

Waste Minimization Initiatives

TRAINING MANUAL



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ClimateSmart Cities Assessment Framework
Waste Management

Waste Minimization Initiatives
Training Module

Developed by:
Climate Centre for Cities, NIUA in association with
Chintan Environmental Research and Advocacy Group

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Photo Credit: Shivam Vij

Executive Summary

On one hand, cities are a significant contributor of carbon emissions aggravating climate change and on the other, cities are considerably impacted by climate disasters. The recently released Global Climate Risk Index 2021 ranks India as the 7th most affected country from climate related extreme weather events (storms, floods, heatwaves etc.). Further, studies indicate that poor planning and urban management are expected to cost Indian cities somewhere between \$2.6 and \$13 billion annually. Cities are increasingly at the forefront of addressing both urbanization and climate change and to strengthen climate-sensitive urban development, a holistic understanding of the urban development from a climate lens is crucial. The ClimateSmart Cities Assessment Framework (CSCAF) launched in 2019 by the Ministry of Housing and Urban Affairs (MoHUA), Government of India aimed to address this gap. This first-of-its-kind assessment with 28 progressive indicators across 5 thematic areas helps cities to benchmark their development, understand the gaps and further prioritize climate relevant development.

With a focus on building local capacities to develop and adopt climate measures, the Climate Centre for Cities (C-Cube) at the National Institute of Urban Affairs (NIUA) initiated a series of training aligned to the thematic areas of CSCAF - Energy and Green Buildings, Urban Planning, Green Cover & Biodiversity, Mobility and Air Quality, Water Management, Waste Management. The focus of the training is to provide a step-by-step approach of conducting studies, assessments, and stakeholder consultations, establishing committees, developing action plans and implementing relevant measures that not only makes the cities climate resilient but also helps them progress across the assessment of CSCAF. The focus of this training is on the 'waste management initiatives' indicator under the thematic areas of Waste Management in the CSCAF.

Significant increase in Municipal Solid Waste (MSW) generation has been recorded worldwide due to rapid population growth accompanied with industrialization, urbanization, and economic growth. The statistical data of waste production around the world is concerning. Waste accumulation and improper disposal severely affects the environment causing air, water and soil pollution which affects public health and causes ecological damage. In India, waste management is one of the major environmental concerns, especially in metropolitan cities due to high amount of waste generation in comparison to the capacity of landfill availability.

The smaller towns and cities face challenges in managing the waste effectively and are usually disposed of in low-lying areas without taking necessary precautions or operational controls. Hence, adopting government policies at national, state, and local level is required

especially in the context of rapid urbanization of peri-urban areas. India has shown progressive waste management approaches in recent years with the introduction Swachh Bharat Mission (SBM) and Swachh Survekshan (SS) in 2014 and 2016 respectively

The objective of this module is to build capacities for innovation and improve their performance around the CSCAF indicator 'waste minimization initiatives' through public-private, community-public and private-private partnerships. Leakages of waste are a challenge to the circular economy and the environment. Providing countermeasures to leakage especially plastic litter, building awareness and inculcating behavioural change will help build a climate smart city. By capturing the impacts of interventions made to manage and minimize waste generation they will be able to undertake informed climate action. The training will be provided to select Urban Local Bodies, Civil Society Organizations, Tourism and hospitality, Informal sector.

The module is aligned to Swachh Survekshan and focuses on capturing the measures adopted by cities in implementing Plastic Waste Management (Amendment) Rules 2021, Extended Producer Responsibility 2021 and initiatives undertaken to reduce dry/ wet waste, treatment of domestic hazard waste, onsite waste processing by non-bulk waste generators, measures taken by bulk waste generators to treat dry and process wet wastes and processing of wet waste at household/ community level.

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Who is the training manual designed for?



What is the focus of the training manual?



How to make use of this manual?



What are the Learning outcomes of the training?



Scope and limitations of the training

The training module on the indicator Waste Minimization Initiatives is intended for Urban Local Bodies (ULBs), specifically waste processing department, along with other Ground personnel like Safai karmacharis in Waste Management Collection, segregation, and processing in urban areas.

The training manual focusses on the practice and performance in the areas of plastic waste management by application of 3R principles, application of Extended Producer Responsibility 2021, Plastic Waste Management (Amendment) Rules 2021. A deeper understanding is provided for identification and elimination of prioritized Hotspots/ leakages of discarded plastics into the riverine system and becoming marine litter.

This manual is to be used as a technical reference material which delves into details touched in the presentation with reference to the additional reading material, the Plastic Waste Management (Amendment) Rules 2021 and Extended Producer responsibility 2021 to aid participants in following the training sessions.

The learning outcomes of this training for cities is to develop a better understanding of waste minimization initiatives and find innovative, collaborative ways for implementing actions plans for Plastic waste Management addressing climate related risks especially Marine Plastic litter. This training module would also equip cities in conducting assessments of waste processing Material recovery facilities (MRF's) and inclusion of informal sector to cater to current and future demand. Decision based identification and elimination of leakage hotspots would lead to cleaner safer environment and cities.

As the training module is designed and developed as a 2 - hour online training session with interactive exercises for city officials its scope is limited to establish a basic understanding of Waste Minimization initiatives at a city level, requirements of the CSCAF indicator and outline of waste management plan and assessments



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Abbreviations

CSCAF	ClimateSmart Cities Assessment Framework
C-Cube	Climate Centre for Cities
NIUA	National Institute of Urban Affairs NGO
NGO	Non-government Organizations



1

Introduction

Plastic Waste

As of 2018, around 55% of the world's population was living in urban areas and it is estimated that by 2050 this would increase to around 68% of the world's population. Most of this increase will be taking place in Asia and Africa and further the 2018 Revision of the World Urbanisation Prospects notes that this increase will be highly concentrated in just a few countries. The same report projects that India will add 416 million urban dwellers by 2050 (UN DESA, 2018).¹ This rapid urbanization will lead to increasing demand for the most essential needs of human beings, notably food and beverages which require packing and transport over distances. Plastic is the convenient packing material for other industry goods also because it is light, cheap and easily available. Plastic, though an integral part of human cities, has now become a significant contributor to climate change through its effects as GHG emissions and effect on marine environment.

Why Plastic packaging serves several important functions in our modern lives?

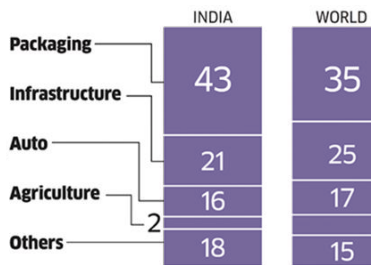
- **Protection:** It Protects vulnerable products especially food and beverages, medical kits from damage whilst in transit and from contamination or damage by moisture, humidity, gases, microorganisms, insects and light.
- **Preservation:** It preserves products for longer, which reduces waste by giving people more time to use or consume them before it is no longer suitable to do so
- **Prevents Waste:** It Helps keep Products together, and subsequently avoids spillages
- **Transportation:** It Allows transport over great distances, so that we have access to a wide variety of non-local produce that, in turn, encourages trade. It also saves space through stacking objects which make transporting more efficient.

¹UN DESA. (2018, May 16). NEWS: 68% of the world population projected to live in urban areas by 2050, says UN. Retrieved from UN Department of Economic and Social Affairs: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

Plastic usage as a packaging material is quite significant and stands at 43% and 37% in India and the world. The other areas of usage are Automotive 21% and 25% in India and the world (Seetharaman G, 2017).²

Today a growing economy like India has a plastic process industry of value India is (FY 15) is INR 1 Lakh Crore. It is ranked 9th in the world for the global production of the resin. The Growth of plastics as an industry is steady at 10-11%.

Figure 1: Share of total plastic use in 2012-2013, India and the world



¹Source Newspaper articles Economic times - India wants to double consumption of cheap material in 5 years, what about its plastic waste?

Image credits: FICCI

²Seetharaman, G., 2017. The Economic Times. India wants to double consumption of cheap material in 5 yrs, what about its plastic waste?, June 25. <https://economictimes.indiatimes.com/industry/indl-goods/svs/paper/-/wood/-/glass/-plastic/-marbles/india-wants-to-double-consumption-of-cheap-material-in-5-yrs-what-about-its-plastic-waste/articleshow/59301057.cms>

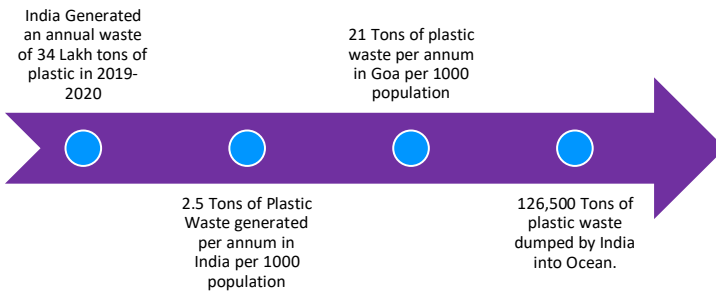
Plastic Waste in India

The sight of plastics, especially plastic litter is a commonplace in most Indian cities. Safai Karmacharis do street sweeping everyday morning to clear off these waste litter found spread over the entire cityscape. In most cases the plastic litter is mixed with the food it had packed prior to consumption. Single use plastics are the most prevalent in plastic litter and can be defined as disposable plastics (use and throw) that are intended to be used only once before they are thrown away or recycled. Awareness about the safe disposal of these plastics has just started in the last two years.

Plastic Litter has been a subject of concern in the upper house of Indian parliament. Replying to a query on the policy to phase out Single-Use plastic and understanding the annual plastic waste generation, Union Minister of state for Environment Mr Ashwini Kumar Choubey had said in the year 2019-20, India generated an annual waste of 34,69,780 tons of plastic waste while in 2018-19 it was 33,60,043 tons and in 2017-18 it was 23.83.469 tons (EconomicTimes,2021).³

The amount of plastic waste generated by 1000 Indians is 2.5 tons over a period of one year. Goa state has the highest plastic litter per 1000 Indian per year and the main reason is plastic littering (CPCB, 2020).⁴ India has the seventh-largest polluted river Ganges flowing across densely populated cities in its journey towards sea. India ranks no 1 in dumping plastic waste into the ocean.

Figure 2 India Waste Generation and Plastic Waste dump to Ocean



¹Source Newspaper articles - Euro news: Ranked: The top 10 countries that dump the most plastic into the ocean updated 22/06/2021

³EconomicTimes, 2021. Over 34 lakh tonnes of plastic waste generated in FY 2019-20: Govt, New Delhi: Economic Times.<https://economictimes.indiatimes.com/industry/indl-goods/svs/paper-/wood-/glass-/plastic-/marbles/over-34-lakh-tonnes-of-plastic-waste-generated-in-fy-2019-20-govt/articleshow/84551047.cms?from=mdr>

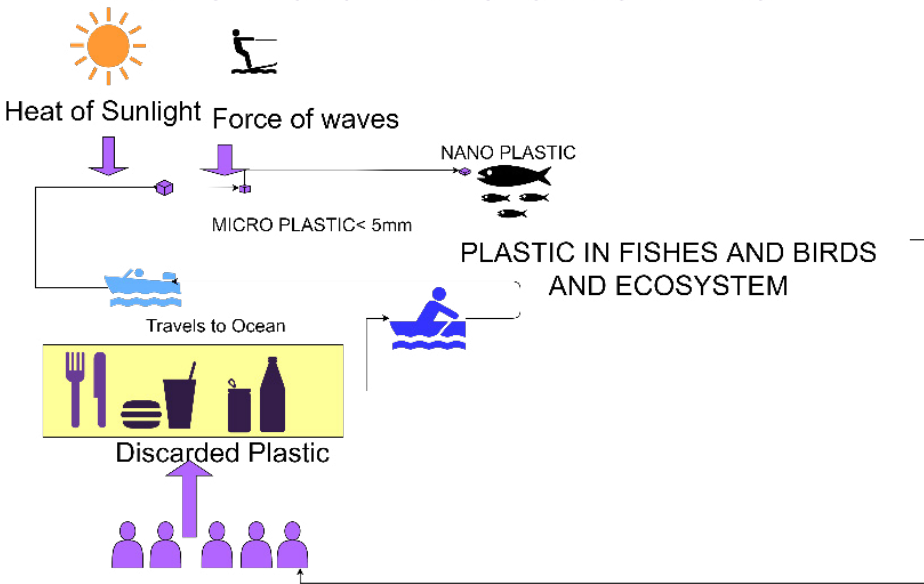
⁴CPCB, 2020. Annual Report 2019-20 on Implementation of Plastic Waste Management Rules, 2016, New Delhi: Central Pollution Control Board. https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2019-20_PWM.pdf

Gap in Recycling Discarded Plastics

In India Plastic waste is 8% of the total solid waste (PrintWeek Team, 2021)⁵. There is a significant portion of the plastic waste being discarded as they are not recycled.

So, what happens to these discarded plastics which land up in the environment, namely air, water and land. Contrary to popular perception these plastics do not decompose but disintegrate into smaller and smaller sizes (Micro plastic<5mm) (Green, 2020)⁶. Plastic begins a long journey meandering through water bodies, rivers and finally to seas and oceans under the full effect of disintegration forces by heat of sunlight and force of waves.

Figure 3: Plastic Disintegrates but does not decompose



The journey begins with the leakage of plastics on land and air in the form of litter. The litter enters the ecosystem through multiple ways like landfills, animals mistaking plastic as food along with the food waste it carries etc.

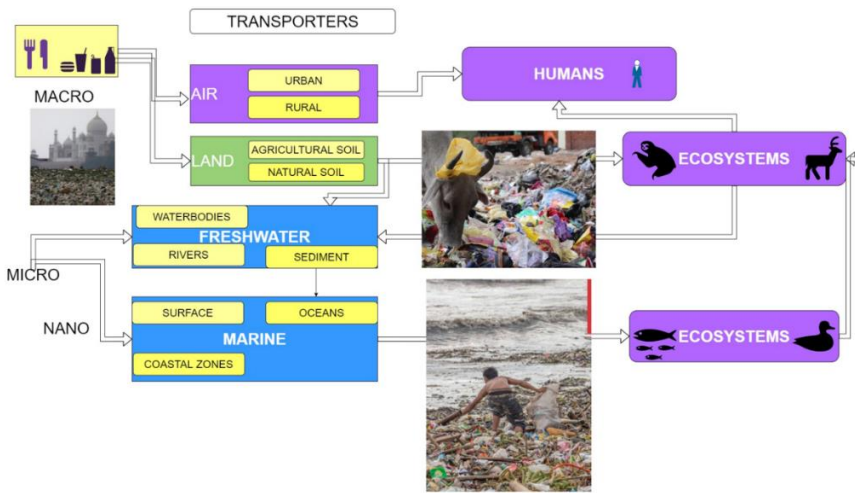
⁵PrintWeek Team, 2021. India ranks top among ocean polluters. Printweek, 26 June. <https://www.printweek.in/news/india-ranks-top-among-ocean-polluters-54786>

⁶Green, H., 2020. Making sense of microplastics? Public understandings of plastic pollution, s.l.: Science Direct.<https://www.sciencedirect.com/science/article/pii/S0025326X20300266>

Once into the ecosystem, plastic awaits accumulation and forward travel by means of freshwater body systems, drains, and conduits into the rivers.

Ganges and Yamuna are the two main rivers crisscrossing India. The Ganges is today the seventh largest polluted river in the world due to the plastic waste which it carries along with other waste on its onward journey to oceans. The surveys at Patna have come up with indications of plastics being recovered in fishes and birds.

Figure 4: Plastic Leaks through Waterbodies



Government of India has now conducted sessions in Awareness on plastic waste for better citizen participation for waste minimization. This is considering the seriousness and the impact it is currently having on the ecosystem and on the climate change parameters. The Government awareness campaign is focussed on the most littered item of packaging i.e., Single use plastics. They are widely used and include carry bags, food packaging, bottles, straws, containers, cups and cutlery. (Environment Minister launches awareness campaign on Single Use plastics., 2022)⁷

⁷Pib.gov.in. 2022. Environment Minister launches awareness campaign on Single Use plastics: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1725458>.



Photo Credit : <https://bit.ly/3f13gMI>

2

Promotion of Countermeasures (CM1) and (CM2) against Marine Litter in Southeast Asia and India

Countermeasures (CM1)

The CounterMeasure1 project by the United Nations Environment Programme (UNEP), launched in 2019 to track and survey the leakage and movement of plastic waste in Asia and the Pacific, particularly in Ganges and Mekong rivers.

In India, the project in Haridwar, Agra, and Prayagraj (also known as Allahabad) along the Ganges and Mumbai, to identify plastic accumulation and leakage hotspots – places within and around the cities where a higher-than-normal number of plastic piles up and eventually enters the river.

The learnings from CM1 in terms of counter measures will help bring in innovation for managing plastic waste through minimization techniques and through capacity building with community, public and private sector.

Countermeasures (CM2) and Objective of the training

Based on the previous CM2 program conducted a deeper stakeholder analysis, perception survey, identified leakage hotspots, identified types of plastics leaking and implemented capacity building through training.

Figure 5: Field Reconnaissance and verification



Credit: Prepared by Amit Jain, NPC Team

1. Stakeholder Analysis: The stakeholder identified for interaction and collaboration for capacity building are listed below for the CM2 program.

- i. Agra
 - a. Capacity Building framework
 - Agra Nagar Nigam (AMC)
 - Informal Waste sector
 - Tourism and Hospitality sector
 - b. Other stakeholders
 - Civil Society organizations
 - Healthcare sector
- ii. Patna
 - a. Capacity Building Framework
 - Patna Municipal Corporation
 - Informal Waste collector
 - Civil Society Organization
 - b. Other Stakeholder
 - Fishing community

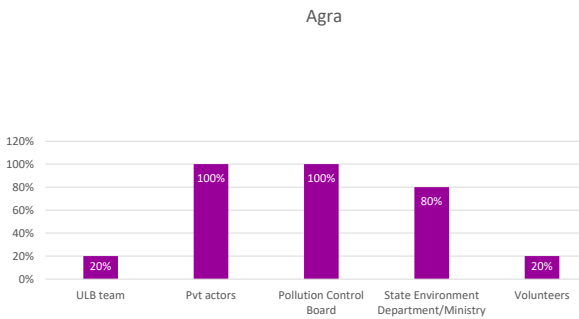
2. Perception Survey: Urban Local Bodies

The key highlights of the perception study report for Agra with Urban Local Bodies are provided below and throws some key insights on Plastic waste management.

Table 1: Agra Urban Local Bodies Perception Survey

Are you able to maintain records about any aspect of plastic waste?											
Officials at the ULB in Agra mentioned that they maintain records of all aspects of plastic waste. However, there is very little data for the city which is available in the public domain or used to communicate to the public about the hazards of plastic pollution that are faced by the city.											
How often do you get data reports?											
100 percent of ULB representatives surveyed in Agra stated that they receive data on plastic waste at a daily level.											
Where is all this data collected from?											
<p style="text-align: center;">Agra</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Source</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>From private contractors doing doorstep collection</td> <td>100%</td> </tr> <tr> <td>MRFs</td> <td>20%</td> </tr> <tr> <td>Landfill</td> <td>80%</td> </tr> <tr> <td>EPR based activities</td> <td>60%</td> </tr> </tbody> </table>	Source	Percentage	From private contractors doing doorstep collection	100%	MRFs	20%	Landfill	80%	EPR based activities	60%	<p>Private contractors who are involved in doorstep collection of waste report data, MRFs report data, landfill site and any EPR based activities are also reported according to the ULB actors.</p>
Source	Percentage										
From private contractors doing doorstep collection	100%										
MRFs	20%										
Landfill	80%										
EPR based activities	60%										

Who collects this data?



Private actors, pollution control boards and other state departments are responsible for sharing the data on plastic waste generated with the ULB as reported by stakeholders.

Are they adequately trained to collect data correctly?

According to the ULB all the actors responsible for collection of data on plastic waste have been adequately trained.

Do you feel confident in the quality of the data?

The stakeholders report that they have complete confidence in the quality of data that is collected on the status of plastic waste in the city of Agra.

Is it collected digitally or as hard copy?

80 percent state that the data is collected digitally while some state that the data is collected in hard copies.

Do you use the data to understand how much plastic waste is generated and recycled?

Stakeholders state that the data that is collected is used to take action on management of plastic waste in the city of Agra.

Do you think it is important to do this?

All stakeholders recognise the importance of using data to manage plastic waste better in the city of Agra

Is there source segregation of waste in the city?

ULB stakeholders report that there is complete source segregation of waste that is happening in Agra.

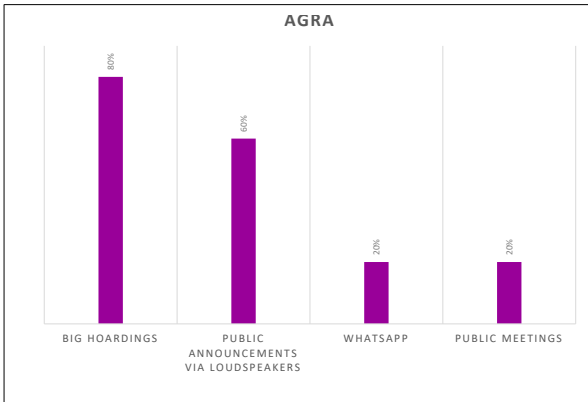
How do you know?

Random checks and daily collection of data helps to ensure that source segregation is practiced at a daily level in the ULB of Agra.

Did you do awareness to train people?

Awareness on source segregation is carried in 80 percent of the households.

What awareness mechanisms do you use?



Hoarding and public announcements are the key means to spread awareness. Slowly social media is also being used to create awareness with stakeholders.

Which one was the most effective?

Big hoardings that are put up to create awareness on management of plastic waste seem to be the most effective medium as stated by ULB stakeholders.

Do you have Material Recovery Facilities (MRF) in the city?

ULB stakeholders confirm that there are MRFs which have been built to help segregate plastic waste from solid waste that is collected from different stakeholders.

Would you like to get training on how to run an MRF?

ULB stakeholders state that there is a need for training and capacity building in order to operate MRFs in the city.

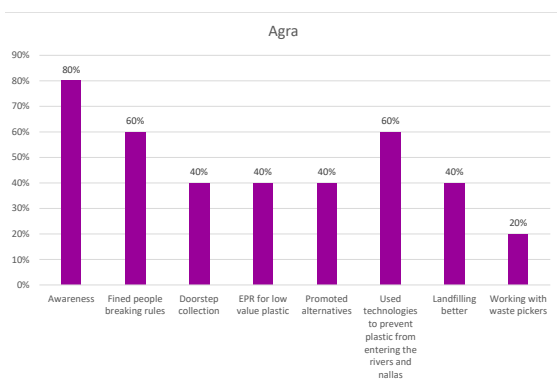
Some of the plastic must be going to informal recycling. Do you have any plan to upgrade this sector?

80 percent of ULB stakeholders believe that there is a need to upgrade the informal sector so that they are able to take up plastic recycling.

Are you undertaking EPR currently?

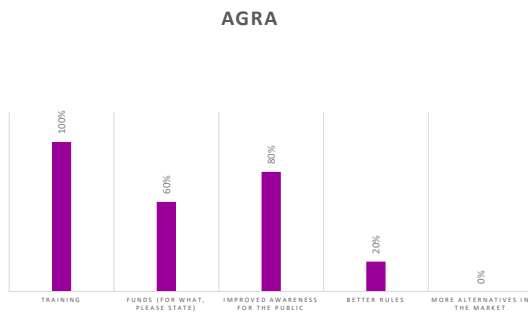
EPR implementation is currently not happening in the ULB of Agra as none of the PIBOs have signed any contracts or MoUs.

Measures you have undertaken to prevent plastic waste leakage?



The ULB stakeholders believe that awareness is the key to preventing leakages of plastic waste in ecosystems. Furthermore, using technological solutions to prevent plastic waste from entering into rivers and nullahs is the second most important item. Penal provisions to ensure that people do not litter are also important to prevent leakages.

If you need help to address these, what help do you need?



Training and capacity building are keys to ensure that such leakages can be prevented. Awareness generation with the public and better implementation of rules are important as well to ensure that leakages can be prevented for plastic waste.

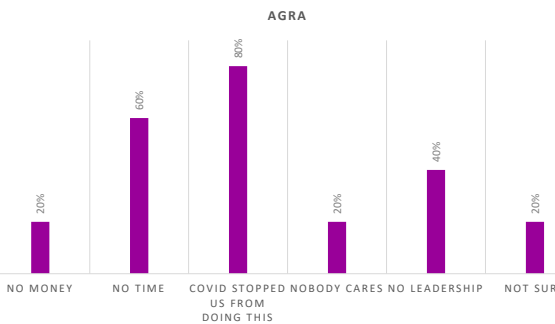
Does the Informal Sector have a role to play in waste management in the city?

80 percent of stakeholders believe that the informal sector has a very important role to play as far as waste management is concerned in the ULB.

Do you think the informal sector will lose income if plastics are banned?

ULB stakeholders believe that the informal sector will lose income if plastics are banned.

Why doesn't the municipality do this?



ULB stakeholders state that COVID was one of the key reasons why their plans to integrate the informal sector have not fructified till date. Furthermore, 60 percent state that it is not a high priority item and taking time out to do this is not available with officials.

Do you think that society can manage well with less plastic?

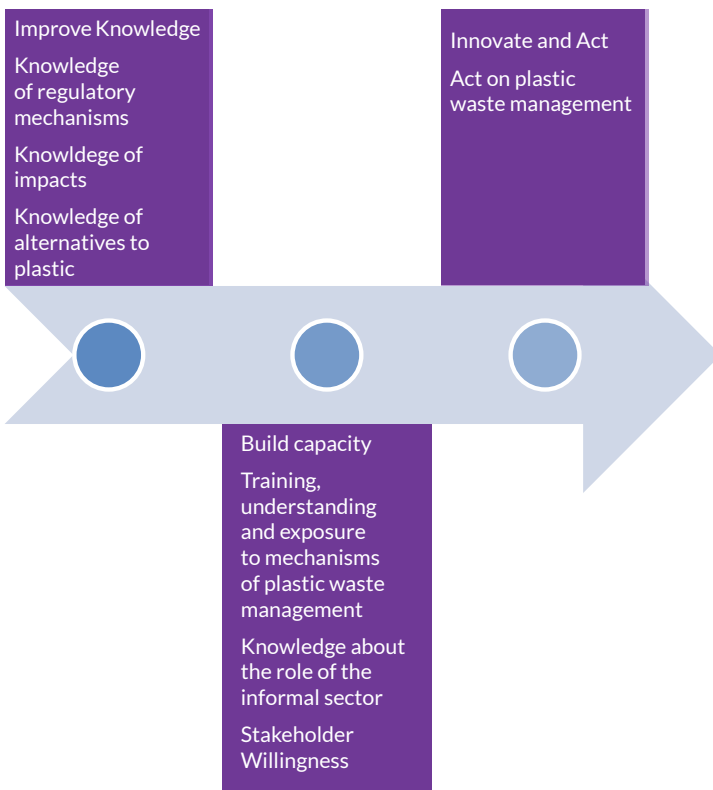
80 percent of stakeholders at the ULB believe that society can do better with lesser use of plastics.

3. **Training:** The training was designed taking the following inputs from stakeholders as described below.
 - i. Key Learning Areas
 - a. Learning and improvement for waste management in their organization
 - b. Need for training
 - c. Need for new initiatives for managing Single use plastic

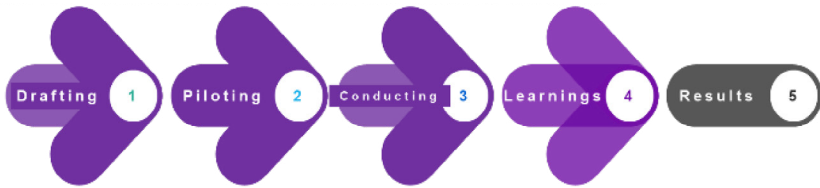
- ii. Challenges on the ground
 - a. Non-identifiable Plastics not treated effectively
 - b. COVID Related single used plastics are not identified and form a part of the leakage system
 - c. Behavioural change required for understanding and identifying the plastics
 - d. Low Value Single used plastic not focussed or prioritized based on economic conditions

The Training has Been Designed on the Framework of New laws like Extended Producer Responsibility 2021 and Plastic Waste Management (Amendment)Rules,2021 for improvement of waste management for every organization, community, private and public. The training module utilized the above two frameworks and highlights inclusion and training of the informal sector private sector bodies. It highlights the importance of the Material Recovery facility, and the ecosystem is highlighted for innovation and cooperation at ground level players.

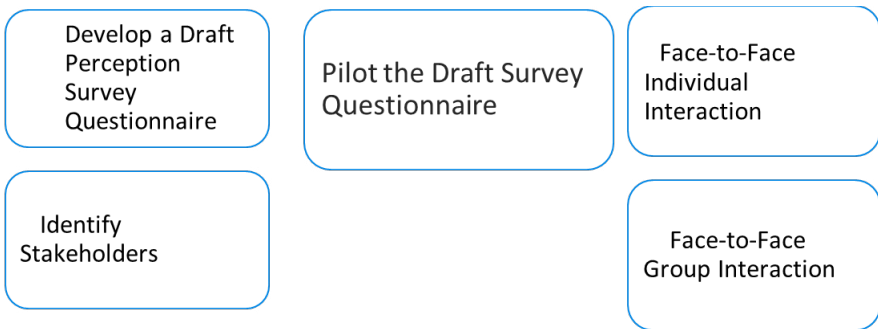
The training will help Urban Local Bodies in the following mode:



The process of perception survey has been very successful in getting a real picture of the ground scenario with the concerned stakeholder. We recommend that during training the process of conducting a perception survey should also be explained to the Urban Local bodies and small exercise conducted on the same.



Steps to Perception survey:



Informal Recycling Sector: Critical Linkages

The informal sector is the backbone of waste management and recycling in India. India is home to anywhere between 15 to 40 lakh waste pickers, who collect, segregate, wash and sell the waste, thus enabling recycling and making a crucial positive environmental impact. As per a prior study, in Delhi alone, waste pickers have saved over 962,000 CO2 tonnes per annum, which is nearly 3.6% higher than any waste project approved for Clean Development Mechanism (CDM). The waste pickers save municipalities across the nation over INR 54.65 crore annually⁶ via avoided costs. In major Indian cities such as Delhi and Bangalore, waste pickers prevent at least 15 percent of Municipal Solid Waste (MSW) from going to landfill, saving the government around USD 13,700 per day in waste collection and disposal costs (Chintan, 2018¹).

¹Chintan, 2018. *Wastepickers: Delhi’s Forgotten Environmentalists?*, New Delhi: Chintan Environmental Research and Action Group. https://www.chintan-india.org/sites/default/files/2019-09/Supreme%20Court%20Report_01.pdf

Thus, any effort to manage waste effectively, create a circular economy, curb plastic pollution and make a positive climate and environmental impact, cannot exclude the waste pickers. Waste pickers have to have a seat at the table whenever a conversation takes place on these topics and their inclusion is a prerequisite for any holistic waste strategy.

Despite the key role that they play, the waste pickers typically live in impoverished conditions, are exposed to hazardous working conditions, have minimal access to social security schemes and are frequently harassed and discriminated against. As is discussed in the later sections of this manual, for us citizens to continue reaping the health and environmental rewards of the informal sector, their inclusion shouldn't just be about responsibilities, but also social justice, financial uplifting and safety infrastructure.

Planning the Ban on Plastics:

As sufficiently evident, we are deeply dependent on the informal sector for our recycling, especially on the waste pickers. What is also well-established is that there is an urgent need to curb plastic pollution in India. A scary fact puts this in perspective – the Ganges is the 7th largest carrier of plastics into the oceans in the world. Therefore, on the surface, a ban on plastics, seems like a natural response. But, an unintended consequence of this ban would be sudden disruption in a major source of livelihood for our waste pickers – plastic waste forms 40% to 60% of their income.

To address this potential sudden loss of income for this vulnerable section of our society, while also combating plastic-pollution, Chintan Environmental Research and Action Group collaborated with its partners to conduct extensive research in four cities – Delhi, Pune, Indore and Nainital, and came out with recommendations in the 'Plan the Ban' report. In summary, the recommendations touch upon below three themes:

1. Elimination of Plastics:

- i. The report does not recommend banning plastics such as PET that form a significant portion of waste picker incomes.
- ii. Low-value, and hence low-income generating plastics that have substitutes, could be banned.
- iii. Plastics that cannot be banned should be brought under EPR framework for effective recycling and financial incentives for the waste pickers.

2. Livelihood's Expansion:

- i. New work opportunities in the space of waste that could provide comparable, if not better, income opportunities for the waste pickers, must be identified.

3. Legal and Policy Approaches:

- i. Legal and policy changes and implementation are needed to materialize the above-mentioned recommendation themes.

What do the laws and policies say about the role of waste pickers and responsibilities of other stakeholders towards them?

Various laws, policies and committees, way back since 1995, have stressed on the importance of including the informal sector waste pickers in the formal waste management system. **The revised Solid Waste Management (SWM) Rules, 2016** lay down clear directions to various stakeholders as far as their duties are concerned. According to the revised SWM Rules, 2016:

- 1. Under duties of Department of Urban Development in States and Union Territories [Rule 11]:**
 - i. Acknowledge the primary role played by the informal sector of waste pickers, waste collectors and recycling industry in reducing waste and provide broad guidelines regarding integration of waste picker or informal waste collectors in the waste management system.
 - ii. Start a scheme on registration of waste pickers and waste dealers.

- 2. Under duties and responsibilities of local authorities and village Panchayats of census towns and urban agglomerations [Rule 15]:**
 - i. Establish a system to recognize organizations of waste pickers or informal waste collectors and promote and establish a system for integration of these authorized waste pickers and waste collectors to facilitate their participation in solid waste management, including door to door collection of waste.
 - ii. Direct waste generators not to litter i.e. throw or dispose of any waste such as paper, water bottles, liquor bottles, soft drink cans, tetra packs, fruit peels, wrappers, etc., or burn or bury waste on streets, open public spaces, drains, waste bodies and to segregate the waste at source as prescribed under these rules and hand over the segregated waste to authorized waste pickers or waste collectors.
 - iii. Setup material recovery facilities or secondary storage facilities with sufficient space for sorting of recyclable materials to enable informal or authorized waste pickers and waste collectors to separate recyclables from the waste and provide easy access to waste pickers and recyclers for collection of segregated recyclable waste such as paper, plastic, metal, glass, textile from the source of generation or from material recovery facilities.

- 3. Provide training on solid waste management to waste pickers and waste collectors.**
 - i. The introductory paragraphs of the revised Plastic Waste Management Rules, 2016, also stress upon the need of including the waste pickers in waste management from households or any other source of waste generation, as follows; “And whereas to implement these rules more effectively and to give thrust on plastic waste minimization, source segregation, recycling, involving waste pickers,

recyclers and waste processors in collection of plastic waste fraction either from households or any other source of its generation or intermediate material recovery facility and adopt polluter's pay principle for the sustainability of the waste management system..."

- ii. Therefore, it is clear that policy on solid waste management has been in favour of creating an enabling environment for waste pickers and to a lesser extent, for re-processors via improved technologies.

4. To provide some historical context, even prior to Solid Waste Management Rules 2016, various national policies in India have clearly recognized the informal recycling sector through referring to them and their work, as follows:

- i. The National Action Plan for Climate Change, 2009, states, "While the informal sector is the backbone of India's highly successful recycling system, unfortunately, a number of municipal regulations impede the operation of the recyclers, owing to which they remain at a tiny scale without access to finance or improved recycling technologies". This is a part of the Mission on Urban Sustainability.
- ii. The Comptroller and Auditor General of India (CAG) audit on Municipal Solid Waste (MSW) in India (December 2008) also recommends (Chapter 3, Section 3.5) that "MOEF/States should consider providing legal recognition to rag pickers so that recycling work becomes more organized and also ensure better working conditions for them."
- iii. The National Environment Policy, 2006, states "Give legal recognition to, and strengthen the informal sector."
- iv. The Supreme Court of India accepted recommendations made in the report of the committee constituted by the Supreme Court in 1999 (Solid Waste Management in Class 1 Cities in India). According to this report, rag pickers must be converted into doorstep waste collectors as a means of up-gradation (points 3.4.7 and 3.4.8).



3

Institutional and Legal framework

Implementation of Circular Economy

The 2019 United Nations Environment Assembly, the UN's flagship environment conference, described the circular economy as a model in which products and materials are “designed in such a way that they can be reused, remanufactured, recycled or recovered and thus maintained in the economy for as long as possible”. The goals are 3 R's – Reduce, Reuse, Recycle.

Circular economy has been a concept for all products like aluminium, steel etc but for plastics the implementation poses the following challenges:

1. Low level of collection and segregation
2. High rate of discard or waste generation
3. Single use of plastic
4. The above problems can be sorted out by using the three stages of applying the circular economy.
5. Eliminate - The start phase for implementation of a circular economy is to eliminate the problematic and unnecessary items from the manufacturing product range. Institutional framework or laws are put in place to provide support for the implementation of the elimination process. In India, Plastic Waste Management (Amendment) Rules 2021 provides a strict elimination process for Single use plastics. The PWM rules will enable closing down on single use of plastic and hence subsequent waste generation of the same¹.

¹MOEF: Draft Notification PWM 2021 <https://cpcb.nic.in/uploads/plasticwaste/Notification-12-08-2021.pdf>

6. Innovation - Innovation is very critical as elimination has certain limitations. Innovation will come through capacity building and an open mind to find solutions to problems of plastics. In India, Extended Producer Responsibility 2021 provides a framework to add additional players like the PIBO (Producers, Importers, Brand Owners) and also the waste processors into the legal framework. For innovation, the group has to work closely, train each other and find solutions. EPR will lead to higher rate of collection and segregation. We are in the current Innovation phase of managing our circular economy for packaging plastics
7. Circulation – Stable when the entire plastic waste lands up in the recycle bin or reused.

Figure 7: Circular Economy

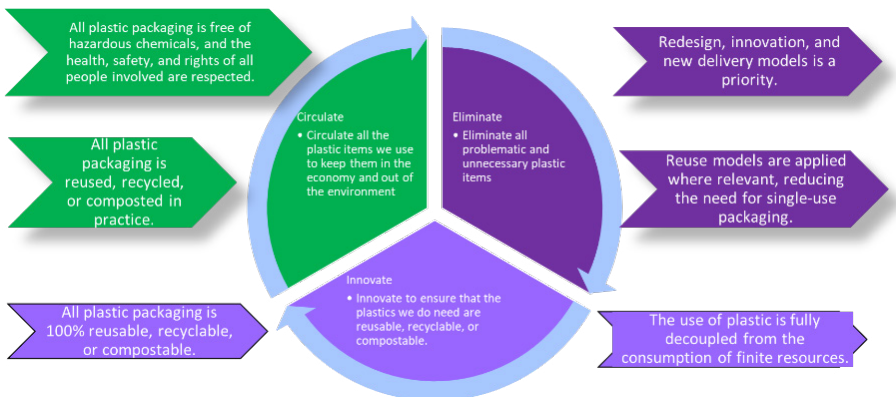
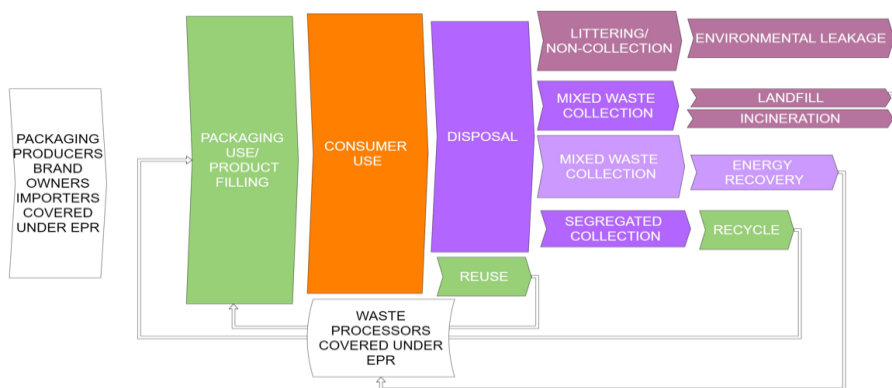


Figure 8: Additional Responsibility on FIBO and Waste processors as per EPR 2021



Extended Producer Responsibility 2021 and Plastic Waste Management (Amendment) Rules 2021 Highlights

The key highlights of EPR 2021 is to ensure that the model of Reduce, Reuse and Recycle is implemented by bringing in additional responsibility on PIBO and Waste processors².

The complete amendment is provided at the end of the manual.

Table 2: Extended Producer Responsibility 2021 – Key Highlights

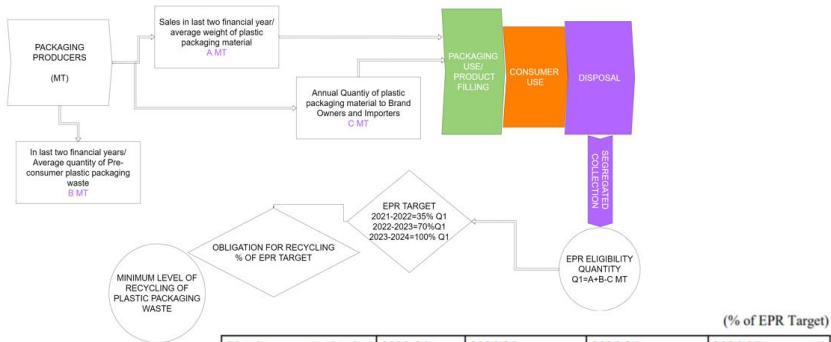
<p>Extended Producer Responsibility (EPR)</p>	<p>Includes responsibility for collection and recycling of plastic packaging waste on the following</p> <p>Producer (P) of plastic packaging</p> <p>Importer (I) of all imported plastic packaging and / or plastic packaging of imported products</p> <p>Brand Owners (BO) including online platforms/marketplaces and supermarkets/retail chains other than those, which are micro and small enterprises as per the criteria of Ministry of Micro, Small and Medium Enterprises, Government of India.</p>	<p>EPR shall be applicable to both pre-consumer and post-consumer plastic packaging waste.</p> <hr/> <p>Category I: Rigid plastic packaging</p> <p>Category II: Flexible plastic packaging of single layer or multilayer (more than one layer with different types of plastic), plastic sheets or like and covers made of plastic sheet, carry bags (including carry bags made of compostable plastics), plastic sachet or pouches and</p> <p>Category III Multi-layered plastic packaging (one layer of plastic and at least one layer other than plastic)</p>
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EPR 2021 is target based and it drives the circular economy by putting targets on the PIBO players in terms of the Minimum level of recycling of plastic packaging waste and mandatory usage of recycled plastic in plastic packaging³.

²CPCB: Draft Notification EPR 2021 – <https://cpcb.nic.in/uploads/plasticwaste/Draft-Notification-EPR-6-10-2021.pdf>

³CPCB: Draft Notification EPR 2021 – <https://cpcb.nic.in/uploads/plasticwaste/Draft-Notification-EPR-6-10-2021.pdf>

Figure 10: Additional responsibility on FIBO and Waste processors as per EPR 2021

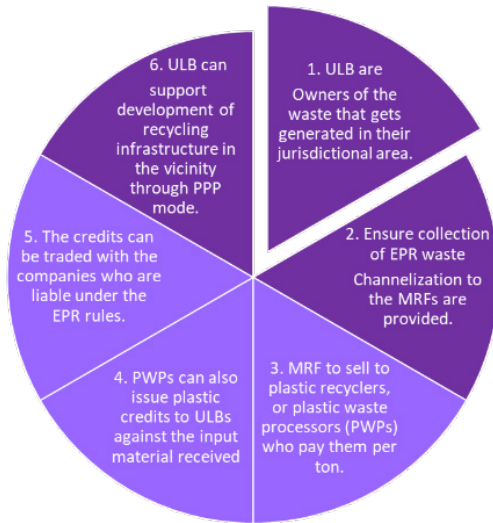


Plastic packaging category	2023-24	2024-25	2025-26	2026-27 and onwards
Category I	50	60	70	80
Category II	30	40	50	60
Category III	30	40	50	60

Plastic packaging category	2023-24	2024-25	2025-26	2026-27 and onwards
Category I	30	40	50	60
Category II	20	20	30	30
Category III	5	5	10	10

The effect of EPR 2021 will be very high on the informal sector or waste collection and segregation as it also guarantees the support through the implementation partner – Urban Local Bodies i.e., Agra Nagar Nigam.

Figure 9: Urban Local Bodies – Enabling change with EPR



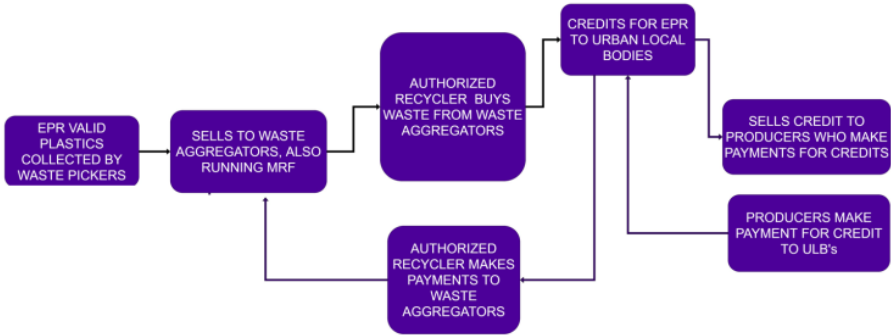
The EPR change will enable Urban Local bodies like Agra Nagar Nigam, who will then work as the Owners of the waste that gets generated in their jurisdictional area.

The entire collection of EPR waste Channelization to the MRFs (Material Recovery facilities) will be done by the support of the Urban Local Bodies. The waste will be processed at MRF facility to be sold to plastic recyclers, or plastic waste processors (PWP) who pay them per ton. The PWP will then issue plastic credits to ULB's against the input material received. The credits can be traded with companies who are liable under the EPR rules.

ULB can support the development of recycling infrastructure in the vicinity through PPP mode.

Other players like waste aggregators' livelihood will be protected by the financial inclusive nature of the EPR. The action is to regroup and build MRFs. Scalable models of MRF built in partnerships at Delhi can serve as a benchmark for association at Agra.

Figure 10: Inclusive Model of EPR



The key highlights of Plastic Waste Management (Amendment) 2021 is listed down below.

The complete amendment is provided at the end of the manual.

Table 3: Plastic Waste Management (Amendment) Rules 2021 – Key Highlights

<p>PLASTIC WASTE MANAGEMENT (Amendment) Rules 2021</p>	<p>The manufacture, import, stocking, distribution, sale and use of following single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from the 1st July 2022:</p>	<p>Plates, cups, glasses, cutlery such as forks, spoons, knives, straw, trays, wrapping or packing films around sweet boxes, invitation cards, and cigarette packets, plastic or PVC banners less than 100 micron, stirrers.</p> <p>Ear buds with plastic sticks, plastic sticks for balloons, plastic flags, candy sticks, ice-cream sticks, polystyrene [Thermocol] for decoration</p>
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Inclusive Support for Informal Sector

The key to success is the inclusion of the informal sector because 58% of all plastic waste collection is currently being done by them. They are collecting pre-collection of Household waste, cleaning waste from streets etc.

They are aligned more with Collection of high value plastics (mostly PET, HDPE) and need to be brought into the collection scheme for processing at Material Recovery facility for all types of plastics (low value and high value). The EPR mechanism will provide them with financial inclusion.

However, operational support can be provided by allowing them to go for Doorstep collection (legalizing framework with ID Cards), allow them to access to waste for collection, provide them space for segregation and MRF's by recognizing them as a significant group (Register and make the same target based)



4

Case Studies

MRF at Zakhira, Delhi

How MRFs can Ensure Both Informal Sector Inclusion and Extended Producer Responsibility (EPR) Compliance

Context

Indian cities have typically collected, transported, and discarded mixed waste in either landfills or dumpsites. This has resulted in air and water pollution, loss of quality materials for reuse and recycling and a waste of resources like land. Moreover, the EPR regime also requires that some plastics, such as PET, Tetrapak and Multi-layered packaging, are the responsibility of the brand owner or producer in their post-consumer stage. The tracking of these wastes-from their generation to their sales, can only be done in an organized MRF ecosystem. Moreover, an MRF system can also help the ULB comply with the SWM Rules, 2018 as well as the Plastic Waste Rules, 2016. This case study shows how this has been done in a sustainable manner.

What was Done?

Chintan set up an MRF with the financial assistance of Coke (full name) in 2020 in Zakhira, North Delhi. The land was given by the North Delhi Municipal Corporation for this purpose and is owned by it. The objective was to reduce the waste going to the Bhalsawa landfill, be able to safely recycle plastic waste, including low value plastics and account for them via an EPR mechanism. The facility was designed to handle 8 tons of waste daily. This includes 1 ton of wet waste, to be composted on-site. The site has been set up to serve as a live education site for visitors, such as other ULBs and informal sector entrepreneurs, amongst others.

Figure 11: MRF Setup with Conveyors at Zakhira, New Delhi



Figure 12: MRF Setup with segregation bay at Zakhira, New Delhi



The MRF is the most advanced in Delhi. It comprises two automatic bailers of 250 kg each for ease of storage. It includes a conveyor belt which changes the working for the waste picker women. This also builds confidence in the idea of local composting. The plastic waste, such as PET Bottles, Tetrapaks and Multi-layered plastics are sold to EPR compliant recyclers by the micro-entrepreneurs after the NDMC verifies the amounts. The facility is working to capacity.

Informal sector inclusion is key to this facility. Two informal sector actors have been trained to lead the work, maintain the MRF and one part time supervisor has been engaged to handle data and ensure safe recycling as well as legal compliance. The entire facility is run by these actors. This includes procuring waste, its segregation and sales, showing guests and working with the NDMC for any inspections etc. Chintan's role is now to ensure quality, COVID protocols and maintain data, as well as help them access more waste where possible.

Conclusions and Learnings

By doing this, the MRF can ensure recycling, document it, provide safe livelihoods to the informal sector and serve as a demonstration unit for the public. It is able to demonstrate how an MRF can serve as a game changer for local waste management and implementation of the Plastic Waste Management Rules, 2021. Key learnings are:

- Including and training the informal sector in EPR compliance is essential
- Enabling the informal sector to run and maintain equipment is key to quality control
- Encouraging the public and others to visit the site helps to create buy-in for the process and confidence in it.
- By adding composting to the MRF, Chintan was able to increase its value to the NDMC and therefore, improve the environmental outcomes from this facility.
- Oversight is key to high quality data and compliance
- The process can become financially sustainable in multiple ways. The informal sector are entrepreneurs and with support can run

Pick my Trash

Pick My Trash is an innovative, waste picker and Chintan not-for-profit collaborative, to pick up dry waste from residential areas, offices and others, free of cost across the NCR, Delhi. It was one of India's first such services based on digital platforms and using an App.

There is no financial exchange involved. The waste generator uses an app or calls to book a pickup. These pickups are undertaken either by a waste picker nearby or Chintan directly, depending on the area. Finally, the waste is sent to authorized recyclers. Chintan also does awareness during a pickup if there is a request from enough people.

The pickups are scheduled no more than twice a week, with careful route planning, so that they remain cost effective. One driver and a vehicle are used. The driver is trained to do all the required actions, to ensure no waste is pilfered. Sometimes, new items are discarded. In that case, if these are electrical items or household goods (such as prams), waste pickers are allowed to keep them for their own use. As a result, NCR residents can dispose of e-waste, plastics, broken plastic furniture, even cycles and milk pouches safely. Many of these items are otherwise managed in a highly polluting manner, often being burned. While the service was suspended frequently due to COVID, it still collected 38 tons of waste in 2019-2020.

This innovation has been able to ensure improved incomes for waste pickers, diversion from landfills, recovery of resources and improved climate change outcomes.

IIT Delhi

How Indian Institute of Technology, Delhi Became Zero Waste

Context

In October 2018, Chintan and Indian Institute of Technology (IIT) Delhi began working to create a zero-waste campus. Key to this effort was a Material Recovery Facility (MRF) on its campus. The concept for this facility was based on Chintan's previous work on responsible waste management that was accounted for, legally disposed of and optimally reused or recycled.

The primary goal of this project was to minimize the amount of waste that is being sent to landfills, thereby combatting climate change and air pollution. Livelihoods and upskilling were another goal. Additional benefits of this project were the **improved cleanliness of the campus. The IIT-Delhi MRF is Chintan's 5th MRF of its kind.**

How Does This Partnership Work?

While Chintan runs the planning and operations, IIT team monitors and identifies any gaps or special concerns. These include those linked with special modifications during the lockdown.

Figure 13: MRF Setup at IIT, New Delhi



For this project Chintan was given a piece of land on campus of approximately 15,000 square feet. The site was selected on the basis of the available space, its central location and space for parking both cycle rickshaws and a truck, shredder and bailer. Space for washrooms and composting nearby. A small office space was also created. The IIT-Delhi MRF was created by IIT based on specs given by Chintan and built over a period of 2 months. It was specifically designed to be manual, for minimal maintenance and optimal hygiene. It currently provides livelihoods for a 25-person team, supporting the 16,000+ staff and student population to be zero waste.

The general flow of the MRF is that the segregated waste is first collected via 8 Door-to-Door Rickshaws which collect residential waste, one tractor that collects horticultural waste and 1 truck that collects the waste from hostels and dhalaos, where some waste is often placed due to huge quantities. This material is then delivered to the MRF where it is hyper segregated by waste category (textiles, metal and glass waste, paper waste, and plastics). The cement platform where segregation takes place is covered with a tarpaulin sheet, so it can be washed at the end of the day, ensuring good hygiene. Workers sit on traditional moorahs, which are inexpensive to replace and culturally acceptable to them. The height of the platform is designed for this and minimum bending, to reduce occupational injuries. What is unique about this design is that it is based on optimal height of sitting for waste pickers, is easy to clean and distributes the workload amongst the workers.

Prior to the creation of this MRF the IIT-Delhi campus was sending 89 tons of unsorted waste to the landfill every month. After the construction of this MRF and the sorting, recycling, and composting processes were implemented the IIT-Delhi MRF has been able to *successfully divert 93% of the waste that was previously being sent to the landfill*. In raw quantity, the IIT-Delhi MRF saves 984 tons of waste from reaching a landfill each year. To provide a visualization, which is equivalent in size to two Boeing 747 jumbo jets not dumped on a landfill! In addition to the obvious environmental benefits of this process, there is also a positive financial impact to responsible waste management. According to a recent assessment by the Centre for Science and Environment (CSE) it was determined that it will cost the Municipal Corporation of Delhi Rs 14,500 for each ton of waste sent to a landfill. This equates to an annual savings of 1,189 lakhs for the system per se.

Wet waste is composted on site, and distributed to the residents, free of cost. A database is maintained to ensure all those who need compost can receive it on time. A shredder has been installed for horticulture waste. However, the horticulture waste is so great in quantity that it is not possible to compost all of it presently. It is kept damp in pits so natural processes can kick in and mulch may be formed as a soil conditioner.

Figure 14: MRF Setup at IIT, New Delhi



There is also an overflow of horticultural waste during peak season, which will require some additional resources to be effectively managed. Plastic waste is given to waste aggregators, who pay a nominal sum for it. The amount is used to pay for tea, additional uniforms, and masks etc. for waste workers in the area, depending on the need. IIT Delhi ensured all of them were vaccinated in its campus clinic.

Several waste items are reused. Packaging waste for laboratory equipment is used as pots for an urban garden in the MRF. Seeds are collected to set up an urban farm to generate vegetables for the waste pickers to take home. This also reinforces the importance of segregation and composting.

Mattresses, pillows, clothing, shoes, kitchen utensils etc. are also reused by the workers. Many of them take mattresses from hotels home, to distribute. Old cycles etc. have also been similarly distributed to children of such workers to help them go to school.

Key Lessons

MRFs are an important tool to control and direct the flow of materials. This project is unique because it uses simple, replicable technology to create a high impact such as fighting climate change and poverty, while cleaning up the IIT Campus and reducing plastics leakage into the ecosystem. The enclosed specs can be used to replicate this

The following lessons are instructive:

- An MRF should be part of any waste reduction exercise, or even waste management.
- Horticulture waste is often overlooked when planning for waste. It poses a significant cost and manpower. This must be additionally factored into any waste contract. Overall, in IIT, the peak season from mid-February to late May can produce anywhere up to 5 tons of horticulture waste a day. Staff should be specially recruited for peak seasons with additional payments. This includes a vehicle, collection workers and composting teams.
- The contracts for waste are often made for the total number of workers needed. However, as workers fall ill, or go to the village, it becomes a challenge to manage the specs with fewer workers. About 10-15% additional workers should be part of any contract for smooth management of services. These payments should be made on the condition that they are substitute or crisis workers (such as during the pandemic)
- Composting should be specifically budgeted for as it requires full time personnel to be well done.
- Hazardous waste requires a notified pathway and separate instructions should be issued and planned for.
- Waste pickers are the only workers increasingly willing to handle waste. However, they are often poor and from marginal sections of society. Therefore, organizations that work with them are more likely to work well with them. Such organizations should be given priority as they are able to work with this team. This ensures a team willing to work in waste that is also rewarded for its work. Contracts should not be

below minimum wages. The worth of waste should not be part of the contract due to wildly fluctuating prices, households' decision to give it to charity or sell it directly or empty houses – all resulting in unreliable incomes.

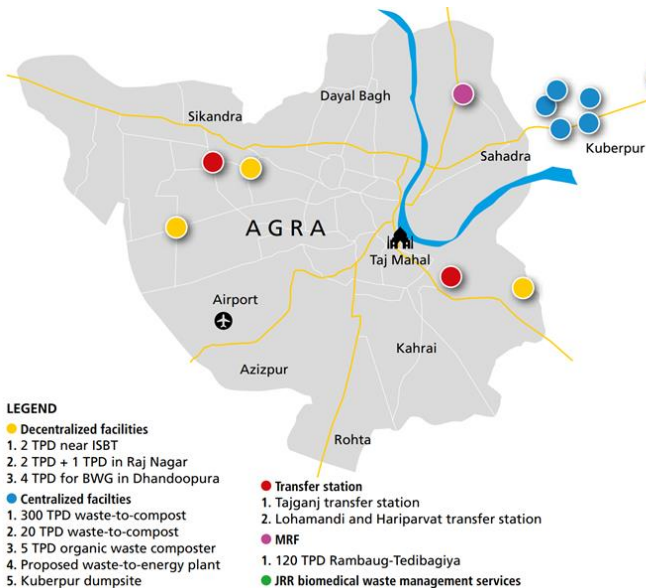
- An important lesson from the pandemic was the need to provide temporary housing to workers and supervisors during a lockdown, curfew or other crisis. In the absence of this, workers may not be able to show up for work or may endanger their lives. The experience during COVID19 is likely to be replicated as climate events across India result in freak weather events, heat stress etc.

Case Study: Agra

Agra Nagar Nigam has been at the forefront of managing waste for Agra and its surrounding areas. The waste processing infrastructure enables Agra Nagar Nigam to process 850-870 Tons per day. The core solid waste is 40% from household and 25% from commercial establishments.

The centralized facilities include 325 Tons per day waste to compost and Kuberpur Landfill dumpsite. The Material recovery facility of Agra is located at Tedibagiya and the capacity is 120 Tons per day. There are three transfer stations located all over Agra (Singh Biswas 2020). The plastic waste that is littered or lost at Agra is 10-25% of the waste generated. This is true for all global cities and globally we are sending across 151 million tons of plastic waste as discarded material.

Figure 6: Waste Processing Facilities, Agra



Credit: CSE, based on data from Agra Smart City Ltd

5

Exercises

Quiz 1 must be conducted prior to the introduction session to energize, get attention of participants, and introduce everyone as a group.

1. **Can you guess which of these are plastic?**
 - i. Your warm fleece jacket
 - ii. The artificial grass on a surface
 - iii. Polyester shirt
 - iv. Packaging for chips
 - v. Sweet boxes
 - vi. PET water bottles

2. **On everyday basis which of the following plastic items do you use?**
 - i. Textiles
 - ii. Chips and snacks packaging
 - iii. Plastic folders
 - iv. Id cards

Quiz 2 must be conducted during the prior to CM2 program perception survey of Agra to give a personal connection to the issue of plastic waste management at Agra and it will be a helpful understanding of the new learnings from the training.

Time 5 Minutes

Quiz 2 must be conducted during the prior to CM2 program perception survey of Agra to give a personal connection to the issue of plastic waste management at Agra and it will be a helpful understanding of the new learnings from the training.

1. **What is the biggest concern you have with respect to plastic waste?**
 - i. It causes animal deaths
 - ii. It releases toxins and chemicals that are bad for the environment
 - iii. It chokes the drains
 - iv. It takes up space in the landfill
 - v. It causes no problems

2. **What do you think is the biggest challenge in solving the plastic crisis?**
 - i. The lack of alternatives to plastics
 - ii. The lack of integration of waste pickers in the formal waste collection system
 - iii. The lack of awareness among citizens
 - iv. The lack of adequate training for critical stakeholders like Municipal Authorities, Safai Karmcharis etc.
 - v. Lack of regulation on mass production of plastics

Please conduct a perception survey as

Time 5 minutes

Exercise 1 is a brainstorming session to understand and implement mechanisms to bring about behavioural change of end citizens or generators of plastic waste. This should be done by understanding the hotspots created at Agra during the technical presentation.

Time 5 minutes

Quiz 3 is to prepare the participant for new knowledge about improvement solutions implemented in other cities using Informal sector and segregation/collection solutions. The message is that the Informal sector is critical for this initiative to be successful. The participant will be getting new knowledge in this session.

Time: 2 minutes

Exercise 3 is for initiating an application of Roll out and implementation of EPR in Agra. The session has to be done in three groups of people. All the groups have to work

Time 10 Minutes

This curriculum has used Donna E. Walker's 'Learning Cycle' to design each of the sessions. Each step of the Walker's cycle serves a specific purpose thus ensuring that the learning effectiveness is maximized. The details of the five steps of the Walker's Cycle are explained below:

Mind Jog:

This step helps to start the session on a positive note and arouse curiosity about the issue the session relates to. Mind jogs need to be short and crisp, lead into the topic.

Personal Connection:

This step helps to bring out the 'what's in it for me' connection and prepares the participants for absorbing new knowledge. The exercises used at this stage try to make the session relevant to the learner's real world 'as is'.

Information Exchange:

The focus of this stage is to build new knowledge, facilitate exchange of information between and among the participants and deduce some key concepts through discussion and presentation to supplement participants' information. In this stage, the

Facilitators allow the participants to come up with concepts instead of downloading it for them and allow extensive peer discussion and learning. The facilitators here need to concentrate on refining and building on participants' inputs.

Information Application:

The purpose of this stage is to build confidence in the participants about new knowledge, support them to apply the key concepts learnt to realistic scenarios (thereby reconfirming the learning of the previous stages), and to facilitate a multi-perspective view. This stage also seeks to add fresh insights into the concepts and apply the skills to real life situations without taking real risks. For this curriculum, we have tried to ensure that the activities are drawn from the participants' background and experiences and enough complexity has been built into it to get a variety of Responses.

Real World Connection:

The activities in this stage seek to elicit personal learning and satisfy the participants that new knowledge will lead to a better performance. The design of this stage enables participants to connect personal learning to learning from the session, as the facilitator

helps them set up clear performance-oriented goals, which are also specific, measurable, and realistic. This way both the facilitators and the participants get a chance to informally assess how effective the participants' learning has been on ground.

6

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List of Additional Materials

Additional Readings

PLAN THE BAN Eliminating Single Use Plastics in India without Displacing People A REPORT: 2021.

This study was carried out by Chintan Environmental Research and Action Group in partnership with several organizations and individuals. These are : Kagad Kach Patra Kashtakari Panchayat (Pune), Deen Bandhu Samaj Sahyog Samiti (DBSSS, Indore) and Safai Sena (Delhi), Frametrics Consulting Private Limited and A.K Roy.

<https://drive.google.com/drive/u/0/folders/1FcfWNwck0dyXalcm9CetiLQIKI8WYrJO>

Safai Sena Manual 2009

Manual for an Inclusive Green Livelihood for Informal Sector Waste Recyclers by Safai Sena a registered group of waste pickers, doorstep waste collectors, itinerant and other small buyers, small junk dealers, and other types of recyclers.

https://drive.google.com/drive/folders/1ONo1oAZIzCBfppjoEV7WwSrdBO8FSJ_i



सत्यमेव जयते

**Ministry of Housing and Urban Affairs
Government of India**

WASTE MINIMIZATION INITIATIVES