the cost of transportation and availability of funds becomes an issue. States also need to identify sources for revenue generation, failing which the deficit of funds may result in ceasing of operation of the created infrastructure. Market interventions also need to be identified to work towards creating a sustainable model of plastic waste management. Capacity building of various stakeholders remains a core requirement.

States like Odisha, Himachal Pradesh, Tamil Nadu, etc. present examples on how policy guidelines can help better manage the informal sector, create employment, improve implementation of EPR, help develop a clear vision on budgetary requirements and stakeholder responsibility, etc. A centrally driven policy and monitoring framework is required along with interdepartmental coordination and collaboration.

At present, there is a need to identify step-by-step solutions at all stages of the plastic waste management chain:

1) Gram panchayats need to encourage segregation at source to ensure only dry waste reaches the waste segregation shed. Wet waste should be taken care of at household and community levels.
2) There is a need to develop community ownership and encourage people to segregate waste at source. They should understand the need for user-fee system and cooperate with the gram panchayats. This shall only be possible with

proper capacity building and awareness programs involving the community.

3) Gram panchayats should facilitate door-to-door collection of waste, so that the waste reaches a common collection point and is not dumped openly.
4) A sustainable model of operation for waste collectors and SHG members should be decided and supported by bye-laws. Market linkages with scrap buyers, aggregators and recyclers need to be built to channelize collected waste to the relevant facilities. Cues need to be taken from Ajouli gram panchayat in Himachal Pradesh and Odisha urban-rural convergence models, which have experimented with and evolved ways of involving informal sector and SHG members. Himachal Pradesh's buy-back policy considering the EPR guidelines is also an excellent example, provided proper implementation can be assured. Various other funding options can be identified such as CSR funds, tourist funds, etc., apart from existing SBM-G funds, to ensure sustainable functioning of the entire system.
5) For creating infrastructure, states need to conduct a proper waste management audit and decide what is needed on the basis of the results, as in the case of Odisha's urban-rural convergence model.
6) Proper channels for reuse and disposal of recyclable and non-recyclable plastic waste need to be identified. Madurai and Dindigul in Tamil Nadu present examples of sustainable and profitable models of recycling plastic waste. More such solutions should be identified and opted for.

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Non-recyclable plastic waste such as wrappers, polythenes, etc. are either burnt or end up clogging the drains and waterbodies in villages. Swachh Bharat Mission-Grameen 2.0, launched in the year 2019, focuses on managing plastic waste to make the villages clean. But, reports from the field and interaction with the communities clearly indicate lack of data on plastic disposal, lack of institutional framework, and lack of area specific disposal and recycling solutions. The present scoping paper lists the gaps and challenges in managing plastic waste and portrays success stories which can be scaled up for bringing in changes on the ground.

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