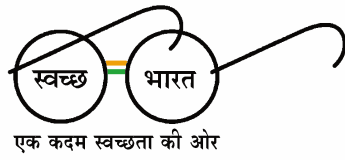




BUSINESS OF CHANGE

CITIES IN CRISIS: BEST PRACTICES ON CURBING PLASTIC WASTE ACROSS URBAN INDIA





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ACROSS URBAN INDIA**



2023

Business of Change

Cities In Crisis: Best Practices on Curbing Plastic Waste Across Urban India

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Foreword



The launch of the Swachh Bharat Mission, grounded in the principles of Reduce, Reuse, and Recycle (the 3R approach), marked a significant milestone in addressing the challenge of plastic waste management¹. For the first time, this critical issue was placed at the forefront of the nation's development agenda with a mission-driven approach. Furthermore, the implementation of the Plastic Waste Management Rules 2016 was a significant leap, underscoring India's commitment to addressing the pressing issue of plastic waste within the framework of the Swachh Bharat Mission-Urban.

To provide context, India generates a staggering 9.4 million tonnes per annum of plastic waste, which is equivalent to 26,000 tonnes per day of waste generation. Out of this, approximately 5.6 million tonnes per annum are recycled², while 3.8 million tonnes per annum remain uncollected or littered. Although India's per capita plastic consumption, at 11 kg, falls below the global average of 28 kg, plastic waste generation is projected to triple by 2031. Notably, in 2021, about 43% of plastic waste consisted of single-use plastics (SUPs). These inexpensive and convenient items have led to various adverse environmental and societal consequences due to their low economic value, resulting in poor collection and recycling rates.

Recognizing these challenges and the need for efficient plastic waste management strategies to safeguard our environment and conserve natural resources, the government has undertaken several steps. SBM-U 2.0 emphasizes reducing plastic waste generation and ensuring compliance with the Plastic Waste Management (PWM) Rules of 2016 and 2021. To effectively monitor the ban on specific single-use plastic items and overall plastic waste management, various online platforms have been established. These include the National Dashboard for the elimination of single-use plastics and efficient plastic waste management, the Central Pollution Control Board (CPCB) Monitoring Module for ensuring compliance with the elimination of single-use plastics, and the CPCB Grievance Redressal App³.

¹<https://mohua.gov.in/pdf/627b8318adf18Circular-Economy-in-waste-management-FINAL.pdf>

²<https://mohua.gov.in/pdf/627b8318adf18Circular-Economy-in-waste-management-FINAL.pdf>

³[https://pib.gov.in/PressReleaseSelfFramePage.aspx?PRID=1907632#:~:text=Swachh%20Bharat%20Mission%20Urban%20\(SBM,\(PWM\)%20Rules%20dated%2012.08.](https://pib.gov.in/PressReleaseSelfFramePage.aspx?PRID=1907632#:~:text=Swachh%20Bharat%20Mission%20Urban%20(SBM,(PWM)%20Rules%20dated%2012.08.)





I am delighted to observe that India Sanitation Coalition, in its unwavering commitment to foster positive change in the sanitation and waste management sector, has recognized the urgency of addressing the challenges of plastic waste management in the rapidly evolving urban landscape.

Within the pages of this publication, you will discover a collection of 20 case studies, each meticulously curated to showcase innovative approaches, best practices, and success stories in the domain of plastic waste management in urban India.

These case studies present real-world examples of how organizations, communities, and individuals are taking significant steps to address the plastic waste challenge. They shed light on practical solutions, strategies, and innovations that have proven successful in managing this pressing issue, ranging from behaviour change communication to recycling and treatment initiatives. Each case study contributes to the larger puzzle of establishing a circular plastic waste management system.

These case studies are not only scalable and replicable but also well-suited for nationwide implementation with support from state, district, and Urban Local Bodies (ULBs).

My best wishes to India Sanitation Coalition as they disseminate this publication on best practices for plastic waste management, with the goal of achieving a cleaner, healthier, and more sustainable environment. This publication stands as a testament to their unwavering dedication to driving positive change in plastic waste management.

Ms. Naina Lal Kidwai

Chair

India Sanitation Coalition



Acknowledgments

This compendium titled "Cities in Crisis: Best Practices on Curbing Plastic Waste Across Urban India" has contributions from 19 partners: Akshar Foundation represented by Mr. Mazin Mukhtar; Banyan Nation represented by Ms. Vaishnavi Dhatrika, Mr. Mani Vajjipeyajula and Mr. Rajkiran Madangopal; Centre for Environment Education (CEE) represented by Dr. Prabhjot Sodhi, Ms. Tavishi Darbari and Mr. Akshay Bhoite; Earth5R represented by Mr. Saurabh Gupta; EcoKaari represented by Mr. Nandan Bhatt and Ms. Shivalika Mohan; Ecowrap represented by Ms. Erin Burneson; GIZ India represented by Dr. Bharat Bhushan Nagar and Ms. Soma Biswas; HCL Foundation represented by Mr. Alok Verma, Mr. Akshay Ahuja and Ms. Riti Mehrotra; ITC Limited represented by Mr. Giresh Mohan and Ms. Jagriti Singh; Midway Journey represented by Mr. Shirshendu Sekhar Das and Mr. Siddharth Rasaily; Nepra represented by Ms. Sonali Beeraka and Ms. Hetanshi Bhavsar; One Earth Foundation represented by Mr. Ferdin Sylvester and Mr. Aditya Kumar; Recity represented by Mr. Suraj Nandakumar; Recycle India Foundation represented by Mr. Ashish Agarwal; Recykal represented by Mr. Nehaal Rao; Saahas Zero Waste represented by Mr. Arun Murugesh, Mr. Jaidev K and Ms. Bhagyashree Vinod Shastri; The Shakti Plastic Industries represented by Mr. Dhananjay Vishwakarma; Social Lab represented by Mr. Anirudha Pandav and Mr. Kunal Thakur; and Waste Warriors represented by Ms. Archana Masih, Ms. Prachi Bhatia and Mr. Suraj Agarwal.

The secretariat at ISC would like to extend their gratitude to all the above organisations and individuals who contributed to the development of this compendium.





Preamble



“Only we humans make waste that nature can't digest” - Capt. Charles Moore¹ of Algalita Marine Research Foundation who first discovered the Great Pacific Garbage Patch² -- an endless floating waste of plastic trash.

Referring to Plastic waste, Capt. Moore's statement precisely defines the problem at hand! India generates about 3.4 million tonnes (MT) of plastic waste annually of which only 30 percent is recycled!³ Furthermore, 20 per cent of plastic waste is diverted to co-incineration, plastic-to-fuel, and road construction, implying that this waste gets burnt⁴. Going by these numbers, a staggering 1.7 million tonnes of plastic waste is annually either sent to landfills or aquatic dumps and not just that, our trash is now being found on other planets as well! Nothing to be proud of, but in June 2022, NASA's Perseverance rover found a piece of human trash on Mars.⁵ This just goes on to show how far and wide the impact of waste can be, if not addressed in the right manner.

According to the United Nations, each year, about 11 million metric tons of plastic waste ends up in bodies of water and by 2040 this number is expected to triple. It further states that by 2050, greenhouse gas emissions associated with plastic production, use, and disposal, would account for 15 percent of allowed emissions, under the goal of limiting global warming to 1.5°C (34.7°F) in line with the Paris Agreement on climate change.

Facing a crisis, the 175 member countries of the UN Environment Assembly in March 2022, agreed to develop a treaty titled, “End Plastic Pollution: Towards an Internationally legally binding Instrument” for curbing plastic use by the end of 2024⁶.

The catastrophic impact that plastic production and pollution can have on climate change, nature loss, and pollution cannot be ignored as exposure to plastics has adverse effects on human health, potentially affecting fertility, hormones, metabolism, and neurological activities, while open burning of plastics contributes to air pollution.

Plastic, which was first invented in 1862⁷, has slowly and steadily become an integral part of our lives. According to a report titled “Innovation in Plastics - the Potential and Possibilities” by Marico Innovation Foundation 2022, India consumed approximately 21 million tons of plastic in 2021, which is a significant increase from 14 million tons in 2016-17. Plastic consumption in India has been growing at a compounded





annual growth rate (CAGR) of 10% over the past five years. This rise in consumption has led to an increase in plastic waste output, which doubled between 2016-2020.⁸

Plastic waste is one of the most critical components of Municipal Solid Waste. According to a report released by MoHUA in 2021, out of 1.45 lakh metric tonnes of Municipal Solid Waste, 35% is dry waste of which 46% is plastic waste.⁹ It takes hundreds of years for a plastic bag to degrade in a landfill. Even then, it only photo-degrades and becomes microplastics that absorb toxins and continue to pollute the environment¹⁰. The towering piles of garbage in our cities speak volumes about the crisis that our country is facing^{11,12}.

According to the Marico Innovation Foundation's report, Maharashtra, Gujrat, and Tamil Nadu together contribute approx. 38 per cent of the total plastic waste that is generated in India. The 2019-20, annual CPCB report on plastic waste management corroborates this data and states that India is the fifth highest generator of plastic waste in the world. The report further states that the per capita plastic waste generation almost doubled between 2015-2020 with Goa, Delhi & Kerala reporting the highest per capita plastic waste generation and Nagaland, Sikkim & Tripura reporting the lowest per capita plastic waste generation.¹³

Municipal solid waste (MSW) management in India has been a long-standing issue, with increasing amounts of waste being generated due to rapid urbanization and population growth. MSW management encompasses the entire process of collection, transportation, treatment, and disposal of solid waste generated in urban areas, and is crucial for maintaining public health and environmental sustainability.

On the brighter side, the government of India has taken several initiatives to address the issue of MSW management (along with plastic waste), including the launch of the Swachh Bharat Mission Urban (Clean India Mission) in 2014. In its second phase (2020-2025), the mission is focussing on making Garbage Free Cities (GFC), thereby moving towards a comprehensive ecosystem of sanitation and waste management. The government is also encouraging a zero-waste approach that entails responsible production, consumption, and disposal of products in a closed, circular system.

In July 2022, the government banned the manufacture, import, stocking, distribution, sale, and use of identified single-use plastic items, which have low utility and high littering potential, all across the country.¹⁴ It also introduced extended producer responsibility (EPR) regulations¹⁵, which hold producers responsible for the entire lifecycle of their products, including their disposal. MoHUA has launched a Mega Campaign titled, 'Meri LiFE, Mera Swachh Shehar' which aims at championing the 3Rs of waste management - reduce, reuse, and recycle.¹⁶ Additionally, through their campaign Swachhotsav 2023, the government has targeted that 1000 Indian cities should achieve a 3-Star Garbage Free rating by October 2024.¹⁷

There are several other interventions like the Plastic Waste Management Rules, 2016¹⁸ which were subsequently amended in 2018¹⁹ and 2022²⁰; the Swachh Bharat Recycle Machine^{21,22,23}, which is a compact bottle crusher machine that recycles PET bottles and in lieu gives discount coupons, etc. These are highly innovative solutions, where the result is visible, with 100% door-to-door waste collection in 97% of wards and source segregation of waste across almost 90% of wards in ULBs in the country¹⁶.

According to a report by IMARC Group, the India waste plastic recycling market size reached 8.9 Million Tons (MT) in 2022 and the market is expected to reach 18.5 Million Tons (MT) by 2028, exhibiting a growth rate (CAGR) of 11.3% during 2023-2028.²⁴ Another report by Mordor Intelligence projects a CAGR of 7.05% by 2028²⁵. Nonetheless, waste processing in India has increased by over four times from 17% in 2014 to 75% in 2023²⁶ which is commendable.



However, no amount of government intervention is going to help resolve the problem if civic society does not play a more active and consistent part. It is often said that in urban India the problem of sanitation is largely viewed as the government's responsibility, where the payment of taxes is expected to cover society's dues. But we know this is too simplistic a solution to one of the most complex problems our country is facing. Starting with household segregation to depositing of waste to ensuring that proper hygiene is maintained in our communities, civic society has a large and equally critical role to play in ensuring that our environment is kept clean and healthy.

The challenge just keeps getting bigger and bigger. According to the 2019-2020 CPCB report, there are 3715 registered plastic manufacturers/producers in 29 States/Union Territories and 823 unregistered plastic manufacturing/recycling units across the country in nine states/UTs. In contrast, there are only 896 registered recyclers. So, most of the waste is handled by the informal sector which lacks proper knowledge, training, and resources for scientific disposal of waste. The informal sector diverts the majority of the waste to landfills due to a lack of knowledge and technology-enabled machinery. Neither is the waste material collected by them channelled transparently. Material recovery facilities and recyclers in the waste management industry often receive contaminated waste that cannot be recovered and is eventually disposed of in landfills.²⁷ Solid waste management workers operate under challenging circumstances, facing hazardous environments and adverse situations²⁸. The absence of proper protective gear, essential amenities, and safety precautions heightens the chances of encountering harmful substances²⁹.

Waste collectors globally grapple with significant public health concerns, including occupational injuries, exhaustion, negative health impacts, and incidents of illness such as runny nose, sneezing, and coughing³⁰. Increased vulnerability to biologically active substances, gases, bioaerosols, and highly organic dust, such as bacteria and fungi, is associated with a higher likelihood of respiratory ailments among workers³¹.

Focusing on one of the main contributors of solid waste, Plastic, and taking cognizance of the crisis at hand, this year's compendium, titled "Best Practices on curbing plastic waste across Urban India" aims to capture some of the noteworthy attempts across the country in dealing with this very critical problem. These examples will aid in understanding the challenges faced by communities in curbing the plastic menace, by recommending solutions, and disseminating best practices, with the aim of amplifying India's efforts in achieving SDG 6 (Clean water and sanitation), SDG 11 (Sustainable cities and communities); SDG 12 (Responsible consumption and production); SDG 13 (Climate action); SDG 14 (Protection of seas and oceans); and SDG 15 (Repair ecosystems and retain biodiversity) by 2030³².

Taking a closed-loop approach to tackle this issue is the need of the hour. It is our premise that developing infrastructure along with a sustainable value chain at the micro-level for upcycling or recycling will enable India to manage plastic waste sustainably. As you dive deeper into the case studies, you will see that each of the 20 models captured through this publication, addresses, in varying degrees, one or more aspects of the closed-loop system of the plastic waste management value chain. **Figure 1** details the steps involved in a closed-loop plastic waste management value chain. It also tries to give an overview of the areas addressed by an organization in its case study.

Further, though EPR has been mandated, it is observed that there is a need to set out robust modalities by the producers for the collection of waste and involve state urban development departments, either individually or collectively, through their own distribution channel or through the local body concerned to successfully implement it across the country³³. Moreover, market-based tools such as tax exemptions, subsidies, or grants/loans may be applied to support businesses to incentivize the minimisation of



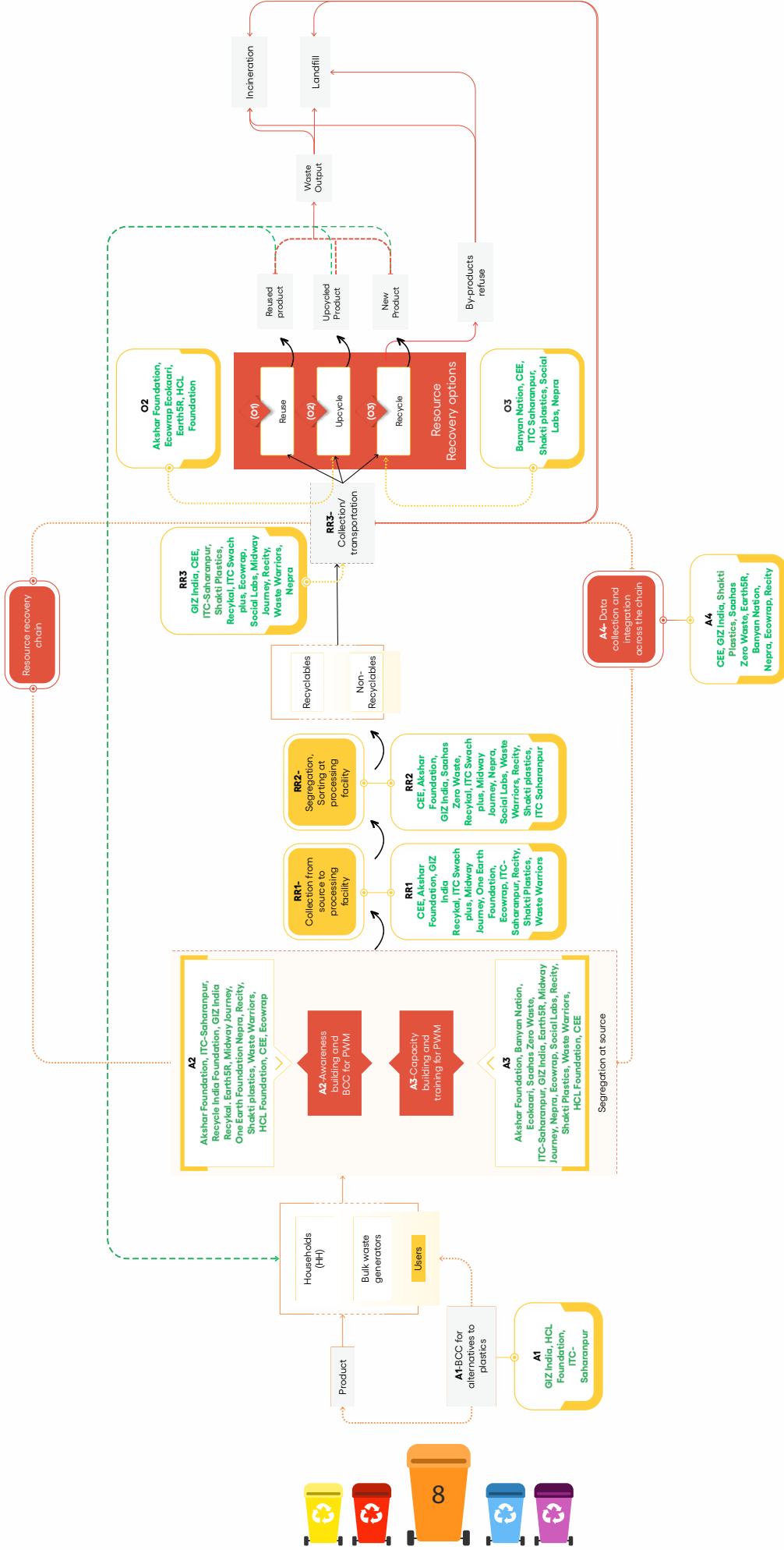


Fig 1: Closed Loop Plastic Waste Management Value Chain

plastic waste and catalyse the closed-loop approach³⁴. Additionally, the Private-Public-Community Partnership (PPCP) model for implementing various plastic waste management projects needs to be further explored. This innovative approach emphasizes the importance of collaboration between private sector entities, government institutions, and local communities. Through this cooperative effort, the community becomes not just beneficiaries but active participants, ensuring the sustainability of these programs in the long term. The corporates can also play a crucial role in expediting these initiatives in collaboration with the government. Civil societies can increase the scale of impact by raising awareness and advocating for policy reform, while individuals can contribute by adopting responsible plastic consumption habits.

By embracing a comprehensive approach that promotes the principles of reducing, reusing, and recycling, strengthening waste management systems, advocating for extended producer responsibility, initiating public awareness campaigns, and implementing forward-thinking policies, we can effectively address the challenges of managing plastic waste sustainably.

As Mahatma Gandhi said, “The future depends on what you do today”, and in the case of plastic waste the time to act is now. We hope these case studies which emanate from all parts of the country can be shared as examples to other communities where there is a need for such solutions by organizations/government departments working in the sector.



Natasha Patel

Chief Executive Officer, India Sanitation Coalition

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Diary of Case Studies







NEPRA Resource Management: Pioneering Sustainable Waste Solutions for a Circular Economy

[\(Click here for intervention video\)](#)

Author: Sonali Beeraka and Hetanshi Bhavsar

1. Location of intervention

Indore, Madhya Pradesh, India

2. Project background

NEPRA, in partnership with various stakeholders, is revolutionizing waste management in Indian cities. It is a socially conscious enterprise operating in the Dry Waste Management segment, specializing in managing plastic waste and recycling. Since its inception in 2012, the core focus has been on People, Processes, and Infrastructure. The rationale is to close the loop of waste by making it a circular economy. This is ensured by providing end-to-end services at the city level, including collection, sustainable disposal, and infrastructure development, focusing on plastic.

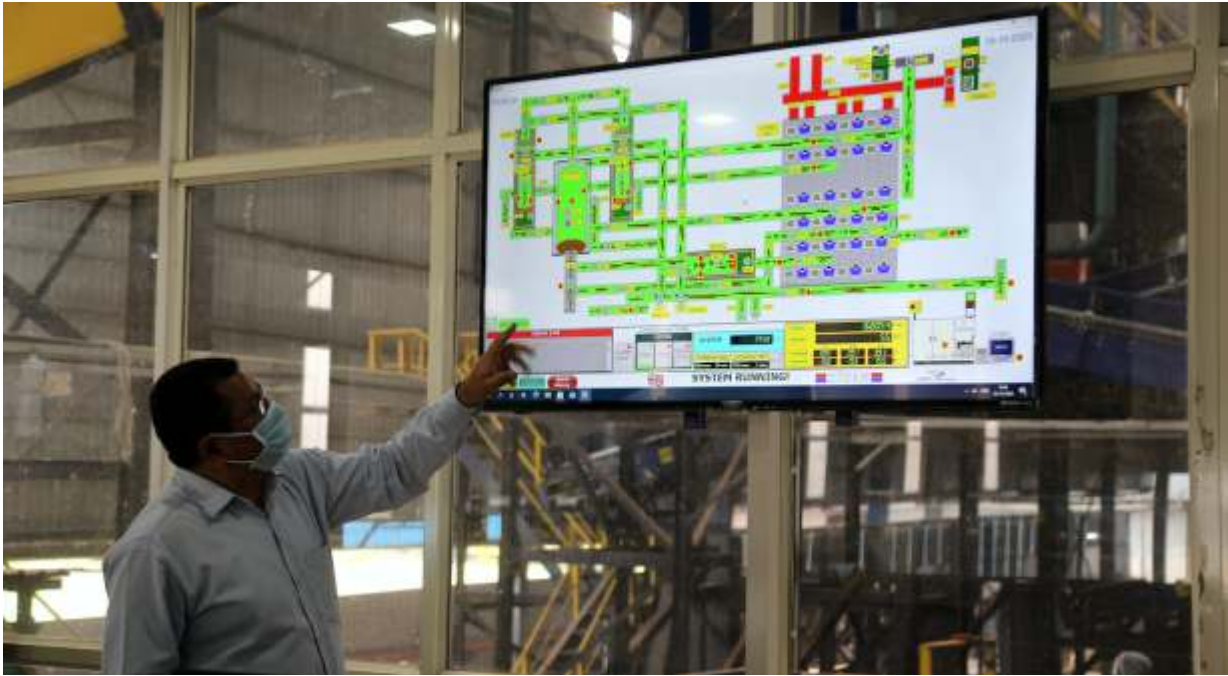
Besides, this model fosters behavioural change through awareness initiatives. It has played a crucial role in sensitizing and mobilizing citizens through campaigns, reaching over 10 Lakh citizens and children. The organization employs over 650 workers, with a significant 55% female workforce at all plant locations, thereby promoting self-reliance and inclusivity. Informal waste pickers benefit from fair treatment and well-being support.

Cutting-edge technology is an integral part of the program, utilizing Facial Recognition and an ERP System for database management, traceability, and transparency. Modern infrastructure, including Material Recovery Facilities (MRFs), ensures efficient sorting and segregation of plastic waste into multiple categories. While 90% of plastic waste recovery is ensured through collaborations with authorized recyclers, to ensure 100% zero waste to landfill, it operates in collaboration with cement plants and Waste-to Energy (WTE) plants to manage its non-recycling by converting it into Refused Derived Fuels (RDF).

NEPRA's collaborations with government bodies like Indore Municipal Corporation and Indore Smart City Development Authority focused on undertaking a designed, customised, and scheduled approach as per the requirement of stakeholders, with a tech-driven system and state-of-the-art technology at its Material Recovery Facility to ensure closing the waste loop. Public-private partnerships are key to its success as the organization also serves as an Authorized Plastic Recycler and EPR executing agency for many governments, non-government, and private organizations to help fulfill their EPR liabilities, in traceable and transparent ways.

The organization collaborates extensively with stakeholders, aligning with SDGs and national/international goals like COP26. Their model is driving socio-economic and environmental change, making cities cleaner and more sustainable for the future.





3. Problem description

Plastic waste (PW) is one of the most rapidly growing waste streams in municipal solid waste all over the world. India has become a global player in the plastic value chain. Despite low consumption, domestic generation and imports create a significant burden on the overall waste management system, which requires an in-depth understanding of the scenario and pathways that can mitigate the crisis.¹

Indore, the largest and most populated city in Madhya Pradesh, has bagged the title of being the cleanest city in India year after year. It now boasts of a well-planned waste segregation, conversion, and disposal system. But things were not so rosy always. In 2013, a survey conducted by the Central Pollution Control Board (CPCB) for the assessment and quantification of plastic waste generation in 60 major cities of the country, named Indore as the largest producer of plastic waste in Madhya Pradesh and the 14th largest producer of plastic waste across the country, as it was generating large quantities of plastic in industrial, residential, and even slum areas.²

The survey stated that Indore was generating 63.40 tonnes of plastic waste every day and a substantial 60% of this waste was not being recycled. A large portion of this waste was being discarded with municipal solid waste. Although Indore Municipal Corporation (IMC) had a system in place for the transportation, processing, and disposal of garbage, it was proving to be inefficient due to a lack of funds, adequate monitoring, and the unavailability of institutional capacity to bring change.

When in 2015, things started to change, NEPRA embraced the opportunity and established India's largest Automated MRF with IMC in PPP mode to put in place a dry waste management system at the city level.

¹<https://www.mdpi.com/2071-1050/14/8/4425>

²<https://timesofindia.indiatimes.com/city/indore/indore-biggest-plastic-waste-generator-in-mp/articleshow/19510322.cms>



4. Objectives

The main objective was to ensure that the city is made waste-free with zero waste going to landfill.

5. Program implementation details

The NEPRA MRF model has been effectively implemented, demonstrating scalability and replicability to adapt swiftly to evolving waste patterns across India. Currently, NEPRA operates Material Recovery Facilities (MRFs) in six different locations within India, including Indore, Ahmedabad, Pune, Bangalore, Jamnagar, and Vapi. However, the scope of its Extended Producer Responsibility (EPR) execution and other operations extends to pan India, covering 28 states and 6 Union Territories, ensuring the widespread and sustainable application of this model in environmental conservation.

Their remarkable work includes the responsible handling of over 5,67,000 tonnes of dry waste. This not only significantly reduces CO₂ equivalent emissions by more than 13,70,000 tonnes but also conserves a considerable 25,40,000 MWH of energy.

NEPRA's collaboration with IMC (Indore Municipal Corporation) to operate an MRF in Indore stands as a pioneering example of Public-Private Partnership (PPP) collaboration in the Waste Management sector in India. This collaboration effectively eliminates waste going to landfills, making the concept of garbage-free cities a reality.

At the beginning of the process, all types of dry waste are collected through different waste generators like individuals, malls, industries etc. Waste pickers are also engaged in this process where NEPRA with the help of Let's Recycle Software, automates this process of waste pickup based on online request generation. This application ensures transparency and traceability. It also allows fair and on-the-spot payments.





A network of more than 1800 waste pickers and multiple waste generators are part of this. Post collection, the waste is weighed on the spot and transported by micro-entrepreneur drivers working with NEPRA. The route is generated through an automated route generation system provided to these drivers. This allows the reduction of emissions generated during collection and transportation aligning with NEPRA's goals. The waste is then processed at NEPRA's highly automated MRF and segregation is ensured in 12+ categories. Plastic is further segregated into more than 9 categories as per the requirement of recyclers and co-processors.

NEPRA has a processing capacity of 650+MT dry waste per day. This waste is then sent for recycling based on the requirement by converting plastic waste into bales or shredded. The organisation at its Value-Added Facility, recycles plastic waste into recycled plastic granules ensuring their quality is near virgin. Non-recyclables are then sent to cement plants and WTE plants for co-processing and utilisation as Refused Derive Fuels (RDF).

A distinctive feature of this model is its emphasis on socio-economic and environmental impact across People, Processes, and Infrastructure. The model's technology-driven systems and state-of-the-art infrastructure embrace the principles of Circular Economy, promoting sustainable resource management. The use of technology unites stakeholders on a common platform, enhancing traceability and ensuring transparency along the entire waste management value chain.

NEPRA's "Let's Recycle (LR)" platform integrates all stakeholders in the waste management process, from waste pickers to drivers, aggregators, and businesses, through features like facial recognition. This end-to-end waste management service, from collection to sustainable disposal, is designed to align with the objective of waste-free cities. It fosters awareness and encourages behavioural change by engaging all stakeholders within the ecosystem.

In addressing the issue of plastic waste management, NEPRA serves as an EPR executing agency for various governmental, non-governmental, and private organizations, fulfilling EPR responsibilities transparently and traceably. Collaborations with these entities align with national and international goals, including Sustainable Development Goals (SDGs) and commitments made at COP26.

This solution not only responds to plastic and dry waste at a city level but also ensures economic growth by generating employment and making resource optimization possible. It also increases employability



through direct and indirect job creation and brings women empowerment and upliftment at focus. This model is also cost-efficient due to its right use of technology and in-house developed systems.

6. Innovative methods/techniques used

NEPRA places a strong emphasis on utilizing cutting-edge technology and advanced infrastructure, making innovation an integral part of its model. This ensures high scalability and replicability. To maximize the retrieval of dry waste and enable effective sorting, tailored to the diverse waste streams and patterns in India, NEPRA has developed multiple in-house technologies. Besides, they have seamlessly integrated internationally certified processes and machinery.

In this collaborative venture, innovative tools and processes such as Double Screening Machines, Magnetic Separators, Density Separators, AI-driven Pneumatic Sorters, Optical Sorters, Robotic Sorting, and SCADA Integration have been harnessed to enhance performance while maintaining the highest operational standards.

The innovative concept of "MRF in Box", ensures the harmonious integration of these systems and models across India. This innovation significantly expedites adaptation to local waste patterns, allowing to sustain the operational quality and standards.

7. Financial/revenue model of the intervention

NEPRA employs various revenue-generating models to sustain its operations. Their most preferred models are the EPC+O&M (Engineering, Procurement, and Construction + Operation & Maintenance) model and the Hybrid Annuity Model (HAM). NEPRA's Indore MRF operates on a Public Private Partnership (PPP) basis with the Indore Municipal Corporation and the Indore Smart City Development Authority.

Since its establishment in 2012, the organization has undertaken multiple initiatives and projects dedicated to waste management and sustainability. The city-level smart waste management model is a key project aimed at fostering a conducive ecosystem. To support these endeavours, NEPRA has successfully raised a total equity fund of INR 220 crores. The capital investment totals INR 159.87 crores, with revenues for the fiscal years 20-21, 21-22, and 22-23 amounting to INR 58.41 crores, 155.24 crores, and 146.27 crores, respectively. These commendable figures reflect a gross margin of 7.53%, 13.31%, and 40.14%, affirming the financial sustainability of the project. The impact is equally substantial, with over 13,70,000 tonnes of greenhouse gas emissions mitigated by diverting more than 5,67,000 tonnes of dry waste.

8. Partnerships

NEPRA is fortunate to have three dedicated investors, namely, Circular Capital, Avishkaar Capital, and Asha Impact. These pillars of support place their trust in NEPRA's operations and provide essential support for their initiatives.

Moreover, NEPRA operates in collaboration with numerous partners under the Public Private Partnership (PPP) model. Over 70 Urban Local Bodies (ULBs) and various organizations have joined hands with them, either through capital investments, operational funding, or collaborative efforts.

The key partners and stakeholders involved in overall operations to ensure circularity and zero waste to landfill are:



- **Waste Transporters, Collectors, and Aggregators:** NEPRA works with waste transporters, collectors, and aggregators to efficiently manage plastic and dry waste. This waste is collected from various sources, ranging from households and residential areas to commercial establishments. By partnering with a network of waste collectors and transporters across India, which includes drivers, waste pickers, and informal workers, waste recovery is maximized. More than 3,000 waste pickers are an integral part of the organization's network.
- **Bottom of the Economic Pyramid Employees (BoEPs):** NEPRA employs over 650 BoEP workers, with 55% of them being women, at their Material Recovery Facilities (MRFs). These employees were formerly engaged in unorganized work at dump yards. NEPRA upskills, trains, and empowers them to play crucial roles in waste segregation operations. Their precision in segregation complements the organization's state-of-the-art automated technology and infrastructure for managing plastic waste.
- **Recyclers, Waste to Energy Units, and Cement Plants:** The organization collaborates with recyclers to ensure further processing of segregated recyclable plastic waste, categorized into more than nine categories. Non-recyclable plastic waste is processed by waste-to-energy (WTE) plants and cement plants as Refused Derived Fuels (RDF).
- **Government Bodies and Agencies (ULBs):** NEPRA actively engages with government bodies, particularly municipal corporations, to manage dry waste at the city level, contributing to the vision of garbage-free cities. NEPRA's collaboration with Indore Municipal Corporation and Indore Smart City Development Authority since 2019 is a testament to this partnership. They have collaborated with over 90 Urban Local Bodies (ULBs) across India.
- **Producers, Importers, and Brand Owners (PIBOs):** NEPRA has established partnerships with multiple PIBOs throughout India, serving as their Extended Producer Responsibility (EPR) execution partner. This collaboration helps these entities fulfil their EPR obligations for plastics.
- **Educational Collaborations with Schools and Colleges:** NEPRA's MRF in Indore, operating under a Public-Private Partnership (PPP) with the Indore Municipal Corporation, serves as a platform for educational and sensitization initiatives. Students from various schools and colleges, along with ULB employees and individuals from research institutes and corporate organizations, visit this MRF to learn about proper waste management practices and gain insights into the scale of waste management and plastic recycling.

9. Challenges and solutions

One of the significant hurdles in handling plastic waste is the lack of awareness regarding waste separation and recycling directly at the source. Another challenge is the diverse waste behaviours and patterns observed throughout India. NEPRA addressed these challenges by developing efficient technology and infrastructure in-house, tailored to the specific waste characteristics found in India.

Raising awareness about source separation was accomplished through numerous collaborative sessions held in both rural and urban areas, reaching out to all community members. Negative perceptions associated with waste management and the plastic recycling industry were tackled by providing a respectable working environment, empowering, and improving the conditions of Bottom of the Economic Pyramid Employees (BOEPs).



10. Future prospects

NEPRA's central objective is to become the foremost waste management enterprise in emerging markets, contributing to both societal advancement and environmental welfare. To realize this vision, NEPRA is guided by a forward-looking roadmap that emphasizes the creation of cutting-edge infrastructure to foster a circular economy. Their goal is to achieve zero waste sent to landfills. As part of its strategic trajectory, NEPRA is resolute in its plan to establish more than 30 Waste Management facilities, encompassing Material Recovery Facilities (MRFs), Value Added Facilities (VAFs), and Refuse Derived Fuel (RDF) units, all by the end of 2023. Intending to make a substantial impact, NEPRA aspires to mitigate approximately 5.77 million metric tons of carbon emissions by diverting an impressive 2 million metric tons of waste from conventional disposal methods by the year 2025.

11. Conclusion

NEPRA has successfully pioneered innovative and sustainable waste management practices in Indore, India. By focusing on the people, processes, and infrastructure, they've not only addressed critical environmental issues but also triggered behavioural change among citizens. Their comprehensive approach, financial sustainability, and numerous collaborations reflect the potential for scalability and replicability, making NEPRA a model for cleaner and more sustainable cities.

Moving forward, NEPRA remains committed to expanding its operations, with a vision of achieving zero waste sent to landfills and contributing significantly to carbon emissions reduction. This initiative showcases a promising future for waste management in emerging markets.



SWOT analysis of Nepra

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Data collection and integration across the chain (A4)
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
 - Recycle (O3)
- Three strong pillars of this model are- People, Process and Infrastructure.
- PAN India presence through EPR services.
- **Creating a closed-loop system-**
 - Starting from collection of waste by working with waste collectors, transporters, and aggregators to operating MRFs and recycling the segregated plastic waste, diverting non-recyclables to WTE plants and cement plants.
- **Use of advanced technology-**
 - NEPRA's adoption of cutting-edge technology, such as facial recognition, AI-driven Pneumatic Sorters, Robotic Sorting, etc. enhances operational efficiency and transparency.
- **Integrating all stakeholders on a single platform-**
 - NEPRA's "Let's Recycle (LR)" platform integrates all stakeholders in the waste management process, from waste pickers to drivers, aggregators, and businesses, through features like facial recognition.
- **Upskilling and capacity building-**
 - NEPRA upskills, trains, and empowers Bottom of Economic Pyramid Employees (BoEPs) to play crucial roles in waste segregation operations.
 - Exposure visits for educational institutes.

Weakness

- **More carbon footprint-**
 - Their major solution for managing plastic waste is incineration at WTE plants and cement factories.
 - This solution is not environmentally friendly.
 - Their operations are highly automated and energy intensive, increasing their carbon footprint.



<ul style="list-style-type: none"> • Diverse revenue model- <ul style="list-style-type: none"> ○ The organisation has multiple sources of revenue, VCs, sale of recyclables, EPR, etc. which makes the model financially sustainable in the long run. • Partnership/collaborations- <ul style="list-style-type: none"> ○ They work in PPP mode under EPC+O&M (Engineering, Procurement, and Construction + Operation & Maintenance) and Hybrid Annuity Model (HAM). ○ They have multiple partnerships for recycling, sustainable disposal of waste and revenue generation. 	
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Opportunity for expansion- <ul style="list-style-type: none"> ○ Currently they have MRF plants only in 4 states, so they have ample opportunity to expand in other regions of the country. • Nepra may explore other eco-friendly avenues for recycling plastic waste. • To reduce their carbon footprint, they may explore the option of using renewable energy in their plants. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Market competitors- <ul style="list-style-type: none"> ○ In order to stay ahead of the curve, their solutions must continuously innovate, scale and remain affordable. • Technological Risks- <ul style="list-style-type: none"> ○ As a company whose services heavily rely on technology, NEPRA may need to continually invest in updating and securing its systems to remain competitive and effective. • Changes in policies and regulations especially with respect to incineration of plastic waste may disrupt one of their major revenue streams.





Community-led Decentralized Waste Management Model to Reduce, Reuse and Recycle Plastic Waste

Author: ITC Limited

1. Location of Intervention

Saharanpur, Uttar Pradesh, India

2. Programme background

Saharanpur Municipal Corporation had initially started waste management by installing open community bins in different localities to improve sanitation and hygiene in the city. Subsequently, the dumped waste from these bins was collected by municipal workers and transported in trucks to landfill sites. This dumped waste came with environmental hazards like fires, GHG emissions, and pollution of groundwater.

The Municipal Corporation was struggling with various challenges such as i) inadequate service coverage and operational inefficiencies of services; ii) lack of source segregation; iii) lack of recycling; and iv) indiscriminate land-fill-based disposal.

Given several decades of ITC's association with Saharanpur City and the enduring relationships with stakeholders through its Mission Sunehra Kal¹ interventions, ITC came to know of these challenges. Post discussions, ITC designed a **Public Private Community Partnership** Programme (PPCP) between Saharanpur Municipal Corporation, ITC, and citizens of Saharanpur for the promotion of a **community-led Decentralized Waste Management** system.

The key focus of the program was **minimizing waste to landfills** and **processing waste close to generators** in a **financially sustainable** manner with community ownership. The key tenets of the program include:

- 1. Decentralized Management of Waste:** The model promoted under this partnership focuses on the management of both **biodegradable and non-biodegradable waste at source**. Recyclables generated, especially plastic, are linked with the recyclers for processing.
- 2. Community Ownership:** The programme is community-managed and **Mohalla Committees** are formed and strengthened to take ownership of waste management in their locality.
- 3. Behaviour Change Communication:** Extensive Information Education and Communication (IEC) campaigns to generate awareness and encourage source segregation.

¹Mission Sunehra Kal, ITC- <https://www.itcportal.com/sustainability/sustainability-report-2013/mission-sunehra-kal-01.aspx>



4. **Financial Sustainability: Household levies** and the **sale of compost and recyclables** a key to ensuring financial sustainability of the program. Also, **low-cost composting techniques** like vermicomposting and aerobic composting at the household level and cluster level are promoted.

The key tenets enable plastic waste management in a sustainable and cost-effective way. Efficient management of waste including plastic waste is an outcome, as well as an important component of the Decentralized Waste Management Programme. Since the waste gets segregated at source, recyclables including plastic waste get separated and are then sold to recyclers or sent for further processing, thereby ensuring that plastic waste is almost entirely avoided from going to landfill.

3. Problem Description

Saharanpur Municipal Corporation, an Urban Local Body (ULB) under the Directorate of Local Bodies of Urban Development Department of Uttar Pradesh manages the waste of Saharanpur city. Presently, Saharanpur is home to 1.5 lakh households spread over 70 wards and generates about 50,000 MT of waste annually, of which plastic waste is 1,350 MT. The 1,350 MT plastic waste includes 1,200 MT of High-density Polythene (HDPE) and 150 MT of Low-density Polythene (LDPE) and multi-layer Polythene.

Like most Municipalities, Saharanpur Municipal Corporation started waste management with open community bins in different localities. Subsequently, the dumped waste from these bins was collected by municipal workers and transported in trucks to landfill sites. This dumped waste created environmental hazards like fires, emission of greenhouse gases, and pollution of groundwater.

The dumped waste included plastic waste as well, which was potentially releasing harmful chemicals into the surrounding soil, and polluting groundwater and other water bodies through seepage in soil, thus, harming the ecosystem. It is a well-known fact now that some kinds of plastics do not decompose at all, whilst others could take up to 450 years to break down. The impact of microplastics in soils, sediments, and freshwater has a long-term negative effect on such ecosystems.

Waste management in urban areas is the responsibility of Municipal Corporations. However, Municipal Corporations generally face the challenge of a lack of adequate expertise, experience, and resources in proper handling of waste. Also, the processing capacity of Corporations falls short of the quantity generated, leading to unsanitary conditions and diseases.

Taking cognizance of the situation and the above challenges, Saharanpur Municipal Corporation decided to work on a **community-led decentralized waste management** model. A **Public Private Community Partnership** was initiated between ITC Limited, Municipal Corporation Saharanpur, and the community, aimed at decentralized waste management and reducing waste to landfills in a financially sustainable manner. ITC also engaged two partner NGOs - Umang Sunehra Kal and FORCE for capacity building, awareness creation, and on-ground engagement.

4. Objectives

An effective solid waste management system was needed to safeguard public health in an environmentally and economically sustainable manner. The key to the success of this comprehensive Municipal Solid Waste (MSW) management system was the ability to achieve **collection of segregated waste**, which was fundamental for value realization from each stream of waste and to prevent littering and landfilling.





The key objectives of the program are:

1. Develop and implement a **community-led decentralized waste management** model, which is **replicable, scalable, and sustainable** and that addresses the waste management issue in the city.
2. Integrate **plastic waste management** system with overall Municipal Solid Waste management system.
3. Ensure **source segregation** and **treating waste close to the generator**, to **minimize waste to landfill**.

5. Implementation details

ITC's Waste Management program uses a decentralized approach and aims at minimizing waste, encouraging source segregation, and recycling plastic waste, thus adopting and promoting a **closed-loop model** for waste management.

The **closed-loop waste management model** helps **convert biodegradable waste** to useful **compost**, and **plastic waste for recycling/upcycling**. The program is designed on the principle of **partnership with local bodies** (Municipal Corporations) and **Community-Based Organizations (CBOs)** to encourage participatory planning and ownership to drive scale and sustainability. Saharanpur Municipal Corporation entered into an agreement with ITC Limited in 2017 to scale up a community-led decentralized waste management model in the entire city of Saharanpur. The program was initially piloted in a few wards of Saharanpur city by ITC, and based on the successful outcomes, it was scaled up to the entire city in a PPCP mode with the Municipal Corporation.

In order to address the public health risk owing to unmanaged solid waste, ITC carried out a study based on which the community-owned decentralized waste management model was devised. Under the Programme, sustainability and operational viability are assured through community participation and ownership. Community-based organizations (CBOs) in the form of **Mohalla Committees (MC)** with each MC comprising 250-350 households are formed under the program. Intensive training is given to these Mohalla Committees by ITC on behaviour change communication, composting, budgeting, record keeping, and monitoring. Required Information, Communication, and Education (IEC) material is provided to them. Initially, close handholding support was also provided by ITC and ITC partner NGOs, and thereafter, MCs have taken over the responsibility for monitoring of segregated waste collection, service charge collection, honorarium payment to waste collectors, and overall cleanliness of the area.

Mohalla Committees also play an active role in **mobilizing households** to adopt **source segregation** and **home composting**. Members of the Mohalla Committees coordinate with various departments for cleanliness and other civic amenities support required for their area. ITC and partner NGO teams monitor these committees and provide continuous guidance and support.

While ensuring source segregation at the household level, a **decentralized model of composting** is emphasized and discussed with community members for adoption, so as to reduce the load at the centralized waste processing unit, thereby **minimizing transportation and other associated costs**.

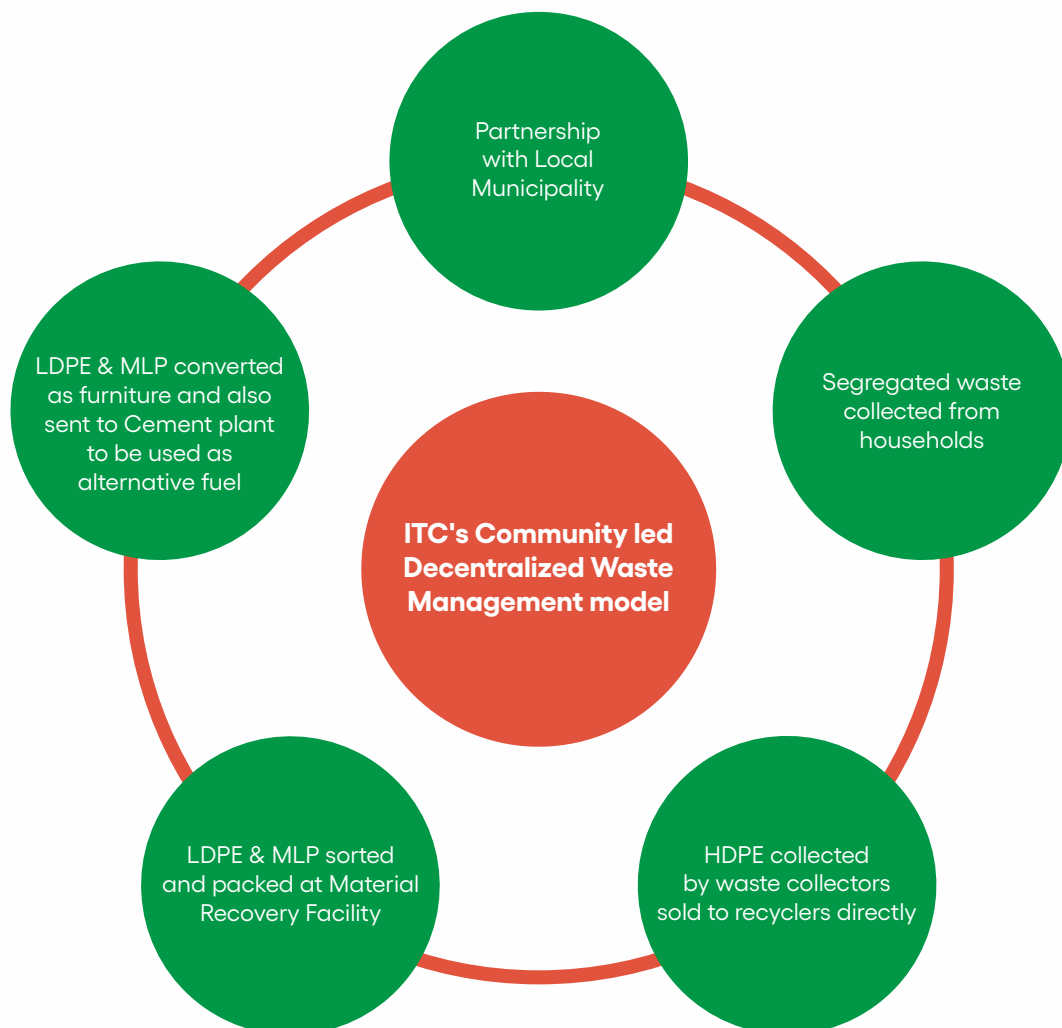
The waste collectors **sell the recyclables** collected from households **including High-density Polythene (HDPE)**, which adds to their **monthly income**. The non-recyclables are mainly sent to **Material Recovery Facilities (MRFs)**. 10 MRFs have been developed by the Municipal Corporation to replace traditional garbage dump points. Operations of the MRFs are outsourced to experienced scrap vendors to leverage their resources to optimize the efficiency and effectiveness of MRF operations. Municipal Corporation engages reputed vendors with experience in recycling, financial stability and adherence to environmental regulations on a rent charge basis.



At the MRFs, the sorters sort the recyclables and plastic. The sorted **plastic waste is then baled and sent to recyclers**, mainly Low-density Polythene (LDPE) and Multi-Layered Plastic (MLP), and the remaining waste is sent to the **cement industry** to be used as an **alternative fuel**. Besides, on a pilot basis **plastic waste (LDPE and MLP) is now being used to make benches & desks**, which are used in the **Supplementary Learning Centres of ITC's Education Programme for Out of School Children**. Thus, both biodegradable and plastic waste are managed on the principle of **circular economy**, such that there is **minimal waste reaching landfills/dumps**. The chart ahead depicts the plastic waste management aspects under the decentralised waste management model.



Material Recovery Facility Centre



The Programme has covered almost **1.5 lakh households with 474 Mohalla Committees** managing the Programme. The average membership is **314 households per Mohalla Committee**. The initiative supports the livelihood of about **485 waste collectors**, who earn a monthly average honorarium of



about **Rs. 10,400/-** and an average **additional monthly income of Rs. 1,500/-** from the **sale of recyclables and compost**. Due to effective mobilization, over 91% of the households segregate **waste at the source**, and about 63% of the covered households are practising **decentralized composting**. As of date, **88% of the waste generated is treated or recycled and only 12% of the waste reaches landfills**. **About 95% of the participating households are paying user fees** regularly, making it a **self-sustainable model**. The **average user fee per household per month** currently is Rs. 34/-. Mohalla Committees together generate nearly **Rs. 51 lakhs as user fees per month and disburse about Rs. 50.63 lakhs** as honorarium to the **485 waste collectors**.

The Saharanpur model has also recognized the **health and well-being of sanitation workers** and a strong focus is laid on their inclusion in the Programme, improving their livelihood, linking them with government schemes for social security, and taking care of their health.

All the waste collectors are provided with **Personal Protective Equipment (PPE)** kits, which reduces health hazards for them. As waste collection is only about 3 hours of work daily, they are supported in taking up a second job/livelihood during the day to increase their income. Their average monthly income has increased from a meagre Rs. 2,000/- to over Rs. 15,500/- per month. Almost 71% of waste collectors have **diversified their livelihood**. This program is thus also contributing to the Government's thrust on '**Green Jobs**'.

For improvement in waste collectors' overall well-being, Mohalla Committees and Saharanpur Municipal Corporation are working together to link them with various government schemes like **insurance, bank accounts, pension schemes**, etc. which provide them long-term **social security**. Some of the schemes in which most of the workers are getting enrolled include:

1. **Bank account – 98%**
2. **Insurance – 79%**
3. **Ration Card – 97%**

6. Innovative methods/techniques

The waste collectors who are mostly from the **marginalized sections** of society are the **prime drivers of the program** and are responsible for door-to-door waste collection, sale of recyclables, and management of the waste. Their engagement through the **Mohalla Committees** ensures a steady honorarium to them for their work. They were also trained on handling various types of waste by the ITC team and Municipal Corporation officials.



Baling for Upcycling/use as an alternative fuel

Plastic Waste Management

To reduce the usage of plastic waste, especially single-use plastic, Mohalla Committee members, commercial establishments, and school children were sensitized by ITC about the harmful effects of plastic waste on the environment and health and were motivated to use cloth bags.

Awareness rallies and plastic usage reduction drives were conducted in the city with the active participation of citizens and Municipal Corporation officials. Waste collectors sell recyclable wastes to scrap vendors and recyclers. On average, from each



house, a waste collector collects 22 to 27 grams of High-Density Polythene (HDPE) and collects 3 to 5 grams of Low-density Polythene (LDPE), which leads to 4 MT of HDPE/day and 0.5 MT of LDPE/day at the program level. The waste collectors drop the LDPE and non-recyclable waste at the Material Recovery Facility (MRF), which is run by scrap vendors on a rental basis. At MRF, the waste is further sorted into recyclables that can be sold to scrap vendors. LDPE, MLP, and Single Use Plastics (SUP) are baled and sent to recyclers for upcycling into school furniture on the circular economy principle and also to cement plants for use as an alternative fuel. The leftover waste is disposed of in the Municipal dump fill site. In the Financial Year 2022-23, a total of 0.5 MT and 49.7 MT LDPE & MLP were collected and dispatched for upcycling and use as alternative fuel respectively, and received **Extended Producer Responsibility** certificate (EPR).



Upcycled furniture from LDPE and MLPs for SLC



Specially designed cart for Digital Kabadiwala

Additionally, a pilot on **digital Kabadiwala** (available on common WhatsApp groups of MCs) was piloted in the city to increase dry waste recycling including plastic waste, where citizens were trained to further segregate dry waste in their households for better price realization. Few of the existing waste collectors were trained in scrap recycling and were motivated to take up the scrap recycling business. MC members willing to sell their stored dry waste share their request with house details and waste on a centralized WhatsApp group that gets forwarded to the nearest

Kabadiwala for procurement of dry waste from the doorstep. So far, 10 digital Kabadiwalas are operational in the city and are helping in recycling of about 30-35 MT of dry waste including plastic waste on a monthly basis.

7. Financial/revenue model of the intervention

The operational and financial sustainability of the program is in-built from day one of the rollouts. The **operations are managed by Mohalla Committees (MC)** and **financial sustainability** is ensured through a **user fee on a voluntary basis** and **resource recovery**. The technologies adopted for the program are simple and **low cost** like **cycle rickshaws for waste collection** and decentralized composter. There have been instances where waste collectors have themselves invested in a rickshaw for livelihood and some MCs have also contributed towards low-cost composters.

In addition to the program being spearheaded by the community, **mainstreaming of informal waste collectors** into a formal waste management system has also been a focus. This has resulted in better working conditions, improved livelihood, and social security scheme linkages and thus ensured waste collectors' participation on a long-term basis.

The recurring cost is entirely borne by households and other generators which comes from **user fees**. It is decided by them on a willingness-to-pay basis as well as based on the requirement of meeting operational costs. The community is convinced to bear the recurring expenditure after realizing the benefit of a healthy and hygienic environment. The operational cost for waste management is presently about **Rs. 39/- per household on a monthly basis**, which is almost **half to one-fourth** of that **incurred in traditional waste management systems**.



There are 3 sources by which revenue is generated to meet the operational cost sustainably.

1. **User fee:** Paid by about 95% of the beneficiary households amounting to a total of Rs. 51 lakhs on a monthly basis, up from Rs. 3 lakhs per month in 2017. It is mainly used for honorarium payments for waste collectors and maintenance of equipment. User fee collection, management, and disbursement are done by the Mohalla Committees.
2. **Sale of Recyclable:** It is presently Rs. 7 to 8 lakhs monthly and is earned by waste collectors and sorters at MRFs run by scrap vendors on a rent basis.
3. **Sale of compost:** Presently it is about Rs. 3 lakhs per month, most of which is used as an additional income to waste collectors.

8. Partnerships

In December 2018, the Saharanpur Programme was awarded the **1st prize under the Uttar Pradesh Government's 'Swachh Ward Pratispardha'** in the decentralized waste management category. Subsequently, a workshop was organized by the Urban Development Department (UDD) at the office of the Director of Local Bodies in Lucknow for Mayors and ULB heads from 42 ULBs of the State to orient all of them on the Saharanpur model.

Subsequently, **UDD, Govt. of Uttar Pradesh entered into an agreement with ITC for technical support** for rolling out of the **decentralized waste management** model demonstrated in Saharanpur in **60 towns of Uttar Pradesh**. This scale-up is based on a partnership between key stakeholders, the foremost being the Urban Development Department (UDD) of Uttar Pradesh as the apex body in the state. UDD extends policy and resource support to scale up the community-based waste management solution.

Under the partnership, ITC has designed training programs for community-based waste management, including the technical, social, and financial aspects. ITC has also helped in the **rollout of the training cascade** and provided **supportive supervision** for the implementation of the program in ULBs. The initiative has already been rolled out in **58 ULBs covering 19.83 Lakh households, benefitting 6,815 waste collectors**.

The successful experience is shared with different State Governments, based on which the **Government of Bihar** has also partnered with ITC to build the capacity of government officials to roll out Community Led Decentralized Solid Waste Management in 271 Ganga gram Villages of 12 districts covering about 5.4 lakh households.

9. Challenges and solutions

The model designed by ITC identifies **communities as change agents** and **Municipal Corporations** as the **facilitator**. Initially, community members were reluctant to take ownership of waste management activities as they considered it to be the responsibility of the civic body. Since the success of the model largely depended on communities owning it, **behaviour change in the communities** emerged as the biggest challenge. **Extensive IEC campaigns** were undertaken to **generate awareness** of the direct and indirect **benefits of the program** and **mobilize community members** to take ownership of the same.

The second challenge was to **convince households to pay user fees** to waste collectors. Gradually, with demonstration, and constant efforts from community mobilizers, community influencers, and Mohalla Committee members, households agreed to pay a nominal amount as a user fee for waste collection services to the Mohalla Committee.



Because of low user fee collection, **engaging waste collectors** became a challenge initially, which also got resolved with a greater number of households paying user fees to the Mohalla Committee.

Also, initially, households were **not providing segregated waste**, because of which entire waste was dumped and waste collectors **did not make any additional income** from the sale of recyclables and compost. Mohalla Committee members were mobilized to identify households not providing segregated waste and then sensitize them. Since women were handling the kitchen waste, they were primarily involved in encouraging segregation. Thus, the collection of user fees by Mohalla Committees as well as the **provision of an additional income** for waste collectors from the **sale of recyclables and compost** ensured regularity and retention of waste collectors, in addition to minimizing waste dump.

The program also faced challenges in recycling LDPE, MLPs, and SUPs. Tie-ups with upcycling vendors who **recycle plastics into useful furniture** for ITC-supported **Supplementary Learning Centres** and with **cement plants** where plastics are used as an **alternative fuel** to help lower their production cost, led to a further reduction of waste going to landfills, thereby benefitting the ecosystem.

10. Future prospects of the Programme

The Public Private Community Partnership (PPCP) model with the Urban Development Department, Govt. of Uttar Pradesh across 60 towns of Uttar Pradesh targeting over **54 lakh households** has **pan-India replicability**. ITC has scaled up this model to **10 other states** in partnership with various State Governments where local bodies and communities are reaping similar benefits.

11. Conclusion

The "Community-led Decentralized Waste Management Model to Reduce, Reuse, and Recycle Plastic Waste" in Saharanpur, India, has proven to be a transformative and sustainable solution to the city's waste management challenges. This innovative model, spearheaded by ITC Limited in partnership with Saharanpur Municipal Corporation and the local community, has not only reduced the environmental impact of plastic waste but also empowered marginalized waste collectors and improved the overall well-being of the community. **Revenue** generated from the program is used for the **livelihood of the engaged waste collectors**, apart from the surplus generated from **user fees** getting used for **local environment development** by **Mohalla Committees**. Additionally, as the operation cost is through user fees, participating towns **save a significant portion of their budget** earmarked for solid waste management.

Further, recycled material, compost, and dry waste reduce the overall requirement of producing and sourcing new materials for sectors like cement, thus benefitting the overall economy through responsible production and consumption and also resulting in emission reduction.

This program stands as a testament to the power of community-led initiatives and public-private partnerships in creating lasting positive change in waste management and environmental conservation.



SWOT analysis of ITC Saharanpur

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Behaviour Change Campaign (BCC) for alternatives to plastic (A1)
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
 - Recycle (O3)
- **Community engagement-**
 - The program has added another dimension to the PPP model by making it a PCPC (Public-Private-Community-Participation) model, empowering local residents and fostering a sense of responsibility for waste management.
 - The entire waste management process from awareness generation, collection and transportation to MRFs is conducted by the Mohalla Committees (Mcs).
- **Addressing the entire plastic waste management value chain-**
 - Every component of the waste management value chain is addressed through decentralised community participation.
- **Upliftment of the informal sector-**
 - The intervention has enhanced the income of waste workers, built their capacities, supported them with supplementary livelihood opportunities, etc. which have improved their standard of living.
- **Self-sustaining revenue model-**
 - Revenue generation from user fees is sustainable in the long run because community ownership is ensured through this.
- **Partnership/collaborations-**
 - The PPCB model through partnerships and collaborations adds to the efficiency of the model.

Weakness

- **Dependency on user Fee Collection-**
 - The major source of revenue is user fees. Any negative fluctuations in this will affect the operations.
- **Behaviour Change-**
 - For the model to succeed, behaviour change and community buy-in are crucial which may require significant effort and time.



Opportunities

- **Opportunity for expansion-**
 - The program's success in Saharanpur provides an opportunity for replication in other urban areas, potentially addressing waste management challenges in more cities across India.
 - By conducting exposure visits to Saharanpur, other corporates may be motivated to replicate and scale the model.
- **Social upliftment-**
 - Partnering with the informal sector of any ULBs will improve their livelihood opportunities and also improve the efficiency of the project.
- **Focus on providing green jobs-**
 - With the government's focus on providing green jobs, business houses may benefit by adopting this model.

Threats

- **Single major source of revenue-**
 - Single revenue source- User fees may threaten the sustainability of the model.
- **Lack of Centralised monitoring mechanism for MRFs and MCs -**
 - Without proper monitoring mechanisms, the efficiency of the model may be affected.





Greening the Future - Sustainable Solutions for Plastic Pollution

[\(Click here for intervention video\)](#)

Author: Mazin Mukhtar

1. Location of intervention

Akshar Foundation is active in multiple districts in the state of Assam, with headquarters in Guwahati.

2. Project background

ECOSOC brings people and issues together to promote collective action for a sustainable world. Akshar Foundation, having ECOSOC Special Consultative Status, is an internationally recognized NGO based in Assam, India. The Foundation was lauded by the United Nations, and World Economic Forum, awarded by the Earth Day Network, and amplified by media outlets including BBC, the Guardian, Al-Jazeera, TIME, Reuters, Forbes, and more, for the innovative policy of “Plastic Schools Fees”, as well as other pedagogical innovations aimed at the elimination of child labour and child poverty.

The foundation works to upgrade schools into centres for sustainable development. Thus, schools become centres for children to learn and work towards achieving the United Nations Sustainable Development Goals. Students work in the schools “earning and learning” by teaching younger students, collecting, and sorting plastic, and creating new products from plastic in their 'Precious Plastic Workshop'.

3. Problem description

According to the CPCB's annual report of 2020-21, Assam generated 58,765 tonnes per annum of plastic waste. Though single-use plastic and plastic waste have posed a serious threat to Guwahati and other urban areas in the state, the government has not taken any scientific or tangible measures to solve the menace. According to a study, Guwahati generates around 600 metric tonnes of garbage daily, including 350 metric tonnes of single-use plastics and plastic materials.¹ These plastic materials often find their way to the drains and canals, ultimately clogging them up.



¹<https://www.sentinelassam.com/topheadlines/no-tangible-measure-yet-to-rid-urban-areas-of-plastic-garbage-648956>



According to another report titled, “Waste Management in Assam: The Way Forward” by the Pollution Control Board of Assam, the state generates 1,284 tonnes per day of solid waste of which 1,114 tonnes per day is collected. However, what is alarming is that out of the 1153 wards having door-to-door collection of waste, only 463 wards have source segregation of waste. Though the report highlights that there has been improvement in all these parameters in the past five years, as in 2018 only 7% (100 tonnes per day) of the waste was being processed, in 2023 51% (652 tonnes per day) of it is being processed², yet there is ample gap in waste being produced and processed.

Akshar's plastic recycling innovations are designed to address the problem of widespread plastic pollution as well as the haphazard burning of plastic in the vicinity of children.



4. Objectives

The program aims to achieve the following key objectives:

- Starting with their model school, the Akshar Foundation aims to introduce plastic collection, sorting, and recycling workshops in schools throughout Assam.
- Providing incentives to at-risk teens for creating Eco-bricks from non-recyclable plastic after school. These bricks will be utilized for small cement construction projects.
- Implement the “Plastic School Fees” policy to make segregation of plastic by parents of children in their free school mandatory, encouraging responsible plastic handling.
- Propagating this model to various schools, establishing them as community plastic collection centres to enhance awareness, and education about plastic, and proactively address the issue.

5. Program implementation details

In October 2018, Akshar Foundation instituted the policy of "Plastic School Fees", to make the participation of parents in recycling efforts mandatory. Before the policy was instituted, the residents were not motivated to participate in the foundation's plastic collection and recycling efforts. So, they made it a mandatory condition for enrolment of children in their free school. Parents also signed a pledge upon enrolment to submit their plastic to the school and stop plastic waste burning at home.

Now students are requested to bring their plastic from home (amounts vary depending on usage). But they are recommended to bring 5 plastic packets per day (25 per week). The teens collect plastic packets and bottles from local businesses. The material is then separated and cleaned, and the

²https://www.mospi.gov.in/sites/default/files/main_menu/Seminar/Waste%20Management-Assam.pdf



plastic bottles are compacted with other plastic materials, such as plastic bags and packets, to create a “brick.” 20-40 packets are sequestered into a single bottle to make a sturdy Eco-brick. These “eco-bricks” are used to construct things for the school, everything from toilets to flower planters, to save money and teach the students important vocational skills. The kids learn how to make the bricks, mix the cement, and learn the construction skills necessary to build with and reuse recycled materials.

One small tree planter holds around 200 plastic bottles and 4,000 plastic packets. This plastic, if not repurposed, might have been discarded or incinerated, causing damage to the local environment. However, by repurposing it, the plastic now serves to safeguard nature rather than cause harm. The Plastic School Fees policy has achieved 100% compliance from students' parents. The foundation has also installed a “Precious Plastic” workshop, based on designs from the Netherlands, which is also being implemented in schools across Europe. Students here use single-use waste plastic to design and produce new products.

6. Innovative methods/techniques used

Akshar Foundation has adopted the 'Plastic School Fees' policy which is a game-changer in reducing the plastic waste that goes to landfills. With the participation of parents of school-going children, they were able to reduce plastic waste across the entire area. Mandatory bringing of plastic waste to school not only incentivized the parents to segregate plastic waste at source, but it also made the students aware of various aspects of plastic waste management such as segregation at source, sorting, and upcycling. The Plastic School Fees policy has achieved 100% compliance from students' parents. From workshops such as 'Precious Plastics', students have been upskilled to use single-use plastics to design and produce new products.



Starting this year, this policy is being implemented in 14 government schools of Assam in a slightly modified version. Instead of Plastic School Fees, it will be called the “Plastic for Tablets” scheme, where students earn the right to use tablets in classes if they submit weekly plastic fees.

7. Financial/revenue model

They have not generated significant revenue from plastic and rely on donations to sustain the work. The foundation has recently started selling products made from waste plastic in its 'Precious Plastic' workshop.

8. Partnerships

Akshar Foundation has signed MoUs with Samagra Shiksha Abhiyan of Assam and Swachh Bharat Abhiyan of Assam to implement their plastic recycling programs in up to 150 schools by next year. Oil India Limited is helping to fund these activities and scale up.



9. Challenges and solutions

Before the Akshar Foundation implemented the policy of “Plastic School Fees”, the residents in the areas where they operated didn't show enthusiasm for participating in their plastic collection and recycling efforts. To address this, the foundation linked it to their children's enrolment in the free school. Only with the potential imposition of a financial penalty, did they manage to attain 100% compliance from parents. Presently, the practice of segregating clean plastic has become a deeply ingrained habit.

10. Conclusion

Akshar Foundation's efforts have provided a blueprint for addressing plastic pollution and child safety through innovative, community-driven initiatives. The success of the Plastic School Fees policy serves as a testament to the power of community engagement and education in tackling pressing environmental issues, while simultaneously contributing to the well-being of children and the communities they serve. This project stands as a shining example of how creative solutions and dedicated partnerships can make a lasting impact on both the environment and society.

SWOT analysis of Akshar Foundation

Strength	Weakness
<ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Capacity building and training for PWM (A3) ○ Collection from source to processing facility (RR1) ○ Segregation, Sorting at processing facility (RR2) ○ Upcycle (O2) • Innovative model to tackle the problem of plastic waste- <ul style="list-style-type: none"> ○ Enabling behaviour change through the 'Plastic School Fees' initiative. ○ Upcycling the collected plastic through the production and use of Eco-bricks. ○ Upskilling the students by organising workshops such as 'Precious Plastics', to use single-use plastics for designing and producing new products. • Integrating plastic waste management with education- <ul style="list-style-type: none"> ○ The Plastic School Fees policy has achieved 100% compliance from students' parents indicating community acceptance of the model. • Creating a closed-loop model- <ul style="list-style-type: none"> ○ The model addresses multiple aspects of the plastic waste value chain including behaviour change, collection, sorting, cleaning and upcycling. • Partnership/collaborations- <ul style="list-style-type: none"> ○ The PPP model is helping the program to scale. 	<ul style="list-style-type: none"> • Dependency on donations for financial sustainability- <ul style="list-style-type: none"> ○ Though there are plans for the sale of upcycled products made at the 'Precious Plastics' workshop, the primary source of funds is donations which may limit the model. • Limited Geographic Coverage- <ul style="list-style-type: none"> ○ This geographical relevance of the model in areas other than Assam are yet to be tested.



Opportunities

- **Opportunity for expansion-**
 - The foundation has opportunities to expand its programs to more schools, districts, and even other regions, contributing significantly to plastic waste reduction and sustainable education.
- **Product Sales-**
 - The 'Precious Plastic' workshop's products could be an additional source of revenue if marketed effectively.
- **Increase in the number of revenue streams-**
 - The foundation must work towards increasing the number of revenue streams to become financially sustainable.

Threats

- **Dependency on Donations-**
 - By characteristic donations are inconsistent, therefore lack of any other funding source may limit the activities and expansion plans.
- Instead of positively influencing the behaviour, the mandatory aspect of plastic school fees may induce a greater generation of plastic waste.





Mitigating Marine Litter by Managing Plastics from Urban Drains in Kanpur: A Case Study

Author: Dr Bharat Bhushan Nagar and Soma Biswas

1. Location of intervention

Kanpur

2. Project background

Under Indo-German Development Co-operation, GIZ -India has been implementing a project on marine litter prevention by managing solid waste in urban spaces- **“Cities Combatting Plastics Entering Marine Environment Project (CCPME)”**. The project was born as a result of a joint Declaration of Intent on Marine Litter Prevention signed on 1st Nov 2019 by The Government of India and The Federal Government of Germany. This project has been funded by the German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) and anchored with the Ministry of Housing and Urban Affairs (MoHUA), Government of India. The primary objective of the project is to prevent plastic and non-biodegradable waste from entering the marine environment by reducing and recycling marine litter through a circular economy approach.

A brief snapshot of the project is provided below

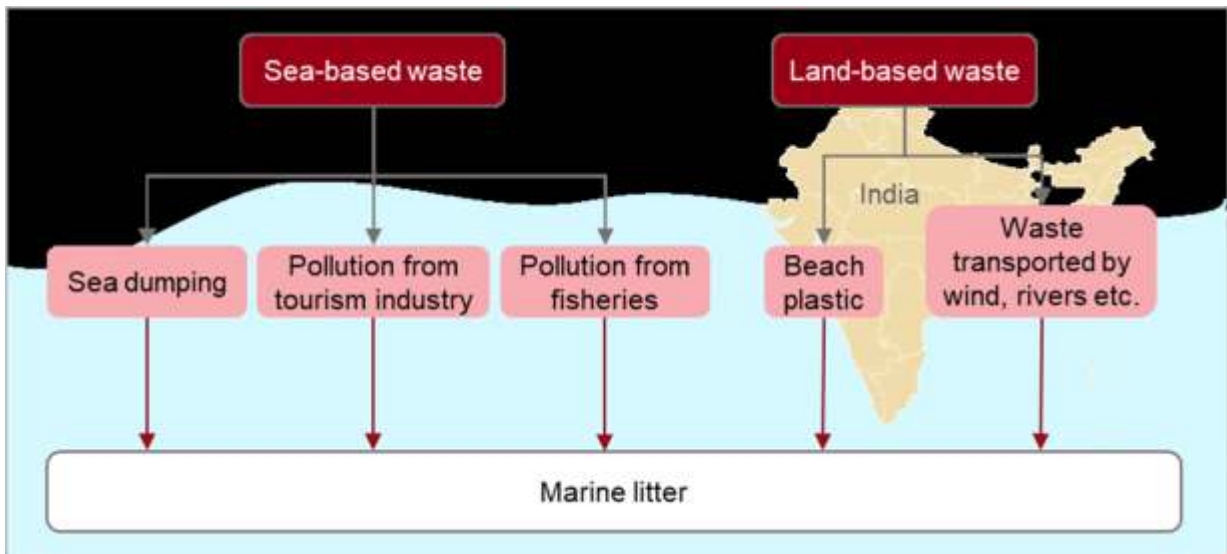


The project is providing technical support to the coastal city of Kochi, the industrial city of Kanpur, and the island city of Port Blair as well as their respective state governments in India. Cities from 3 different regions were selected to develop solutions for three varied types of ecosystems comprising riverine, coastal, and marine characteristics. The focus is also to consolidate the learnings derived from these cities and develop a digitised format of appropriate recycling; that will assist MoHUA at the central level.

3. Problem description

The city of Kanpur is located in the terrestrial plain area on the bank of the river Ganges and is the second largest city in the state of Uttar Pradesh. The city generates approximately 1400-1600 tons per day of MSW¹. Kanpur has been known as a major point and non-points-based pollution hotspot for the river Ganges. The city has a major industrial hub, probably the largest in the state, catering to the manufacturing and recycling of plastic and other dry waste streams. There are 4 to 5 major drains flowing across the city, which receive a significant quantity of waste leakage, which subsequently adds to the Ganges flow and is carried to the Bay of Bengal. A river-to-sea flow approach has been established to account for leaked waste into urban drains, leading to the build-up of marine litter.

Sources of Marine Litter²



Throughout its journey, the river accumulates plastic – macro, meso, and micro, from various sources, and transports it towards the sea. The Ganges network forms the second-largest plastic-polluting catchment in the world, with over 0.12 million tonnes of plastic discharged into marine ecosystems per year and is among 14 continental rivers into which over a quarter of global waste is discarded³. 150 Kilo tons of plastic waste is generated in Kanpur, out of which 10%-13% of plastic is leaked into the local drains and water flow systems.

¹GIZ Waste Characterization study Report 2022

²(Source: <https://os.copernicus.org/articles/18/1/2022/>)

³<https://india.mongabay.com/2022/03/message-in-a-plastic-bottle-ganges/#:~:text=The%20Ganges%20network%20forms%20the,of%20global%20waste%20is%20discarded.>



4. Objectives

During the diagnostic studies conducted at Kanpur, it was found that approximately 10%-13% of city plastic waste was finding its way into these drains. The reasons were found to be primarily related to poor waste management services; the discard of poor commercial dry waste by informal rag-pickers and littering by the common public. Based upon the above reasons, the project had fixed the following objectives:

- Identification of drains and rivulets infested with waste leakage and littering.
- Establishing waste leakage hotspots and linking them with the waste characterization of city MSW.
- Exploring Low-cost indigenous technology for immobilization and removal of drain waste.
- Development of circular economy models for drain waste.
- Exploring the potential of creation of local jobs with drain waste management

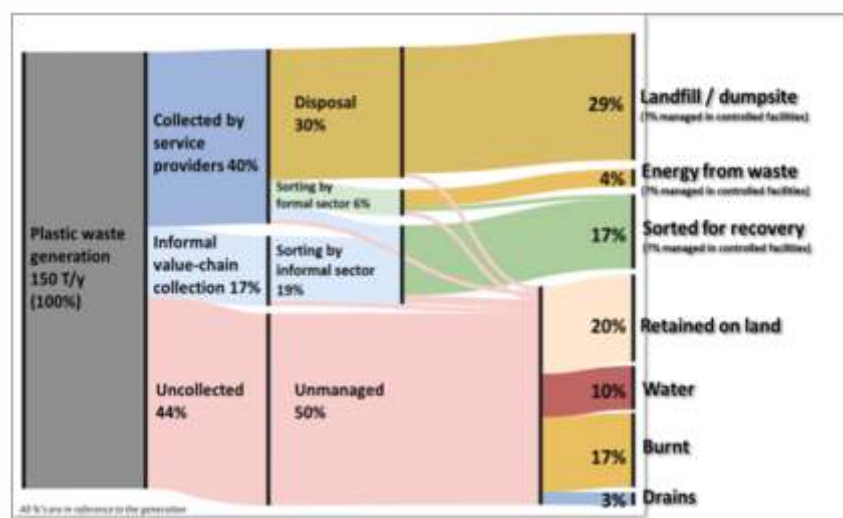
Overall, the project was trying to focus on achieving remediation of drain waste with a socially inclusive development approach.

5. Implementation details

The project kicked off with a detailed waste leakage hot-spot identification. A local NGO partner was hired, who was vested in surveying the identified drains with significant waste leakage and outfall in water bodies. For Kanpur 3 major drains - COD, Halwakanda & Sisamau, were identified as hotspot water bodies for surveying. After primary short-listing, detailed surveys were conducted. The survey was undertaken with the following details to be captured for detailing the base-line data and existing situation:

- Establish major waste leakage points with consideration of the adequacy of existing waste management services in the vicinity of hotspot points.
- Studying the behaviour of surrounding habitation and littering behaviour.
- Identifying these hotspots into GIS maps for ease of implementation and planning.

Subsequent to the surveys, waste characterization studies were conducted to get information on waste composition for the cities. Waste flow Sankey diagrams, developed by GIZ to identify plastic leakage into local water bodies in local areas were prepared to get an idea of the extent of the prevailing leakage situation.



Sankey Diagram for Kanpur Plastic Waste Status



Waste characterization study outputs were correlated to the portion of waste shown as leaking into the water bodies by the Waste flow diagram. A baseline for leakage was established, which varied between 10% -20% of total daily waste generation. A strategy for the development of mitigation measures was developed, with a focus on objectives mentioned in the previous section. The results of surveys conducted gave deep insights into prevailing poor waste management service and related dissatisfaction among the residents living on the banks of the identified urban drains of Kanpur. Survey results also identified a need for implementing a strong behavioural change strategy, in conjunction with improved waste collection services.

Kanpur's problem with more aggravated conditions was taken as a priority. A German startup- Plastic Fisher was identified for providing a solution to capture the drain waste and achieve its recycling in a sustainable manner with a circular economy approach. The team at Plastic Fisher conducted joint surveys and identified locations on 3 drains at Kanpur using GIS maps developed during the survey. It suggested putting floating 'Boom Barriers' across the drains with a low-cost material, which reduced their cost to only 2000 INR per barrier.



Boom Barrier in Action

These 3 boom barriers were fixed at pre-identified locations. As a result, a significant quantity of leaked waste started getting captured at these three points. Preliminary estimation of waste leakage quantities established that a significant quantity was expected to be captured and available for diversion to recycling chains. A location was identified, where a structure was provided, with support from Kanpur Nagar Nigam which functions as a Material Recovery Facility (MRF).



Material Recovery Facility for Drain Waste

Plastic Fisher engaged a small team of local people to collect plastics from these 3 selected drains, undertake their drying, aggregation into baled form, and despatch to the cement industry and other users for recycling/disposal.

The daily average drain waste capturing ranges between 300- 550 kg per day on a wet basis and 200-350 kg on a dry basis. To date, a total of 5500 kg of plastics have been captured, aggregated, and diverted towards the recycling loop.

The project implementation also witnessed the execution of a customised behavioural change communication strategy, which comprised clean-up drives, awareness campaigns, capacity building, and door-to-door mobilisation to motivate people towards behaviour change under the umbrella campaign 'Clean Up Kanpur'. The campaign promoted the concept of management of solid waste at source, waste segregation, prevention of litter, and reduction of plastic use amongst its three key target audiences – households, commercial, and decision-makers. The campaign is being implemented in cooperation with Kanpur Nagar Nigam. It has been joined by many local NGOs, Institutions, agencies,



volunteers, commercial units, and households. In the last one and half years more than 8 cleanup drives have been conducted along the selected drains in the hotspot area.

6. Innovative methods/techniques

During this entire project, a systematic process was built up and adopted to address the problem of removing the drain waste for Kanpur and Port Blair cities with varied geographical and climatic features. This project's learnings have been conceived into a stepwise flow diagram as shown in Figure-6⁴.

Waste flow-based Sankey diagrams were used for assessing the waste leakage extent into water bodies. The project has been able to reduce the cost of easy adaptive technology boom barrier technology, wherever the cost remains a concern. Circular model development adoption and success for drain waste is another innovative approach in the country. The behavioural strategy implementation included a total of 50+ clean-up campaigns as part of project objectives attainment. These clean-up campaigns have been documented into state-specific SoPs for the first time in the country and shall be released in the coming months for public usage.



The entire drain waste collected, aggregated, and diverted into the recycled loop is being digitally monitored by the project through a digital portal – “**Sansaadhan**”. This portal has been already adopted by MoHUA and will shortly be expanded to 10 cities across India. The development of micro-plans along with all identified hotspots is another important and innovative approach undertaken under the project sites, which are ready for adoption and implementation by the local ULBs for minimizing waste leakage into drains.

A socially inclusive approach for the entire project has also resulted in the engagement of local informal rag-pickers, who otherwise were engaged in littering.

⁴GIZ Advisory -How to Clean Our Drain, 2023



7. Financial/revenue model of the intervention

The project was built upon the self-sustaining financial model. The project includes activities, where a cost-efficient model is developed and adopted for a socially self-inclusive model. The project has recommended the use of low-cost floating boom barriers for capturing waste from drains. This involves a one-time time cost and has no operational cost. Manpower is engaged in fishing and capturing immobilized waste, whose salaries are paid by the Plastic Fisher. The captured material is sun-dried and transported to the designated place, where the shed and power connection, which act as MRF, are provided by the city Municipal corporation. Material aggregation, baling, and transportation cost to end-users is borne by Plastic Fisher as well.

Plastic aggregation and its recycling help Plastic Fishers earn Plastic credits, which are registered under various international certification programs. These plastic credits are traded by Plastic Fishers across the globe under the Global Plastic Credits market. These credits are subsequently monetized to capture the cost of OPEX, while the CAPEX is covered through funding received from multiple sources. Additionally, EPR revenues are also leveraged for operational expenditure. This entire initiative also saves a significant cost to the other agencies engaged in river cleaning and drain management. In case improved waste collection services are started by the city municipality in fringe areas located on drain embankments it shall also save the transportation cost to the city, as this facility can also receive the dry waste collected by the city in source-segregated form.

8. Partnerships

The project involved various stakeholders, which ranged from local residents living in surrounding areas of these water bodies; local administration including the municipal body's higher officials; its sanitation staff, private operators engaged in providing SWM services in the local area, commercial traders associations, NGOs, schools, and other institutional bodies. All stakeholders played a cohesive role, as they were interwoven by the behavioural change communication strategy. The project was able to garner significant support from the city corporation, particularly the support of the City Municipal Commissioner. The city corporation was convinced from the onset of the project about the anticipated results of the project. They were swift in providing a piece of land for setting up a recycling drain waste management facility, building a structure, and tagging of proposed facility as MRF.

The project brought considerable social, economic, and overall well-being to a slum located at the OD drain adjacent location. More than 15 people were employed under the project activities. City corporation also launched a project – “Mahima”, connecting all slum residents with government health and social security schemes to ensure its outreach to all.



9. Challenges and Solutions

The project, when conceived in the opening phase had a lot of challenges in terms of defining the



problem area limitation, as Kanpur is a very large city. It was also very difficult to establish specific leakage waste points across the drains. Interaction with people, with a deterrent and persistent behaviour on a littering subject, and expecting a behavioural change was a challenge. As a normal approach, city corporations are always engaged in desilting the drains for cleaning purposes, which does not avoid the leakage of plastics. Exploring an alternative and easiest way to capture and remove floatable and semi-floating suspended waste streams was a major challenge.

A flexible, agile, indigenous, people-centric approach helped the GIZ team crack these hard nuts. Preparation and adoption of an effective behaviour change communication strategy, coupled with a low-cost easy-to-adopt technology and support from local city corporation administration have been the key game-changer points for the success of this project. The challenges also existed in terms of suitable NGO partners, whose task delivery methodology are commonly neglected aspect.

These all were adopted with the designing of suitable Key performance indicators and the adoption of focussed interaction parameters and their amalgamation with suitable IoT interactions. Digital monitoring of drain waste Inventorisation- both at operational MRF and its subsequent linkage with the Sansaadhan portal has also ensured accountability and transparency on sustainable aspects of the project.

10. Future Prospects of the Program

After the project has received success through the management of drain waste at Kanpur, it is planned to further consolidate by establishing another MRF at Saraimita under the ongoing CCPME project. This MRF at present is under construction. CCPME project has prepared a technical design for this facility and would be responsible for procuring and supplying equipment for MRF. The city municipality has already extended support by undertaking required civil infrastructure support, which is in process. The city municipality has expressed its intention to expand the boom-barrier system to all other existing drains and increase the degree of capturing, diversion, aggregation, and recycling of various dry waste streams captured.

GIZ under the CCPME project is also supporting the Uttar Pradesh state government to upscale these learnings across the state. There exists a lot of potential to replicate these learnings in other cities.

As a normal course, Kanpur has been considered a city with a stubborn image, when it comes to improving its waste management. Therefore, if Kanpur has been able to learn, implement, realize, and disseminate benefits from this experiment, other cities across the country can also replicate this.

Taking the initiative forward, GIZ has also developed an Urban Drains Cleaning Advisory, which is proposed to be launched under the auspices of “National Rivers Alliance”, which is a joint interphase of the National Institute of Urban Affairs (NIUA) and National Mission on Clean Ganga (NMCG), MoEFCC, Govt. of India in coming days.



SWOT analysis of GIZ India

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page 8)**
 - Behaviour Change Campaign (BCC) for alternatives to plastic (A1)
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Data collection and integration across the chain (A4).
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
- **Addressing the problem of marine plastic waste-**
 - Prevented waste including plastic from entering the marine environment.
 - To date, a total of 5500 kg of plastics have been captured, aggregated, and diverted towards the recycling loop.
- **Scientific, localised, customisable approach-**
 - This approach has helped to create local solutions that are customisable as per the requirements.
 - This ensures the sustainability of the model.
- **Use of low-cost indigenous technology and local workforce-**
 - The floating 'Boom Barriers' costing only 2000 INR per barrier ensure affordability.
 - A socially inclusive approach has resulted in the upliftment of the informal workforce. This boosts the efficiency of the program.
 - Employing a local workforce is contributing towards the acceptability of the initiative.
- **Increased awareness through BCC campaigns-**
 - Addressing behaviour change at two levels- one aimed at reducing the use of plastic and the other at managing plastic waste, makes the model comprehensive.

Weakness

- **Too much dependency on Plastic Credits-**
 - The project's financial sustainability relies majorly on Plastic Fisher's ability to earn from the global Plastic Credits market, which might be uncertain in the long run.
- Only focussed on dry waste management.
- The barrier booms are being installed at the hotspots, but the model fails to address possible spots from where the waste may enter the water bodies.
- The model seems unsuitable for flood-prone areas.
- Lack of adequate monitoring mechanisms for recyclers.



<ul style="list-style-type: none"> • Digital monitoring of plastic waste value chain- <ul style="list-style-type: none"> ○ The entire drain waste collected, aggregated, and diverted into the recycled loop is being digitally monitored by the project through a digital portal – “Sansaadhan”. ○ Transparency and increased efficiency of the entire waste management system is ensured. • Self-sustaining financial model- <ul style="list-style-type: none"> ○ Both OPEX and CAPEX are covered through diverse funding sources ○ Adoption of the PPP model with the local ULBs ensures government support which is crucial for the success of the project. • Partnership/collaborations- <ul style="list-style-type: none"> ○ The project's success can be attributed to the involvement of various stakeholders, which range from local residents living in surrounding areas of these water bodies; local administration including the municipal body's higher officials; its sanitation staff, private SWM service operators, commercial traders' associations, NGOs, schools, and other institutional bodies. • Standardisation of clean-up campaigns- <ul style="list-style-type: none"> ○ The clean-up campaigns organised during the project have been documented into state-specific SOPs for the first time in the country. This will be made available for public use. ○ Ensures effective implementation of such campaigns by government and other organisations across the country. 	
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Building an encompassing model by addressing both dry and wet waste. • Using innovation to reduce the OPEX and CAPEX, enabling the model's scalability to tier 3 and statutory towns. • Collaboration with the government to onboard them with the idea of establishing MRFs near the intervention location would not only reduce the cost, carbon footprint (fuel saving), time and effort. • Integrating this model with the waste management system of the municipality for mutual financial and operational efficiency. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Financial Sustainability- <ul style="list-style-type: none"> ○ Changes in regulations or market dynamics coupled with excessive reliance on plastic credits and EPR could pose a threat. • Environmental Factors- <ul style="list-style-type: none"> ○ The project's success is also dependent on external environmental factors, such as the monsoon season affecting waste flow in drains. This might in turn impact the quality and quantity of plastic waste collected.



Behavioural Change led by Digital Solution for Litter-free and Swachh Kedarnath – Deposit Refund System

Author: Nehaal Rao

1. Location of intervention

Kedarnath, Uttarakhand

2. Project background

Recykal decided to implement the Deposit Refund System (DRS) in the holy township of Kedarnath in Uttarakhand as a large number of pilgrims visiting this sacred destination generated massive quantities of litter. This was degrading the sanctity of the site, causing environmental harm. The issue necessitated a comprehensive intervention to alter pilgrims' behaviour and encourage responsible disposal of plastic waste. Accordingly, a pilot program was initiated by the organisation in April 2022.

3. Problem description

Kedarnath, a revered pilgrim destination in Uttarakhand, attracts thousands of devotees annually as part of the 'Char Dham' yatra. However, the surge in visitors, especially following a two-year hiatus due to COVID-19, led to a concerning issue: piles of litter strewn across this sacred site and its pristine surroundings, including the mountains and water bodies along the trekking path. The sheer volume of pilgrims, peaking at around 50,000 per day, exacerbated the problem of waste management. This not only caused environmental degradation but also detracted from the spiritual experience of the pilgrims.



The litter included various plastic items, such as bottles and packaging, which posed an immediate threat to the sanctity of the pilgrimage and the environmental health of the region.

This environmental concern gained national attention when the Honourable Prime Minister addressed it during his radio address on May 29, 2022. In response to this critical problem, the district administration of Kedarnath actively engaged in cleanliness drives to address waste management challenges. To augment their efforts, they collaborated with local distributors, shopkeepers, and Recykal, a Hyderabad-based clean tech startup, to initiate a pilot program in April 2022. The primary objective was to instigate a digitally enabled behavioural change among pilgrims visiting the shrine.

The pilot project, known as the 'Deposit Refund System' (DRS), aligns with the Plastic Waste Management Rules, 2016. It



focuses on collecting every plastic bottle and item sold within the temple precinct, ensuring they are returned to the collection system to prevent littering. In a DRS system, consumers pay an additional deposit when purchasing products, which is refunded when they return the empty packaging (bottles, sachets, chip packets, etc.) to a designated collection point.

4. Objectives

The DRS program was strategically designed to achieve several key objectives, including:

- **Promoting Responsible Behaviour:** Instill a sense of environmental responsibility among pilgrims, motivating them to participate in recycling efforts actively.
- **Minimizing Litter:** Effectively prevent littering within the sacred precincts of Kedarnath and its pristine surroundings.
- **Collection and Recycling:** Establish a seamless system for the collection and recycling of plastic packaging materials, ensuring they do not end up as environmental pollutants.
- **Creating Awareness:** Raise awareness among visitors about the significance of their actions in preserving the sanctity of the pilgrimage site and the natural beauty of the region.



5. Implementation details

The Implementation Process of the DRS Program at Kedarnath follows a comprehensive life cycle:

1. **QR Code Distribution:** The initiative commences with the mandatory distribution and sale of QR codes to all local shops. Recykal plays a pivotal role in generating and managing these QR stickers.
2. **QR Code Allocation:** Recykal employees stationed at the checkpoints facilitate the allocation of QR stickers to the shop owners. In future, they plan to automate QR code distribution, return and refund processes. Eventually, the unique QR codes will be integrated directly into the packaging as part of the label. This will be achieved through partnerships with brands and producers.
3. **Shop Integration:** Shop owners seamlessly integrate these QR stickers onto their product containers, creating a digital tracking system that maps all products sold within the area.
4. **Green Deposits:** Pilgrims purchasing products encounter a unique feature – the 'Green Deposit.' This additional deposit motivates consumers to participate in the program.
5. **Return and Refund:** Upon product consumption, consumers return the empty containers to designated Recykal points located at multiple locations. The containers are then scanned, and the deposited amount is instantly refunded to the returning individuals with valid QR codes.
6. **Waste Collection:** Collected waste is gathered at various collection points across the area and subsequently transported to a central hub for processing. All the plastic waste collected is sent to partner recyclers for processing.
7. **Material Processing:** The hub is responsible for processing the collected materials and ensuring their safe transfer to authorized recycling centres.



- Information Dissemination:** Essential data is shared with the district administration, facilitating efficient monitoring and management of the program.

This structured life cycle forms the backbone of the Deposit Refund System at Kedarnath, ensuring its seamless operation and success.

6. Financial/revenue model of the intervention

The financial model of the Deposit Refund System (DRS) program is designed for sustainability.

The DRS program operates on a dual financial structure that includes revenue from the sale of waste to partner recyclers and funds generated from unredeemed consumer deposits.

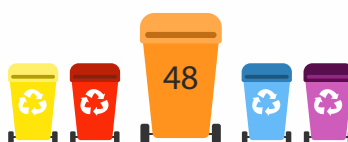
In the DRS model, consumers pay an additional deposit when purchasing products, which is fully refundable upon returning the empty packaging to designated collection points. This incentivizes responsible behaviour and ensures that the packaging items are not littered in the holy site.

Funds from Unredeemed Deposits: When consumers do not redeem their deposits by returning packaging items, the unclaimed funds are held in an escrow account. After a specific period, and in consultation with the respective state government, any unredeemed amount will be reinvested in their operational activities. These funds serve a dual purpose. Firstly, they help cover the operational expenses of the program, which include infrastructure setup, app development, awareness campaigns, and managing the collection and recycling process. Secondly, these funds are directed towards cleaning littered areas, further contributing to the cleanliness and sanctity of the pilgrimage site.

Sale of collected plastic waste to partner recyclers: The collected plastic is sold to the partner recyclers. This is the primary source of revenue for the DRS model.

The combination of these two revenue streams not only sustains the DRS program but also creates a positive financial cycle that contributes to the overall cleanliness and environmental well-being of Kedarnath.

Additionally, as part of their future plans, Recykal intends to partner with brands that will contribute through a reverse collection/participation fee. These fees will be utilized to cover the operational expenses.



7. Partnerships

Key stakeholders in this initiative include local distributors, shopkeepers, the district administration, and Recykal, the Hyderabad-based clean tech startup. These stakeholders played pivotal roles in project execution and expansion. Partners and shopkeepers are initially motivated to participate through government mandates, combined with the broader goal of contributing to the greater good. In the long run, shopkeepers will be incentivized with a handling fee for each unit they collect back, while partner brands will receive assistance with their Extended Producer Responsibility (EPR) obligations.

8. Challenges and Solutions

Implementing the DRS program came with its set of challenges, each requiring unique solutions:

- **Behavioural Change:** Convincing pilgrims, accustomed to conventional waste disposal practices, to adopt a new recycling-centric approach was challenging. To address this challenge, extensive awareness campaigns were conducted, educating pilgrims about the environmental significance of their actions. The introduction of 'green deposits' encouraged pilgrims to actively participate in recycling.
- **Infrastructure Setup:** Establishing collection points and ensuring proper management of returned packaging items was another challenge. Distribution of QR codes to shops and meticulous tracking of products ensured seamless management of returned packaging items. Multiple collection points were established for ease of access.
- **Network Availability:** Ensuring consistent network connectivity in a region known for challenging terrain was another major hurdle. Despite the region's network challenges, the DRS app maintained an impressive 99.9% uptime, guaranteeing reliable service to pilgrims.

These solutions, driven by collaborative efforts, played a pivotal role in overcoming the challenges encountered during program implementation.

9. Future prospects of the program

The DRS program, with its innovative approach to waste management and behaviour change, has paved the way for promising prospects:

Scale and Impact: The program's collective aim is to channel more than 100 tons of plastic waste in the region by the end of the year, significantly contributing to the cleanliness and sustainability of Kedarnath.

Furthermore, building upon the resounding success of the pilot phase and bolstered by unwavering support from the District Administration and Swachh Bharat Mission, the project embarked on **Phase 2**. This expansion of the Deposit Refund System (DRS) model entailed the augmentation of collection and channelization infrastructure along the route from Guptkashi to Kedarnath, encompassing three additional zones. Notably, the interventions were meticulously divided into four distinct zones as mentioned below to ensure comprehensive coverage –

Zone 1- Dham area: Kedarnath to Kedarnath Base Camp

Zone 2- Outside Dham area to Gaurikund covering Linchouli, Bheemball, Jungle Chatti (15 km)

Zone 3- Gaurikund to Sonprayag

Zone 4- Sonprayag to Guptkashi





Phase 3: Extending to Yamunotri & Gangotri - The project's evolution extended beyond the confines of Kedarnath, radiating its positive impact to other revered Dhams - Gangotri and Yamunotri, alongside Kedarnath. This ambitious undertaking set its sights on the collection of 25 to 30 metric tons of plastic waste generated during the Chardham Yatra season. These collected materials were subsequently dispatched to authorized recycling centres, aligning with the project's commitment to environmental sustainability.

In a concerted effort to safeguard the sanctity of sacred rivers - Mandakini, Yamuna, Bhagirathi, and Alaknanda - as well as the pristine forests of Uttarakhand, the initiative also sought to gather 15-20 lakh plastic PET bottles and 20-30 lakh chip packets. This multi-pronged expansion reflects the program's unwavering dedication to mitigating plastic waste across these sites, ensuring their continued purity and sanctity.

Recognition: Notably, the program's success has garnered recognition from the Government of India, highlighting its significance as India's first Digital Innovation in Deposit Refund System in 2022.

Sustainability: With its unique financial model, which includes consumer deposits and unredeemed funds, the program demonstrates a sustainable approach to waste management that can be replicated in other pilgrimage sites and across the country.

10. Conclusion

The DRS pilot in Kedarnath has achieved remarkable success on multiple fronts:

- **Broad Acceptance:** The program garnered widespread acceptance among various stakeholders, including temple priests, pilgrims, shopkeepers, municipal staff, and sanitation workers.
- **QR Code Distribution:** Thousands of QR codes were effectively distributed to all shops in the temple area, creating a robust infrastructure for the program.
- **High Collection Success:** The DRS program achieved a notable 52% success rate in collecting bottles and providing successful refunds, indicating active participation from pilgrims.
- **Tech-Driven Engagement:** The innovative tech-based approach intrigued pilgrims and positively enhanced the program's brand image.
- **Reliable App Uptime:** The DRS app maintained an exceptional uptime rate of 99.9%, ensuring smooth operations.
- **Environmental Impact:** Funds generated from unredeemed deposits were employed to clean littered areas, making a tangible impact on the environment.
- **Effective Material Management:** The program efficiently channelled collected materials to recyclers, contributing to the local economy.

Additionally, it serves as a trailblazing initiative, promoting behavioural change and sustainability at a pilgrimage site of immense significance. By incorporating innovative methods and fostering strategic collaborations, this program has not only substantially reduced litter but has also stimulated local economies and advanced environmental sustainability. Its resounding success has paved the way for expansion, showcasing the potential for similar initiatives to create positive transformations at sacred sites throughout India.



SWOT analysis of Recykal India

<u>Strength</u>	<u>Weakness</u>
<ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Collection from source to processing facility (RR1) ○ Segregation, Sorting at processing facility (RR2) ○ Collection/Transportation (RR3) • Use of digital technology to ensure effective collection of plastic waste- <ul style="list-style-type: none"> ○ Printing and distribution of QR codes (currently manual). ○ In future they plan to automate QR code distribution, return and refund processes by partnering with brands and producers. • Innovative approach for behaviour change towards plastic waste- <ul style="list-style-type: none"> ○ The 'green deposit' concept is innovative and motivates consumers to participate in the program. • Community Engagement- <ul style="list-style-type: none"> ○ The program has successfully engaged various stakeholders, including temple priests, pilgrims, shopkeepers, and sanitation workers, creating a sense of responsibility and ownership. • Secured government buy-in at the local level which motivated shopkeepers and the local community to participate in the program. • Increased awareness among tourists to protect an ecologically sensitive zone- <ul style="list-style-type: none"> ○ This helps the model to be financially viable and the brand gets visibility as being eco-friendly. • Self-sustaining financial model- <ul style="list-style-type: none"> ○ Dual sources of revenue: Channelisation of waste to recyclers, and funds from unclaimed consumer deposits. 	<ul style="list-style-type: none"> • Lack of collaboration in conducting behaviour change activities- <ul style="list-style-type: none"> ○ This could hinder the implementation of the model in newer geographies where attitudes and behaviours may be different. • Infrastructure Setup- <ul style="list-style-type: none"> ○ Establishing and maintaining collection points, central hubs and QR code distribution can be challenging, especially in remote and challenging terrains. ○ Moreover, effective transportation to partner recyclers can also be difficult considering the terrain and weather conditions. • Addressing the plastic waste management value chain partially- <ul style="list-style-type: none"> ○ Although the model addresses many components of the value chain, there is no tracking mechanism to ensure that the waste is being efficiently managed by their partner recyclers. • Revenue streams- <ul style="list-style-type: none"> ○ Though the DRS has two major revenue streams, for long-term sustainability, they should look for more such options.



Opportunities

- **Opportunity for scale-**
 - The successful implementation of the DRS in Kedarnath opens up opportunities for expansion to other tourist spots and pilgrimage sites.
- **Partnerships-**
 - Partnerships with brands and producers may open doors to ensure operational efficiency with reduced cost and help scale up the project.
 - Partnering with on-ground local organisations may help in the effective implementation of the program.
- Opportunity to close the loop by processing the collected waste themselves.

Threats

- **Lack of diverse revenue streams-**
 - Reliance on only two revenue streams, of which the unclaimed consumer deposit stream is likely to be reduced over time with increased behaviour change, may destabilise the financial stability. Besides, changes in regulations or market dynamics could pose financial threats.
- **Resistance from consumers-**
 - Consumers who visit the location of intervention, being majorly outsiders, may resist changes in their disposal habits. Moreover, due to the short exposure time, the behaviour change campaigns may be less effective.
- **Environmental Factors-**
 - The project's success is also dependent on external environmental factors, given that Kedarnath or similar hilly terrains are ecologically sensitive zones.



 HCLFoundation

Transforming Noida into a Waste-Free City: HCL Foundation's Clean Noida Initiative

Author: Ms. Riti Mehrotra

1. Location of intervention

Noida, Uttar Pradesh

2. Project background

Recognizing the importance of managing Noida's solid waste for the long term, HCL Foundation, with its corporate headquarters in Noida, Uttar Pradesh, works in partnership with Noida Authority to improve the city's waste management. The Foundation aspires to make the city one of the cleanest in the country through its initiative, the "Clean Noida program".

Focused on effective solid waste management across the city, the program aims to turn the area into a litter-free zone, covering Residential Welfare Associations and urban villages. The project emphasizes stakeholder training, behaviour change campaigns, awareness programs, and technological solutions.

3. Problem description

Due to rapid urbanization and population growth, there has been a rise in the consumption of resources. Plastic usage has been growing tremendously leading to an increase in plastic waste. According to the United Nations Environment Programme (UNEP) report of 2022, the world generates around 300 million tonnes of plastic waste annually and only 9 percent of this is recycled; the vast majority of the rest accumulates in landfills or the natural environment.¹ This number is expected to double by 2034 if appropriate actions to reduce plastic consumption and improve recycling rates are not undertaken.

While designing the Clean Noida program, it was found that major single-use plastic items like poly bags, straws, bottles, etc. were being generated in the market areas. Therefore, HCL Foundation focused on targeting the market areas of Noida.

4. Objectives

The objective of the program was to achieve the following:

¹<https://www.unep.org/news-and-stories/story/world-leaders-set-sights-plastic-pollution#:~:text=Approximately%20300%20million%20tonnes%20of,landfills%20or%20the%20natural%20environment.>



- **Generate Awareness among citizens:** To trigger the community by using a non-conventional method to engage the youth population and make them realize the ill effects of single-use plastic.
- **Test and refine campaigns:** To test the social experiment in 5 markets of Noida, refine the campaign, and take it ahead in the entire Noida city.
- **Provide Social proof:** To demonstrate that the program is effective and is creating a behaviour change.

5. Program implementation details

HCL Foundation's Clean Noida program focuses on sensitizing the community at the grassroots level by conducting behaviour change campaigns with the consumers through cleaning and collection drives, street plays, and wall painting. This is achieved with the support of civil societies and local Government institutions.

Their intervention in plastic waste awareness complemented the Central Government's ban on all kinds of single-use plastic products. Taking inspiration from Netflix's Spanish drama series La Casa de Papel, popularly known as Money Heist, a social experiment called "Plastic Heist" was designed to highlight the issue of plastic waste mismanagement in a way that captured people's attention and encouraged them to act, by creating a situation that triggered the community to take the initiative themselves.

Under the project, multiple social experiments were piloted in 5 Markets of Noida, namely – Sector 18, Brahmputra Market, Ganga Shopping Complex, Godavari, and Jaipuria Plaza.

Implementation Process:



Impact:

The Plastic Heist Campaign was successful in reaching out to over **5,000 citizens** of Noida through multiple social experiments. With the active participation and support of Noida citizens, the organisation was able to collect more than **1700 kgs** of plastic, out of which more than **750 kgs** were sent to the CPCB-authorized plastic waste recycler for ethical recycling. The remaining **1000 kgs (approx.)** of plastic waste (cutlery waste) was converted into a 20-foot-tall sculpture of *Marching Bapu*.

Moreover, several posters were displayed in the market areas, encouraging residents to bring their bags instead of relying on plastic bags from shopkeepers. A total of **197 businesses** confirmed abstaining from the use of single-use plastic products. Among the surveyed food vendors, **41 businesses** reported having replaced plastic straws with paper ones, and **117 businesses** reported having switched to non-plastic cutlery.

A considerable **81.6%** (271 out of 332) mentioned using alternatives to single-use plastic, such as paper, leaf, or biodegradable plates, wooden cutlery, and cloth bags. Furthermore, it was observed that



residents were exchanging plastic bottles in bulk with eco-friendly goods and ensuring the safe disposal of plastic bottles.

Glimpse of recognition, that the campaign received



6. Innovative methods/techniques used

Social Awareness Experiments were used to make the residents aware of plastic waste management. Various modes of interaction like social media campaigns, community participation, citizen engagement, etc were utilized for this purpose.

The plastic waste awareness campaign was focused on the following:

- Highlighting the impact of plastic waste on the Environment, human health, and the entire ecosystem
- Showcasing the alternatives available through demonstration of reusable and eco-friendly items
- Demonstrating how ethical channelization and disposal can reduce the burden on landfill sites.
- Demonstrating the effective roles of everyone in society by focusing on training and engaging both shopkeeper and customer

Following are the list of Social Experiments conducted to sensitize the citizens:

Plastic Heist

Taking inspiration from Netflix's Spanish drama series La Casa de Papel, popularly known as Money Heist, a group of Volunteers from Noida- donned in red-coloured jumpsuits with Salvador Dali masks entered the market area and started collecting all the plastic-related items such as straws, polythene, etc. into a bag. These items were later kept inside the 'plastic heist' Van.

This was followed by a street play that showcased various aspects of life affected by plastic, including the presence of microplastics in food items;



consumption of polythene by street animals resulting in their death; Litter created post-celebration of events like birthday parties, weddings, etc. The performance was followed by an educational message to encourage residents to use cloth bags and water bottles, besides avoiding taking unnecessary cutlery from vendors.

Only one earth, only one shopper

World Environment Day 2022 was celebrated by combining fashion and art to convey the critical message of having #OnlyOneEarth and everyone's shared responsibility to minimize their use of single-use plastics. Sensitively addressing social and environmental concerns, the aim was to raise awareness about the growing issue of single-use plastic consumption through creative experiments.

Using the World Environment Day theme 2022, the HCL Foundation initiated a social experiment to draw citizens' attention to the escalating use of plastic bags, straws, and other single-use plastic items. Two artists fashioned clothing using plastic bags and straws collected from Noida markets over the past few months as part of the Plastic Heist campaign.

One dress was crafted to illustrate the global rise in single-use plastic waste. Symbolically, it represented how the number of polybags an average shopper uses in a year could bury a person under a heap of plastic. This 'Polyman' interacted with the public, spreading awareness about reducing plastic consumption. The other creation, a plastic waste statue, portrayed the open disposal of plastic bags, forming a mountain of litter that blocks drains and creates environmental havoc. Atop this statue was an Earth model, emphasizing how the planet is affected by the burden of plastic waste.

Live quiz

A quiz on Waste Management was conducted in Noida's market areas. Residents participated in a multiple-choice format quiz to test their awareness about solid waste management. Those who answered correctly were rewarded with eco-friendly sustainable goodies, encouraging a sense of responsibility towards the environment. The quiz received a positive response from a diverse audience, including sanitation workers, shopkeepers, common citizens, and the youth.

Plastic Barter

A barter system is known to be the oldest method of exchange. This has been practised for centuries and long before money was introduced. People used to trade goods and services directly with other goods and services. Using the same idea, as part of the Plastic Heist initiative, a barter system was organized. A mobile exchange van travelled around Noida City, aiming to raise awareness about plastic waste. Citizens could exchange plastic items like bottles, toothbrushes, and polythene for eco-friendly products such as cloth bags, bamboo straws, and toothbrushes.

Mahatma Gandhi's Sculpture of Plastic Waste

A 20-foot-tall, 6-foot-wide, and 6-foot-long sculpture of Mahatma Gandhi was created using 1000 kg of plastic waste collected in Noida. The sculpture, weighing 1150 kg, aimed to showcase the principle of waste circularity, emphasizing the 3Rs (Reduce, Recycle, and Reuse). It was crafted from plastic



gathered during the Plastic Heist campaign and through fines imposed by the Noida Authority to curb plastic waste in the city. The collected plastic was melted, cast, and shaped to form this artistic piece.

Reuse of Paper & Textile Waste to Reduce Plastic Waste/Carry Bags

To ensure the availability of alternatives to poly-bags, HCL Foundation in partnership with Noida Authority initiated Reduce, Reuse, and Recycle (RRR) centres in Noida city, where a group, Swachhata Nigrani Samiti, was identified, engaged, and trained to upcycle collected textile and paper waste to Cloth and Paper bags. These products were then sold at an efficient rate to local vendors as eco-friendly alternatives to polybags. This initiative also created long-term benefits by offering livelihood opportunities to local women's groups.



7. Financial/revenue model

The project was implemented by HCL Foundation which is the CSR wing of HCL Technologies. HCL Foundation works on two modes of implementation – self-implementation and partnering with NGOs.

The project on Plastic Waste Management (Noida Plastic Heist) was implemented through the support of a service-based agency, for supporting on-ground implementation and resource mobilization. The project costs involved the cost of human resources including the cost of the social experiment team, and paraphernalia costs that included canopies made from recycled bottles, La Casa De Papel Costumes and Paper Mache Masks, Branding & IEC Material, Cloth bags and Sustainability Kits, and Badges for citizens. A total of INR 6.82 lakhs were spent on this project.

In order to further sustain the activity, the organization has been undertaking training and workshops for the Market Association and citizens. Through these efforts, they were able to declare Markets Single-Use Plastic Free.

The project was self-funded by the HCL Foundation. Noida Authority (Public Health Division) participated in it and verified and certified the shops as plastic-free.

8. Partnerships

For the successful implementation, replication, and sustenance of the program –HCL Foundation partnered with 90+ Residential welfare associations (RWAs) in Noida. They conducted training, workshops, and awareness programs focusing on the 3R (Reduce, Reuse, Recycle) approach for residents, domestic workers, and sanitation staff.

Engaging citizens significantly contributed to the effective expansion and replicability of the program. The campaign achieved success by involving more than 250 volunteers from the community who actively advanced the initiative, joining forces to transform their city into a plastic-free environment.



9. Challenges and solutions

An effective behaviour change campaign can be successfully implemented only if it is complemented with Government support. Few of the shopkeepers were not supporting the campaign and continued the use of plastic. However, in phase 2 of the plastic heist campaign, the organization sought assistance from the Noida Authority to persuade shopkeepers to discontinue the use of single-use plastics.



10. Future prospects of the program

HCL Foundation has planned to extend the program to the entire Gautam Buddha Nagar District. Post the success of the Plastic Heist campaign, many cities adopted similar ideas and replicated the projects in their cities.

In addition, the campaign Plastic Heist was telecast on the Deutsche Welle channel, and they promoted this unique idea to spread plastic waste awareness among the citizens.

11. Conclusion

The "Clean Noida" program by HCL Foundation in collaboration with Noida Authority aimed at transforming the city into one of the cleanest in India by managing solid waste effectively. Through innovative initiatives like Plastic Heist, barter systems, other social experiments, and community involvement, the campaign successfully gathered more than 1700 kgs of plastic waste. The utilization of this waste to create a 20-foot-tall Mahatma Gandhi sculpture exemplified the 3Rs concept—Reduce, Recycle, and Reuse. The engagement of residents and partnerships with local communities contributed to the program's scalability and success. The program showcases an excellent model for sustainable waste management and community awareness, fostering a cleaner and greener environment for Noida and beyond.

SWOT analysis of HCL's case study-

Strength	Weakness
<ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Behaviour Change Campaign (BCC) for alternatives to plastic (A1) ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Capacity building and training for PWM (A3) ○ Upcycling (O2) 	<ul style="list-style-type: none"> • Dependency- <ul style="list-style-type: none"> ○ The success of behaviour change campaigns is heavily dependent on government support, as demonstrated by the need for Noida Authority's involvement in convincing shopkeepers. ○ The model is being funded by the HCL foundation with no external source of revenue. This could be a challenge for large-scale implementation of the program.



<ul style="list-style-type: none"> • Innovative Approach- <ul style="list-style-type: none"> ○ Used innovative BCC and IEC activities (e.g., The Plastic Heist campaign) to conduct effective awareness and behaviour change campaigns. • Collaboration and partnerships- <ul style="list-style-type: none"> ○ Collaboration with NOIDA Authority provided the much-needed impetus to the organisation's efforts. ○ Partnerships with volunteers, Residential Welfare Associations (RWAs), and local organizations, added to the efficiency of the program. • Women empowerment- <ul style="list-style-type: none"> ○ Building capacities of local women to provide an alternative to plastic bags, thus providing them a revenue source. • Validation of the model- <ul style="list-style-type: none"> ○ Recognition from international media house, Deutsche Welle has validated the model. 	<ul style="list-style-type: none"> • Potential relapse- <ul style="list-style-type: none"> ○ These are isolated campaigns with no long-term plans to take care of potential relapses in behaviour.
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Opportunity for expansion- <ul style="list-style-type: none"> ○ The model can be easily replicated all over India, provided some other funding sources are explored. ○ Partnerships with other corporates could help increase the rate of expansion. • Social and environmental impact- <ul style="list-style-type: none"> ○ By creating more RRR centres, the social and environmental impact of the model can be increased. • Expanding its reach - <ul style="list-style-type: none"> ○ Leveraging social media and other digital platforms can further expand their reach. ○ Partnerships with schools, colleges, etc. could help expedite in dissemination of awareness messages. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Resistance to Change- <ul style="list-style-type: none"> ○ Some individuals and businesses may resist the transition to eco-friendly alternatives, posing a challenge to the program's objectives. • Lack of funding partners- <ul style="list-style-type: none"> ○ Without additional funding partners, the long-term sustainability of the program may be threatened. • Resistance from plastic manufacturers- <ul style="list-style-type: none"> ○ Since the program focuses on the reduction of plastic usage, it may face resistance from those manufacturing plastic bags, etc.





ITC's SWaCH Plus Program for Managing Multi-Layered Plastics in Pune

Author: ITC Limited

1. Location of intervention:

Pune, Maharashtra.

2. Project background

This initiative was set up by ITC Limited and SWaCH Plus to address the growing problem of effectively handling multi-layered plastics (MLP) and demonstrate that such a system can be done in partnership with the existing informal waste recycling ecosystem i.e. waste pickers. In this system, multi-layered plastics are directly purchased from waste pickers and scrap dealers, finely sorted and pre-processed, and then sent to mechanical recyclers. Since its inception in 2019, over **2.5 million kgs (2,500 metric tonnes) of multi-layered plastics** have been collected and channelled toward recycling. Currently, the program collects over **90,000 kgs (90 metric tonnes) of MLP per month from over 650 waste pickers covering 1.5 lakh households.**

3. Problem description

Low-value plastic packaging, which is majorly composed of multi-layered plastics, is the mainstay of the industry, given its superior ability to preserve the integrity of products and increase shelf life. However, multi-layered plastic packaging on account of its lightweight and often complex structures is challenging to collect and recycle. The majority of the material when collected is usually sent for end-of-life treatment at cement plants where it is incinerated for energy recovery. Further, the collection and processing of materials like MLP is done outside the existing collection systems. As plastic-producing companies begin to take responsibility for the entire life cycle of plastic packaging, it is critical to ensure that these systems are set up in a way that complements and strengthens the existing waste economy.

4. Objectives

The program has two major objectives as mentioned below:

- To ensure the collection and recycling of multi-layered plastics – which are typically non-recycled.
- To collect these materials through the existing informal recycling economy, thereby making the process more efficient and benefiting waste pickers directly.



The support price mechanism adopted by this initiative creates a market-based incentive to maximize the collection of multi-layered plastics by waste pickers. The plastics thus collected are treated through mechanical recycling processes rather than end-of-life and incineration processes, thereby also ensuring better environmental outcomes.

5. Implementation details

Through this initiative, over 3,000 kgs (3 metric tonnes) a day of multi-layered plastics are purchased directly from 650 waste pickers of SWaCH Cooperative every day. The system is designed to complement the door-step waste collection system that has already been in operation by the SWaCH Cooperative in partnership with the Pune Municipal Corporation (PMC) since 2008. In the SWaCH-PMC system, **3,800 waste pickers** provide daily doorstep collection services to over 9,00,000 households across the city. After collecting segregated waste, individual waste pickers recover the recyclable materials from the dry waste for sale to (mostly informal) scrap dealers. The remaining dry waste and wet waste are transferred to PMC secondary collection vehicles at 1,000 feeder points across the city.



Low Value Plastic Purchased from the waste pickers

The MLP collection and recycling system is designed and operated as follows –

Every day, a fleet of vehicles operating as '**mobile scrap shops**', serve as transaction points where waste pickers sell the MLP waste recovered from the waste collected by them through the daily door-to-door collection system. These transaction points are co-located with the designated municipal '**feeder points**', where waste pickers transfer wet waste into the municipal secondary collection system. This allows for efficient collection and saves the waste pickers any additional effort. At these points, waste pickers are paid on the spot. For the first year of the project, the purchase rate was Rs. 2.5/kilogram. At the end of 2019, the rate was increased to Rs. 4/kilogram, which doubled the quantum of waste collected through the system.



Payment to the waste picker

Once full, the vehicles unload at one of the two decentralized storage hubs (spaces provided by the PMC) across the city. These hubs allow the optimization of routes and the number of trips by the primary collection vehicles. The material is then transported to a SWaCH-run warehouse in Uruli Devachi. At the facility, 21 waste pickers are employed full-time as sorting and baling operators. To ensure resource-effective handling, the **plastic waste is sorted into over 8 categories**, baled, and then sent to mechanical recyclers.



Value Addition i.e., Baling of the low value plastic



Material is also purchased directly from scrap dealers. In such cases, SWaCH audits the scrap shops to ensure that waste pickers are being remunerated at Rs. 4/kilogram.

Owing to this initiative, each waste picker earns an additional income per month from the sale of multi-layered plastics. This represents an incremental income for waste pickers from waste that they were collecting during their daily door-to-door collection drives but were disposing of along with wet waste while transferring waste to the municipal vehicle at designated feeder points. The vehicle-based collection system eliminates the need for storage of this voluminous material, thus allowing for **maximum recovery**. The system can collect over 90 metric tonnes of MLP each month for recycling.

6. Innovative methods/techniques

The minimum support price allows a direct integration of the informal sector, by creating an incentive for improving the collection, recovery, and recycling of MLP waste. This is a method that can be used for implementing Extended Producer Responsibility (EPR) by plastic producers. In such systems, the existing materials economy can be strengthened by 'adding on' a material that was otherwise unfeasible to handle in the open market. This creates an incentive for maximum recovery, leverages existing infrastructure, and augments the incomes of a marginalized occupational group (waste pickers, scrap dealers).

Other interventions aimed at processing MLP, typically pick up MLP from municipal material recovery facilities (MRFs), from where the plastic waste is sent to cement plants for incineration (co-processing). In such systems, the plastic waste is usually mixed with other wastes, including organic waste, leading to contamination by the time it is picked up at the MRF. In Pune, waste pickers recover and sell MLP right after it is collected from the household. The SWaCH-PMC model promotes and ensures a high level of **at-source segregation because of which the plastic waste collected is of good quality**. It is due to this quality control that the material can be diverted towards mechanical recycling. Contaminated plastics cannot be effectively and economically handled through existing recycling technologies and therefore end up at landfills or in incineration.



Baled low-value material channelized to the Recycler

7. Financial/revenue model of the intervention

ITC finances this system by paying the viability gap funding required to run the system at a breakeven cost. The viability gap or 'loss' gap is the difference between the total costs incurred by SWaCH to operate the system, netted off against any cost recovered from the recycling of MLP. The costs incurred include the direct purchase of MLP from waste pickers, transport, and logistics, overheads of the sorting and baling facility, salaries of staff including waste pickers employed at the facility, and system management costs.

8. Partnerships

This is a **joint initiative of ITC Limited and SWaCH Plus**. ITC plays the role of financing the system and providing operational and technical inputs from time to time. SWaCH Plus is responsible for the day-to-day operations of the entire system from purchase to recycling.



To implement the initiative in Pune, SWaCH Plus has worked closely with the **SWaCH Pune Cooperative**. The system has been designed with inputs from the SWaCH Pune Cooperative and is operated with their ongoing support on the ground. The city-wide door-step waste collection operations of SWaCH Pune and their **partnership with the PMC** make SWaCH a critical partner in the project. Without the waste collection system, integration of waste pickers into such a model would not have been possible at this scale. The link with effective source segregation also ensures that the plastics can be handled through recycling rather than incineration. The Pune Municipal Corporation, owing to its long-standing partnership with SWaCH Pune, has supported the initiative by providing two spaces for the storage of MLP. Both partners are critical to ensuring the smooth operations of the initiative.

9. Challenges and Solutions

Multi-layered plastics are technologically and operationally complex to recycle. This has made it extremely challenging to find a Pollution Control Board registered recycler (as opposed to an end-of-life processor) that can consistently accept large quantities of MLP at a reasonable purchase rate. In general, recyclers of flexible plastics tend to operate in the informal sector and at very low purchase costs (due to the extremely low margins on recycling). The costs of formalizing are high and keep back most flexible plastics recyclers in the informal sector. Formal recyclers have struggled with technology and operations in handling MLP on an ongoing basis, leading to uncertainty in material flow and revenue. Investment in improving pre-processing and recycling technologies, and measures to support the formalization of flexible plastics recyclers would be critical to ensuring at-scale handling of MLP.

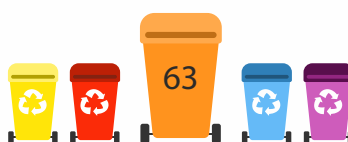
Cost control is another major challenge of the initiative. Given the logistics-heavy nature of the collection system, the effective pro-rata costs are challenging to control and balance against the scale of the collection. The most effective method for increasing the scale of collection has been through an increase in the purchase cost of MLP. However, the limitations of the financing model limit the flexibility in purchase rates.

10. Future prospects of the program

In Pune, it is envisioned that the system will grow in scale and impact, leading to increased recycling of MLP and improved incomes for more waste pickers. The system can be replicated in other cities in the absence of a SWaCH-like model and for other materials through replication of the core design elements. A minimum support price can be created to increase the existing market value of a poorly recycled material or to create value for a non-recycled material (like MLP). Where door-step collection systems are not well-developed, or where waste pickers are not organized, scrap shops can serve as the entry point for working directly with the informal sector.

11. Conclusion

The ITC's SWaCH Plus Program has made significant strides in managing multi-layered plastics (MLP) in Pune, Maharashtra, setting a pioneering example for effective waste management in India. The project's unique approach of directly purchasing MLP from waste pickers and scrap dealers has not only diverted a substantial amount of MLP from landfills but has also provided waste pickers with a new source of income.





The initiative addresses the pressing issue of managing MLP, a challenging material to recycle, by ensuring at-source segregation and maintaining the quality of collected plastics. Through innovative methods such as a minimum support price, this program has successfully integrated the informal waste recycling sector into the broader waste management ecosystem, creating a win-win situation for both waste pickers and the environment.

This collaborative effort between ITC Limited, SWaCH Plus, and SWaCH Pune Cooperative has demonstrated that the circular economy principles can be applied effectively to challenging materials like MLP. The system's success in Pune paves the way for its replication in other cities and for other materials, contributing to a cleaner, more sustainable future for India's waste management practices. Overcoming challenges such as limited recycling infrastructure and cost control, the program offers a scalable model that can revolutionize how India deals with complex waste materials while improving the livelihoods of those at the grassroots of the waste management sector. As this initiative expands and adapts to new contexts, it holds the promise of significantly reducing the environmental impact of multi-layered plastics while empowering waste pickers across the nation.



SWOT analysis of ITC and SWach Plus

<p><u>Strength</u></p> <ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page 8) <ul style="list-style-type: none"> ○ Collection from source to processing facility (RR1) ○ Segregation, Sorting at processing facility (RR2) ○ Collection/Transportation (RR3) • Leveraging the existing infrastructure - <ul style="list-style-type: none"> ○ In this system, the MLPs are collected and processed by leveraging the existing infrastructure of the SWaCH cooperative- a network of existing informal workers, a centralised warehouse at Uruli-Devachi ○ The system is designed to complement an already existing waste management system. • Cost optimisation and increased efficiency of waste collection and processing system- <ul style="list-style-type: none"> ○ Optimisation of routes and number of trips due to the introduction of decentralised storage hubs in partnership with PMC. ○ By ensuring the collection of MLPs right after it is collected by the waste workers, the model prevents their contamination, thus ensuring efficient PWM. ○ The model diverts MLPs from being incinerated towards effective recycling. • Augmenting the social impact- <ul style="list-style-type: none"> ○ through increased earnings of informal workers. ○ Introduction of minimum support price which in turn allows direct integration of the informal sector. • Partnership/collaborations- <ul style="list-style-type: none"> ○ The PPP model allows for streamlining the operations. 	<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Financial sustainability- <ul style="list-style-type: none"> ○ Viability gap funding provided by ITC coupled with heavy dependency on the sale of MLPs to recyclers may affect the sustainability of the model in the long run. • Lack of collaborations or intervention to integrate assured recycling of MLPs in the long run. • Cost Control- <ul style="list-style-type: none"> ○ The logistics-heavy nature of the collection system makes it cost-intensive. • Limited scope for scalability and replicability - <ul style="list-style-type: none"> ○ The program's success relies on the presence of SWaCH-like models, limiting its scope. ○ Limited flexibility in purchase rates has the potential to affect the scalability of the program.
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Due to its PPP nature, the model could be lucrative to corporates including plastic producers- <ul style="list-style-type: none"> ○ The model leverages existing infrastructure and emphasises cost optimisation in PPP mode. ○ The model can be easily adopted for EPR implementation. • Investment in Technology- <ul style="list-style-type: none"> ○ Investments in creating recycling facilities can address the challenges associated with the processing of MLPs. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Recycling of MLPs is not assured in the long run, which poses a threat to the program's sustainability. • Dependency on waste workers' motivation to sell the MLPs- <ul style="list-style-type: none"> ○ Minimum support price (MSP) catalyses the sale of MLP. ○ Fluctuation in MSP may disrupt the plastic waste supply chain.





Rescuing Deepor Beel: Tackling Guwahati's Waste Crisis Through 'Power Loop'

Author: Shirshendu Sekhar Das and Siddharth Rasaily

1. Location of Intervention

Guwahati, Assam

2. Project Background

The Midway Journey initiated a riverbank cleanup mission in January 2019, organizing regular weekend cleanup events. However, when the first COVID lockdown in 2020 threatened to stop their work, they had a chance encounter with a plastic recycler where they discovered the recyclable potential of plastics commonly thrown away with household waste. Further investigation showed that over 70% of the waste accumulating at Guwahati's landfill originated from households. It was also observed that much of this recyclable plastic was contaminated with food waste, making it tough for waste pickers to salvage it without proper gear in unclean conditions.

Recognizing the need for a shift, they promptly designed a waste segregation campaign. Their idea was to have volunteers collect plastic waste and facilitate its recycling within the city. What made this project unique was that it was launched online, which allowed ongoing community involvement during COVID lockdowns. They named this transformative project "Power of 300," symbolizing the collective strength of 300 citizens capable of reshaping the fate of their city.

3. Problem description

Guwahati generates around 625 tonnes of solid waste every day. Since 2006, about 95% of this waste has been dumped at the Boragaon site, located near the Deepor Beel Wildlife Sanctuary. Deepor Beel is a wetland recognized by the International Ramsar Convention and an important bird habitat.¹ This relentless dumping has wreaked havoc on the wetland's delicate ecosystem and created a highly polluted environment for nearby villagers.

In their cleanup efforts of 2019, Midway Journey emphasized the importance of waste segregation at the source, recognizing it as the fundamental solution to waste-related problems. However, their efforts faced a significant hurdle as despite waste being segregated at source, in the absence of an established and sustainable waste management model, the waste was indiscriminately mixed during

¹<https://thewire.in/urban/guwahati-chandrapur-garbage-dumping-protest#:~:text=Guwahati%20generates%20around%20625%20tonnes,and%20an%20important%20bird%20habitat.>



collection. This nullified the efforts of citizens and demoralized them. Consequently, many abandoned the practice of waste segregation. This challenge pushed the organization to start "Power of 300". The initiative was started with a small group of individuals during the lockdown. Their goal was to try and discover an efficient solution to Guwahati's waste management problem.

4. Objectives

- To create a strong awareness campaign on source segregation based on real visuals and data of Guwahati city.
- To encourage at least 300 citizens to start source segregation of waste.
- To initiate a monthly dry waste collection service with a nominal user fee.
- To induce the public behaviour of keeping dry waste "clean and dry".
- To make this a citizen-led initiative.
- To generate dignified employment opportunities for waste pickers where they collect uncontaminated and segregated dry waste directly from households.
- To create a localized, small-scale, sustainable model that can encourage the municipality to promote decentralized waste management approaches.

5. Program Implementation details

The 'Power of 300' project has evolved significantly since its beginning. Initially, it aimed to aid citizens involved in waste segregation, particularly those unsure about recycling possibilities. Over time, it transitioned into researching the market potential of different categories of dry waste in Guwahati, instilling optimism in the community about the city's waste situation. This transformation occurred during their second year of operation, at a time when they possessed limited technical expertise in waste management.

In its first phase, the organization collaborated with a local recycling firm and compiled a list of accepted items. They also conducted numerous webinar sessions to raise awareness among the public about recyclable plastics, encouraging people to clean, dry, and store their recyclable plastics. Post relaxation in COVID restrictions, they commenced plastic collection from just three households, utilizing bicycles as their sole mode of transportation. Lacking financial resources for the project and unaware of user fees, they provided this collection service entirely free of charge.

Initially, they stored the collected plastics in their residences and acquired the skills of categorizing the plastics into various groups with the guidance of local waste pickers. Due to recurrent lockdowns, they primarily carried out waste sorting individually in their own homes before eventually delivering it to the recycler.

As more individuals became aware of the initiative, there was a surge in interest, leading to the second phase. In this phase, they facilitated registration and participation from interested citizens through a



Figure: Image from their first plastic collection on a bicycle in August 2020



Google form. Besides, creatives were made and shared on social media to maximize participation from individuals, however, word of mouth and encouragement from participants to their neighbours and friends maximized the reach and participation of the project.

The second phase also saw the expansion of the organization's network of scrap dealers and recyclers, creating a comprehensive value chain encompassing various types of recyclable plastics and other categories of dry waste. Transitioning from bicycles, they began collecting waste using a private car owned by one of their team members.

With their homes no longer suitable for waste sorting and storage, citizens generously provided them space at three different locations within the city



Figure: Collecting and sorting waste plastics in their home after a few months of starting the project

for this purpose. Within 1.5 years, they extended their waste collection to nearly 100 households. As they did not have funds to employ people, many citizens volunteered for waste sorting.



Figure: Testimonial of a participant in the first year of the project

Moreover, they enhanced their sorting expertise through collaboration with waste pickers. This allowed them to categorize waste into more than 20+ categories.

As they were not officially approved by the municipality for waste collection, they refrained from advertising their doorstep waste collection service. However, with time, primarily through recommendations from participants, the number of citizens using their service steadily grew.

This marked the current phase of their project where the participant count surpassed 300, prompting a change in the project's name from "Power of 300" to "Power Loop".

Their private car could no longer accommodate the increasing waste collection. Starting from a single monthly cycle trip around the city to car trips twice a month, they currently employ a rented commercial vehicle for waste collection 5-6 days each month.

To offset transportation costs for waste collection, they introduced a donation system where all participants contribute a minimum of 50 rupees per collection. On July 1, 2022, they relocated to a leased 325-square-foot facility and hired two informal workers for waste sorting. Exactly one year later, they expanded to a 2000-square-foot facility and now support four informal workers in the project.

They began in phase 1 with a monthly collection of 10-12 kgs, then progressed to 500-600 kgs in phase 2, and currently collect over 3000 kg of materials every month from 700+ households.



Figure: Waste collection in a private car back in 2021





Figure: One of the spaces donated by a school to store and sort the dry waste while they were closed due to COVID-19 restrictions



Figure: Waste collection conducted from a residential complex in a commercial vehicle

6. Innovative methods/techniques

The Power Loop project has received significant support from the citizens, and recently, they were invited by the municipal administration to collaborate and expand their scope of work. Some of the methods they employed include:

- **Localizing the IEC campaign:** Over 90% of the visuals used in their presentations depict the city's challenging situation, most of which were captured by their members. Their awareness sessions incorporate local stories that people can relate to, motivating more individuals to segregate waste at home and donate dry waste.
- **Organizing public visits:** They arrange visits to their facility and nearby plastic recyclers, allowing citizens to witness the post-segregation journey of their waste and the creation of new products from it. They also take visitors to the city's dumpsite to reveal the real extent of damage caused by waste mismanagement. These activities inspire consistent waste segregation at the source.
- **Recognizing citizen efforts:** They acknowledge the contributions of citizens who have influenced others in their neighbourhoods, communities, or workplaces to start source



segregation. This recognition encourages more citizens to voluntarily promote the message of source segregation.

- **Accepting various clean and dry waste materials:** They welcome all types of dry waste, making them the sole service in the city capable of receiving a wide range of dry waste. This inclusivity has attracted more participants to the project.
- **Implementing a thorough sorting process:** They categorize dry waste into 75+ groups, leading to better material revenue and ensuring sustainability.

7. Financial/Revenue model of the intervention

The 'Power Loop' project has not received any funding or grants. It operated for the first 1.5 years with the assistance of its volunteers and supporters. Two spaces were given to them for waste storage and sorting. Additionally, citizens volunteered every month to sort the waste for recycling. In July 2021, they converted this volunteer-driven project into an employee-run program. Presently they incur the following expenditures every month:

Expenditure heads	Amount spent (Rs.)
Transportation for waste collection using a rented vehicle	12,000
Salary of four waste pickers	30,000
Salary of facility manager	15,000
Rent	23,000
Electricity	1,000
Transportation costs for sending waste for recycling	4,000
Total expenditure per month	85,000

Their revenue channels are as follows:

Revenue streams	Amount received (Rs.)
User fee collection	12,000
Revenue from the sale of recyclables	65,000
Revenue from the sale of reusable items that come in the waste stream	10,000
Total revenue per month	87,000

As is evident from the data above, they have been able to cover the cost of operations, transportation, and IEC as they are generating just enough revenue to cover all their costs, but they aren't generating any surplus for investment. As they continue to collect more waste over time, if their calculations are accurate, they will eventually begin to generate a profit.



8. Partnerships

When they initiated the project, the team's understanding of valuable recyclables and sorting techniques was limited. There they formed a partnership with a recycling company called "Shree Guru Plastics." This collaboration was important as it provided them with a list of recyclable materials and a commitment to purchase the waste they collected, regardless of quantity. Recycling centres typically prefer larger, uncontaminated waste from factories, making it challenging for smaller quantities from households to be accepted. Shree Guru Plastics not only supported them but also provided training on sorting recyclables to add value. Initially, Midway Journey sold around 10-11 kg of materials per month to this entity, but today, they supply more than 3 tons of materials per month to Shree Guru.

After the project's first year, Shree Guru Plastics introduced the organization to an authorized scrap dealer named "Jeelani Enterprises." This partnership allowed them to expand their range of collected materials from plastics to encompass all types of dry waste, including paper, metals, and glass. They received valuable training in sorting these diverse materials.

Currently, Midway Journey consistently supplies its non-plastic dry waste materials to Jeelani Enterprises. While material prices may fluctuate throughout the year, Jeelani has consistently offered them competitive rates in Guwahati. Midway Journey began by selling approximately 100 kg of materials to Jeelani, but they now sell close to 2 tons of material every month.

Managing electronic waste collected was a concern, as the team was hesitant to hand it over to the informal sector, which often handles e-waste in an environmentally hazardous and unscientific manner, posing risks to both the environment and the workers. Last year, they entered into a partnership with "Karo Sambhav," a government-recognized organization specializing in efficient e-waste recycling. This collaboration led to several Bulk Waste Generators donating their e-waste to Midway Journey, significantly boosting their revenue.

For textile waste, they partnered with a local startup called "Cloket." Cloket collects clean, reusable clothes from Midway's facility and sells them in their thrift shop.

Initially, the organization did not have funds for IEC activities and this cost kept on escalating as there were more and more requests for these activities to encourage waste segregation. Last year, an NGO named Kudrat partnered with Midway Journey to fund their IEC arm under a program titled "Wiser Planet". This support helped Midway Journey cover their IEC expenses, a critical aspect of their project.

Furthermore, Midway Journey partnered with several Bulk Waste Generators like schools (Shiksha Niketan and Pub Guwahati High School), industries (North Eastern Handicrafts & Handlooms Development Corporation Limited, Indian Oil Corporation), retail outlets, and distributors, scaling their project over the last year.

9. Challenges faced and solutions

The challenges in this project have evolved over time, leading Midway Journey to expand the project and make it financially viable.



Figure: The first facility that they rented was in 2022. This was a small area of approximately 325 square feet area and two informal workers were hired for waste sorting





Figure: This is the present facility. This is one part of the 2000 square feet area. This is under construction now and they plan to transform this space into a waste experience facility

Initially, they lacked funds for waste collection, so they began with a bicycle and one of their member's cars. As the number of participants grew, they had to rent a commercial vehicle for collection. To cover the costs, they initiated a nominal fee of Rs 20 per collection, which has now increased to Rs 50, paid by every participant.

They initially used two rent-free locations for waste collection and sorting. In 2021, they found an industrial area to operate in. To secure this space, a security deposit equivalent to the initial 10 months' rent was required, exceeding their financial means. The recycling business owner, Shree Guru Plastics, stepped in and covered the deposit. Subsequently, Midway Journey repaid this amount to Shree Guru Plastics as monthly rent over 10 months, without incurring any interest charges.

In 2022, they expanded their operations as the number of participants nearly tripled. They got a bigger area, however, the challenge was once again the security fee, this time amounting to an advance for 20 months, which was substantial for them. Once again, they received support from another benefactor, Mr. Milin Dutta, who covered the required amount. They are now repaying him the same through monthly rent.

One of the primary hurdles they faced was generating sufficient revenue from household waste to cover all expenses. Household waste contains a wide variety of waste streams, and manually sorting these items is time-consuming. In an effort to increase their income, Midway Journey partnered with a nearby recycling facility that regularly supplied them with a significant quantity of factory waste for sorting. They would then purchase the sorted waste from Midway Journey. This factory waste was typically clean and consisted primarily of a few types of plastics, enabling efficient sorting by Midway's workers and competitive compensation. The combination of revenue from household waste and the additional income from factory waste ensured fair compensation for their sorting workforce.



10. Future prospects of the program

Recently, the local municipality invited Midway Journey for meetings to discuss the potential expansion of their model to various city wards. They are also in the early stages of planning a partnership with the local body to enhance the capacity of various NGOs in the waste management sector, aiming to foster decentralized waste management in the city.

To increase revenue further, Midway Journey is actively exploring partnerships with more Bulk Waste Generators (BWG) within the city, allowing them to scale up operations. Simultaneously, they are working on certifying these BWGs for their waste management practices.

As Midway Journey expands its operations to a larger facility, it envisions transforming its waste sorting facility into a Waste Experience Centre. While this centre will continue waste sorting and serve as a hub for workshops and training on various waste management facets, it aims to become a prominent learning centre for individuals and organizations interested in adopting Midway's model across the state or country.

Additionally, they are developing an application to streamline the waste collection process, eliminating the need for manual listing and communication with participants before each collection event. To enhance their workers' income and ensure social security compliance according to State and Central Government policies, they are diversifying revenue streams, including hosting workshops at their facility. Within the next year, they plan to introduce Repair and Resale schemes, extending the lifespan of products before recycling, potentially boosting the project's revenue.

Finally, Midway Journey looks forward to partnering with various organizations, especially across Northeast India, to share their experience and support them in establishing waste recovery business models. For instance, they are closely collaborating with Further & Beyond Foundation to replicate their waste management model in a village called Chullyu in Arunachal Pradesh.

11. Conclusion

The 'Power Loop' project, initiated by Midway Journey, began as a response to Guwahati's pressing waste crisis. Over the years, the project has significantly evolved, marked by phases of growth, collaborations, and innovative approaches. Despite numerous challenges, they have been successful in establishing a citizen-driven initiative for sustainable waste management.

With increasing community support and partnerships, the project's future prospects are promising. The potential expansion into various city wards, the transformation of their facility into a Waste Experience Centre, and the development of an application for streamlined waste collection signify their dedication to sustainable waste management and community engagement. This initiative also aims to serve as a model for other regions, reflecting the potential for replication in addressing waste management challenges.

As a citizen-led approach to waste management, the 'Power Loop' project represents a grassroots solution with broader implications, not only for Guwahati but for the entire nation. It's a testament to the impact of community-driven initiatives in addressing complex environmental issues and fostering sustainable practices.



SWOT analysis of Midway Journey

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page 8)**
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
- **Community engagement-**
 - Initially started by a few individuals, the project has been able to attract local citizens to contribute to waste segregation, particularly plastic waste which can be recycled.
 - This has increased the collection efficiency and contributed towards their revenue stream.
 - Besides, it reduces their effort in behaviour change.
- **Innovative IEC campaigns-**
 - Effective behaviour change due to local, relevant and relatable messages
 - Motivating the residents through exposure visits to their facility and nearby plastic recyclers.
 - Using reverse psychology through visits to the dump site. These activities inspire consistent waste segregation at the source.
- **Partnership/collaborations-**
 - The model ensures strong partnerships and collaborations with multiple stakeholders which contributes to its longevity.
- **Transforming organisational set-up-**
 - It's a growth-oriented model as they have evolved over time indicating the forward-thinking approach of the organisation.

Weakness

- **Financial Constraints-**
 - The project faced financial constraints in its early stages, relying heavily on volunteers and lacking resources for waste collection and sorting.
 - The project relied on benefactors and partners to cover security deposits and rental fees for spaces, which may not be sustainable in the long run.
- **Limited use of technology in managing the plastic waste -**
 - Manual sorting of diverse waste streams can be time-consuming and labour-intensive, potentially limiting the project's scalability.
 - Lack of digital monitoring mechanism to ensure operational efficiency of Midway Journey.
 - Lack of adequate monitoring mechanism for recyclers.



Opportunities

- **Additional collaboration/partnership-**

- Collaboration with the local municipality will help expand the model and ease regulatory aspects.
- Exploring partnerships with more Bulk Waste Generators (BWG)/corporates in PPP mode will make it financially viable.

- **Waste Experience Centre-**

- Expanding their idea of a waste experience centre to encompass a plethora of activities like tie-ups government institutions, schools, colleges etc. to expose more people to the concept of circular economy.
- A good example can be a collaboration with the government on the LiFE initiative.

- **Digitalisation of the waste management process-**

- Developing a digital platform/dashboard in each phase of waste management will enable them to efficiently streamline the process.
- This will also enable them to maintain transparency.

Threats

- **Financial Sustainability-**

- Relying on a few revenue sources may affect the long-term financial sustainability and scalability.

- **Local Resistance-**

- Since the model relies heavily on local volunteers, its implementation may be limited to a few geographies where there is community buy-in.





Enabling recovery and recycling of low-value plastic through waste pickers integration at Baramati in Maharashtra

Author: Anirudha Pandav and Kunal Thakur

1. Location of intervention

Baramati, Maharashtra (a medium-sized city with a population of around 1.1 Lakhs).

2. Project background

In Baramati, a government MRF facility is **operated by waste pickers, without formal engagement by the municipality**. This facility employs a total of 45 waste pickers of which 34 are females and 9 are males. These workers, who have been working at the facility for about 12 years, have been sorting valuable dry waste, including plastic, and earning income by selling recyclable waste to the local Kabadiwala.

Notably, before project interventions, the waste pickers sorted only high-value plastic waste, while low-value plastic, like flexible plastic, remained unsorted due to a lack of market demand. Besides, the waste pickers faced various challenges, including health and safety risks, inadequate waste handling capabilities, lack of formal recognition, low and inconsistent income, and absence of linkages with government schemes.

In response to these issues, the organization undertook a project from April 2022 to March 2023.

3. Problem description

Plastic waste management poses a notable challenge in Indian cities, particularly in the handling and recycling of low-value plastic waste. Waste workers, crucial to the waste management system, confront difficulties in handling waste and suffer from poor health. To address these issues, project interventions were launched, aiming to tackle environmental and social concerns. Environmentally, the problem revolved around the lack of sorting and recycling low-value flexible waste, which ended up in landfills, contributing to greenhouse gas emissions.

From a social perspective, the issue was tied to the well-being of waste pickers. They faced financial instability due to inconsistent income from waste sorting and selling. Furthermore, they lacked formal recognition, were exposed to significant health and safety risks from improper waste handling, and were disconnected from government schemes providing social benefits.

In response to these challenges, Social Lab introduced various measures in Baramati. These initiatives aimed to integrate waste pickers into the recycling process of flexible plastic waste while also enhancing the overall well-being of these workers.



4. Objectives

The objectives of the project were as follows:

- Achieving 100% recovery of flexible plastic waste (from the waste stream)
- Developing capacities of waste workers for safe waste handling and proper waste sorting
- Developing forward market linkages for the sale of flexible plastic
- Ensuring waste pickers' formalization and social recognition

5. Program implementation details

The project was implemented in 3 phases over a period of 1 year (from April 2022 to March 2023) as mentioned below:

Phase 1-Waste-pickers onboarding

Phase 2-Capacity-building sessions

Phase 3-Processing operations

Phase-1 activities were implemented at the beginning of the project, while Phase-2 and Phase-3 activities were continuous throughout the project period. The activities under each phase are depicted below.

Phase 1

Waste-pickers onboarding

- Instilling formal recognition through ID Cards
- E-shram registration

Phase 2

Capacity building sessions

- Training sessions on waste sorting, and health & safety aspects
- Distribution of PPE kit
- Distribution of sanitary pads
- Arranging medical health camps

Phase 3

Processing operations

- Obtain the low-value flexible plastic waste through 'Plastic Collection & Purchase Center'
- Channelizing the sourced plastic to the recycling plant of *Social Lab* at Malegaon for recycling
- Stopping informal tipping fee to the collection vehicles from the waste pickers



Waste pickers onboarding



Distribution of ID-card



Training session



Distribution of Sanitary pads

Capacity Building Sessions

Processing Operations

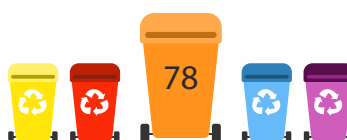


Under the program, waste contractors contracted by the municipality provide approximately 23 tonnes of waste per day, collected from households to the Baramati MRF (processing plant). Of this, wet waste is around 14 Tonnes and dry waste is 9 Tonnes per day. The municipality bears all the costs associated with this including transfer station, contractors fee etc. This waste is received, sorted and cleaned by the waste workers working at the MRF. While the wet waste is composted within the MRF premises, the dry waste is further sorted into low-value flexible plastic waste and high-value waste.

The high-value waste is sold to recyclers and the low-value flexible plastic waste is isolated and stored at the 'plastic collection and purchase centre of Social Lab established within the MRF. The waste workers are paid according to the quantity of waste sorted and stored at the centre. This waste is subsequently transported to the organization's recycling plant in Malegaon, and Social Lab provides the transportation cost amounting to approximately Rs 2,500 per tonne. At the recycling plant, the collected plastic is transformed into plastic pellets, which are then supplied to their partner agricultural pipe producer, Rupa Agro.

Impact achieved

In its one year of operation, the program achieved its goals of improving the well-being of waste pickers and contributing to environmental sustainability through various means -



Improved well-being of the waste pickers

- 45 waste pickers were formalized with ID cards.
- 21 waste pickers received E-Shram cards and life insurance of Rs 2 lakhs/-. The remaining workers already had both E-Shram cards and life insurance.
- The health and safety of these waste pickers were improved with the use of PPE kits and sanitary pads. Moreover, 3 medical health camps have been conducted for them.
- Social lab conducted 4 training sessions for upskilling the waste pickers.
- Their income was significantly improved, with average monthly earnings increased from Rs 8,400/- to Rs 13,604/-. Initially, the waste workers at the MRF only sold high-value plastics. However, their monthly income increased by Rs 5,204/- after selling low-value flexible plastic to Social Lab.

Environmental Sustainability

- 120 MT of low-value flexible plastic was recycled
- Additionally, 585 metric tons of high-value dry waste were further sorted and sold to local kabadiwala

6. Innovative methods/techniques used

The project embraced an innovative approach- the "waste pickers selling model," which revolutionized the conventional methods employed. This entrepreneurial model empowered waste pickers, enabling them to elevate their earnings through the sale of a substantial volume of waste. Implementing this approach, not only fostered a heightened entrepreneurial mindset among the waste pickers but also created a strong incentive for them to ensure 100% sorting of flexible plastic waste.

Through this model, waste pickers saw a significant increase in their income due to the higher value derived from selling a larger quantity of waste including both, high-value and low-value plastics. This not only provided a financial benefit but also catalyzed instilling a sense of entrepreneurship within the waste pickers' community.

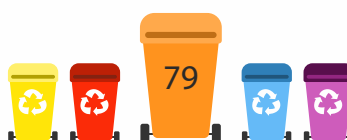
In essence, this innovative method resulted in a more comprehensive and efficient segregation of waste.

7. Financial/revenue model of the intervention

Social Lab operates a recycling plant in Malegaon specifically designed for recycling low-value flexible plastic. In their current operational model, they buy flexible plastic from the waste pickers, bear the transportation cost to the Malegaon recycling plant and offset the costs by selling recycled products. This approach makes the model self-sustaining, with minimal assistance required from the municipality. The municipality supports mainly by providing sorting infrastructure at the processing plant and covering expenses for PPE kits and training programs.

8. Partnerships

The project established collaborations with various entities, each with specific roles and responsibilities:



- **Municipality:** Responsible for providing sorting infrastructure at the processing plant and covering expenses for PPE kits and training programs. Besides, the waste contractors contracted by the municipality are responsible for the collection of segregated waste from households and transporting it to the MRF.
- **Waste Pickers:** Tasked with sorting low-value flexible plastic waste and selling it to Social Lab. Social Lab's engagement with the waste pickers is a symbiotic partnership wherein Social Lab motivates and works for their upliftment by formalising them and ethical sourcing of low-value plastic waste.
- **Transporter:** In charge of transporting the sorted flexible plastic to the recycling plant in Malegaon. The cost is being paid by the social lab.

9. Challenges and solutions

The primary hurdle was persuading the waste pickers to sort the flexible plastic waste. Initially, they hesitated, viewing it as an extra task, uncertain about the added income, and lacking the capacity to perform this task. In response, the Social Lab team conducted numerous training sessions, assured them of the purchase of flexible plastic through formal agreements, and established a plastic collection and purchase centre.

10. Future prospects of the program

Future prospects for the program primarily centre around sorting and recycling low-value flexible plastic waste. With a vast amount of flexible plastic waste stemming from packaging, ending up in landfills or water bodies, there exists a substantial market and potential for sustainability in sorting such waste. The model's replicability is viable in smaller cities where there's a shortage of plastic waste sorting and a significant presence of informal waste workers.

11. Conclusion

This initiative in Baramati, Maharashtra, showcases a successful model to handle plastic waste, enhancing the well-being of waste pickers while promoting environmental sustainability. The project notably uplifted the status of waste pickers, providing better health and safety measures, and increasing their income.

It effectively diverted 120 metric tons of low-value flexible plastic from landfills and further sorted 585 metric tons of high-value dry waste, boosting environmental sustainability. The innovative "waste pickers selling model" significantly improved waste sorting, benefitting both the pickers and the environment. The model is self-sustainable and collaboration among stakeholders further strengthens the waste management process. The program not only met its goals but also presented a scalable model for similar waste management challenges in smaller cities.



SWOT Analysis of Social Labs

<p><u>Strength</u></p> <ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Capacity building and training for PWM (A3) ○ Collection/Transportation (RR3) ○ Recycle (O3) ○ Formalisation and capacity building of informal waste workers- <ul style="list-style-type: none"> ○ The organisation provided the informal waste workers working at the government-run MRF with E-Shram Cards and Life Insurance, Sanitary pads, PPE kits, etc., thereby uplifting their social status and formalising them. ○ Capacities of the workforce were built to identify and sort low-value recyclables that were earlier discarded. • Innovative approach to recycle flexible plastic waste- <ul style="list-style-type: none"> ○ In this model, the earnings from the sale of low-value recyclables are credited directly to the waste workers, increasing their overall income. • Leveraging the existing infrastructure- <ul style="list-style-type: none"> ○ By connecting the dots, they established a supply chain whereby, the low-value plastic waste was stopped from going to the landfills. 	<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Single product, single buyer- <ul style="list-style-type: none"> ○ To ensure long-term sustainability, they need to broaden their product range and expand their network of partners to manage plastic waste. • Limited revenue sources can in turn limit their scalability. • Long-term sustainability of the project has not been tested as it has been under implementation for just one year.
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Expanding and creating social impact- <ul style="list-style-type: none"> ○ The success of the project's model can be replicated in other smaller cities facing similar problems. ○ As the model focuses on the formalisation of the informal workforce and increasing their income generation capacity, therefore with scale they can increase their social impact footprint. • Diversified revenue streams- <ul style="list-style-type: none"> ○ They may diversify their range of recycled products to have an additional revenue stream. • Funding opportunities- <ul style="list-style-type: none"> ○ They may explore funding opportunities like debt-finance, CSR funding etc. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Dependencies- <ul style="list-style-type: none"> ○ Lack of control over the collection process may threaten their model in case the quality and quantity of collected low-value plastic waste declines. ○ Their operations may be affected by the quantity of flexible plastic waste in the collected waste. ○ Their entire model may come under threat if either the municipality, its contractor (waste collector) or waste workers lose synergies.





Pioneering Sustainable Solutions: Banyan Nation's Plastic Recycling Revolution

[\(Click here for intervention video\)](#)

Author: Banyan Nation

1. Location of intervention

Hyderabad, Telangana.

2. Project background

Mismanaged plastic waste has become a global crisis, and India stands as a major contributor to this mounting problem. Banyan Nation, founded in 2013 by Mani Vajjipeyajula and Raj Madangopal, emerged as a visionary response to the pressing issue of non-recycled plastic waste in Hyderabad, Telangana.

Combining environmental consciousness with technological innovation, Banyan Nation aimed to revolutionize plastic waste management. Guided by waste management pioneer Ron Gonen during their MBA program at Columbia Business School, the founders recognized the urgent need for a holistic plastic waste management solution in India. Through dedication and strategic partnerships, Banyan Nation evolved into a promising venture, creating a closed-loop system to transform discarded plastic bottles into premium quality recycled plastics.

3. Problem description

India, as one of the largest consumers of plastic, confronts a monumental challenge in managing its non-recycled plastic waste, resulting in severe environmental repercussions. The negative impact of this plastic waste crisis is significant, polluting the environment, harming wildlife, and posing health risks to both nature and people.

Despite the informal sector's valiant efforts in recycling, the scale of plastic waste management remains insufficient to address the escalating crisis. The bulk of plastic waste is downcycled or disposed of in a manner that exacerbates environmental degradation. This calls for an urgent and comprehensive solution that can address the root cause of the problem and drive sustainable practices on a larger scale.

Recognizing the gravity of the situation, Banyan Nation decided to confront the challenge of managing plastic waste head-on by creating a sustainable and efficient system encompassing collection, transportation, and recycling. Their goal was to curtail the volume of plastic waste that ends up in landfills and oceans while promoting the adoption of sustainable practices in plastic consumption and recycling.



Banyan Nation, an award-winning, vertically integrated plastics recycling company leverages mobile technology to map, integrate and train thousands of informal recyclers, creating a fully digitized and traceable supply chain, to curate feedstocks that guarantee the production of premium quality recycled plastics.

Its state-of-the-art recycling plant in Hyderabad uses proprietary plastics cleaning technology to produce high-quality recycled granules from discarded HDPE and PP plastics. Their innovative closed-loop system, which involves converting post-consumer plastic bottles into premium quality recycled plastics, sought to reduce the dependence on virgin plastic and promote a more sustainable circular economy.

4. Objectives

The planned objectives of the intervention by the Banyan Nation were:

- To reduce plastic waste: The primary objective was to significantly decrease the amount of plastic waste that ends up in landfills and oceans by promoting efficient collection and recycling practices.
- To promote sustainable practices: Banyan Nation aimed to encourage the use of recycled plastic over virgin plastic, thereby promoting more sustainable production and consumption patterns.
- To empower informal recyclers: By leveraging mobile technology and providing training, the intervention sought to empower informal recyclers, integrating them into a formal and traceable supply chain for improved livelihoods.





- To produce high-quality recycled plastics: The goal was to develop proprietary plastics cleaning technology that ensures the production of premium quality recycled granules comparable to virgin HDPE plastics.
- To contribute to a circular economy: Banyan Nation's intervention aimed to support the concept of a circular economy by efficiently recycling plastic waste, reducing the need for new raw materials, and minimizing environmental impact.

5. Implementation details

a. Program Purpose and Design:

Banyan Nation's goal is to address the plastic waste crisis in India and promote sustainable plastic waste management by establishing a closed-loop system for packaging plastics, wherein post-consumer plastic bottles are collected, sorted, and processed into high-quality recycled HDPE and PP pellets. These pellets are then used in the production of new packaging bottles, reducing the reliance on virgin plastic, and minimizing environmental pollution.

At the heart of its operations lies a state-of-the-art plastic recycling facility in Hyderabad, India spread over 3.5 acres with a processing capacity of 12,000 TPA of post-consumer plastics. Through this facility, Banyan has become the sole supplier of high-quality blow-grade recycled HDPE and PP in India.

Their proprietary recycling process and washing technology are water-positive, with a focus on energy efficiency and zero-emissions production. It produces human-contact-safe recycled plastics that meet US and EU packaging safety standards. Banyan's work has been instrumental in driving the adoption of a circular economy in the South Asian region.





b. Geographical Coverage:

Banyan Nation is currently focused on the southern region of India, with its recycling unit situated in Hyderabad. The primary coverage area includes the following states in South India - Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, and Kerala.

c. Implementation Process:

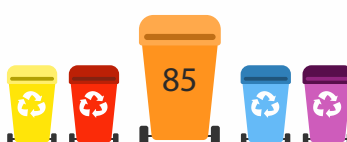
Through a closed-loop system, Banyan empowers the kabadiwallas/waste collectors who collect and sort discarded plastic bottles into raw materials. This is then processed into creating recycled packaging products. This innovative collection model integrates informal collectors into the supply chain.

Banyan Nations's in-house application called **Banyan's Mapper app** is used where the field team first geotags and collects vital data on all the scrap traders in a city—what material they collect, how much they collect, and how much trade. Once they identify a set of such scrap traders they can work with, Banyan's team trains them on their quality expectations, and social compliance expectations such as ensuring no child workers, regard for personal safety, fair payment of wages, etc. They are then on-boarded on **Banyan's Trader platform** where they log all trades and track their progress through time and space through uploaded photos and updates in the mobile app. Leveraging these mobile technologies, the organization maps integrates, and trains these collectors to ensure the production of premium-grade recycled plastics. Banyan's fully digitized and traceable supply chain, coupled with its proprietary cleaning technology, removes contaminants from HDPE and PP plastics.

The organization's data intelligence platforms offer complete transparency and accountability by tracking plastic waste from collection to recycling. Banyan has pioneered the model for plastic recycling in developing countries, blending technology, inclusivity, and environmental responsibility with economic viability.

d. Impact:

Through its partnerships with multinational corporations such as Unilever, Shell, and Reckitt, Banyan Nation has put over 1 billion recycled plastic bottles on the shelves, demonstrating its commitment to



promoting a circular economy and reducing plastic waste. These recycled plastic bottles have found applications in various sectors, including packaging for consumer goods and automotive parts, proving the viability of recycled plastic as a sustainable alternative.

6. Innovative methods/techniques

Banyan Nation stands out due to its innovative methods and unique approach to plastic recycling. Here are the key aspects that set it apart from standard approaches:

- Closed-loop system: Banyan Nation has implemented a circular production model, where discarded plastic bottles are collected, sorted, and processed into plastic pellets, which are then used to produce new packaging bottles.

This closed-loop system significantly reduces plastic waste ending up in landfills and the environment. By creating a self-sustaining cycle, the organization minimizes the need for virgin plastic production, thereby conserving natural resources and reducing overall environmental impact.

- Proprietary washing technology: Their cutting-edge washing technology enables the production of recycled plastics which meet the stringent safety standards set by the US and EU for human contact. This innovative technique ensures that the recycled plastics are of high quality and safe for use in packaging applications.
- Water-positive and environmentally responsible: Banyan's recycling process is designed to be water-positive, focusing on energy efficiency and achieving zero-emissions production. The company collaborates closely with chemical suppliers to test and use chemicals with minimal impact on water quality. By treating and reusing water about 5-6 times, Banyan reduces water consumption by up to 80% while maintaining water quality standards. This approach showcases the commitment to sustainability and environmental responsibility.
- Adaptation to Indian post-consumer recycled (PCR) plastics: Banyan Nation's technology is uniquely adapted to the heterogeneous nature and challenges associated with post-consumer recycled (PCR) plastics in India. The company has spent significant time and effort



developing the supply chain for PCR plastics, giving it an advantage over global competitors who may not be as well-versed in navigating the complexities of the Indian market.

a. Expected outcomes and benefits:

- Reduction in plastic waste: The closed-loop system helps reduce plastic waste in landfills and the environment, contributing to a cleaner and healthier ecosystem.
- Conservation of resources: By using recycled plastics in the production of new packaging, the organization saves valuable natural resources that would otherwise be used for virgin plastic production.
- Lower carbon footprint: Recycling plastic consumes less energy and produces fewer greenhouse gas emissions compared to the production of virgin plastics, leading to a lower carbon footprint.
- High-quality recycled plastics: Banyan's proprietary washing technology ensures that the recycled plastics meet high safety and quality standards, making them suitable for various packaging applications.
- Competitive advantage: Their focus on quality, sustainability, and local adaptation gives them a competitive edge over other material suppliers, helping them to maintain a strong position in the Indian market.

Banyan Nation stands out for its innovative and sustainable approach to plastic recycling. By employing a closed-loop system, proprietary washing technology, and a commitment to water efficiency and quality, Banyan sets a high standard for plastic waste management and plays a vital role in promoting the circular economy in India.

7. Financial/revenue model of the intervention

The major source of revenue is the sale of premium recycled PE and PP granules for making packaging for FMCG and Lube companies that have committed to reducing their packaging footprint. Besides, they earn a small stream of revenue for providing EPR services to brands and third parties.

Their key costs are

- Cost of raw materials – post-consumer discarded packaging plastics collected by a system of itinerant collectors and stationery aggregators.
- Processing costs such as energy, labour, and water management



Banyan's model is financially sustainable at scale in the long run.

8. Partnerships

The organization has scaled its model through partnerships and support from various types of stakeholders as mentioned below:





- *Customers* helped Banyan develop and refine its product, and gave long-term contracts that made it possible for the company to raise capital and invest in growth and R&D
- *Investors* provided debt and equity capital to help fund the company's growth
- *Suppliers* work with Banyan's team to aggregate and supply consistent quality materials that meet the company's quality specifications

9. Challenges and Solutions

The organization encountered several challenges in its journey. The most prominent ones include -

- *Sourcing consistent and quality raw materials.* To overcome this, the organization worked closely with suppliers, aggregating and ensuring a steady supply of post-consumer discarded packaging plastics that met their quality specifications.
- *Convincing major FMCG brands to pay a premium price for human-contact-safe recycled plastics.* However, through persistence and demonstrated quality, Banyan Nation secured long-term contracts with multinational corporations like Unilever, Shell, and Reckitt, showcasing the viability and reliability of their recycled plastics.

10. Future prospects of the program

Banyan Nation's model has proven its sustainability and scalability. With recent capital raises, the organization is set to increase its production capacity to four times the current volumes. Their vision for the future includes replicating their success across India and expanding partnerships to create a more extensive network of closed-loop systems for plastic waste management.

As Banyan Nation continues to lead the charge in promoting the circular economy and reducing plastic waste, its impact is expected to grow exponentially. By providing a reliable and eco-friendly alternative to virgin plastics, Banyan Nation's innovative approach sets the stage for a cleaner, greener future, not only in India but also beyond its borders. Their commitment to empowering communities, conserving resources, and driving sustainable practices cements Banyan Nation's position as a pioneering force in transforming plastic waste management.

11. Conclusion

In conclusion, Banyan Nation has revolutionized plastic waste management in India through its innovative and sustainable approach. By promoting a closed-loop system, leveraging proprietary technology, and empowering informal recyclers, they have significantly contributed to a reduction in the quantity of plastic waste that would have otherwise gone to landfills and oceans. Their commitment to quality, water efficiency, and local adaptation positions them as a key player in the waste management landscape.

Banyan Nation's scalable and financially sustainable model holds great promise for creating a cleaner, greener future. Their efforts inspire others to embrace responsible waste management practices, contributing to a more sustainable world for generations to come.



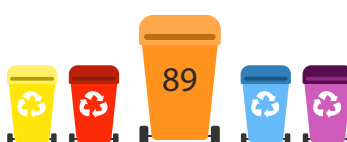
SWOT analysis of Banyan Nation

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Capacity building and training for PWM (A3)
 - Data collection and integration across the chain (A4)
 - Recycle (O3)
- **Creating a closed-loop system to address the plastic waste management value chain-**
 - Banyan Nation has implemented a circular production model, where they empower the kabadiwallas/waste collectors who collect and sort the discarded plastic bottles into raw materials. This is then processed into creating recycled packaging products discarded post-consumer packaging plastics and plastic bottles.
 - This closed-loop system significantly reduces plastic waste (bottles etc.) which would have otherwise ended up in landfills and the environment. The plastic waste is converted into pellets which are then used in the production of new packaging bottles, reducing the reliance on virgin plastic, and minimizing environmental pollution.
 - Banyan boasts of a supply chain that is fully digitized and traceable.
 - They have a proprietary cleaning technology that ensures the complete removal of contaminants from HDPE and PP plastics.
 - The organization's data intelligence platforms offer complete transparency and accountability by tracking plastic waste from collection to recycling.
 - It produces human-contact-safe recycled plastic granules that meet US and EU packaging safety standards.
- **Technology integration-**
 - Banyan Nation's in-house applications-
 - Banyan's Mapper app (geotagging and collecting information on scrap dealers)
 - Banyan Traders app (logging all scrap dealers trades and track their progress)
 - Leveraging mobile technology, the organization maps, integrates and trains these collectors to ensure the production of premium-grade recycled plastics.

Weakness

- **Cater to a specific type of plastic waste-**
 - Banyan nation only recycles post-consumer packaging plastic or plastic bottles(HDPE and PP).
 - Management of other similar major sources of plastic such as PET, LDPE or MLPs are not in their scope of work.
- **Sourcing consistent and quality raw materials-**
 - Reliance only on a single source (informal waste collector/kabadiwallas) for sourcing the raw material.
- **Limited Geographic Coverage-**
 - Banyan Nation's primary focus is only in one location (Telangana), which may limit their ability to address the plastic waste crisis on a national scale.
- Lack of partnerships with informal sanitation workers/waste pickers who are the backbone of any waste management system.
- Lack of partnerships/collaborations with any state governments/ULBs may hinder their growth (they haven't expanded to any other location in the last 10 years).
- Despite securing huge funding (\$800K till 2020) and incubation/acceleration support from Plug and Play APAC, they have contained themselves to only Hyderabad, Telangana.



- **Use of environment-conscious technology-**

- Banyan Nations's proprietary recycling process and washing technology is water-positive, with a focus on energy efficiency and zero-emissions production.
- By treating and reusing water about 5-6 times, Banyan reduces water consumption by up to 80% while maintaining water quality standards.

- **Integrating informal waste collectors/kabadiwallas-**

- Banyan empowers the kabadiwallas/waste collectors who collect and sort the discarded plastic bottles into raw materials.
- Upskilling of the informal waste collectors/kabadiwallas
 - By leveraging mobile technology and providing training, the intervention empowered informal recyclers/ waste collectors/kabadiwallas, integrating them into a formal and traceable supply chain for improved livelihoods.

- **Revenue model-**

- They adopted a diverse revenue model rather than a single revenue source. This includes –
 - The sale of premium recycled PE and PP granules for making packaging for FMCG and Lube companies.
 - They also earn revenue by providing EPR services to brands and third parties.

- **Partnership/collaborations-**

- Multiple partnerships with multinational corporations such as Unilever, Shell, and Reckitt, Banyan Nation help ensure the sustainability of the operations of the organisation.
- These partnerships/collaborations also helped them reach their goal of reducing waste to landfill and reliance on virgin plastics for packaging products.
- This also helps to ensure the viability of recycled plastic as a sustainable alternative for multiple applications in various sectors.



Opportunities

- **Opportunity for expansion-**
 - Expanding its recycling capacity to include other forms of plastic like LDPE, PET, MLP etc.
 - The organization is set to increase its production capacity to four times the current volumes.
 - Apart from partnerships with corporates, they may partner with ULBs for effective sourcing of plastic products.
 - Expanding their operations to similar tier 1 cities like Bangalore, etc.
- Provide livelihood opportunities to informal sanitation workers/waste pickers.
- With an increase in the number of units established, the Banyan Nation will provide livelihood opportunities to more informal scrap collectors/kabadiwallas.
- **Increased Awareness-**
 - Growing awareness of environmental issues and the benefits of recycling can create a more favourable market for recycled plastics.

Threats

- **Market competitors-**
 - Various organisations have come up with a similar project in this sector. They need to make sure their project stands out from the rest by making it unique, affordable, accessible and scalable.
- **Supply Chain Disruptions-**
 - Dependence on only informal waste collectors and aggregators can pose risks if there are disruptions in the supply chain or fluctuations in the quality of collected materials.
- Lack of diversification may make their model obsolete.





recity

Pioneering the Transformation of Municipal Solid Waste Management: Recity's Circular Economy Solutions

(Click here for intervention video)

Author: Suraj Nandakumar

1. Location of intervention

Multiple cities across the country including Pondicherry, Mahabaleshwar, and Mathura-Vrindavan.

2. Project background

Started in 2017, Recity is an impact-focused organization innovating solutions to maximize the circular economy of all kinds of plastics. Their municipal solid waste management projects focus on transforming vulnerable cities by streamlining the waste supply chain. They bridge gaps in the city's waste processes by catalysing citywide campaigns and collaborations among Urban Local Bodies (ULBs), waste professionals, households, etc. During Recity's inaugural project in Ambala, Haryana, collaborating with the city administration to promote source segregation, they discovered that plastic waste posed a paramount challenge in urban settings. Despite the annual production of more than 15 Metric Tonnes of plastic across various industries and sectors¹, India's waste disposal infrastructure remained incapable of addressing the plastic waste crisis effectively. Consequently, Recity shifted its focus towards developing comprehensive, data-driven solutions backed by extensive expertise to tackle municipal solid waste challenges.

3. Problem description

Municipal solid waste management is a major issue in India due to rapid urbanization, population growth, and inadequate infrastructure. The major challenges include insufficient waste collection coverage, improper waste segregation at source, limited & inadequate recycling facilities, and open dumping in landfills or burning in fields. Globally, 400 million tonnes of waste is generated annually, 60% of which ends up in either landfills or other environmentally vulnerable regions². These issues can be tackled effectively, by enabling an ecosystem to collectively build waste management systems. Moreover, building waste processing capacities of cities in collaboration with local ULBs will help in effectively tackling the municipal solid waste problem and work towards a cleaner, greener, and more sustainable future.

¹Hishan, S.S. (2023), "Changing Landscape of Plastic Waste Management in India", Crowther, D. and Quoquab, F. (Ed.) Socially Responsible Plastic (Developments in Corporate Governance and Responsibility, Vol. 19), Emerald Publishing Limited, Bingley, pp. 105-119. <https://doi.org/10.1108/S2043-052320230000019007>

²<https://www.unep.org/interactives/beat-plastic-pollution/>





4. Objectives

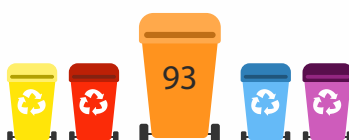
Recity aimed to design a cost-effective model for solving the mixed municipal waste problem along with mismanaged plastic waste in various cities of the country. Their model has the potential to be customized to suit the unique needs and characteristics of diverse geographies. Cities that are beginning to segregate can immediately reduce their dependence on landfills. The core objectives are as mentioned below:

- Improved Waste Collection and Coverage: Enhance waste collection services to cover all urban and rural areas, ensuring that no community is left unattended.
- Promote Waste Segregation: To improve source segregation to accelerate the circular economy of plastics.
- Enhanced Infrastructure: Establish and expand material recovery facilities to handle different types of waste.
- Public-Private Partnerships: Foster collaborations between the government and private sectors to improve waste management infrastructure and services.

5. Program implementation details

Recity, through its Municipal Solid Waste Management initiatives, has created a significant impact in various Indian cities by collaborating with companies like Nestle India, Godrej Consumer Product Limited, Pepsico India, and the Alliance to End Plastic Waste. These partnerships, named Hildaari, KEEP, Purna, and ParikraM respectively, have streamlined the systems for post-consumer plastic waste through a multi-collaborative approach within the ecosystem.

Started in 2018, **Hildaari** is an initiative supported by Nestlé India to develop inclusive, contextualized and resilient models for solid and plastic waste management, in the tourist cities of the country. It is currently being implemented in Mussoorie and Nainital in Uttarakhand, Dalhousie in Himachal Pradesh, Ponda in Goa, Mahabaleshwar in Maharashtra and Munnar in Kerala with Stree Mukti Sanghatana as the implementation partner, and Recity as the technical partner. This initiative has streamlined the Municipal Solid Waste systems of post-consumer plastic waste across cities.





Project KEEP, the CSR initiative of Godrej Consumer Products Limited, in partnership with Pondicherry Municipality, Swachata Corporation and Recity Network, aims to make Pondicherry, Tamil Nadu, one of the cleanest coastal cities in India. The project has developed an inclusive, contextual, and resilient model to streamline the management of Municipal Solid Waste (MSW) and professionalize 700 waste workers for enabling a circular economy by 2024. From diverting post-consumer dry waste, especially plastics, to ensuring scientific end-of-life solutions for it, Project KEEP is building the circularity of 170 tonnes per day of waste from formal and informal sources in the city, daily.

Purna is an initiative that aims to transform the waste workforce by developing a circular, equitable and inclusive model of solid and plastic waste management. PepsiCo Foundation in partnership with Recity Network and Mathura Vrindavan Nagar Nigam (MVNN), launched this initiative with a vision to make the twin cities of Mathura -Vrindavan, the cleanest tourist cities of India. Initiative Purna intends to build the socio-economic resilience of waste workers and facilitate the diversion of municipal solid waste, especially post-consumer plastics, through a multi-collaborative strategy with the ecosystem. The project is being implemented in phases in Mathura Vrindavan, initiating with the professionalization of 100 waste workers and the diversion of 500 metric tons of city waste from 4000 property units comprising 20,000 citizens.

Under **Parikram**, in partnership with Mathura Vrindavan Nagar Nigam a 250 MTPD Material Recovery Facility (MRF) was constructed. The project was also supported by the Alliance to End Plastic Waste. This resilient and tech-enabled infrastructure will bridge the gap in mismanaged plastic waste in the city and has the capability to segregate even mixed Municipal Solid Waste and channel it to recycling and other end-of-life solutions. The MRF has the potential to collect and process 40,000+ MTs of plastic waste in the next 10 years, along with the creation of 100+ green jobs and the formalization of 1000+ waste value chain members.

Through these multi-stakeholder engagements, Recity implemented innovative strategies, including behaviour change activities to encourage segregation of waste, establishing sustainable infrastructure for efficient waste processing, transformation of the workforce, creation of sustainable business models for Urban Local Bodies, and use of tech platforms for end-to-end traceability.

These efforts have shown impressive results, diverting 17,547 Metric Tons of waste, involving more than 50,000 households in behaviour change programs, incorporating Waste Intelligence Technology in over 46,000 property units, and formalizing the work of over 700 waste management professionals. Recity aims to continue expanding its successful models across more cities in India to effectively manage Municipal Solid Waste and contribute to a cleaner and more sustainable environment.



6. Innovative methods/techniques used

This program is distinctive for its inventive methods and advanced techniques used in its interventions. Collaborating with different organizations, Recity has pioneered a transformation in waste management across Indian cities. Their effective solutions have resulted in diverting thousands of metric tons of waste from the environment. Some of the innovative methods employed are:

Diversion of waste from landfills by:

- Organizing behaviour change activities to ensure source segregation and anti-littering.
- Deployment of digital technology for real-time visibility and transparency when governing the journey of waste.
- Organizing clean-up drives to encourage the city's participation and build ownership of the environment.
- Visible transformation of open spaces in cities to instill a sense of belongingness among citizens and strengthen their connection with their cities, through wall arts and placement of recycled and upcycled infrastructure.

Unlocking Sustainable Business Models for Urban Local Bodies by:

- Developing business models for the city governments to unlock revenue.
- Monitoring of their city's waste enabled with access to insightful data dashboards.

Reimagining Workforce as Professionals by:

- Bridging gaps in the workforce by envisioning them as waste professionals and training them to better handle waste more safely.
- Enabling them to enter formalized roles, have access to better healthcare, fair income, and thereby improved life chances.

7. Financial/revenue model of the intervention

Recity's projects on Integrated Solid Waste Management (ISWM) are effectively carried out by harnessing financial support from corporate social responsibility (CSR) initiatives. These projects





operate in a collaborative framework alongside local government administrations. A fundamental aspect of project implementation revolves around bolstering the capacity of the urban local bodies. Through targeted efforts, Recity has achieved notable success in unlocking supplementary government funding specifically earmarked for waste management endeavours. However, the true sustainability of these projects materializes when the urban local bodies take up ownership of the diverse waste management activities entrenched within the city. By embracing this responsibility,

the urban local bodies guarantee the long-term viability and efficacy of the waste management initiatives. This transfer of ownership not only fosters the project's enduring impact but also empowers the urban local body to proactively address future challenges and evolve their waste management strategies in line with the city's needs.

8. Partnerships

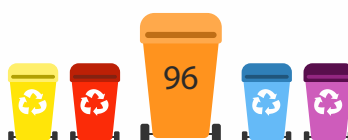
Recity collaborates with various entities, including brands, government bodies, non-profits, and recyclers, to spearhead impactful projects targeting Municipal Solid Waste. These initiatives—Hilldaari, KEEP, Purna, and ParikraM—are key examples of this collaboration. Their approach involves:

- Engaging with citizens and bulk waste generators across cities through door-to-door IEC and behaviour change models for source segregation.
- Partnering with Urban Local Bodies (ULBs) to ensure effective waste management in cities, including training formal waste workers for monitoring of collection and segregation processes.
- Formalizing waste workers, granting them access to government benefits and social security schemes while prioritizing their occupational health and safety.
- Working with the informal supply chain, such as waste pickers and scrap dealers, to enhance the value of recyclable waste and promote circularity.
- Teaming up with brands and creating multi-lateral alliances to establish more sustainable and circular supply chains, attracting investments for achieving plastic circularity.
- Collaborating with recyclers and partners to create forward linkages that promote circularity in handling plastic waste.

9. Challenges and solutions

Recity encountered multiple challenges during the implementation of its Municipal Solid Waste Management (SWM) program across various cities. These challenges included:

- Lack of source segregation practices, complicating efficient waste handling and recycling.
- Limited citizen awareness about responsible waste disposal, hindering behavioural change.



- Inadequate infrastructure impeding effective waste processing and recycling, contributing to environmental pollution.
- Complexities in recycling efforts due to mixed waste disposal.
- Irregular door-to-door waste collection leading to waste accumulation.

To counter these challenges, Recity adopted a comprehensive strategy. This approach involved awareness campaigns, source segregation programs, and enhancement of waste processing infrastructure. These collective efforts were aimed at revolutionizing waste management and fostering cleaner, more sustainable environments in Indian cities.

10. Future prospects of the program

The program has made remarkable strides in its mission, having expanded itself to cover 22 cities across 13 states in India. Through these efforts, over 55,000 metric tons of waste have been effectively integrated into circular systems, preventing their adverse impact on the environment. Moreover, Recity has played a pivotal role in enhancing the roles and skills of 2,700 waste workers while generating over 6 million USD in 12 Indian cities.

Looking forward, by 2030, the organization aims to substantially increase the circularity of 350,000 metric tons of plastics across 100 cities in order to significantly contribute to a cleaner, more sustainable environment on a much larger scale.

Besides focusing on Municipal Solid Waste Management, they emphasize climate action. Recognizing climate change as a global challenge, they work on creating sustainable business models alongside climate financing. To achieve a climate-resilient circular economy, Recity undertakes the recovery of plastic waste from environmentally sensitive sources. They also construct automated and compliant Materials Recovery Facilities (MRFs) to ensure the proper recycling and scientific end-of-life solutions for these plastics. Notably, Recity was among 8 startups shortlisted by NITI Aayog to showcase its automated MRF model at the National Technology Week held from 11th May to 14th May 2023, where it was exhibited to the Honourable Prime Minister of India, Shri Narendra Modi.

11. Conclusion

The model adopted by Recity proves effective for several reasons. Primarily, it leverages strategic collaborations and partnerships with leading companies, government bodies, and local organizations, thereby ensuring a multi-faceted approach to waste management. By initiating impactful projects such as Hilldaari, KEEP, Purna, and ParikraM, Recity's focus on behaviour change activities, infrastructure development, and workforce training creates a comprehensive and holistic system for managing municipal solid waste effectively.

This model not only contributes to the circularity of plastics across multiple cities but also aligns with climate action through the establishment of advanced Material Recovery Facilities. Moreover, the financial structure, supported by CSR initiatives and governmental partnerships, ensures the sustained success of the program and promotes ownership by local bodies in waste management initiatives.



SWOT analysis of Recity

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Data collection and integration across the chain (A4)
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
- **Creating a closed-loop model-**
 - They bridge gaps in the city's waste processes by addressing all aspects of the plastic waste value, starting from behaviour change, capacity building, and infrastructure construction to diversion of waste from landfills.
- **Integrating the informal sector-**
 - They have created a social impact by formalising the waste workers, building their capacities, and improving their standard of living.
- **Financial sustainability of the projects-**
 - Working in the PPP mode and transferring the ownership to the ULBs at the end of the project guarantees its long-term financial viability and efficacy.
- Strong multi-stakeholder partnerships and collaborations help create impactful projects.
- Each project may require 3-5 years of execution time before the ownership can be transferred. In 5 years of its establishment, Recity has undertaken 6 projects that prove the efficiency of their model.
- Leveraging technology for end-to-end traceability of the collected plastic waste ensuring transparency and efficiency of the initiative.

Weakness

- Since this is a PPP model, depending majorly on corporates for funding, interventions would have to be designed on corporates' preference rather than on the need of a geography.
- **Challenges of Behavioural Change-**
 - Overcoming the lack of source segregation practices and low awareness among citizens about responsible waste disposal can be a challenging and time-consuming process.
- **Low community engagement-**
 - Community is being engaged only for behaviour change.
 - Low community engagement may affect the quality and quantity of waste collection.



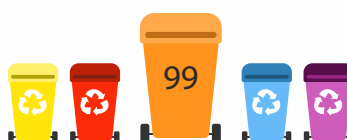
Opportunities

- **Increased community engagement-**
 - Engaging the community for data traceability and accountability through citizen science³.
 - Transferring ownership to the community rather than ULB may give better results in the long run.
- **Opportunity for expansion-**
 - Since their model is proven they have ample opportunities to scale it at a much faster pace.
- **Creating green jobs-**
 - Scaling their impact area will present more opportunities for social upliftment of the informal workforce along with the creation of newer opportunities.
- **Technology Advancements-**
 - Integrating Artificial Intelligence (AI), Machine Learning (ML), drone mapping and other new-age technologies to further improve the efficiency and efficacy of their model.
 - A centralised portal to collect and collate data would help to provide comprehensive insights.

Threats

- **Market competitors-**
 - In order to stay ahead of the curve, their solutions must continuously innovate, scale and remain affordable.
- **Accountability of the ULB -**
 - Dual accountability with the involvement of citizens.

³Citizen science is the involvement of the public to gather data cost-effectively over a large geographical area, while simultaneously raising public awareness of the environmental impacts of plastic waste. (<https://plasticsmartcities.org/citizen-science/#:~:text=Citizen%20science%20%E2%80%93%20the%20involvement%20of,TARGET%20USERS%3A%20Individuals%2C%20Government>)





Ecokaari: Humanising Fashion through Sustainable Upcycling of Single-Use Plastic Waste

[\(Click here for intervention video\)](#)

Author: Nandan Bhat and Shivalika Mohan

1. Location of intervention

Pune, Maharashtra, and Vijaynagar, Karnataka

2. Project background

Ecokaari, a social enterprise, was born from an ardent desire of the team to create a community where bottom-up development is the key to achieving a better living for all in a sustainable way. With an unwavering commitment to environmental conservation and social empowerment, Ecokaari embarked on a transformative journey to combat plastic pollution by redefining fashion through sustainability.

An innovative initiative called "Humanising Fashion", addressing the pressing issue of single-use plastic in India was launched to combat the critical issue of increasing plastic waste in the country.

Through this initiative, Ecokaari weaves together traditional Charkha (Spindle) and Handloom techniques to create exquisite, handcrafted fabrics by upcycling waste plastic. By emphasizing ethical sourcing of waste plastic from waste picker organizations, the initiative not only tackles the problem of plastic waste but also champions the livelihoods of women and youth from marginalized communities in India.

3. Problem description

The Central Pollution Control Board (CPCB) Report (2019-20) stated that India generates a staggering, 3.5 million metric tonnes of plastic waste annually.¹ The improper disposal of plastic waste results in mounting landfills with plastic waste often ending up in water bodies, rivers, and eventually, the oceans, exacerbating the ecological crisis. This poses a severe environmental threat, leading to increased pollution, and adversely impacts wildlife and marine life.

Ecokaari recognised the pressing need for a sustainable and innovative solution to this waste management problem and emerged as a sustainable solution, ingeniously transforming single-use waste plastic like carry bags, multi-layered packs, and glittery gift wraps into exquisite, handcrafted fabrics, while also empowering women and youth from underprivileged backgrounds.

¹<https://www.livemint.com/news/india-generates-3-6-lakh-million-tonnes-plastic-waste-50-of-it-is-recycled-11660029497756.html>



4. Objectives

The objectives of this initiative centred on:

- Address the challenge of non-biodegradable and difficult-to-recycle waste plastic while prioritizing ethical sourcing of waste plastic from waste picker organizations.
- Emphasis on women and youth employment with an aim to create a positive social impact by transforming waste plastic into beautiful fabrics using the traditional Charkha and Handloom.
- Championing eco-friendly practices and empowering marginalized communities to bring about meaningful change in waste management.

5. Implementation details

The innovative and socially conscious green upcycling process employed by Ecolaari involves transforming single-use waste plastic and Multi-Layered Plastics (MLPs) into handcrafted fabrics.

The waste plastics, including carry bags, chips, household items, gift wrappers, audio/video cassette tapes, and e-commerce plastics, are ethically sourced from waste picker communities in Pune. These are then manually cleaned, sanitised, dried, and cut into thin strips. Post cleaning and sanitisation the plastic is sorted based on colour and also various other factors including the thickness of plastics (less than or more than 50 microns), to maintain the consistency of the end-product. Next, these strips are rolled on a traditional charkha and woven into fabric on a handloom device.



The entire weaving process is manual, devoid of electricity, heat, or chemicals, ensuring no further harm is caused to the environment or animals. They use electricity only to stitch the products. The manual process also enables livelihood opportunities for women and youth empowering them to become self-reliant to support themselves, their families, and their education.

Moreover, the initiative includes empowerment programs to equip individuals outside the weaving community with valuable skills. The upcycled handwoven fabrics are then designed, stitched, and transformed into various types of products. Each product also goes through a stringent, manual quality-checking process.

6. Innovative methods/techniques used

Ecokaari's distinctiveness lies in its eco-friendly approach, upcycling single-use waste plastic using traditional Charkha and Handloom. The organization consciously abstains from employing electricity or chemicals during the manual weaving process, minimizing the environmental impact.

By sourcing waste plastic ethically from waste picker organizations, the initiative provides alternative earning opportunities to underprivileged communities. The project showcases the innovative integration of traditional craftsmanship with modern environmental awareness, resulting in the production of unique and sustainable handcrafted fabrics.

7. Financial/revenue model of the intervention

The organization effectively introduced its products in domestic and international markets, receiving commendable responses from consumers. They adopted a diverse revenue model, selling their products through various channels including –

- Personal and corporate gifting
- Pan India events and handicraft exhibitions
- Their website and other third-party platforms
- Exports
- Customizations for designers, including bulk orders

The strategy of utilizing a diverse mix of channels contributed to their increased revenue generation. Additionally, collaborations with renowned designers, like Gaurav Gupta for his Sustainable Show at Lakme Fashion Week, expanded Ecokaari's reach and market presence.



Till May 2023 the organisation was not funded by any external source. However, in May 2023, they were incubated at the incubation centre at IIM-Bangalore (Nadathur S Raghavan Centre for Entrepreneurial Learning -NSRCEL)².

8. Partnerships

In April 2022, the organization initiated a pilot project in Vijaynagar, Karnataka in partnership with JSW Foundation. The targeted beneficiaries of the project are women and youth from underprivileged communities. Through Phase I of the project, they are supporting 25 beneficiaries and have a target to increase this number to 75 by the end of Phase III.

The project focuses on upcycling and offsetting waste plastic bags and MLPs and aims to eventually reach a monthly volume of upcycling 1500 - 2000 kgs of plastic waste by the end of Phase III. The organization has collaborated with Saahas Zero Waste to facilitate direct engagement with waste-picking communities for waste management and sourcing waste plastic required for the initiative. This has significantly contributed to increasing the scale and impact of the project.

Besides, the organization is supporting 25 skilled artisans at their well-established Pune unit which currently upcycles 30,000 plastic bags per month. These artisans from diverse backgrounds and communities are at the heart of Ecokaari's transformative initiative. The organization recognizes the value and potential of these artisans, many of whom have faced socio-economic challenges in their lives.

Under the nurturing guidance of Ecokaari, these artisans have been provided with a supportive and inclusive workspace that encourages creativity and innovation. The Pune unit has become a vibrant hub where traditional craftsmanship and modern environmental awareness seamlessly converge.

Ecokaari's investment in empowering these artisans extends beyond providing livelihood opportunities. The organization conducts regular skill development workshops and training sessions for them to enhance their craftsmanship and expertise. By honing their skills, Ecokaari ensures that these artisans become adept in their ability to create exquisite, handcrafted fabrics from plastic waste.

The success of Ecokaari's Pune unit is not merely measured by the upcycling of waste plastic but also by the profound impact on the lives of these 25 artisans. Their involvement in this eco-conscious endeavour has revitalized traditional weaving techniques and rekindled hope for a sustainable and dignified livelihood.

Through the creative transformation of waste plastic into handcrafted fabrics, these artisans contribute to a greener and more compassionate fashion industry. Their artistry and dedication serve as a source of inspiration, not only to their peers but also to the wider community, encouraging greater awareness and consciousness towards plastic waste management.

As Ecokaari continues to expand its reach and scale its upcycling process, the organization remains steadfast in its commitment to empowering artisans and nurturing a more sustainable, inclusive, and eco-friendly future.

²https://nsrcel.org/mentor_feature/humanising-fashion-with-ecokaari/



9. Challenges and solutions

The organization faced several challenges during the implementation of its innovative plastic waste management solution. The initial hurdle was the procurement of waste plastic in an appropriate form. Another major challenge was to secure funding for scaling the intervention. To overcome these hurdles, the organization proactively sought innovative solutions and collaborations, establishing partnerships with funders like JSW Foundation and organizations like Sahas Zero Waste which are directly working with waste pickers.

Further, the challenge of managing the steep learning curve for training individuals on the process of converting plastic waste to handwoven fabric was addressed by organizing regular skill development workshops and training sessions.

10. Future prospects of the program

The organization aims to replicate and increase the scale of its upcycling intervention by the end of 2026. They plan to set up 100 weaving units pan India, creating job opportunities for approximately 5,000 individuals from marginalized communities.

By significantly increasing the upcycling capacity of each of these 100 units, the initiative plans to upcycle 2,00,000 single-use waste plastic bags per month through each unit. The overall targeted impact by the end of 2026 is upcycling 8,000 plastic bags per day, 2,00,000 waste plastic bags per month or 24,00,000 waste plastic bags per year.

This ambitious expansion aims to address the plastic waste problem on a larger scale, both in urban and rural areas, and provide sustainable livelihood opportunities to marginalised communities.

11. Conclusion

Ecokaari's transformative initiative exemplifies an innovative and socially conscious approach to tackling the mounting challenge of plastic waste in both urban and rural areas. By ingeniously upcycling single-use plastic waste using traditional Charkha and Handloom techniques, Ecokaari not only addresses the pressing issue of plastic pollution but also empowers women and youth from humble backgrounds and provides them with sustainable livelihood opportunities.

The organization's environmentally responsible and inclusive approach is reflected in its ethical sourcing of plastic waste from waste picker organizations and the adoption of a manual and eco-friendly weaving process. This not only benefits marginalized communities and minimizes harm to the ecosystem and wildlife but also showcases their commitment to creating positive socio-economic change.

The initiative's scalability and vision to establish 100 weaving units pan India promises to generate job opportunities for thousands of individuals from humble backgrounds, contributing to a more equitable and sustainable society. By converting waste plastic into exquisite, handcrafted fabrics, the organization redefines fashion with sustainability, demonstrating the immense potential for creative and conscious solutions to pressing environmental challenges.

With a commitment to fostering sustainable livelihoods and a greener future, Ecokaari's pioneering approach serves as an inspiring example for organizations and communities across India and beyond. As the world grapples with the urgent need to address plastic waste, Ecokaari's innovative way of managing plastic waste through upcycling stands as a beacon of hope, leading the way toward a more sustainable and empowered tomorrow.



SWOT analysis of Ecokaari

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Capacity building and training for PWM (A3)
 - Upcycle (O2)
- **Addressing the problem of SUPs and MLPs-**
 - Ecokaari through their initiative 'Humanising fashion' is upcycling plastic waste to create exquisite, handcrafted fabrics.
 - They target non-biodegradable and difficult-to-recycle waste plastics, especially SUPs and MLPs.
- **Use of climate-conscious manufacturing techniques-**
 - The entire process right from cleaning plastic waste to weaving the end product is manual, devoid of electricity, heat, or chemicals, ensuring no further harm is caused to the environment or animals. Electricity is only used for stitching the products.
 - Using traditional Charkha (Spindle) and Handloom techniques promotes and helps to sustain our age-old heritage of weaving technique.
- **Livelihood opportunities by empowering the communities-**
 - The organisation ensures a trained and skilled workforce by conducting regular skill development workshops and training sessions for women and youth including those outside the weaving community, to enhance their craftsmanship and expertise.
 - This not only provides livelihood opportunities but also empowers individuals to become self-reliant.
 - These artisans have been provided with a supportive and inclusive workspace that encourages creativity and innovation.
- **Sourcing of plastic waste-**
 - Ethical sourcing of plastic waste builds credibility among the waste collectors. This helps in maintaining a steady and sustainable supply chain of plastic waste.

Weakness

- **Geography-**
 - Their area of intervention is currently small (in Pune, Vijaynagar).
- **Lack of diversification, processing only certain kinds of plastic waste.**
- **Lack of partnership/collaboration with any government agencies may create bottlenecks in their operation and expansion plans.**
- **Technology-**
 - Adopting manual processes to manufacture their products may limit their waste processing capabilities.
- **Gaps in closing the loop-**
 - Addressing only one part of the plastic waste management value chain hinders the attainment of the zero waste to landfill goal-processing any kind of waste generates residue waste which the organisation is not managing.



- **Revenue model-**

- They adopted a diverse revenue model which reduces the chances of failure in case of bottlenecks in any stream.
- Various sale channels include –
 - Personal and corporate gifting
 - Pan India events and handicraft exhibitions
 - Their website and other third-party platforms
 - Exports
 - Customizations for designers, including bulk orders
- It also contributes to their increased revenue generation (\$67.9K as on Mar 31, 2022³).

- **Partnership/collaborations-**

- Collaborations with renowned designers, like Gaurav Gupta for his Sustainable Show at Lakme Fashion Week, expanded Ecokaari's reach and market presence.
- Partnering with corporates like JSW Foundation helps the organisation replicate its model in newer geographies.
- Collaboration with organisations involved with the waste-picking communities like Saahas Zero Waste helps maintain a steady supply of plastic waste.
- These partnerships and collaborations have not only improved the efficacy of their operations but have also helped establish them as an environmentally conscious and socially positive organisation.

³https://tracxn.com/d/companies/ecokaari/_2fAs1CH4XovjeYE5v4T02gv_Ns505_oJQU5OKHCswIE



Opportunities

- **Opportunity for expansion-**
 - The organization aims to replicate and increase the scale of its upcycling intervention by the end of 2026.
 - They plan to set up 100 weaving units pan India, creating job opportunities for approximately 5,000 individuals from marginalized communities.
 - It plans to upcycle 2,00,000 single-use waste plastic bags per month through each unit.
 - The overall targeted impact by the end of 2026 is upcycling 8,000 plastic bags per day, 2,00,000 waste plastic bags per month or 24,00,000 waste plastic bags per year.
 - The model could be replicated near the production/manufacturing units of corporates to leverage CSR funds.
- **Increasing the social impact of the organisation -**
 - By expanding its operations, the organisation can provide more livelihood opportunities to underprivileged communities/artisans.
- **Integrating eco-friendly technology-**
 - Using eco-friendly technologies for processing plastic waste will ensure that the carbon footprint remains low along with increasing their processing capacity.

Threats

- **Mass production and uniqueness-**
 - Their process is manpower intensive and heavy reliance on the workforce can impact the quality of finished products as well as the sustainability of the organisation.
- Lack of availing diverse funding options may limit their scaling opportunities (they have been incubated only recently by the IIM-B incubation centre, NSCERL)⁴.
- Lack of proper fund management and continuous cost reduction along with innovation may render the model inefficient.
- Government buy-in is an essential prerequisite for the sustenance of any model. Ecokaari lacks this.

³https://nscerl.org/mentor_feature/humanising-fashion-with-ecokaari/





Transforming India's Perception of Plastic Waste: A Case Study on Recycle India's Waste Management Campaign

Author: Ashish Agarwal

1. Location of intervention

The Recycle India campaign was launched nationwide, covering various urban centres and cities across India.

2. Project background

The burgeoning problem of plastic waste in Municipal Solid Waste (MSW) poses a critical challenge for urban India, necessitating urgent action and innovative solutions. In response to this pressing environmental concern, Recycle India, a prominent NGO in waste management, took the lead in launching a comprehensive and impactful campaign aimed at transforming people's perception of plastic waste and promoting responsible waste management and recycling practices.

The Recycle India campaign was born against the backdrop of the COVID-19 pandemic. The primary goal of this initiative was to raise awareness and educate people about the significance of effective waste management. The campaign ingeniously introduced the concepts of "Waste to Wealth" and "Wealth in Waste," capturing the attention of the people of India. Through captivating and interactive content, the campaign forged connections with individuals, instilling a profound sense of responsibility towards waste disposal practices.

By debunking the notion of solely banning plastic packaging, Recycle India's approach emphasized the paramount importance of embracing proper waste management and recycling as sustainable and viable solutions.

3. Problem description

Amidst discussions around the prospective ban on plastics in India, Recycle India recognized the multifaceted implications of such a move. Instead of attributing the issue solely to packaging, the campaign delved deeper, unearthing the root causes of littering and inadequate waste collection. A pivotal realization emerged that the livelihoods of waste pickers were intricately tied to the very waste being discussed. Any drastic ban or restriction on plastic packaging could lead to catastrophic consequences for these vulnerable individuals and their means of sustenance. Moreover, the flourishing recycling industry in the country stood at risk of significant disruption. Armed with this discerning understanding, the Recycle India campaign sought to instigate a fundamental transformation in people's behaviour and attitudes toward plastic waste. The campaign's primary objective was to instil a strong sense of responsibility and encourage people to actively participate in the proper disposal of waste and endorse recycling as a sustainable and long-term solution.



4. Objectives

The main objectives of the Recycle India campaign were to:

- Transform people's perceptions of plastic packaging and waste.
- Encourage responsible decision-making regarding plastic waste disposal.
- Promote sustainable recycling practices.

5. Implementation details

The success of the Recycle India campaign hinged on a well-planned and meticulously executed program implementation. Recognizing the importance of comprehensive research to understand the mindset of the Indian population concerning plastic waste and littering, exhaustive research was conducted as the first step to design the Recycle India campaign. Based on the insights of this research, the organization launched its flagship campaign.

a. Research insights: Unveiling the Mindset

Before launching the campaign, Recycle India embarked on a comprehensive research phase. The team conducted surveys, interviews, and focus groups across different demographics to gauge public perceptions and attitudes toward plastic waste. The research findings were eye-opening, revealing that many individuals lacked a deep understanding of the detrimental impact of plastic waste on the environment and public health.



Moreover, the research helped to dispel misconceptions about the role of plastic packaging in waste management. It became evident that people attributed the problem solely to the packaging itself, overlooking the vital aspect of proper waste disposal and recycling.

Besides, one of the key findings of the research was that India's informal recycling system was a significant strength that had already positioned the country ahead of many nations in the West and the East. Armed with these insights, the campaign was designed to address these misconceptions head-on.



6. Innovative methods/techniques

The campaign strategists recognized that to bring about a lasting change in behavior, the message needed to be powerful, memorable, and engaging. Consequently, they invested in a creative approach that could resonate with people from all walks of life. Hard-hitting creatives and videos were crafted with a focus on delivering a profound message while evoking an emotional response.

The visuals used in the campaign were thoughtfully designed to depict the consequences of unchecked plastic waste, showcasing its harmful effects on the environment, wildlife, and human health. By presenting real-life scenarios and potential future scenarios if the issue persisted, the campaign stirred a sense of urgency and responsibility among the audience.

a. Leveraging social media platforms

Recognizing the importance of adapting to the prevailing circumstances, especially during the Covid-19 pandemic, Recycle India strategically leveraged social media platforms. Facebook, Instagram, and Twitter became the primary channels to disseminate the campaign's message to a broad audience effectively. Social media provided a cost-efficient and far-reaching means of connecting with people, even amidst lockdowns and social distancing measures.

The team ingeniously utilized the power of storytelling and relatability to craft simple yet humorous images and videos. These captivating visual content pieces helped break down complex waste management concepts into easily digestible and shareable formats. As users engaged with and shared the content within their social circles, the campaign's reach expanded exponentially, fostering a sense of community responsibility toward waste management and recycling.

7. Financial/revenue model

As an NGO, Recycle India primarily relied on donations and grants to fund its campaign.

8. Partnerships



Recognising the power of partnerships and community involvement, Recycle India collaborated with local stakeholders, civic bodies, educational institutions, and waste management agencies. These collaborations helped amplify the campaign's reach and fostered a sense of ownership and responsibility among different segments of society.

The NGO also empowered grassroots volunteers and waste pickers to act as ambassadors for the cause. By engaging these individuals who were directly impacted by waste management practices, Recycle India created a sense of pride and purpose in their efforts to educate their communities and promote responsible waste disposal.



9. Challenges and Solutions

a. Monitoring and adaptation

Throughout the implementation of the campaign, Recycle India continually monitored the response and impact of its outreach efforts. Analysing audience feedback, engagement metrics, and sentiment analysis allowed the team to gauge the campaign's effectiveness and make data-driven improvements.

In response to challenges or instances where the content did not resonate as expected, the NGO remained agile and open to adjustments. Feedback loops were established to gather insights directly from the audience, enabling the campaign to be refined iteratively.

This approach of learning from both successes and setbacks enabled Recycle India to fine-tune the messaging and maximize the campaign's effectiveness.



10. Conclusion

The successful implementation of the Recycle India campaign was a result of meticulous research, creative storytelling, strategic use of social media, and a commitment to learning and adapting. By addressing the root cause of the issue – a lack of awareness – and employing innovative communication methods, the campaign effectively transformed perceptions and behaviours toward plastic waste management. The case study of Recycle India stands as an inspiring example of how a well-executed waste management campaign can create a positive and lasting impact on society's approach to curbing plastic waste.



SWOT analysis of Recycle India's case study-

<p><u>Strength</u></p> <ul style="list-style-type: none"> • Contribution in the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Awareness building and BCC for plastic waste management (PWM) (A2) • Developed a research-based campaign - <ul style="list-style-type: none"> • It was able to debunk notions, expel myths and engage people with hard-hitting creatives. • Use of digital platforms for advocacy - <ul style="list-style-type: none"> ○ This helped in expanding reach and gathering real-time insights to modify the campaigns appropriately. • Collaboration and partnerships- <ul style="list-style-type: none"> ○ Multi-stakeholder engagement with various government and non-government institutions helped amplify the reach of the campaign. • Social Impact- <ul style="list-style-type: none"> ○ Empowered grassroots volunteers and sanitation workers by titling them as waste management ambassadors. 	<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Gaps in measurement of impact evaluation- <ul style="list-style-type: none"> • Lack of adequate impact measurement system. • Efficiency of communication cannot be measured. • Addressing only the management of plastic and not reducing its consumption.
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Implement innovative campaigns, training and workshops- <ul style="list-style-type: none"> • Rather than only building waste management ambassadors, Recycle India Foundation should focus on building their capacities so that dissemination of correct information is ensured. • They should also plan to provide capacity-building sessions/workshops to increase the effectiveness of their model. • Tie-ups with corporates for implementing the BCC campaigns in areas adjacent to their manufacturing units. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Budget Constraints- <ul style="list-style-type: none"> • Dependency on donations and grants might result in budget constraints, limiting the campaign's ability to scale or sustain its efforts. • Impact assessment- <ul style="list-style-type: none"> • Without conducting effective impact assessment, campaigns may not yield the expected results.





Revolutionizing plastic waste management through Tech-Enabled Source Segregation

Author: Erin Burneson

1. Location of intervention

Jaipur, Rajasthan

2. Project background

In 2015, Mr. Angraj Swami, co-founder of Ecowrap, initiated a recycling unit in Delhi to encourage recycling practices in India. However, the scarcity of recyclable materials within the country posed a significant challenge. Surprisingly, most recyclers relied heavily on imported waste. Therefore, in 2019, Angraj Swami and three associates decided to establish ECOWRAP in Jaipur, Rajasthan. Drawing from eight years of experience in solid waste management, Angraj's knowledge formed the core of ECOWRAP. Their objective was to transform waste management by creating a sustainable solution that not only recycles waste but also ensures a steady supply of recyclable materials in India. ECOWRAP emerged as a promising initiative aimed at tackling India's recycling difficulties and steering towards a more environmentally friendly future.

3. Problem Description

ECOWRAP focuses on promoting sustainability through source segregation, an aspect predominantly tied to human behaviour. The key challenge in achieving sustainable solid waste management is the lack of source segregation. Without this practice, the waste management sector cannot be financially or technically feasible. ECOWRAP provides a technology-driven reverse supply chain solution, emphasizing waste segregation at its source. They offer waste generators essential infrastructure like free dustbins, decentralized door-step waste collection, training, and a technology-driven process to encourage public involvement in waste segregation. Waste generators receive rewards based on their segregation performance and ratings. Leveraging their expertise, they've converted 847 bulk waste generators into "zero dumping" entities, successfully diverting 90% of waste from being deposited in landfills.



4. Objectives

The primary objectives of the organization encompass fostering a widespread culture of waste segregation and achieving the recovery of up to 90% of waste for integration into a circular economy. This involves:

- **Promoting Waste Segregation Awareness:** Instilling a sense of responsibility among communities, industries, and households by raising awareness about the significance of waste segregation. Encouraging them to participate actively in separating recyclables from non-recyclables at the source.
- **Infrastructure Development:** Providing the necessary infrastructure to support effective waste segregation, including the distribution of bins, decentralized waste collection systems, and promoting the use of technology-driven solutions for streamlined waste segregation.
- **Training and Education:** Implementing training programs for waste generators to educate them on best practices in waste segregation, emphasizing the environmental and economic benefits of this approach.
- **Incentivizing Segregation:** Establishing systems to reward and incentivize waste generators who consistently segregate their waste.
- **Zero Landfill Goal:** Working towards a "zero landfill" vision, where a minimal amount of waste ends up in landfills, the aim is to channel a significant portion of waste back into the circular economy through recycling, reusing, or repurposing.
- **Collaboration and Partnerships:** Forging alliances with government bodies, corporations, non-profit organizations, and other stakeholders to create a collective effort in promoting waste segregation and circular waste management.
- **Measurable Impact:** Establishing metrics and tracking systems to measure the impact of waste segregation efforts, with a specific focus on achieving the 90% waste recovery target. This data-driven approach helps in assessing and improving the effectiveness of these objectives.



By expanding and diversifying these objectives, the organization aims to lead the nation towards comprehensive waste management and a more sustainable, circular economy.

5. Implementation Details

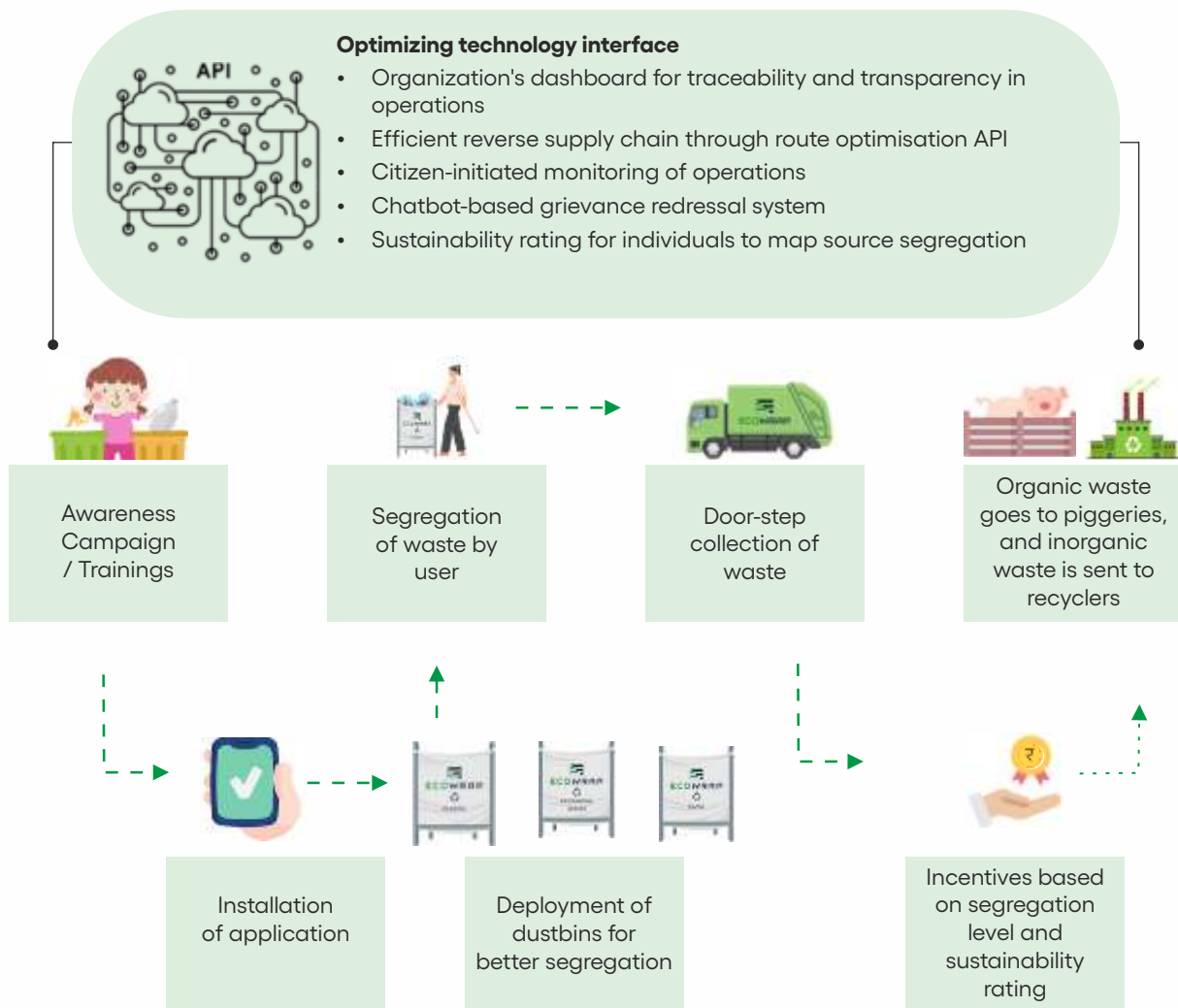
The organization has devised two business models: Business-to-Business (B2B) and Business-to-Government (B2G). They collect waste from all types of waste generators: HORECA, businesses, schools, colleges, companies and other commercial establishments.



B2B: For this model, the organization has tailored its services for the hospitality industry, which generates a significant amount of waste daily. Ecowrap provides services such as free dustbin installation, segregation training, doorstep waste collection, sustainability ratings, and the transfer of collected waste to recyclers and piggeries.

B2G: For this model, they implement a three-phase approach to achieve primary and deeper segregation in designated zones. This involves integrating technology and enhancing waste collection systems to establish zero-dumping zones, promote deeper segregation, and ensure 90% diversion from landfills.

Implementation process



The implementation process starts with awareness campaigns and training post which the users are motivated to install the ECOWRAP application. The organisation then deploys IoT-enabled dustbins (Eco-Patras) free of cost for better source segregation of waste. Real-time data is collected from these dustbins. There are 5 types of Eco-Patras, each dedicated to a particular type of waste. To reduce carbon emissions from their



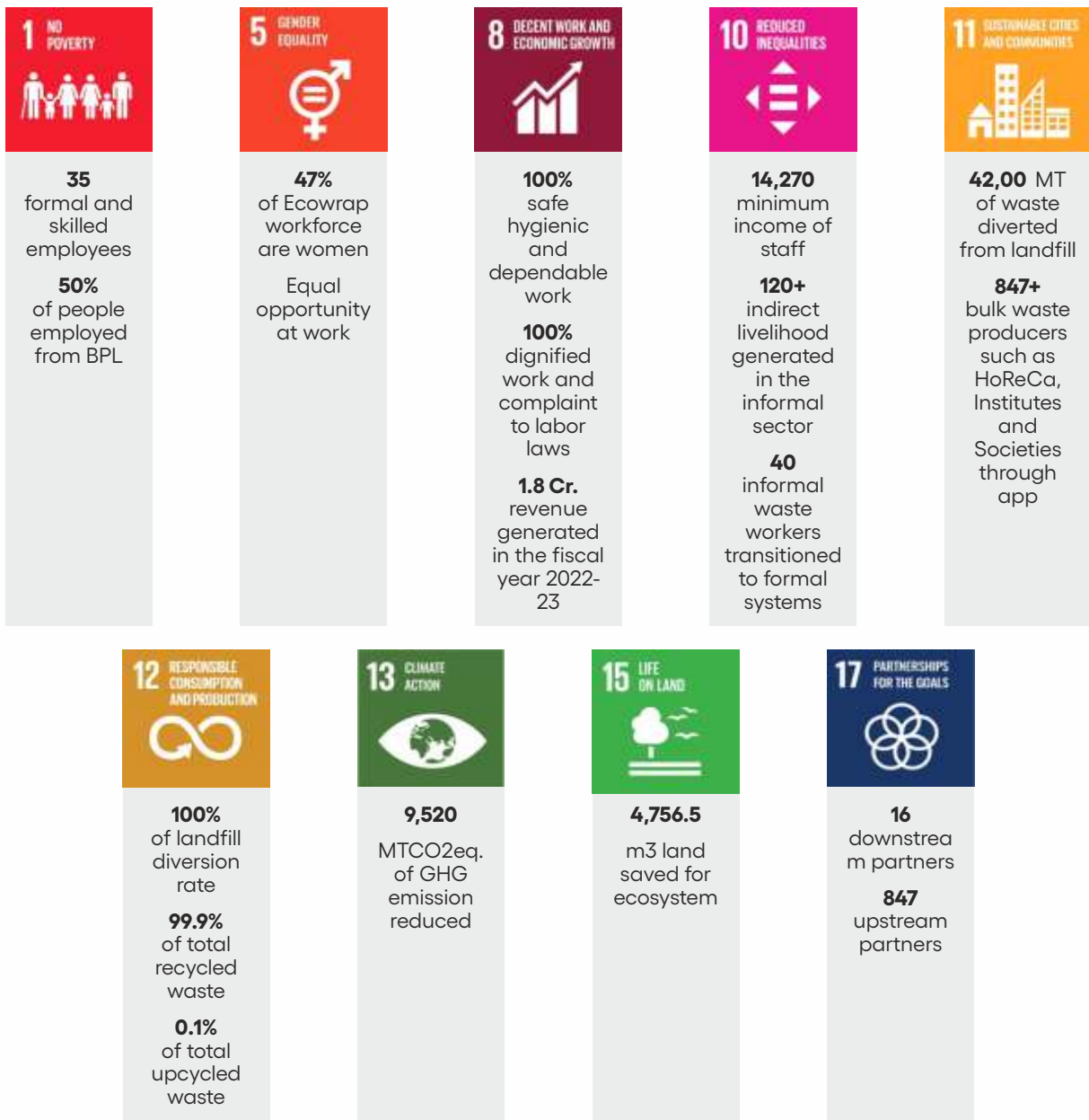
logistic vehicles, the "Eco Patras" (Smart Bins), decide the shortest route to reduce the distance travelled and provide time-bound service with the help of GPRS and load sensor data. Based on the quantity of segregated waste provided, ECOWRAP gives the title of 'Green Champions' to household users. The segregated waste is then collected, and incentives are provided on the user fee based on the quantity and quality of waste collected. The maximum incentive is 40% to 'Green champions' and 60% to HORECA.

The collected organic waste is sent to piggeries and inorganic waste is sent to partner recyclers.

ECOWRAP also provides quarterly waste audit reports to their partners stating the positive impact they have created.

Through its sustained efforts the organization has been able to create a remarkable impact and is contributing towards the attainment of several SDGs (Sustainable Development Goals) as depicted in the picture below:

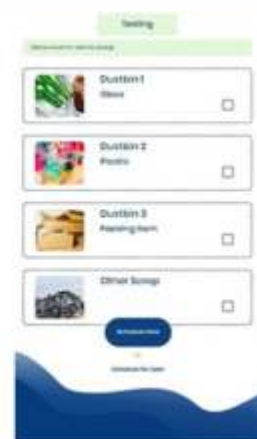
Creating Impact



6. Innovative Methods/Techniques used

ECOWRAP leverages advanced technologies, including waste tracking systems, data analytics, and citizen-centric platforms, to streamline waste management processes and enhance transparency. Their approach includes:

- Categorization and geotagging of properties for effective waste management.
- Transparent collection and processing methods, optimizing waste collection pickups and tracking the volume and type of waste collected.
- City-wide sustainability ratings and tracking, enabling individuals and communities to monitor their segregation activities.
- Competitions to motivate source segregation and improve the quality of recyclables (providing clean, dry, contamination-free recyclables).
- Complaint redressal system for citizens to raise concerns and track the status of their complaints in real-time.
- Real-time monitoring and tracking of waste, ensuring efficient waste collection and tracking the amount, type, and disposal of waste.



7. Financial/Revenue Model

ECOWRAP received seed funding from Social Alpha, Villgro and JITO Incubation and Innovation Foundation.

The revenue model employed by the organization encompasses a diversified approach to generating income. They collect user fees for the range of services they offer, creating a sustainable financial structure. Additionally, they engage in the sale of source-segregated, less contaminated waste, not only fostering the recycling process but also establishing a steady revenue stream.



The organization is committed to environmental sustainability and actively participates in the carbon credit market by offsetting carbon emissions. Moreover, they play a role in the FMCG & Upcycled Products Marketplace, a platform facilitating the sale of various items derived from recycled materials.

Through these endeavours, they contribute to reducing waste while creating a marketplace that supports the development and sale of eco-friendly products, furthering the goals of a circular economy.

8. Partnerships

The organization has effectively expanded its reach and impact through numerous strategic partnerships and collaborations. This includes their partnerships with 847 HoReCa establishments (comprising Hotels, Restaurants, and Cafés), which signifies a substantial alliance aimed at tackling waste management within the food and hospitality sector.

In addition, the organization has fostered a productive reverse supply chain model focusing on aluminium through a partnership with Hindalco Group, a leading player in the metals industry. This collaboration emphasizes responsible sourcing and recycling of aluminium, contributing to a more sustainable materials lifecycle.

To empower and uplift rural women, the organization has initiated training programs under the Muskaan project, promoting skill development and self-reliance. Project Muskaan aims to empower rural women to achieve financial independence. Through this upcycling initiative, waste materials are utilized to create unique and beautiful products.

Furthermore, in an effort to minimize waste generation within the entertainment industry, the organization has partnered with Greenmyna for zero-waste film shoots. This collaboration underscores the importance of adopting eco-friendly practices in a traditionally resource-intensive sector, aiming for more sustainable and environmentally responsible film production.

The organization's commitment to promoting cleanliness and sustainability is further



demonstrated through its role as the sustainability partner for Swachh van Abhiyan 5.0, an initiative organized by eco rescuers. This collaboration underscores the organization's dedication to advancing cleanliness and sustainability, particularly within local communities. Through these diverse partnerships, the organization is actively contributing to sustainable practices, community development, and environmental conservation.



9. Challenges and Solutions

The initial challenge was collecting recyclables for the sustainability of their business. They tackled this by launching waste collection initiatives. Another hurdle was educating and raising awareness among customers about the importance of segregation. To overcome this, they implemented education and awareness programs. To maintain customer interest in segregation, which dwindled over time, they introduced incentives to encourage ongoing participation.

10. Conclusion

ECOWRAP has emerged as a promising initiative to tackle India's recycling challenges and promote a greener future. With a primary objective to encourage waste segregation and recover up to 90% of waste for circular integration, they've innovatively addressed challenges in waste management, offering technology-driven solutions. Their unique approach encompasses tailored business models, partnerships across various sectors, and active involvement in the carbon credit market and FMCG & Upcycled Products Marketplace. ECOWRAP is committed to promoting environmental sustainability while contributing to a cleaner, more sustainable future for India.

The organization envisions to make India waste-free by 2030, contributing to a cleaner and more sustainable future. By implementing innovative waste management solutions, they aim to create a positive impact on the environment and society.

SWOT analysis of ECOWRAP

Strength	Weakness
<ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Capacity building and training for PWM (A3) ○ Data collection and integration across the chain (A4) ○ Collection/Transportation (RR3) ○ Upcycling (O2) • Use of technology to close the loop- <ul style="list-style-type: none"> ○ ECOWRAP leverages advanced technologies and innovative methods for waste management, such as waste tracking systems, data analytics, and citizen-centric platforms, which enhance transparency and efficiency. • Supply chain optimisation- <ul style="list-style-type: none"> ○ The model focuses on source segregation of waste in multiple categories, thus eliminating the need for an MRF/processing facility. ○ Therefore, it ensures a steady supply of raw materials to the recyclers. 	<ul style="list-style-type: none"> • Initial behaviour change- <ul style="list-style-type: none"> ○ It might be difficult to scale the project to newer territories without substantial awareness training and behaviour change about source segregation. • Without an MRF/processing facility integrated into the model, cleaning and storage of segregated waste may impact the efficiency of the model. • Single channel for processing organic (piggeries) and inorganic waste (recyclers). • They only accept specific types of waste e.g. in plastics they accept only PET and HDPE.



- **Diverse funding and revenue Streams-**
 - The organization has received seed funding from multiple accelerators/incubators.
 - Revenue streams include user fees, selling source-segregated waste, participation in the carbon credit market, etc, ensuring their financial sustainability.
- **Partnership/collaborations-**
 - Strong partnerships of the model ensure a steady supply chain (847 HoReCa establishments) on one hand and a steady source of revenue (recyclers) on the other hand.
- **Innovative methods to encourage source segregation-**
 - Recycling competitions with cash prizes
 - Discounts on user fees.
 - Sustainability ratings and waste audit reports.

Opportunities

- Providing EPR services to BWGs.
- They have majorly targeted the hospitality sector and they have the opportunity to expand to other sectors.
- They have the opportunity to expand their accepted list of waste to include other forms of waste (e.g., low-value flexible plastic)
- Explore multiple channels for the end-use of plastic waste.
- **Increasing government partnerships-**
 - With their proven model (B2G), they have the potential to expand pan India.
- **Prove model for source segregation for waste-**
 - Source segregation is a major challenge in the waste management sector. This being a proven model where waste is voluntarily segregated at source, its relevance in the current scenario is immense.

Threats

- **Supply Chain Disruptions-**
 - Fluctuation in the demand and price of recyclables may threaten revenue generation.
 - In the absence of any storage facility, it may be difficult to continue the collection process.
- **Social Resistance-**
 - If the waste is not segregated while being disposed of in the Eco-Patras, then the model will be rendered inefficient as there is no provision for sorting facilities.





Saahas Zero Waste: Empowering Waste Workers and Transforming the Plastic Value Chain

[\(Click here for intervention video\)](#)

Author: Arun Muruges, Sayuja Suresh Babu, Jaidev K, Prathik E and Vivek C

1. Location of intervention

Bangalore, Chennai and Udupi

2. Project background

Saahas Zero Waste (SZW) is committed to fostering a circular plastics economy in India by addressing the challenges of plastic waste management and social inclusion. The organization recognizes the vital role played by the informal sector in the waste value chain and seeks to formalize and professionalize this sector. SZW's intervention begins with identifying and supporting project leaders (entrepreneurs) who are crucial in driving transformation. A baseline assessment evaluates these leaders and the scope of interventions, followed by one-time infrastructure support for machinery procurement and ensuring adherence to health and safety standards in the facility. Capacity building focuses on adopting formal processes and ensuring social justice for employees, while regular monitoring ensures compliance and informs ongoing improvements. SZW aims to maximize social and environmental impact through these initiatives.

3. Problem description

In India, the informal waste sector serves as the backbone of waste collection, channelization, and processing. Paradoxically, workers in this sector endure substandard working conditions, meagre incomes, and limited social support. The absence of standardized scientific waste handling & processing systems, coupled with the absence of Extended Producer Responsibility (EPR) policies for specific waste streams like textile, sanitary, etc., leads to improper disposal with much of the waste ending up in landfills, burned, or downcycled. Through the theory of change exercise, SZW identified four critical challenges to building an inclusive society: the lack of access to a secular identity and dignified livelihoods; social stigmatization, discrimination, and harassment; limited resource recovery leading to environmental degradation & resource loss; and exclusion from social support, undignified livelihood. Thus, the professionalization of waste workers leading to an inclusive society is essential for transforming the linear plastics system into a circular plastics economy.



4. Objectives

The initiative has threefold planned objectives:

- Infrastructure development for safe and healthy working conditions, better resource recovery, data capturing, etc.;
- Capacity building to transition towards adopting the formal process of operations, social justice to employees and upstream partners; and
- Facilitating a viable business case through additional revenue streams like user fees, EPR service fees, ethical sourcing surcharge, incentives for plastics recovery (plastic credit, ocean-bound plastic), etc.

5. Implementation details

Purpose, design, and geographical coverage:

- The project tackles the problem of plastic recovery and management along with the informal nature of plastic supply chains. It addresses the identified issues by empowering social entrepreneurs in the waste management sector- to scale up and bring about socio-economic transformation for workers in this sector as well as build a viable business model for maximum plastics recovery.
- SZW selected 3 entrepreneurs from a curated network of partners and through a proven approach facilitated the setting up of 3 Plastic Recovery Facilities (PRFs) for them.
- Key environmental and social outcomes were achieved including improved plastics recovery through the application of technology, reduced GHG emissions, and improved economic opportunities for waste workers.
- The project aimed to recover approximately 3,300 metric tons of plastic per year from Chennai, Udupi, and Bangalore.



Implementation process and impact:

- The required infrastructure i.e., Baler, Conveyor, and mezzanine; secondary sorting conveyor; and Shredder were installed in all PRFs to improve sorting efficiencies and better price realisation.
- The SZW team provided support to get all the necessary approvals from the government namely: NOC from local body, trade license, SPCB approval (in the application stage), and factory registrations.
- Tracer (a traceability platform developed to maintain the supply chain traceability of plastic waste) has been installed in all PRFs. Though the tracer platform is not open source, it can be customized and used for different types of waste being used in any other city.



- They are also in the process of implementing a system for scanning the incoming plastic waste through a vision system, enabling improved quality analysis of waste.
- Workshops were conducted, where- basis the post-consumer plastic waste ecosystem at respective locations, a standard process layout was established. The PRFs were designed with a focus on process, data & documentation. A strong emphasis was laid on a viable annual business plan.
- Considering the operations- Profit & Loss and cash flow planning was done keeping in mind individual investment requirements, viability gap funding utilization, and a month-on-month ramp-up.
- **EHS, Fire Safety, and First aid training were given to the workers in the PRF.** The importance of the use of proper uniforms, shoes, gloves, and masks was highlighted concerning occupational health and safety. A focused training on fire safety was carried out. As part of monitoring, **Quality, Environmental, Health and Safety Management System (QEHS) and iMust audits** were conducted.
- **The workers hired for the different PRFs belonged to the informal sector.** This made it mandatory to conduct an induction program and provide them with hands-on training related to material characterization, sorting, and processing of waste along with proper use of PPEs.
- Entire documentation and end-to-end material movement has been maintained on Tracer at the respective PRFs. Additionally, physical traceability was maintained separately. Training & capacity-building sessions were also conducted to enable compliance.
- Currently there are no plans to in place an automated buyer system to buy the waste from other industries. However, given their extensive supply chain, SWZ is well positioned to understand and sample different types of plastic waste generated in the ecosystem, understand and map the end destinations, and accordingly accept higher quantities.



Impact:

- More than 652 MT of plastic diverted from landfills.
- Beneficiaries of this intervention include – **43** Field staff (who are the direct beneficiaries), 7 Transport vendors, 7 waste management entrepreneurs from whom waste was sourced along with more than 100 of their waste workers, and **55** school-going children of the field staff, taking the total number of beneficiaries to **more than 212**.





6. Innovative methods/techniques

This project stands as a pioneering endeavour in the realm of social inclusion. It comprehensively addresses the **professionalization of informal waste workers**, with the primary beneficiaries being these field staff. **Remarkably, the approach is channelled through the leaders of these waste workers, represented by the three selected entrepreneurs.**

Moreover, this initiative diverges from the conventional understanding of formalization, which typically revolves around social status, identity, and specific government schemes. Under this project, a holistic perspective is adopted, encompassing issues such as resource loss, systemic deficiencies, exclusion, limited livelihood opportunities, and technological inadequacies.

Recognizing the profound impact of infrastructure and technology on plastic resource recovery, this project adopts a holistic rather than piecemeal approach. The multifaceted inputs include mapping and trust-building with entrepreneurs and their teams, infrastructure upscaling and enhancement, skill development training, the establishment of a robust social support system, leveraging social learning, and implementing technological innovations.

These comprehensive efforts yield diverse outcomes, including the creation of a traceable database for waste workers, improved access to government schemes and financial instruments, provision of basic amenities and safety equipment, and the integration of over 43 waste workers into formal institutes, fostering gender equality. Moreover, it enhances waste handling capacities at the Plastic Recovery Facilities (PRFs) while adhering to best waste management and Quality, Environment, Health, and Safety (QEHS) practices.

Notably, this project distinguishes itself from existing models by not only promoting improved waste management practices and enhanced resource recovery rates but also by actively progressing toward the establishment of sustainable business models.



Key innovative interventions in this project encompass –

- Infrastructural development i.e. Baler, Conveyor, and Shredder for improving efficiencies, moving up the value chain, and better price realisations.
- Tracer (data encryption through blockchain technology) for end-to-end traceability of the waste, access to dashboards, and for simplified and efficient conduct of audits.
- MIS on the Zoho creator platform for comprehensive tracking of all KPIs, digitalised management of operational data, automated generation of monthly P&Ls, effective inventory management, etc.
- Digital weighing kit to minimize human errors, ensure reliable data, and yield cost savings by eliminating manual data entry.

Furthermore, the project team is actively testing and implementing two additional tools: asset monitoring for precise machine location tracking, notification of undesirable asset movement to production leads, utilization of runtime data for preventive maintenance planning, and real-time monitoring of production data; and quality control through vision sensing for material purchases based on verified quality, conducting thorough material analysis to ensure quality and minimize deductions imposed by recyclers.

7. Financial/revenue model of the intervention

The initiative has been supported by IKEA Social Entrepreneurship B.V. as part of its commitment to implementing the IKEA Concept. Aligned with their strategic roadmap aimed at generating a positive impact on people, society, and the planet, Inter IKEA Systems B.V. entrusted IKEA Social Entrepreneurship with supporting social entrepreneurship projects, both within and outside the IKEA value chain. This initiative is designed to harness the social influence of the IKEA business, ultimately bolstering the IKEA brand and Concept while fostering positive change in the realms of people's lives, society, and the environment.

In light of this overarching vision, Saahas Zero Waste (SZW) proposed a project aimed at creating a proof of concept for the transformation and formalization of plastic waste management. This ambitious endeavour centres around the Plastic Recovery Facilities (PRFs) and their role in crafting a value-driven model.

To execute this vision, SZW meticulously formulated a comprehensive program budget. This budget encompassed critical elements such as funds allocated for infrastructure development across all facilities, financial support for bridging crucial working capital gaps, building ethical supply chains, ensuring fair wages, covering SZW's project management expenses, as well as costs associated with project coordinators, marketing initiatives, event coordination, and the creation of informative blogs, articles, and video content.





Demonstrating a substantial commitment to the project's execution, IKEA Social Entrepreneurship B.V. made a total financial commitment of INR 868 lakhs + taxes. So far from this sum, SZW has judiciously spent INR 462 lakhs for on-ground activities. Notably, a substantial portion of these funds, approx. 77%, has been directed towards critical infrastructure acquisitions, while 7% has facilitated essential gap funding. The remaining 15% has been allocated to support SZW's dedicated teams, ensuring the seamless execution and success of this transformative initiative.

8. Partnerships

This initiative engages a diverse range of stakeholders, each playing an important role in its success:

- IKEA Social Entrepreneurship B.V.- Serving as the project's primary funder, IKEA Social Entrepreneurship B.V. provides crucial financial support, aligning with their commitment to promoting impactful social entrepreneurship initiatives.
- Entrepreneurs- Three dedicated entrepreneurs helm the operation of the three Plastic Recovery Facilities (PRFs). Empowered through one-time infrastructure support, capacity building, and comprehensive business development, they serve as the driving force behind the project's on-ground success. These entrepreneurs are also instrumental in monitoring and reporting their operations, providing valuable data and feedback that is used by Saahas Zero Waste (SZW) to refine the inclusion framework and/or operational model.
- Bulk Waste Generators and Aggregators- These vital stakeholders are instrumental in maintaining the waste supply chain. They are mapped and actively participate in sourcing waste materials for the PRFs, ensuring a consistent flow of materials for processing.
- Recyclers, Co-Processors, and Waste-to-Energy Entities- Serving as the end destinations for the waste processed in the PRFs, these stakeholders form a critical link in the recycling and waste management ecosystem. They play an essential role in the final stages of waste transformation, ensuring that materials are effectively and sustainably managed.
- Saahas Zero Waste (SZW)- As the project's executor, SZW shoulders the responsibility of overseeing, monitoring, evaluating, and managing the initiative's day-to-day operations. Their multifaceted role is crucial in ensuring the project's overall success and its alignment with its intended social and environmental impact.



9. Challenges and Solutions

The initiative encountered a set of common challenges across all locations, and the project team devised specific approaches to address each one effectively:

Challenges	Approach
Unavailability of skilled workforce and low retention rate	The team focused on upskilling the existing field staff through dedicated training programs conducted at SZW's own facility. This strategy aimed to enhance the skills of the current workforce, mitigating the challenge of a shortage of skilled personnel and improving staff retention.
Cash flow crunch due to unavailability of working capital	To overcome financial constraints and navigate the fluctuating raw material prices, the project increased the budgets allocated for gap funding. This financial support facilitated the entrepreneurs with their initial working capital requirements and ensured the establishment of ethical supply chains, fair wage practices, and financial stability.
High volatility of raw material prices	
Delay in obtaining legal authorisations from local government bodies	Recognizing the importance of government authorizations, the project team persistently pursued the necessary approvals. This involved making repeated visits to government bodies, ensuring that all required permissions were obtained, and regulatory processes were expedited.
Poor manufacturing of shredder leads to process interruption and reduced efficiency	Innovative solutions were devised to address issues related to the malfunctioning of infrastructure, particularly the shredder. These solutions aimed to enhance the reliability and efficiency of the equipment, ensuring uninterrupted processing and improved yield.
A high percentage of unsorted waste results in the accumulation of neglected plastics with no market value.	The project tackled this challenge by identifying low-value plastic within the supply chain and devising strategies for the value realization of unsorted plastics. This involved optimizing supply chain processes to extract value from plastics that would otherwise be considered low-value or neglected.
Lack of processing solutions for low-value plastic	
Power outages leading to process interruptions and reduced efficiencies.	Recommended the use of diesel generators to mitigate power outages. Additionally, separate power backup solutions were installed for office operations, ensuring continuity. These measures aimed to maintain consistent processing efficiencies.
Collaboration with the municipality for sourcing the materials was encountering roadblocks	In Udupi, the project took a strategic step by entering into a Memorandum of Understanding (MOU) with the local government. This MOU facilitated the procurement of plastic waste from the municipality, ensuring a steady and reliable source of materials for the initiative.

10. Future prospects of the program

Integral to the project's design is the critical milestone of achieving self-sustained operations. The project envisions that beyond the initial two years, entrepreneurs should autonomously manage their operations using a blend of complementary business models. Notably, post this two-year period, government support is not anticipated.

Presently, the entrepreneurs have not reached the break-even point and rely on the support provided under the project, including advances from SZW. Additionally, SZW has facilitated the acquisition of low-cost loans to meet working capital requirements for two of these entrepreneurs.

By the conclusion of the fiscal year 2023-24, it is anticipated that the entrepreneurs will achieve the





break-even point and sustain their operations. SZW is actively assisting them in identifying potential investors for further expansion of their facilities.

This project, along with its valuable insights and experiences, holds the potential for replication across India. Adaptations can be made based on geographical considerations and ecosystem mapping, tailoring interventions to specific needs, thus ensuring scalability and widespread impact.

Additionally, Saahas in the next 2-5 years is aiming to become an INR 100 cr. + company by expanding to new geographies across India, introducing new products, identifying new markets/brands, moving up the value chain and integrating technology. They are looking to significantly expand their presence and become a truly PAN India company.

11. Conclusion

This project stands as a unique endeavour in the realm of social inclusion and resource recovery. It adopts a comprehensive approach towards professionalizing waste workers, placing a dedicated team on the ground to facilitate the transition of selected entrepreneurs from informal setups to formalized systems of operations.

The project continually evolves, with on-ground teams implementing necessary changes as they monitor various parameters. This dynamic approach has resulted in improved sorting efficiencies, enhanced value realization, and the establishment of robust data traceability, alongside numerous other value-adding elements. Several initiatives are in the testing and customization phase, promising further innovations.

Significantly, the project has successfully diverted 'low-value' or 'neglected plastics' from ending up in landfills. Neglected plastics, characterized by their lack of ideal economic value and underdeveloped recycling infrastructure, account for approximately 14% of inorganic Municipal Solid Waste. This achievement marks a substantial contribution to both waste management and environmental sustainability.



SWOT analysis of Saahas Zero Waste's (SZW) case study-

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Capacity building and training for PWM (A3)
 - Data collection and integration across the chain (A4)
 - Segregation, Sorting at processing facility (RR2)
- **Empowering social entrepreneurs from among the informal waste workers-**
 - They choose leaders from the informal waste workers and develop them as entrepreneurs.
 - They provide the infrastructure support, develop a viable business model, build the capacities of the social entrepreneurs and handhold them till the model becomes self-sustainable.
- **Focus on ethical sourcing and capacity building-**
 - The model focuses on ensuring fair pricing and upliftment of the informal workforce.
 - Capacity building focuses on adopting formal processes and ensuring social justice for the employees of plastic resource facility (PRF), while regular monitoring ensures continuous upliftment.
- **Technological Integration-**
 - All the PRFs are highly automated and have technology integrated in all stages of their operations.
 - Transparency at all levels is ensured through platforms such as Tracer and Zoho Creator.
- **Collaboration and partnerships-**
 - Strong collaborations and partnerships help streamline the funding, and supply chain and effectively and sustainably manage the waste.

Weakness

- **Financial dependency-**
 - The project heavily relies on external funding from IKEA Social Entrepreneurship B.V., which may not be sustainable in the long term.
 - Fluctuating raw material prices may impact cash flow and sustainability.
- **Cost intensive-**
 - Due to the highly automated nature of the PRFs, this is a cost-intensive model (approx. Rs 3.88 crores spent on 3 PRFs) which may restrict its scalability.
- **Gaps in closing the loop-**
 - There is no monitoring system in place to assess the end-of-life processes undertaken by the recyclers/WTE plants.



Opportunities

- **Opportunity for expansion-**
 - SZW's aim to become a PAN India company presents opportunities for growth and increased impact of this model.
 - Exploring more funding options will help scale the model.
- **Environmental regulation-**
 - Potential future regulations on waste management and recycling could create opportunities for SZW to expand its operations.
- **Diversification-**
 - Exploring additional revenue streams like expanding the PRFs by integrating a recycling unit in it.
 - This will also increase the social impact as more people from the BoEP can be involved in the process.

Threats

- **Policy changes-**
 - Shifting government policies, like promoting Waste-to-Energy plants for mixed waste, can affect the project's goals and priorities.
 - Without adequate involvement of the government, sustainability including effective monitoring of the recyclers/WTE plants may not be possible.
- Heavy dependency on a single source of funding i.e. IKEA.





Earth5R's Plastic Waste Management in Urban Mumbai: An Intricate Case Study

(Click here for intervention video)

Author: Saurabh Gupta

1. Location of Intervention

Powai, Andheri East, and Kurla in Mumbai, India.

The intervention encompasses a total of 400 high-rise buildings, comprising 28,000 high and middle-income families, alongside 25,000 families from underserved slum communities. The project's area also includes Powai Lake and a section of the Mithi River, both of which were identified as waterbodies impacted by plastic pollution.

2. Project Background

Commencing in 2014, Earth5R's Plastic Waste Management initiative took on the formidable challenge of addressing plastic waste management in Mumbai, a city renowned for its huge population and diverse socio-economic landscape.

In Mumbai, the challenge extended beyond environmental concerns and involved planning and working with different communities. Initially, the team concentrated on river and lake cleanup efforts, collaborating with local volunteers. However, they soon realised that they needed to do more as only cleanup efforts were insufficient to create a sustainable and enduring impact.

In a rapidly urbanizing and populous city like Mumbai, with its complex social and economic fabric, simple cleanup efforts proved to be a temporary solution. There was a persistent lack of transformation in the public's attitudes toward waste disposal and recycling. This resulted in the continuous generation of new waste. Therefore, they decided to implement a more innovative and sustainable solution that involved changing consumer behaviour, promoting upcycling and recycling, and cultivating a circular economy.

3. Problem Description

Mumbai, a large and densely populated city, produces a significant amount of plastic waste, contributing to both local and global environmental problems. It is estimated that Mumbai generates 9,000 metric tons of plastic waste every day¹. According to a study conducted by Earth5R, titled "Another pandemic: India's fight against single-use plastic falls victim to Covid" published in the Economic Times,

¹<https://www.shaktiplasticinds.com/plastic-waste-management-in-mumbai/#:-:text=Mumbai%2C%20India's%20financial%20and%20entertainment,it%20being%20collected%20and%20recycled.>



while there was a fall in single-use recyclable plastics till September 2020, there was a spike in the use of multilayer packaging. Overall, it found a 47% rise in single-use plastic in Mumbai, Bengaluru, Delhi, and Pune during COVID times.² Moreover, the issue of plastic pollution is getting worse due to factors like globalization and changes in people's lifestyles.

4. Objectives

The key objectives of the initiative by Earth5R were:

- To navigate the socio-economic and logistical challenges in urban Mumbai.
- To drive community participation across fragmented demographic strata.
- To implement technologically advanced, yet community-based, plastic waste segregation and recycling programs.
- To get real-time, geospatially encoded data to create citizen-driven waste management programs.
- To create circular economy-based livelihood programs for underprivileged women living in Mumbai slums.



Figure: Earth5R members engage with local communities under the Plastic Credit-Based Livelihood Program in the Mithi River Belt at Kurla.

5. Implementation Details

In its efforts to tackle plastic waste, Earth5R employed a strategic approach to engage a broad demographic, focusing on youth and environmentally conscious citizens. Utilizing its website as a recruiting platform, Earth5R offered participants incentives such as certification and leadership training. The organization employed streamlined, lightweight technology solutions, including Google Drive, Google Sheets, and WhatsApp groups, for efficient management of team members and local initiatives.

²<https://economictimes.indiatimes.com/news/politics-and-nation/another-pandemic-indias-fight-against-single-use-plastic-falls-victim-to-covid/articleshow/78848847.cms?from=mdr>



The outreach extended to 400 buildings in Mumbai, where residents, domestic workers, and waste collection staff were trained in waste segregation. Live demonstrations on segregating waste into categories such as recyclable waste (including various types of plastic, glass, metal, and electronic waste), organic waste, medical waste, and hazardous waste were provided.



Figure: Earth5R Founder Saurabh Gupta conducts waste segregation demo training for residents, house-help, and waste collection staff at a high-rise building at Hiranandani, Powai, Mumbai

Further, Earth5R successfully installed composting units in 75 buildings and offered consultation to another 120 buildings for indigenous composting solutions. Additionally, training was conducted for municipal staff to align them with ongoing circular economy initiatives. Open forums at 70 different locations served to engage citizens, waste management staff, local NGOs, and residential associations.

Furthermore, Earth5R provided livelihood and financial literacy training to 10,000 families in low-income areas such as Chandivali, Powai, Sangharsh Nagar, and Kurla. These families were taught skills like making paper bags, cloth bags, and handicrafts by upcycling waste material collected from the high-rise buildings and in the process, diverting waste from going to the landfills.

The impact of the Earth5R project extended beyond waste management and community engagement. The products created by these trained families were purchased by Earth5R's partner organizations as part of their Corporate Social Responsibility (CSR) initiatives, providing an economic boost to these low-income communities.

The project's success and innovative approach garnered international recognition. Earth5R's founder, Saurabh Gupta, was honoured with the Young Leader India Award by French President Emmanuel Macron, and the initiative was featured at the 2018 Paris Peace Forum. This level of acknowledgement highlighted the project's potential as a scalable solution for plastic waste management.

Earth5R's selection as one of the project partners for the Mithi River plastic debris clean-up program by the United Nations Technology Innovation Labs in 2020 further cemented its position in global sustainability. In January 2023, Earth5R launched its Environmental Sustainability App, a digital tool designed to help citizens actively engage in tackling the global plastic waste crisis. This app is a central part of Earth5R's broader mission to become the go-to platform for building sustainable communities around the world.





Figure: Earth5R Volunteers segregate the collected waste during the Powai Lake Cleanup

The app is built to provide users with practical information and collect real-time environmental data. Its goal is to encourage local, community-based solutions to sustainability issues. Through this digital platform, Earth5R aims to make it easier for individuals to access information and contribute to meaningful change. The Earth5R Sustainability App blends technology and citizen involvement, aiming to boost community-led sustainability efforts. It offers a scalable, adaptable model that could significantly change how communities participate in caring for the environment.

6. Innovative Methods/Techniques

Earth5R's multi-faceted approach combines community engagement, innovative business models, and cutting-edge technology to tackle the complex issue of plastic waste management in a densely populated urban environment like Mumbai.

They identified that school-going children and college students were particularly concerned about the escalating plastic waste crisis. To channel this concern into constructive action, Earth5R designed a system rooted in reward and recognition. This system was tailored to engage younger demographics by incentivizing positive behaviours through rewards, thereby driving community-level change. Furthermore, they adopted an innovative strategy that viewed waste not as an issue, but as an untapped opportunity. This led to the establishment of a circular economy and a supply chain that fostered social entrepreneurship which was mutually beneficial for both the urban and suburban demographics in Mumbai.



Figure: A Volunteer feeds the cleanup waste data into the Earth5R

In terms of technology, Earth5R implemented advanced drone mapping techniques to evaluate waste distribution patterns in urban Mumbai. The team conducted periodic assessments around major waste hotspots, designing targeted awareness and action programs based on this data. Post-implementation, drone mapping was also used to gauge the effectiveness of these programs by comparing changes in the waste flow over months. This data-driven approach enabled more precise and tailored interventions, thus amplifying the impact of their initiatives.

Besides, the Earth5R app has modern technological features like Geo-tagging of data, Artificial Intelligence (AI), and Machine Learning (ML). These technologies are integrated into the app to ensure the effective implementation of sustainability programs. For instance, Geo-tagging allows for the accurate monitoring of problem areas, while AI and ML algorithms help in analysing large sets of environmental data to provide actionable insights.



7. Financial/Revenue Model

In its foundational years, Earth5R operated on a self-financed, bootstrapped model, generating its primary revenue from waste management initiatives. These initiatives often attracted funding from Corporate Social Responsibility (CSR) programs, demonstrating the project's alignment with broader sustainable development goals. One of the significant avenues for revenue was the sale of eco-friendly products that were produced as a result of their circular economy programs.

The landscape of Earth5R's financial structure evolved significantly when the organization received seed investment capital. This infusion of funds was earmarked for bolstering Earth5R's technological framework, enabling the organization to transition into a more growth-oriented start-up mode. The investment has allowed Earth5R to focus on technological enhancements, specifically geared toward the development, improvement, and scaling of its sustainability app, alongside other digital platforms. The funds are also being used to incorporate more advanced technology such as Artificial Intelligence and Machine Learning for more effective program implementation.



Figure: Earth5R makes use of Drone Mapping to analyze the flow of plastic waste and the effectiveness of its awareness program through periodic studies in the same area

As Earth5R continues to evolve, the organization is better positioned than ever to drive substantial change in the realm of environmental sustainability.

8. Partnerships

In the context of community-based sustainability, Earth5R's strategic collaborations have had measurable impacts. Partnerships with local municipal corporations, research institutions, and industrial entities have served to amplify Earth5R's capabilities in project execution and scalability. The collaborations have facilitated the collection of validated data and the sharing of resources, which are essential components for ensuring the efficacy and sustainability of Earth5R's programs.

On a global scale, Earth5R's engagement as a project partner with the United Nations Technology Innovation Labs, Lufthansa Group, and Swiss Air has extended its reach, enabling international knowledge exchange. Contributions to the National Geographic Society's roundtable consultations on Ganga River Plastic Pollution and collaboration with Thomson Reuters Events have further cemented Earth5R's role in contributing to critical sustainability dialogues.

Collectively, these partnerships underscore Earth5R's commitment to environmental preservation and social entrepreneurship, providing a comprehensive network that bolsters its long-term goals and enhances its societal and environmental impact.

9. Challenges and Solutions

During the COVID-19 pandemic, Earth5R encountered one of its most significant challenges, as the global health crisis severely restricted the organization's ability to carry out its usual on-ground



activities. The limitations imposed by the pandemic acted as a catalyst, compelling Earth5R to pivot its operational strategy. The inability to conduct physical programs spurred the organization to transition to an online training and awareness-based model, a shift that had a profound and transformative impact on its business strategy.

This inflection point in Earth5R's operational paradigm prompted the team to recognize the urgent need for

a technology-driven approach that was both scalable and replicable. It became evident that relying solely on manual oversight and management of day-to-day operations was unsustainable in the face of such unforeseen disruptions. This realization led to the conceptualization and subsequent development of Earth5R's Sustainability App, designed to automate various aspects of the organization's environmental initiatives, thereby allowing for more seamless operations regardless of external circumstances.

The experience during the pandemic not only underscored the vulnerabilities in Earth5R's previous model but also presented an opportunity to innovate and adapt. It has been a transformative period that has significantly influenced the organization's current and future strategies, ensuring a more resilient and adaptive framework for its sustainability efforts.

10. Future Prospects

From the perspective of plastic pollution, Earth5R's circular economy and technology-based model offer a robust and adaptive solution to one of the most pressing environmental challenges of our time. By incentivizing waste segregation and recycling through its digital platform, Earth5R directly targets the root cause of plastic pollution in urban ecosystems. The initiative effectively transforms waste into resources, thereby reducing the volume of plastic that ends up in landfills, rivers, and oceans.

The program's modular architecture is particularly advantageous when dealing with the complexities of plastic waste management in diverse urban landscapes. Plastic pollution is a multi-dimensional problem that involves not just waste accumulation but also issues related to human behaviour, waste management infrastructure, and public awareness. Earth5R's scalable solution allows for the implementation of targeted initiatives aimed at specific aspects of the plastic waste problem, from collection and segregation to recycling and repurposing.

Moreover, the data-driven approach, made possible by Earth5R's digital backbone, enables continuous monitoring of plastic waste streams in different urban settings. This is particularly crucial for megacities, where the sheer volume of plastic waste generated can be overwhelming. The analytical capabilities of the Earth5R Sustainability App and other digital tools help in identifying 'hotspots' of plastic waste generation and guide subsequent intervention strategies, thereby maximizing impact.

Earth5R's circular economy and technology-based model present a scalable, adaptable, and data-driven approach to tackling the intricacies of plastic pollution in urban environments. Its strategic partnerships and digital capabilities position it as a frontline solution, capable of addressing the plastic waste crisis in an effective and sustainable manner.



Figure: The Earth5R team at one of the waste sorting centres with waste collection partners.



In addition to its main goal of environmental conservation, Earth5R's project has a significant impact on economic empowerment, especially within local communities. By offering specialized training in waste management, Earth5R is essentially creating a workforce of microentrepreneurs in the eco-sector. This is not just about cleaning up the environment; it is also about improving the livelihoods of community members.

This training is comprehensive and covers various aspects like waste segregation, recycling methods, and the use of eco-friendly alternatives to disposable plastics. With this approach, Earth5R is transforming what is generally considered a 'low-value' sector—waste management—into a sector that offers valuable employment opportunities. This is vital for community development and also ensures the long-term success of the project.

11. Conclusion

Earth5R's Plastic Waste Management initiative in urban Mumbai is a commendable case study addressing the plastic waste challenge in a complex urban setting in a socially inclusive manner. The model offers a scalable, data-driven solution to urban plastic pollution. Starting with cleanup efforts, it quickly shifted focus to a more holistic and sustainable approach. Their approach involved training residents, installing composting units, upskilling low-income families, and leveraging technology like drones and AI for data-driven interventions. This initiative proves that by engaging communities, harnessing technology, and promoting circular economies, plastic waste can be managed while fostering economic growth and environmental preservation. The project in Mumbai is a global blueprint for tackling plastic pollution.

SWOT analysis of Earth5R's case study

<u>Strength</u>	<u>Weakness</u>
<ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Capacity building and training for PWM (A3) ○ Data collection and integration across the chain (A4) ○ Upcycle (O2) • Closing the loop- <ul style="list-style-type: none"> ○ The model starts from mapping to awareness generation and ends with the creation of waste-to-value products and their sale. • Effective behaviour change communication model- <ul style="list-style-type: none"> ○ IEC/BCC activities through live demonstrations. ○ Having the power to influence family behaviours, young volunteers comprising of students and college goers may ensure quick behaviour change in the community. 	<ul style="list-style-type: none"> • Dependency on volunteers- <ul style="list-style-type: none"> ○ Excessive reliance on volunteers comprising of young populace may compromise the quality of its operations. ○ Replicability and scalability of the model may depend on the availability of volunteers in newer geographies. • For waste management, they are dependent on families living in the vicinity of the intervention areas who may be affected by external factors like migration, climatic conditions etc. • Depending only on CSR for buying the upcycled products may not be sustainable in the long term. • Technology- <ul style="list-style-type: none"> ○ Utilizing drones in urban settings requires numerous permissions and restricted flight zones resulting in limited data collection and restricting the intervention's impact area.



- **Community engagement-**
 - Dual community engagement- engaging the young population as volunteers for BCC activities, engaging the entire community in the data collection process.
- **Creating social impact-**
 - Building capacities of people living at the bottom of the pyramid to manufacture waste-to-value products.
 - Addressing the problem of managing plastic waste along with enhancing their lifestyle.
- **Technology Integration-**
 - Earth5R's Sustainability app along with the use of technologies like Geo-tagging, Artificial Intelligence (AI), Machine learning (ML), and advanced drone mapping techniques are designed to automate its operations.
 - This enables more precise and tailored interventions.
- **Collaboration and partnerships-**
 - Partnering with local municipal corporations, research institutes and national and international entities helps amplify their capabilities in project execution.
 - These collaborations have facilitated the collection of validated data and the sharing of resources, which are essential components for ensuring the efficacy and sustainability of Earth5R's programs.
- **Financial sustainability-**
 - Multiple sources of revenue such as seed funding, CSR funding and partnerships with various international organisations such as United Nations Technology Innovation Labs (UNTIL), Huhtamäki Oyj, etc.
- This is a comprehensive model addressing both wet and dry waste management.
- Validation from various National and International forums.

Opportunities

- **Opportunity for expansion-**
 - They may replicate their program in other geographies to become more financially sustainable.
 - This model can be replicated in all tier I and tier II cities with high-rise populations and slum dwellers.
- Diversifying the model by creating a market for upcycled products.

Threats

- Lack of collaboration with the government may hamper the implementation of the model.
- **Efficiency of technology used-**
 - Using technology without ensuring its efficacy may render the model inefficient.
- **Market competition and policy changes-**
 - Without continuous innovation along with cost reduction and expansion, market forces may threaten the existence of the model.
 - Without adequate government collaboration, changes in waste management policies of the region have the potential to disrupt the operations.





Mitigating Plastic Waste in Coastal Ecosystems Through Education and Circular Economy Innovation

Author: Ferdin Sylvester and Aditya Kumar

1. Location of intervention

Mangrove of Mandovi and Mapusa River, Chorao Island, Panaji, Goa; Miramar coastline, Indian Ocean, Goa; Malim Jetty, Mandovi River.

2. Project background

The Plastic Pirate Program addresses the pertinent issue of plastic pollution in water bodies. It involves youth, fishing communities, and government bodies in the program. This includes collecting, processing, and making products from low-value plastic waste like single-use bags and bottles, as well as fishing-related waste such as nets and lines. The program aims to create collective partnerships for plastic waste management and recycling through community-driven projects by leveraging the fishing communities, youth, the tourism sector, and government along the Indian coastline, rivers, and mangroves. Zero-value plastic waste is transformed into valuable items at One Earth Foundation's 'Centre for Circularity,' an innovation and community space equipped with the necessary machinery and technology for recycling, upcycling, and repairing waste.

3. Problem description

Plastic pollution in oceans and rivers is an evolving environmental threat, and its accumulation in the water ecosystem is rapidly rising. Of all plastics ever manufactured till now, it is estimated that 60% has been discarded in landfills, oceans, or other such natural environment. Between 1.15 and 2.41 million metric tons of plastic waste enters the global ocean per year, and 20 % of this enters the Indian Ocean (Lebreton et al.)¹. Abandoned, lost, or discarded fishing gear (ALDFG) by the fishing industry also produces large quantities of plastic debris, i.e., monofilament lines and nets primarily made from plastic materials which turn into 'Ghost Nets' that trap and kill marine animals, and are a major source of microplastic in the water. The microplastics are eaten by the fishes which in turn are eaten by humans. Studies have detected microplastics in human blood and milk and they can potentially cross over to one's brain.

¹<https://os.copernicus.org/articles/18/1/2022/#:~:text=In%20addition%2C%20these%20estimates%20were,1b>





4. Objectives

- Mitigate the influx of plastic waste into the mangrove, coastal, and riverine areas by promoting a change in behaviour and adopting a circular economy model for converting waste into products.
- Raise awareness about the detrimental effects of plastic waste on the environment and marine life, especially through Information, Education, and Communication (IEC) campaigns targeting students, fishing communities, and tourists.
- Encourage active involvement of youth/students, tourists, residential communities in and around mangrove estuaries, rivers, and oceans, and fishermen in collecting plastic waste for recycling.
- Organize innovative and engaging IEC activities and events such as mangrove mapping, cleanup and collection drives, waste-to-product workshops, classroom discussions, and incentivization programs.
- Transform Zero or Low-value, ocean-bound plastics and plastics retrieved from river or mangrove ecosystems, including waste generated by the fishing industry (nets, floats, lines), into functional products.

5. Program implementation details

Design

Plastic Pirate Program operates through a systematic approach. It commences with a baseline assessment and mapping exercise that comprehensively analyzes the existing scenario of plastic pollution in the mangrove, river, and ocean areas. This process identifies the sources and hotspots of this



pollution, providing essential data for informed action. Simultaneously, it maps Changemakers and Stakeholders, ensuring a broad network of support and engagement. Once the information is gathered, the program proceeds to establish specific objectives. These objectives target the reduction of plastic waste entering coastal and riverine areas, primarily through behavioural shifts and the implementation of a circular economy model that converts waste into valuable products.



The program does not stop at this stage but reaches out to local officials, policymakers, industry associations, and manufacturers. Their advocacy aims to influence policies and regulations favouring plastic waste reduction, recycling, and circular economy practices, creating a conducive environment for the program's goals. Furthermore, the Plastic Pirate Program fosters innovation by developing or supporting new products and applications that incorporate recycled plastic as raw material or additives, demonstrating the practical use of repurposed plastic.

Continuously monitoring and evaluating progress and impact plays an important role. The program employs various indicators to assess its efficacy, including metrics such as the amount of plastic waste collected, recycled, reused, or prevented; reductions in greenhouse gas emissions; income generated; jobs created; increased awareness; and altered behaviours. This multifaceted approach ensures that the Plastic Pirate Program is not just an idea but a comprehensive and dynamic initiative working towards substantial plastic pollution reduction and waste management.

Implementation process

The operational framework of the program encompasses a range of strategic actions. It starts with IEC campaigns, specifically designed to raise awareness among the program's target groups. These



activities take diverse and interactive forms, including classroom workshops and engaging mangrove walks. Additionally, a dedicated club known as the "Plastic Pirates" is established, fostering a sense of belonging and collective responsibility among participants.

Concurrently, mapping activities are undertaken by identifying waste hotspots and sources of plastic pollution along the river, providing critical insights for precise interventions.

Crucial to the success of this program is its collaboration with local government bodies, such as the Urban Local Bodies (ULBs) (Corporation of the city of Panaji). Their participation strengthens the program's reach and impact. Additionally, the fishing community is onboarded into the program and incentivized to ensure their active participation in collecting and storing waste generated by the fishing





industry. In tandem, the program actively involves tourists and the youth through enjoyable cleanup activities, aligning their efforts with the broader mission.

The collected plastic waste is efficiently channelled to the 'Centre for Circularity,' a crucial facility equipped with the necessary machinery and technology for recycling, upcycling, and repairing waste. Here, these discarded plastics are transformed into functional products, including bins, picket fences, tables, and benches. These products are not just symbols of transformation but also serve practical purposes, reinforcing the program's commitment to sustainability and environmental conservation.

Impact

The project has made significant strides in its mission to combat plastic pollution. Covering an expanse of approx. 28 kms, an extensive field mapping exercise was conducted. This comprehensive survey included journeys by kayak, and boat,

and thorough on-ground assessments across diverse ecological zones, ranging from the serene mangroves to the winding rivers, creeks, canals, and expansive coastline.

In terms of community engagement, a diverse group of 525 individuals, including students, members of the fishing community, waste workers, and local shopkeepers, were successfully onboarded as "Plastic Pirates" through awareness drives, classroom workshops, community outreach, and recycling partners. These "Plastic Pirates" now play an important role in the program's efforts.

Additionally, 218 kilograms of plastic waste has been collected through mangrove cleanups, and 1.4 tons of plastic waste has been channelled for recycling, contributing significantly to a more sustainable waste management system. As a result, a substantial 750 kilograms of previously considered zero-value waste, has been ingeniously transformed into valuable products.

The program has also created three functional product prototypes, showcasing its ability to turn recycled materials into practical and useful items. Additionally, four other products are currently in the research and development phase, underscoring the program's commitment to continuously expanding its portfolio of eco-friendly products. These achievements collectively depict the program's meaningful contributions to the fight against plastic pollution and its unwavering dedication to environmental conservation and sustainability.

6. Innovative methods/techniques used

One Earth Foundation integrated an element of impact, inspiration, fun, and adventure through their plastic pirate program. The Plastic Pirate Club has a sense of togetherness and a like-minded community that instills a feeling of support and collaboration among the people who joined the program.

They worked with the fishing community, holding awareness talks and



onboarding them as plastic pirates. By providing storage solutions for their plastic waste like the ghost nets dumped in the ocean and collected by fisherman as well as their used fishing accessories, they were able to collect, sort (HDPE, Nylon, etc.), and channel the plastic for processing and conversion into products at their Centre for Circularity.

Marine/Riverine waste was directly converted into products thereby giving more reverse economic incentives to the people involved in the collection of plastic waste like the fishing community, and informal waste workers.

7. Financial/revenue model of the intervention

Currently, the Corporation of the city of Panaji is funding the working space, transport logistics, IEC, workshop, and awareness drives. Other expenses are managed by the organization through the revenue generated by the sale of recyclable waste and plastic products. The funding sources and other details are as mentioned below:

- **Recyclable Waste Sales:** The primary revenue stream for this project is channelling and selling the collected plastic waste to recycling facilities. These recyclable materials can be transformed into various products, including plastic pellets and fibre, which have market demand.
- **Grants and Donations:** In addition to revenue from the sale of recyclables, the project is getting funds from government agencies such as CCP, environmental organizations, and volunteer contributions.
- Additionally, products made from plastic waste will add to the revenue stream and over time become the main source of income, ensuring the long-term sustainability of the program. The target market for such products are businesses, consumers, government institutions, and educational institutions.

Details of project expenditure	
Capital Cost/investment	
Particulars	Amount (INR)
Machinery	16,00,000
Tools and related equipment	1,50,000
Total	17,50,000
Operational Cost (Per Year)	
Particulars	Amount (INR)
Human Resources for Machine Operations	5,20,000
Human Resources and collaterals for IEC	6,00,000
Total	11,20,000

Projected Revenue Generation from the Sale of Ocean-bound Plastic Products	
Particulars	Amount (INR)
Bins, Benches, Fence etc	15,00,000
*The revenue generation is projected based on orders received to date and considering market variabilities	



8. Partnerships

Successful execution of the program was ensured through several key partnerships as mentioned below:

- **Corporation of the city of Panaji (CCP):** They provided vital support in connecting with various stakeholders such as schools, colleges, fishing communities, and waste workers. Additionally, CCP played a significant role in shaping the design of plastic waste-to-product initiatives, including leaf compost bins. These bins were created based on CCP's guidance to redirect plastic waste from Panaji through the Plastic Pirate Program for conversion into useful products. Furthermore, CCP has been a crucial funding partner for One Earth Foundation's IEC activities and community mobilization efforts.
- **Ayya Waste Management:** Their involvement was crucial for on-ground waste management through their dry waste collection centres.
- **Ecobel Solutions:** They provided essential technical support and machinery for plastic waste collection.
- **Magic Spangle:** Responsible for designing IEC materials and program collaterals.
- **CEE (Centre for Environment Education):** Their guidance was instrumental in integrating government agencies into the program and developing strategies for long-term policy integration.
- **Cyclingszen:** They played a crucial role as the local kayak (boat) provider and partnered with One Earth Foundation in the Plastic Pirate program to map the sources and hotspots of plastic waste along the mangroves and rivers.

9. Challenges and solutions

Permission and on-ground support for initiating workshops and cleanup drives was a challenge, as this was a new concept of collecting plastic waste from mangrove and river ecosystems and converting it into valuable products. The corporation of the city of Panaji supported One Earth Foundation by providing network linkage and on-ground support.

Another hurdle was to onboard the fishing community to gather and hold their plastic waste instead of disposing of it in the sea. The major challenge here was the lack of a designated collection space. This problem was resolved by providing them with large temporary bags that they could place in the jetty area. After these bags were filled and the collection process was completed, the plastic waste was transported to One Earth Foundation's Centre to be transformed into various products.

10. Future prospects of the program

The plastic pirate program is planned to be scaled up in Goa in the following areas:

- Major rivers which are Zuari, Mapusa, Mandovi, Sal, Chapora.
- Mangrove areas in the state which are Choraó, Kumbharjua Canal, and Sal estuary.
- Fishing communities across the state
- Adventure tour operators in the state to organize cleanups along mangroves.
- Sale of products to ULBs, citizens, educational institutions, and businesses across the state, India, and the world.



The program will be replicated across all states with mangroves, rivers, and ocean coastline through collaboration with local government bodies (ULBs, RLBs), state pollution control boards, Fishing associations (both state and national level), plastic packaging brands (HCCB, Pepsico, HUL for EPR target fulfilment) and environmental organizations like CEE, TERI, UNEP, UNDP, WWF.

In the future, by optimizing revenue streams such as CSRs, optimizing costs of recycling and logistics, and fostering partnerships with fishing associations, environment protection bodies, and Governments in states, the recycling intervention can remain financially viable for long-term sustainable operations of the project. The revenue stream from the sale of products will allow for reverse incentivization of the collection, segregation, and storage of plastic waste from the fishing industry in a net positive economic model.

11. Conclusion

The Plastic Pirate Program, operating in the Mangrove of Mandovi and Mapusa River, Chorao Island, Panaji, Goa, and the Miramar coastline, Indian Ocean, Goa, has effectively addressed the critical issue of plastic pollution in water bodies. By engaging youth, fishing communities, and government bodies, it has created a comprehensive strategy for collecting, processing and converting low-value plastic waste into valuable products. This initiative aims to mitigate plastic waste inflow into the mangrove, coastal, and riverine areas through behavioural change and a circular economy approach. It also emphasizes raising awareness about the adverse effects of plastic waste, particularly through IEC campaigns targeting students, fishing communities, and tourists. The program's approach of actively involving various stakeholders has successfully led to the collection, recycling, and transformation of plastic waste, contributing to a more sustainable environment. Additionally, the program's innovative methods and financial models show promise for its future expansion, with the potential to significantly impact plastic pollution reduction on a larger scale.

SWOT analysis of One Earth Foundation

<u>Strength</u>	<u>Weakness</u>
<ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page 8) <ul style="list-style-type: none"> ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Collection from source to processing facility (RR1) • Addressing the problem of coastal plastic waste- <ul style="list-style-type: none"> ○ Mitigated the influx of plastic waste into the mangrove, coastal, and riverine areas through a behavioural shift and implementation of a circular economy model that converts waste into products. ○ Since the model is fairly new, the actual on-ground impact cannot be measured at the moment. 	<ul style="list-style-type: none"> • Lack of diverse revenue streams- <ul style="list-style-type: none"> ○ Currently the project is dependent on government support which may reduce over time. Therefore, other streams of revenue must be explored to sustain the project in the long run. • Cost intensive model- <ul style="list-style-type: none"> ○ The CAPEX and OPEX for the first year approx. Rs 29 lakhs. Therefore, without a reduction in cost, scalability may be an issue. • Lack of technology integration- <ul style="list-style-type: none"> ○ There are no plans to integrate digital technology in any aspect of PWM.



- **Partnership/collaborations-**

- Multi-stakeholder engagement ranging from the corporation of the city of Panaji, on-ground waste collection centres, CEE, technical solutions, and machinery providers, etc. strengthened the program at all levels.

- **Strong behavioural change approach-**

- Bringing about behaviour change through innovative and interactive activities such as classroom workshops, mangrove walks, and the formation of a club (Plastic Pirates).

- **Integrating local community into the program-**

- Ensuring the success of the program through affirmation from the local community.

- **Undertake a localised scientific approach-**

- The model is designed to be comprehensive starting from mapping waste hotspots to conducting baseline assessments, M&E of various indicators of waste management system and ending at ensuring adequate management of marine waste.

- Plans to close the loop by production and scale of recycled products at the centre for circularity

Opportunities

- There are ample opportunities to scale the model. However, these can only be stated once the model is fully implemented, and its impact measured.
- The model seems to be missing out on technology integration. Therefore, there is an opportunity to create a balance between integrating eco-friendly technology, reducing cost as well as dependency on manpower for plastic waste collection and management.

Threats

- **Economic Viability-**

- The project's sustainability relies on its ability to generate revenue from the sale of recyclable waste and recycled products. Economic fluctuations or changing market dynamics could threaten this revenue stream.

- **Dependency on Local Actors-**

- If the local government or fishing communities withdraw their support, the project's progress may be at risk.





Pioneering Sustainable Plastic Waste Management and Recycling

Author: The Shakti Plastic Industries

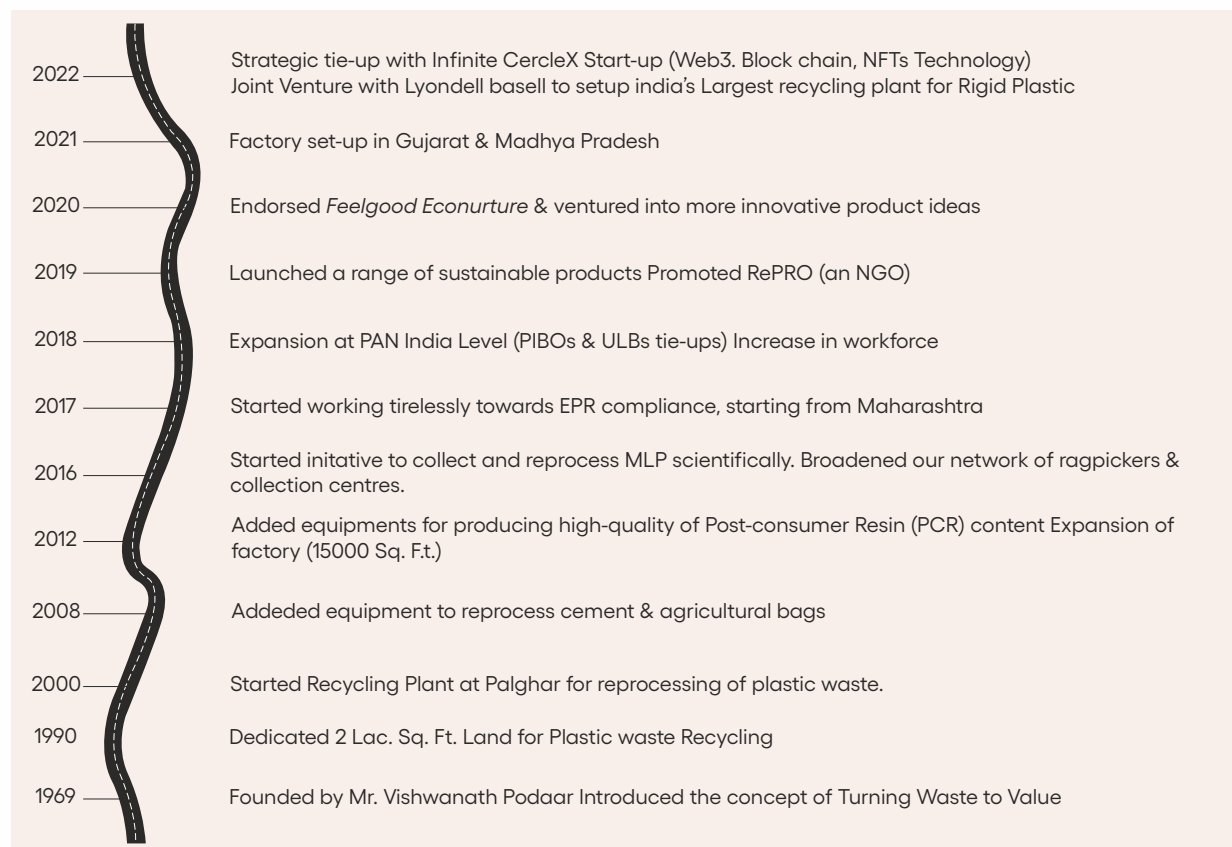
1. Location of intervention

PAN India and Dubai

2. Project background

Founded in 1969, The Shakti Plastic Industries is a Mumbai-based company that specializes in recycling all types of plastic waste. The company boasts of a legacy spanning over three generations and has positioned itself as a leading expert in post-consumer and industrial waste management for the past 54 years. With a presence both in India and Dubai, Shakti Plastics handles the collection and recycling of various types of plastics, including flexible, MLP, rigid, and mixed plastics.

Journey of Shakti Plastic Industries



3. Problem description

The global issue of plastic waste management has grown exponentially over the years. Accumulation of non-biodegradable plastic has not only polluted the environment but also posed significant threats to marine life and human health. The Shakti Plastic Industries addresses this pressing concern by engaging in comprehensive plastic waste recycling, providing a sustainable solution to plastic disposal, and reducing its environmental impact.

4. Objectives

The primary objectives of the program are:

- To offer a sustainable solution to plastic waste management by recycling all types of plastic waste.
- To provide Extended Producers Responsibility (EPR) to major brands across India, ensuring best practices in collection, logistics, and recycling.
- To innovate by developing products from plastic waste using recycled content.

5. Program implementation details

The organization has established a vast network to achieve its goal of sustainable plastic waste management. This network includes:

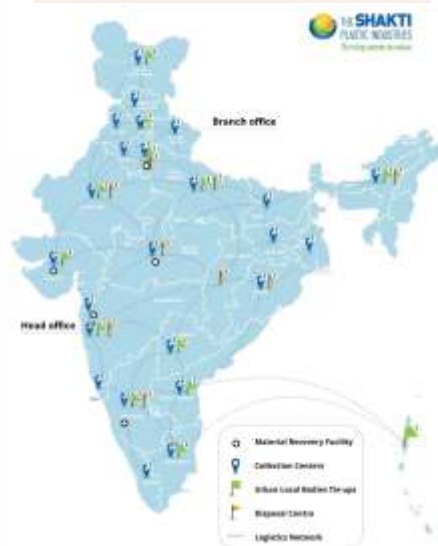
- Over 15,000 Rag-pickers (referred to as 'Safai-Saathis')
- Numerous Collection Centres
- Logistic Partnerships
- 150+ ULB (Urban Local Bodies) Tie-ups
- 6 Recycling Facilities

The company operates six recycling plants across India and one in Dubai. They offer Extended Producers Responsibility (EPR) to over 600 major brands across India. This includes ensuring best practices in collection, logistics, and recycling with full transparency and traceability.

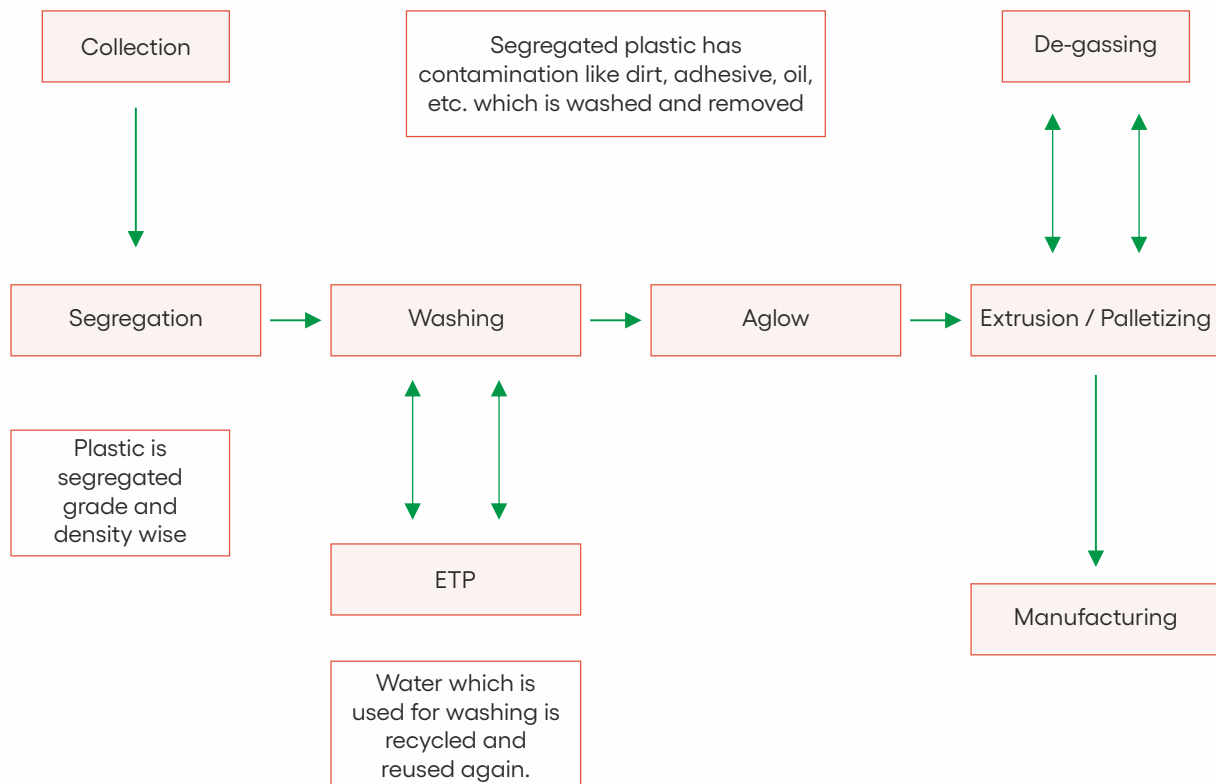
Each recycling plant of the organization has several key sections, which play a crucial role in the recycling process:

1. **Collection and Segregation:** For plastic waste collection the organization has a vast network of urban local bodies, and rag-pickers ('Safai-Saathis'), scrap traders, societies, NGOs, and schools. The plant uses a well-organized sorting system to categorize incoming plastic waste. The collection and segregation area handles this waste, sorting it by type, colour, and quality to ensure efficient processing, compatibility and high-quality end products.
2. **Cleaning and Washing:** In this section, sorted plastic waste undergoes thorough cleaning to remove contaminants, such as dirt, food residues, and labels, ensuring the recycled plastic's quality and suitability for reuse.

Presence of Shakti Plastic Industries



Recycling Process Flow Diagram



3. Plastic processing: Patent technology is used for recycling plastic waste which allows the organization to recycle even multi-layered plastic waste into high quality granules which is further used by other industries to manufacture various type of products. The process includes:

- a. **Aglow, Shredding and Grinding:** Clean, sorted plastic is shredded or ground into smaller pieces, facilitating processing and melting in subsequent steps.
- b. **Extrusion and Pelletizing:** Shredded plastic is melted and extruded into continuous strands, which are then cooled and cut into small pellets, serving as raw materials for manufacturing new products across multiple industries, such as packaging, automotive, construction, and consumer goods. By providing high-quality recycled plastic pellets, Shakti Plastic Industries effectively supports sustainable manufacturing processes and promotes a circular economy within these sectors.



4. Quality Control and Testing: The plant conducts rigorous testing of the physical and chemical properties of the recycled plastic pellets to ensure they meet the required quality standards. Dedicated quality control labs & team of experts are responsible for monitoring the entire recycling process and maintaining high-quality output.



5. **Packaging and Storage:** Upon passing quality control, recycled plastic pellets are packaged and stored in a controlled environment, ready for shipment to manufacturers.
6. **Research and Development:** The organization boasts advanced machinery for efficient and high-quality plastic recycling. The R&D section focuses on advancing innovative recycling technologies, enhancing existing processes, and designing new products from recycled plastic, furthering the company's and industry's sustainability goals.



The company's versatility is demonstrated by their ability to process various types of plastic waste. Moreover, the organization prioritizes employee safety by providing necessary safety gear and conducting regular safety training sessions. They comply with all relevant environmental regulations, and actively seek to improve energy efficiency and conserve water, showcasing their commitment to sustainable practices.



Furthermore, they actively address the complete value chain of plastic waste management. Their operation encompasses organizing awareness campaigns, collecting plastic, managing logistics, developing Materials Recovery Facilities (MRFs), setting up recycling plants, and ensuring strict compliance. These various activities are part of their integrated approach to manage plastic waste comprehensively.

6. Innovative methods/techniques used

Shakti Plastics boasts patented technology for recycling MLP Waste. Their R&D and Innovation teams have successfully created numerous award-winning products using up to 100% recycled content derived from plastic waste. The company's approach is technology-centric, supported by its proprietary digital platform. Furthermore, they've ventured into the realm of digital startups, specifically concentrating on end-to-end traceability, blockchain technology, web3, and NFT-based solutions tailored for efficient plastic waste management. Some of the distinctive qualities that differentiate the organization from others are:

1. **Customized Machinery:** The company develops and customizes machinery tailored to specific recycling needs. This customization enhances efficiency and product quality.
2. **In-house R&D:** The organization takes pride in its dedicated research and development team. Through continuous innovation and improvements, they remain industry leaders.
3. **Workforce:** A well-trained and committed workforce is one of the company's primary assets. Their expertise is crucial for effective operations.



4. **Complete Process Integration:** The company ensures a seamless recycling process, starting from segregation and ending with extrusion. This integrated approach guarantees both quality and efficiency.
5. **Zero Discharge:** Committing to sustainability, The Shakti Plastic Industries has systems in place to prevent any waste discharge into the environment.



7. Financial/revenue model of the intervention

The financial model of The Shakti Plastic Industries revolves around a multifaceted revenue stream, given their diverse operations in plastic waste management:

- **Sale of Recycled Granules:** As the company processes plastic waste into various types of recycled granules, these granules become a significant revenue source when sold to manufacturers. These manufacturers then use the granules to produce various plastic products.
- **Extended Producers Responsibility (EPR) Services:** The company provides EPR services to over 600 major brands across India. Brands are increasingly mandated by regulations to ensure their plastic waste is responsibly managed. Shakti Plastics charges fees for these services, which include waste collection, recycling, and reporting.
- **Import and Export:** The company's activities in importing and exporting post-industrial plastic waste are another revenue stream. They import specific types of plastic waste, recycle them, and then export the recycled product or raw material to global markets that demand it.
- **Products from Recycled Plastics:** Sale of products like tiles, benches, and pallets made from hard-to-recycle plastic waste (like MLP) is another revenue stream.



- **Collaborations & Partnerships:** Strategic alliances and partnerships with local bodies, municipalities, and other organizations come with financial incentives or grants, especially when these collaborations lead to significant environmental benefits.

- **Technology Solutions:** The company's foray into digital solutions for plastic waste management, including blockchain and traceability solutions, are also monetized by offering these services to other companies and partnerships.

8. Challenges and solution

a. Collection & Segregation:

Sourcing and segregating different types of plastic waste was a complex task, especially with the diverse types of plastics in use. Shakti Plastic Industries established a vast network of



ragpickers, urban local bodies, and their own collection centers. This network ensures efficient collection and segregation.

b. Technology & Innovation:

Recycling certain types of plastics, especially Multi-Layered Plastic (MLP), was technically challenging. To overcome this, the company invested in R&D, leading to the development of innovative technologies to process hard-to-recycle plastics.

c. Awareness & Behaviour Change:

Convincing the public and industries about the importance of plastic waste management was a tough job. Through awareness campaigns and partnerships with major brands, the organization fostered a culture of recycling and responsible waste management.

d. Regulatory Compliance:

Adhering to ever-evolving waste management regulations in different regions was quite demanding. By offering Extended Producers Responsibility (EPR) services and maintaining transparency and traceability in their operations, the company ensures compliance with regulations.

e. Global Operations:

Managing operations in diverse regions, including India and Dubai, brought logistical and operational challenges. However, strategic placement of recycling facilities and strong partnerships ensured smooth global operations.

9. Future prospects of the program

Over the year Shakti Plastic Industries has been able to create substantial environmental and social impact and they aim to continue replicating and expanding their efforts. Some of their significant accomplishments are:

• **Environmental Impact –**

- o 10,00,000 MT+ of plastic waste collected
- o 20,00,000 MT CO₂ offset - The plants invest in energy-efficient equipment and technologies to minimize energy consumption and greenhouse gas emissions during the recycling process.
- o The Shakti Plastic Industries employs water-saving techniques such as wastewater treatment and reuse systems, reducing water consumption and safeguarding local water resources.

• **Social Impact –**

- o 15,000+ Rag-pickers empowered PAN India - By partnering with local communities, urban local bodies, and rag-pickers ('Safai-Saathis'), Shakti Plastic Industries supports sustainable waste management practices and generates a positive environmental impact at the grassroots level.



- o 52%- women employees
- o The company offers ongoing training and awareness programs for employees, promoting environmental best practices and fostering a culture of sustainability within the organization.
- o 400+ IEC activities
- **Pillars of Strength –**
 - o 150+ ULB tie-ups PAN India
 - o 30+ Disposal Centres PAN India
 - o 600+ Esteemed brands associated
- **Products/Sites**
 - o 50K+ Sustainable products delivered

Furthermore, the organization has extensive expansion plans, intending to achieve the following:

- o Development of over 100 sustainable products from Multi-Layered Plastic (MLP)
- o Establishing more than 10 upcoming recycling facilities

Besides, they have projects lined up for recycling across India and are also establishing a unit in the UAE.

10. Conclusion

Shakti Plastic Industries, operating in PAN India and Dubai, stands as a leading solution for the growing challenges of plastic waste management. Established in 1969, they've solidified their legacy over three generations, excelling in recycling various plastic types, offering Extended Producers Responsibility (EPR) services, and developing innovative products using up to 100% recycled content. Their initiatives aim to address the critical environmental impact of non-biodegradable plastic, maintaining a sustainable solution to plastic disposal and recycling. The company's multifaceted approach, diverse network of collection and recycling facilities, along with its innovative patented technologies, ensures a comprehensive handling of plastic waste.

Their strong revenue model, including granule sales, EPR services, import/export activities, recycled product sales, and technology solutions, ensures financial sustainability. Challenges related to collection, technology, awareness, and compliance have been effectively tackled through a well-established network, R&D investments, awareness campaigns, and transparent practices. With ambitious expansion plans across India and a new venture in the UAE, Shakti Plastic Industries aims to continue its impactful journey in sustainable plastic waste management.



SWOT analysis of Shakti Plastic's case study

Strength

- **Contribution in the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Data collection and integration across the chain (A4)
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
 - Recycle (O3)
- **Closing the loop-**
 - Shakti Plastic Industries covers the entire value chain of plastic waste management, from awareness campaigns to collecting plastic, managing logistics, and recycling waste while ensuring strict compliance.
- **Technological Integration-**
 - The organization has well developed R&D facilities resulting in patented technologies.
 - They have integrated technology in all aspects of plastic waste management value chain.
 - By working with start-ups, they promote technological innovation.
- **Diversification of revenue streams-**
 - The company's multifaceted revenue model, including granule sales, EPR services, import/export activities, recycled product sales, and technology solutions, provides financial stability.
- **Environmental and Social Impact-**
 - The company has invested in eco-friendly technologies to manage the waste with focus on zero discharge.
 - Capacity building of rag-pickers and focus on women empowerment has created substantial social upliftment.
- **Collaboration and partnerships-**
 - Strong partnerships with over 600 brands, more than 150 ULBs has helped in scaling the operations and its impact.

Weakness

- **Financial risks-**
 - The organisation invests heavily in R&D and also promotes newer technologies by collaborating with start-ups. This may increase the CAPEX and create a risk factor if such technologies fail resulting in financial crunch.
- **Awareness and Behavior Change-**
 - Convincing the public and industries about the importance of plastic waste management may be an ongoing challenge, requiring continuous efforts in awareness campaigns.
- **Importing plastic waste-**
 - Considering the huge piles of plastic waste towering in India, it would be beneficial for the country if such big industries focus their efforts on solving the local issues.



Opportunities

- **Opportunity for expansion-**
 - Leveraging their strong partnership and collaborations, Shakti plastics should scale their recycling plants to more than the current 6 locations.
- **Increasing local environment and social impact-**
 - With such strong R&D facilities, the organization may continue to find more sustainable solutions to manage plastic waste generated in the country rather than importing the waste.
- **Foraying into newer markets for recycled products-**
 - Being a veteran in the field, they may leverage their expertise to foray into newer markets for recycled products and engage start-ups in the process.

Threats

- **Dependency on global market forces-**
 - Engaging in the import and export of post-industrial plastic waste introduces currency exchange rate risks, trade restrictions, and international market dynamics that can affect the profitability of these operations.
- **Public Perception-**
 - Negative public perception or controversies related to its brand could harm the company's reputation and operations.
- **Policy changes-**
 - Adhering to evolving waste management policies and regulations can be demanding, any unfavourable changes in these may disrupt the operations.





A Systemic Approaches for Management & Operations - Increasing Plastic Waste in Municipal Solid Waste (MSW) - A Unique Model of Partnerships & Convergence

Author: Prabhjot Sodhi & Tavishi Darbari

1. Location of intervention

08 cities – Samstipur, Nirmal, Mehboob Nagar, Guwahati, Ranchi, Bhubaneshwar, Jammu) and 02 Rural landscapes - village, panchayats, and blocks at Bastar and Behrampur (Odisha)

2. Problem description

The Central Pollution Control Board (CPCB) Report (2019-20) stated that 3.5 million metric tonnes of plastic waste is generated in India annually and only 50% of the total plastic waste produced is recycled. The waste generation rate in small cities and towns in India is 0.41 kg /capita/day while the surrounding villages generate around 0.08 kg/capita/day of solid waste (IJERMCE 2018). The per capita consumption of plastic products in India is rising and is expected to go up to 16-20 kg per annum by 2025.

The informal sector handles 42-86 percent of the waste.¹ The streamlining of the waste collected by the informal sector is usually unaccounted for. While the informal sector contributes toward diverting waste from landfills and checks the loss of habitats, the release of methane from landfills ultimately contributes to climate change. If not properly managed, plastic waste has numerous implications for the environment and health.

The Solid Waste Management Rules 2018 & Plastic Waste Management Rules 2016 & 2018 and 2022 clearly emphasize the route map & importance of managing plastic waste sustainably. Unscientific disposal in landfills and uncontrolled open burning of plastic waste at landfills can lead to severe land, air, and water pollution. The infiltration of toxic chemicals from plastic waste into the food chain and water resources can cause severe health issues such as genetic disorders, and endocrine system damage. Plastic production results in the release of many toxic substances, as many of the chemicals that are integral to the production of plastics are hazardous air pollutants. Many additives in plastic are toxic and have known



¹the rising problem of plastic waste in India". Available at <https://recykal.com/2022/08/08/the-rising-problem-of-plastic-waste-in-india/>



human health impacts. It poses direct human risks, impairs human immune systems, and affects the hormone system; therefore, it is important to reduce, reuse, repair, and redesign products and services. Over time, plastics fragment into microplastics and nano-plastics, that enter food, water, and soil, and may have negative health effects that are still not completely understood.

Considering the growing population, increasing incomes, finite resource availability, ever-changing consumption, and lifestyle patterns, and the lack of efficient processing systems, a need is felt to make the cities resilient to ensure effective waste management and to reimagine how we produce, consume, and dispose of materials. Therefore, the Centre for Environment Education (CEE) joined hands with private-public-people-centric partnerships in Rural and Urban landscapes in India. A brief on this follows.

2. Project background

CEE put up a proposal to HDFC Bank to address distinct risks to human health (SDG 3) at every stage of the plastics lifecycle from oil extraction, production, use, and recycling to disposal. To expedite the efforts towards making the city clean and healthy, and to effectively manage dry and plastic waste, the project through its mechanisms is trying to reduce these effects across the stakeholders in the waste supply chain.

In every landscape in the project, agreements were signed with clearly defined responsibilities to address a pilot – holistic, integrated model approach between the District Administration and HDFC Bank-CEE. The objective was to develop and establish a model in various wards for an integrated dry and plastic waste management system that is sustainable, cost-effective and could help the city adopt the principles of circular economy and meet the desired targets set forth under the SBM (U) and SBM (G) 2.0.

The model approach covered 15-20 wards in cities and 115 villages or around 80 panchayats in rural areas. In the project landscapes, materials were recovered from collected and segregated dry and plastic waste. This was executed through ULBs-women Self Help Groups, as well as through materials purchased from informal chains of small and large aggregators, waste pickers (safai mitras), and different dry and plastic product recyclers to ensure safe and scientific disposal of waste.

Under this project, a material recovery facility (MRF) and 2 material recycling facilities (MRC)² were established on the Municipal Corporation (MC) land to ensure efficient waste sorting and maximize material resource recovery. Besides, green jobs were created for the Safai Mitras and circular economy approaches were promoted (minimizing waste to landfills) through a sustainable business model.

The model embraces inclusivity for the informal sector, small and large aggregators, and waste pickers (Safai Mitras) and encourages investments besides building forward linkages for sustainability with different recyclers. This strategy was institutionalized through the selection of experienced, localized, committed Implementing Partners (IP) in the intervention areas.

²Cities of Jammu and Bastar/Jagdalpur (Chhattisgarh)



Figure 1: Project Team apprising officials about the project



3. Objectives

The main aims of the Project are:

- Improve source segregation at all levels in the agreed areas of the cities, peri-urban areas, and rural areas;
- Reinforce dry waste collection and transportation mechanisms with ULBs, women SHGs, cooperatives, and village and panchayat SHGs;
- Maximise Resource Recovery by facilitating the Material Recovery Facility (MRF);
- Reinforce traceability and transparency (accountability) at all levels in the material flow, from waste generation to the recycling points, thereby bringing the circularity principles of reduce, reuse, recycle, repairability, recover and refurbish of materials, cost efficiencies, and waste minimization into play;
- Embed measurability in monitoring systems and dashboards;
- Engaging in continuous dialogue with people, citizens, and related stakeholders for sustainable processes.
- Developing and implementing a socio-economically sustainable model (SESM) for packaging plastic waste management.
- Utilizing a holistic, integrated convergence approach (partnerships, financial) with different stakeholders.
- Implementing pilots in cities and towns through Material Recovery Facilities (MRFs) or Material Recovery Centres (MRCs) for enhanced dry and plastic waste management.



- Focusing on institutionalization, governance, and improving socio-economic conditions for waste pickers.
- Developing knowledge management, digital monitoring, and communication mechanisms with built-in adaptable feedback systems at various stages in rural and urban areas throughout the project duration.

4. Program implementation details

The CEE-HDFC Bank project was implemented with a hands-on gender-sensitive, participatory, process-driven approach to ensure community engagement. This participation ensures local ownership through the implementing partner (IP) for the self-help groups/entrepreneurial cooperative or company by the IP. The sustainable business approach fosters partnerships and convergence of funds from different sources.

The different stages of implementation were –

- Waste characterization exercises, that are essential to assess the type, quantum, and character of waste for ensuring systemic management of the plastic waste were undertaken by the IP.
- Parallely, to address citizens and consumer behaviour, a range of continual activities of nukkad nataks, plogging marches, clearing littering hot spots, wall paintings – citing messages as use of **one cloth bag reduces 169 plastic bags and nearly 5.2 kgs of CO2 emission, saving one drop of water/sec from one leaking tap saves 28.8 litres of water per day or nearly 10,512 litres/year** - that reinforce and advance India's commitments of CO2 levels³, were undertaken.
- Operations and management of MRF-related activities were undertaken in every city/rural area. This was managed by the local waste management implementing partners (IPs) with ground presence and experience.
- The MRF is functional with cost-effective, appropriate machinery, a weighbridge to measure incoming and outgoing waste, a baler, an air blower or phatka machine, a conveyor belt, a grinding machine, an electronic weigh scale, and an Incinerator (for domestic household sanitary waste).
- Appropriate vehicles, supported at times by ULBs or the IP partner, were deployed to ensure regular and appropriate collection of dry waste. Additional machines were also supplemented for coconut and cloth shredding.
- More efforts have started in different cities to link the multi-layered plastics (MLP), flexibles, and rejects for co-processing at cement plants and putting the thin LDPE and MLP into 2-4 mm shreds as per the guidelines⁴. This is however at times a challenge at the MRFs and local areas.

Figure 2: A social mapping in a panchayat agreeing on the collection, storage, etc. in villages.



³Countries publicly outlined what post-2020 climate actions they intended to take under the new international agreement, known as their Intended Nationally Determined Contributions (INDCs). The climate actions communicated in these INDCs largely determine whether the world achieves the long-term goals of the Paris Agreement

⁴CRRI - Central Roads research Institutes, and CPCB or MOEFCC guidelines.



- Further, small & large aggregators and Safai Mitras (SMs) were engaged and institutionalized into Self Help Groups (SHGs). This step was undertaken to encourage their participation in the waste collection system, ensure fair compensation to the SMs for the sorted waste, prevent material deductions based on weight, and guarantee a seamless flow of materials. Besides, this safeguards the dignity and respect of the informal sector.

Figure 3: Project Team engaging with the Local SHG members for bank accounts



- Regular training (Fire & safety, SHGs, accounts, book-keeping, business models, MRF & MRC machines) and capacity-building activities were undertaken. Additionally, they were provided with insurance, PPE and safety kits, sanitation & hygiene facilities, bank accounts, health cards, and health camps were also organized to help them avail benefits under government schemes. This empowered them and brought them on board to handle and manage the day-to-day operations of the MRF.
- More than 10 different monitoring registers were kept at MRF. Daily and weekly reports on inwards and outwards of materials are updated on WhatsApp. CEE ensures that all the transactions concerning the sale and purchase of different types of materials, receipts, vouchers, and registers are maintained at all levels. Cash Vouchers are maintained for every payment made, largely managed by women.
- Simple, integrated standard operating procedures (SOPs) were developed at all levels to keep a record of various activities implemented under the project. This systemic detailing of data ensures sustainability; and helps address any irregularities or discrepancies for smooth functioning.
- Networks were created with recyclers and waste processing organizations to ensure forward and backward linkages for better sustainability. The waste collected at the MRFs is weighed and sent to the recyclers with invoices, etc. All payments in the project for both purchases (communities, SHGs, aggregators) and sales (recyclers) are made according to the agreed rates and 90% of these payments are made through bank transactions. Proper GST is being deposited in the process. The MRFs established at various places are now linked with 21 other recyclers and Plastic Waste Management Units (PWMUs).
- In both, rural and peri-urban areas, the segregated waste is being collected from the village, panchayat level storage points at an average of Rs 6-8/kg (agreed city wise) and brought to the MRF for secondary segregation and processing at the District/Block levels.
- The project has been able to provide direct employment opportunities to Safai Mitras and indirect livelihood opportunities for more than 60-80 people in each area, including waste collectors, Aggregators, and Safai Mitras, in all cities. About 47 RWAs, 45 schools, 601 Safai Mitras, and 129 SHGs (Self-Help Groups) have been onboarded so far under the project at Samastipur. Total daily collection (varies from area to area) is nearly 170 tonnes/month and the average sale is 150 tonnes/month. Profits have started to happen.



Figure 4: MRF established in Samastipur



Figure 5: SHG members at work at the MRF



- Over a period of 6-8 months, CEE with support from IP partners has organized and conducted more than 400 training, workshops, and awareness camps for various stakeholder groups such as RWA members, residents, PRIs (Panchayati Raj Institutions), BDOs (Block Development Officers), Government officials, and Safai Mitras, sensitizing more than 12,600 participants. About 10 health camps were organized aiding more than 1250 Safai Mitras.

Figure 6: Health Camp organized under the project



The project has received many awards, and it is an apt example of a successful public-private-community partnership (PPCP) model.



5. Innovative methods/techniques

The project has many unique aspects. Firstly, partnerships with local ULBs (urban), and PD DRDA (rural) - help the project leverage the system's flow, and policy interventions. The Government's review mechanism of project activities and visits leads to mainstreaming it within the systems. Officials from the



National, State, and District levels visit the intervention areas regularly to review and analyse the project on aspects like what works, what needs to be linked, and learn and unlearn the processes, and systems. This builds an air of positivity, confidence, encouragement, performance, and delivery. The success of this project lies in stakeholders' ownership.

The project is continuously focused on - better business decisions with inventory tracking; operational insights with material flow analysis; mass-balancing; real-time customized reports; and process optimisation with comprehensive planning and digital control. However, at times when all these processes are combined it leads to complex issues at the MRF and MRCs; therefore, constant introspection is a priority in the project to optimize benefits, and material use efficiencies.

Seamless communications and hours spent by teams between stakeholders result in building the net worth of the project. The project has started building knowledge at all levels and local ownerships, using both physical and virtual means. The monitoring dashboards, for MRF, MRC, technology interface,⁵ and the feedback mechanisms to the IPs⁶ in cities on traceability of business trade and incomes have been a unique feature that others are taking inspiration from.

Handholding and tracking visits are made regularly by the project team. Formats have been developed for tracking performance, innovations⁷, tour reports, and monthly reports from IPs. The Director and M&E teams monitor the reports and upload them into Google systems regularly so that the District Government is apprised of the progress of the project regularly.

The donors of the project maintain a high level of transparency and engagement, ensuring that they stay informed about any changes and difficulties. Their approach involves fostering an open and self-critical atmosphere, encouraging a reflective partnership rather than a mere transactional relationship. Comprehensive reports are actively shared with the donors who employ robust tracking systems and routinely monitor both financial and program-related aspects. Using tools like Google Sheets and Forms, they collect real-time data from project partners, allowing for continuous adaptation and improvement of monitoring processes and indicators.

Scheduled trips are arranged for various groups, including ULBs, other interested NGOs, internal team members, and IP partner teams. These visits allow individuals from different areas to learn from one

⁵The review is done monthly on the machine performance, waste processing, safety, goods in stock and other staff-oriented issues.

⁶Continuous, regular meetings with IPs in the inward and outward system analytics and which materials the incomes are low, efficiencies are poor is highlighted to ensure sustainability. Record keeping is given a priority.

⁷Innovations include both in processes, technology and approach. What materials sourced needs to be addressed first, how on disposal and links to the recyclers. Regular interactions with ULB and informal sector set up, yet informally and over time agreements will be done.



another. To ensure the success of these trips, it's vital that the group actively participates in determining the topics they wish to explore. Stakeholders in the ecosystem engage in regular visits to locations such as Material Recovery Facilities (MRFs), Material Recovery Centres (MRCs), Safai Sathi's housing areas, and landfills as part of these exposure visits.

6. Financial/revenue model

This is the heart of the project. Detailed plans of actions and activities are linked to budgeted expenditures with clear indicators and targets for activities. Monitoring in the urban and rural spaces is undertaken monthly to outline achievements v/s targets. Of course, the purpose is process-based and finding solutions rather than a top-down autocratic approach.



In every city, the project submits a business case proposal in agreement with the PD-DRDA/PD-ZP/DC⁸ to set up an MRF/MRC and undertake other expenditures for 3 years. The detailed capital expenditures, defining plant and machinery costs, vehicles (for transportation) costs, with the specifications, photos of machines and warranties, etc are duly provided. Negotiations and meetings happen regularly for convergence with the ongoing schemes of Governments. Secondly, the operations and management (O&M) costs are clearly defined by the project in its proposal – Project CSR, and IP partner and Local Governments in Cities. The focus is to develop a working synergetic model among Private-public-people partnerships. Coordination with various governments at all levels has been the foundation of the project with large infrastructure and vehicle costs borne by Governments; management and facilitation costs borne by the project. Local management including, operational, segregation, and transportation expenditure is born by the IP⁹ as an entrepreneur.

Initially, the model subsidizes O&M for 2 years to invest and develop the approach, system, and a genuine resilient partner; in 2 years, the waste-to-resource ecosystem is set up in a city. But the subsidy by way of CSR funds/Grants/Investor support decreases with time and the amount for the Entrepreneur increases supporting the thought that waste is a resource! All partners enter into legal agreements among themselves clearly defining the roles, responsibilities, clear activities to be achieved in a time frame, payment terms, etc.

This well-defined systems approach is leading to the success of the project in cities. The IP, largely after 7-9 months of operations, at a minimum of daily 5000 kgs of waste processing, starts turning the MRF/MRC into a profit centre. The processing capacities of these centres vary between 7-10 tonnes per day, largely depending on the type of dry and plastic waste intake.

⁸Project Director Zilla Parishad/District Rural Development Department, District Collector.

⁹IP can be a NGO, a Company, SHG, Society etc. But as it is going to be entering into sale-purchase therefore it has to be a business organisation.



7. Partnerships

This initiative is designed to partner in Urban and Rural areas to synergize the efforts with the Urban Local Bodies, State Pollution Control Boards, Safai Mitras, Service Providers, Recyclers, Swachh Bharat Mission (SBM), Swachh Survekshan (an initiative of the Ministry of Housing and Urban Affairs (MOHUA) and other stakeholders, to minimize negative impacts and risks to the environment and health.

Partnerships at national and state levels are encouraged with different players such as technology service providers, citizens & waste generators in small groups, and resident welfare associations (RWAs). The project efficiently builds connections through workshops, meetings, and training sessions with government bodies, regulatory agencies, as well as academic and technology institutions. The project is actively engaged in multiple forums such as the Material Recycling Association of India (MRAI), APIC, IFAT India - Messe München India Pvt. Ltd., Circular Economy committees of Niti Aayog, and other relevant private sector forums.

8. Challenges and solutions

The plastic market is highly fluctuating, volatile in prices, and dissimilar for different places. At the MRFs, the sorting takes place in 20 to 25 different types of dry waste categories. Each category also has price variations. Prices of certain products like paper, cardboard, and glass decline during the rainy season. Team CEE and the Implementing partner (IP) continuously aim to get the right price for the products at the right time and avoid the lock-up of capital.

Figure 7: Shows interface between collection to safe disposal of Dry & Plastics



Real-time challenges and solutions in the project involved:

- Efficient transportation management to optimize truckloads (8-10 tonnes) of materials, which sometimes leads to stocking excessive material, resulting in the need for working capital support to IP on flexible terms. Collaborating with Governments helps to establish links for the co-processing of plastics in cement plants and road making, although it requires extensive coordination.



- Well-designed spaces, with concrete floors, and fire safety methods are necessary to sort and organise recyclables. This can be easily achieved with the help of good design and air circulation. Spaces were made more attractive with safe drinking water, bathing, toilets (separate for men and women), water harvesting, and separate vaults for safaii mitras to safely put their materials and clothes as changeovers.
- Ensuring dignity, reducing drudgery for waste pickers, and providing timely payments for waste supplied is a significant focus area. The project addresses scenes of exploitation, domestic conflicts, and unavailability of schooling for waste pickers' children, all aligned with emphasizing Sustainable Development Goals (SDGs).
- Managing records of waste sales through weighing scale slips is a standard practice. However, irregular agreements with recyclers, leading to cash transactions and delayed payments for the supplied materials, often extend the collection-disposal-payments cycle to 60-90 days. This has a significant impact on the IP's resources and tax revenue for the Government. Encouraging bank transactions is a priority to address these issues.
- Payments are made at the MRF at pre-decided rates which change every 15 days unless market prices drastically fall. However, some plastics, like Styrene and polycarbonate, are challenging to sell at reasonable prices. Eliminating problematic and single-use packaging plastics is crucial for overcoming these challenges.

9. Future prospects of the program

Currently, the project is operational in 8 cities and has the potential to be replicated across the country. The paradigm of partnerships with the ULBs and PDs ZP is path-breaking in many ways; it helps in mutual understanding of policymakers; and the implementers' anxiety for performance, creating measurable impacts of these partnerships in the collection, and clearing of waste hot spots in cities. But the time frame of 2-3 years of support under CSR for a place is just the beginning of transformative thinking and this project (of 3.5 years) with HDFC Bank needs to be seen as a developing phase; setting up systems in cities for collection, segregation, and safe disposal, ensuring local waste business organization's sustainability, inclusivity of the informal sector, and a business model. It further needs to be complemented for another 2 years as – the evaluation & monitoring phase (with newly defined roles).



Organizations such as CEE are perceived as waste business organizations (WBOs) contributing to the path of sustainability. The project emphasizes recognizing these organizations as potential WBOs in challenging circumstances, highlighting their role in fostering innovation.

Additionally, the project is still struggling with residential/household waste; in the future, it needs to address pre and post-industrial waste which has other challenges. Extended Producer Responsibility (EPR) is addressing many issues, and despite being a step in the right direction, it is still just the beginning.



Verification processes and systems being followed are the ethos of the sustainable model. The role of CEE as a facilitator will change to an evaluator (in the next phase), both in physical actions and for smooth books of account operations as a business model.

Long-term vision and targets on waste management; internal market rules for products; environment and consumer protection; tackling regulatory or enforcement issues; innovation and investments require more thinking and provocative proactiveness. This will largely be addressed at the national level and will help in achieving the UN Sustainable Development Goals (SDGs); and India's climate change targets – Nationally Determined Contributions (NDCs).

10. Conclusion

In conclusion, this project delivered effective strategies for managing plastic waste across urban and rural landscapes. By focusing on partnerships, innovative approaches, and sustainable models, it addressed challenges in waste segregation, resource recovery, and socio-economic development.

While facing market volatility and transportation efficiency hurdles, the project thrived by building strong collaborations with local government bodies, empowering waste pickers, and establishing efficient waste sorting systems.

Its successful financial model and replication potential underscore its role in reshaping waste management systems. Moving forward, the project aims to tackle industrial waste and expand Extended Producer Responsibility (EPR) strategies while evolving its verification processes toward more evaluative roles.



Overall, this initiative stands as an example of effective collaboration, innovation, and commitment to establishing cleaner and more sustainable urban and rural environments.



SWOT Analysis of CEE's case study

<p><u>Strength</u></p> <ul style="list-style-type: none"> • Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8) <ul style="list-style-type: none"> ○ Behaviour Change Campaign (BCC) for alternatives to plastic (A1) ○ Awareness building and BCC for plastic waste management (PWM) (A2) ○ Capacity building and training for PWM (A3) ○ Data collection and integration across the chain (A4) ○ Collection from source to processing facility (RR1) ○ Segregation, Sorting at processing facility (RR2) ○ Collection/Transportation (RR3) ○ Recycle (O3) • Comprehensive model - <ul style="list-style-type: none"> ○ The model focuses on filling the gaps by leveraging the existing infrastructure/value chain and/or developing new ones wherever required to create a comprehensive system. • It is a good example of PPCP (Public, Private, Community partnership) model- <ul style="list-style-type: none"> ○ The government provides a large infrastructure and collection & transportation vehicles. ○ The O&M of MRF and MRCs along with the transportation cost is borne by the Implementation Partner which has to be a commercial organisation. • Organising waste workers as SHGs- <ul style="list-style-type: none"> ○ This amplifies the impact of social efforts like capacity building, institutionalisation, income generation, etc. 	<p><u>Weakness</u></p> <ul style="list-style-type: none"> • Lack of systems to overcome the challenges of irregular contracts with recyclers and delayed payment cycles. • Complete dependency on CSR funding- <ul style="list-style-type: none"> ○ In the absence of this funding source, the project may find it difficult to sustain. • Lack of automated data collection and monitoring system. • The project is still struggling with residential/household waste which may impact the operations.
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> • Opportunity for expansion- <ul style="list-style-type: none"> ○ Being a comprehensive and validated model, it has the potential to be replicated in PAN India. • Collaborating with Governments to establish links for the co-processing of plastics in cement plants and roadmaking to overcome the hurdle of excessive stocking. • Integrating new-age technologies to increase the efficiency of data collection and monitoring processes. • Collaborating with bulk waste generators to build a steady supply chain. 	<p><u>Threats</u></p> <ul style="list-style-type: none"> • Optimisation of transportation system may sometimes lead to excessive stocking of waste material which may cause financial crunches for the IP. • Market volatility- <ul style="list-style-type: none"> ○ Fluctuations in demand and price of recyclables may affect the profitability and operations of the IP.





Waste Warriors in Dharamshala: Urban Interventions to Setup Replicable Waste Management Systems

[\(Click here for intervention video\)](#)

Author: Archana Masih, Prachi Bhatia,
Shashank Prabhu and Suraj Agarwal

1. Location of intervention:

Dharamshala (Urban), District Kangra, Himachal Pradesh

2. Project background

Dharamshala, being an Important Bird Area (IBA), is disproportionately impacted by waste due to exacerbating land and water pollution, waste-wildlife conflict, and degradation of the natural environment. The Model Ward Program aims to address Dharamshala's solid waste management issues by building end-to-end systems and inculcating behaviour change in the local community. The program focuses on raising public awareness regarding waste management practices among households, schools, and businesses in Ward 7, Secretariat, and Ward 8, Khel Parisar. With the support of the HT Parekh Foundation, Waste Warriors is impacting communities in the region to create robust systems for the government to replicate.

The project addresses the environmental and health hazards from improper waste disposal like open burning and dumping in dark spots or slopes, by educating and engaging the community to adopt



sustainable waste management practices like source segregation, 3R (Reduce, Reuse, Recycle), etc. to ensure a clean Dharamshala for residents and visitors.

3. Problem description:

Despite being a majority rural state, Himachal currently generates 370 TPD (tonnes per day) of solid waste, much of it being non-biodegradable. According to official estimates, 111 TPD of solid waste, is landfilled. With increased tourism in the state, the numbers are expected to grow continuously, even in major cities like Dharamshala and Shimla¹. Poor source segregation and lack of awareness on solid waste management is the key factor that contributes to this problem. Besides, there are an estimated 1.5 - 4 million waste pickers in India who collect, clean, sort and segregate recyclable waste to sell it to scrap dealers to make a living.



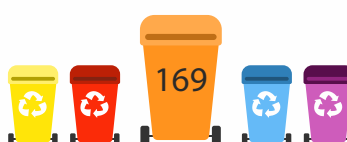
Dharamshala Planning Area Development Plan 2035 mentions a +3% growth in population yearly in addition to tourist entry of 25 Lakh per year in Kangra. The waste due to this influx becomes a huge challenge, causing waste-wildlife conflict and environmental degradation due to unmonitored waste dumping and burning. Mixed waste ends up at the municipal dumpsite without any sorting or processing, thus exacerbating GHG and methane emissions. According to the Dharamshala Municipal Corporation, approximately 50,000 MTs of legacy waste have formed giant mountains of garbage.

4. Objectives

The objectives that were planned to be achieved are as follows:

- Increase source segregation rates at the household and commercial establishment level.
- Create replicable wards in the city for the local government to adopt.
- Establish infrastructural support including segregation centres and Material Recovery Facilities (MRF).
- Generate livelihoods in the waste sector through engagement at the Material Recovery Facilities and correctional facilities.
- Reduce waste to landfill/slope/dumpsite movement through at-source behaviour change interventions and supporting operations by establishing infrastructure.
- Support local biodiversity by mitigating waste from ending up in wildlife areas and natural habitats.

¹<https://www.himdhara.org/2023/03/24/its-more-difficult-to-live-struggling-with-mountains-of-waste-in-himachal-pradesh/>



5. Implementation details

a. Model Ward Program (MWP)

MWP involves engagement with households in Dharamshala Urban's Ward 7 and Ward 8 by educating residents on the importance of source segregation and home composting through door-to-door awareness, follow-ups, and regular Mohalla Meetings. Community-based workshops were organized, and monthly training for door-to-door Safai Sathis was conducted. Young Warriors clubs helped spread the importance of source segregation in their neighbourhoods.

Waste Warrior's continued advocacy prompted the installation of a partition between wet and dry waste in the Nagar Nigam vehicles. Additionally, they have worked closely with religious leaders to integrate sustainable practices into their teachings, fostering a sense of environmental consciousness, and promoting eco-friendly behaviours among their followers. Their partnership with local entities such as Nehru Yuva Kendra, Rotary Club, Inner Wheel Clubs, and others helped increase community participation during cleanups and boosted their efforts towards space transformation and dark spot cleaning.

b. Material Recovery Facility (MRF)

The Dharamshala Material Recovery Facility (MRF) is a collaboration between the Waste Warriors Society and Smart City Dharamshala. Spanning 800 sq. m. in Ward 8, Khel Parisar, the MRF is operated by Waste Warriors Society and aims to recover recyclables and useful products from non-biodegradable waste fractions in municipal solid waste. The MRF receives mixed dry waste, including paper, cardboard, textiles, glass, rubber, plastic goods, metals, tetra packs, ceramics, and aluminium cans, which are segregated, baled, and sent to recyclers for reuse.

c. Waste Under Arrest

The Model Jail Program, named 'Waste Under Arrest,' was implemented in Lala Lajpat Rai District Correctional Home in Dharamshala in collaboration with the Directorate of Prisons and Correctional Services, Himachal Pradesh. The program aimed to establish a Waste Management System in the correctional home, including infrastructure support, IEC posters, and training for workers, staff, and inmates on waste segregation and disposal. The correctional home had approximately 400 residents, with 75 engaged in various activities within and outside the premises. The Waste Management infrastructure comprised a food waste composting pit, a dry leaf composting pit, and drop-offs for segregated dry waste collection. 60% of the funding was provided by the Waste Warriors Society, and the remaining 40% came from the correctional home. The program has received approval for scaling up in all 14 Correctional Homes of Himachal Pradesh by ADGP (Additional Director General of Police), Prisons, and will be conducted in collaboration with the Directorate of Prisons.

d. Clean Business Program

The Clean Business Program incentivises sustainable practices, adhering to Solid Waste Management Rules 2016. Weekly training helps entities meet Clean Business Standards, certified by Himachal Tourism and Dharamshala Municipal Corporation. They collect dry waste, strengthening the recyclable waste value chain. Waste Warriors awards certificates and five badges to businesses excelling in waste management including back-of-house staff waste segregation, guest facilities for waste segregation, identification of reusable non-recyclable materials, source segregation of food waste and composting, and provision of awareness materials for staff and customers.



6. Innovative methods/techniques used

The 'Waste Under Arrest' program in Lala Lajpat Rai District Correctional Home introduces innovative methods to engage inmates in waste management by providing them training on waste segregation and proper disposal techniques. They are actively involved in the process of sorting and managing waste within the facility. This involvement imparts valuable skills and fosters a sense of responsibility and environmental consciousness among the inmates. By participating in waste management activities, inmates have the opportunity to contribute positively to society, learn new skills, and potentially gain a sense of purpose and accomplishment during their time in the correctional home, and take up waste-related employment later.

The program intervention for the Bhagsu-McLeodGanj highway employs innovative methods of nudging tourists through art, enabling them to undertake pro-environment steps by adopting appropriate waste management practices. This includes the iconic Dalai Lama Mural, installing dustbins and signboards with innovative designs, and creating art installations with waste like “THINK CARE, and CHANGE”. These techniques contribute to the preservation of cultural landmarks, promote cleanliness and waste management, provide valuable information, and create thought-provoking artistic expressions. By utilising these innovative approaches, the intervention aims to create an engaging and environmentally conscious environment, to educate both residents and visitors.

Additionally, they collaborate with businesses and government offices to encourage waste segregation and collection of dry waste. The construction and operation of a Material Recovery Facility (MRF) plays a crucial role in sorting and processing waste. Overall, the program emphasises sustainable waste management practices, raising awareness, and engaging citizens to separate their waste properly.



Building productive relationships with stakeholders ensures a steady supply of dry waste to sustain MRF's functionality. These initiatives aim to create a cleaner and healthier environment while fostering a sense of responsibility among stakeholders.

7. Financial/revenue model of the intervention

The long-term sustainability of the program is ensured by integrating several revenue streams and cost structures as mentioned below:

i. Revenue Streams:

- a. **Grants/Corporate Social Responsibility (CSR) Funding:** The intervention has been supported by grants and funding from various sources, including corporate social responsibility grants.
- b. **Sale of Recyclables:** Given the nature of work at MRF, the collected waste materials are sorted and processed for recycling which generates revenue by selling the recyclable materials such as plastic, glass, paper, and metal to recycling companies or manufacturers.
- c. **Plastic Credits/Extended Producer Responsibility (EPR):** The intervention works in collaboration with producers and manufacturers who are required to comply with EPR regulations.
- d. **Government Funds:** Direct financial support from government bodies is being explored to contribute to the sustainability of the intervention.

ii. Cost Structure:

- a. **Labor Cost:** The project requires a dedicated workforce to carry out waste collection, sorting, recycling, and other related activities. Labour costs include wages, salaries, benefits, and training expenses.
- b. **Contingency Cost:** It is important to allocate a portion of the budget for unforeseen events or emergencies that may arise during the implementation of the intervention.
- c. **Information, Education, and Communication (IEC) Activities:** To raise awareness and promote behaviour change, the intervention conducts IEC activities such as public campaigns, educational programs, and community engagement initiatives.
- d. **Salaries:** Wages and benefits for waste workforce; vary based on roles, expertise, and regional rates.
- e. **Logistics:** Covers transportation, storage, and distribution of waste resources; includes vehicle, fuel, maintenance, storage, and infrastructure costs.
- f. **Technology:** Expenses for waste management technology; include equipment, treatment tech, monitoring systems, software, and tools to enhance efficiency.

Ensuring the long-term sustainability of the intervention is crucial by carefully balancing the revenue streams and cost structure. By diversifying revenue sources and reducing costs through efficient operations, efforts are being made to ensure the financial viability of the interventions.



8. Partnerships

HT Parekh Foundation has been a key funding partner of Waste Warriors since 2017, to address the solid waste management challenges in Dharamshala. This partnership has enabled the organization to expand its initiatives and make a significant impact in the community.

Other major stakeholders involved are:

- i. **Dharamshala Municipal Corporation:** As the local governing body, the Municipal Corporation plays a crucial role in waste management policies and implementation. The collaboration involves designing and executing waste management strategies and programs.
- ii. **Dharamshala Smart City Ltd:** Smart City Limited is responsible for the development and implementation of smart solutions in Dharamshala by integrating innovative waste management practices and technologies into the city's infrastructure.
- iii. **HP Forest Department:** The Forest Department of Himachal Pradesh is involved in waste management efforts to ensure the protection of the natural environment by addressing such issues in forested areas and promoting environmental conservation.
- iv. **Himachal Pradesh Tourism Department:** They collaborated with Himachal Pradesh Tourism Department to implement waste management initiatives that focus on maintaining cleanliness and preserving the natural beauty of tourist destinations.
- v. **HP Prisons Department:** Waste Warriors Dharamshala has partnered with the HP Prisons Department to implement the "Waste Under Arrest" program in the Lala Lajpat Rai District Correctional Home. This collaboration involves infrastructure support, training programs, and waste management systems within the correctional facility. The program benefits both the facility and its residents.

In addition to these stakeholders, Waste Warriors Dharamshala has formed partnerships to enhance community engagement and participation including Nehru Yuva Kendra, Rotary Club, Inner Wheel



Clubs, Training Academies, and a local group called "Green Friends." These partnerships have facilitated increased community participation in clean-up drives, awareness campaigns, and space transformation efforts.

The impact of these partnerships can be seen through various initiatives, including the successful completion of Dharamshala's first Material Recovery Facility (MRF). This has significantly improved waste management efficiency in the city. These partnerships and collaborations have not only contributed to the scale and coverage of the organization's waste management initiatives but have also fostered community ownership and participation. The involvement of stakeholders from different sectors has facilitated the sharing of resources, expertise, and funding, making the initiatives more sustainable and impactful.

9. Challenges and solutions

The project faced several challenges including the existing gap in the infrastructure for waste collection and processing. Lack of adequate facilities hindered the collection and processing of waste, leading to inefficient operations and, thus poor waste management. Addressing the challenge required substantial investments and resources to upgrade the infrastructure and establish efficient waste management processes.

Another challenge was the post-COVID boom in tourism across the country. This sudden increase in tourist activities surged waste generation, thus overwhelming the existing waste management systems. Dealing with this sudden influx of waste required quick adaptation and scaling up of the project's operations to meet the increased demand. It also necessitated coordination with local authorities and stakeholders to manage the waste effectively during peak tourism seasons.

Additionally, delays in obtaining permissions from various government departments posed a significant hurdle in implementing the project. The bureaucratic processes and multiple stakeholders involved in granting approvals affected the project's timeline and caused disruptions in its execution.



Furthermore, the delay in the construction of the Material Recovery Facility (MRF) by the contractor posed challenges in commencing the operations at the facility. The inability to start operations has affected the project's efficiency and progress.

10. Future prospects of the program

The organization has developed a 6-step roadmap to sustainability for their model ward programs with specific targets under each of the following:

- a. IEC & Awareness:** To raise the general level of awareness of the community & to create a demand for solutions.
- b. Outreach:** To engage with multiple stakeholders like the contractor, the ULB, ward councillors, etc. to define each of their roles in setting up the system.
- c. Infrastructure:** To identify infrastructure gaps & liaison with ULB to set up appropriate collection and processing technologies.
- d. Operations:** To assist the ULB & contractor in optimum route mapping to ensure 100% efficient coverage & to ensure that the MRF operations are effectively handed over to a local entrepreneur.
- e. Advocacy:** For improvement in various policies and by-laws related to SWM and implementation of the 2016 rules especially concerning bulk generator on-site composting. Waste management will also need to be made a political agenda.
- f. Economic:** To ensure that the entire model is economically viable by linking multiple revenue channels from user fees, sale of waste, service fees from ULB, EPR fees from Brands & global plastic credits, etc.

Moreover, they are currently working on a tourist activation model in Dharamshala since the annual tourist population surpassed the local population, thus evincing the clear need to nudge the tourist population to take pro-environment actions. Eco-Daan, born out of the noble Indian idea of voluntary and selfless contributions, focuses on contributions towards local ecology and economy in Dharamshala. The idea is to involve the tourists and travellers and take individual, community, or collaborative actions toward solving the waste crisis in the region.

The upcoming intervention seeks to inculcate behaviour change in the local community and floating population through Eco-Daan, by creating an ecosystem of touchpoints to nudge them towards contributing to keep Dharamshala cleaner than they found it.

11. Conclusion

In conclusion, the Waste Warriors' Model Ward Program in Dharamshala, Himachal Pradesh, has demonstrated a commendable approach to addressing solid waste management challenges in a region facing environmental and health hazards. Through strategic initiatives, community engagement, and innovative methods, this program is laying the foundation for cleaner and more sustainable waste management practices. By creating replicable models and building key partnerships, the program's prospects are promising. The roadmap for sustainability and the forthcoming tourist activation model reflect the commitment to continuous improvement and the positive impact on the local environment and community.



SWOT analysis of Waste Warriors

Strength

- **Contribution to the plastic waste management (PWM) value chain (refer to the chart on page number 8)**
 - Awareness building and BCC for plastic waste management (PWM) (A2)
 - Capacity building and training for PWM (A3)
 - Collection from source to processing facility (RR1)
 - Segregation, Sorting at processing facility (RR2)
 - Collection/Transportation (RR3)
- Using influencers like religious leaders, local clubs, etc. for community participation.
- **Awareness generation and capacity building through innovative techniques-**
 - BCC activities for households through door-to-door awareness, follow-ups, workshops, and regular Mohalla Meetings.
 - BCC activities for jail inmates, workers, and staff (Waste Under Arrest) through infrastructure support and IEC posters, along with capacity-building training.
 - Awareness generation among businesses for EPR compliance through training and incentives.
 - Nudging tourists towards waste management practices through art.
 - Monthly door-to-door training for Safai Sathis was conducted.
- **Unique social experiment-**
 - Building capacities of jail inmates in waste management provides a unique livelihood opportunity and contributes towards the upliftment of the stigmatised community.
- **Partnership/collaborations-**
 - Focus on partnerships to ensure acceptance both from governments and the community.

Weakness

- **Lack of steady and diversified funding options-**
 - The major source of funds is the HT Parekh Foundation which if ceases may impact the model's operations.
 - A portion of their funding comes from the sale of recyclables and sourcing consistent, and quality raw materials could pose challenges, as it relies on post-consumer discarded plastics.
 - Besides, fluctuations in the demand and price of recyclables have the potential to impact the revenue generated.
- **Limited Geographic Coverage-**
 - Waste Warrior's primary focus is on Himachal Pradesh, and the model is not tested in any other geography.



Opportunities

- **Multi-stakeholder collaboration -**
 - Collaboration with government agencies and their financial support can enhance the program's reach and impact.
 - Leveraging private sector support (PPP model) can contribute to long-term sustainability.
- **Scale Up-**
 - The success of the program in Dharamshala can serve as a model for replication in similar geographies.
- Increase the scope of the program from waste segregation and disposal to creating waste-to-value products e.g., capacity building of jail inmates in the Waste Under Arrest program.

Threats

- Financial vulnerability
- **Supply Chain Disruptions-**
 - Dependence on informal collectors and aggregators can pose risks if there are disruptions in the supply chain or fluctuations in the quality of collected materials.





Way forward A practical approach

The case studies in this compendium cover **19 states** of the country, offering a comprehensive overview of plastic waste management (PWM) efforts across various regions. Attempts have been made to incorporate at least one model from all parts of the country, including the Union Territories.

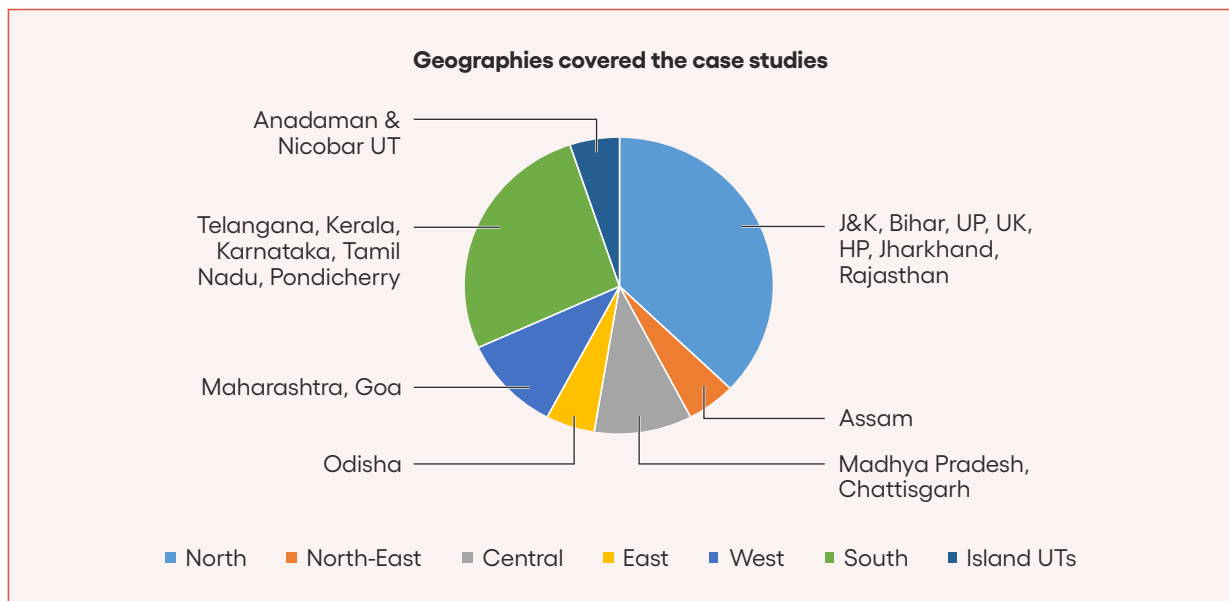
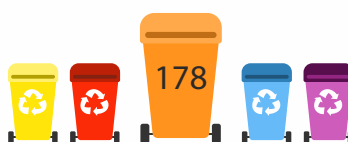


Fig: Geographies covered through the case studies

1. Gap Analysis and Recommendations

The closed-loop system, illustrated in Figure 1 on page 8, outlines the various steps in the Plastic Waste Management (PWM) value chain. The process commences with behaviour change campaigns for alternatives to plastic products and concludes with end-of-life processes like recycling, incineration, or landfill dumping. However, efforts should be made to minimize waste sent for incineration and landfill dumping, as both have adverse effects on human health and the environment. A closer examination of the number of states covered and the organizations involved in one or more of these components reveals that organizations are emphasizing awareness-building and BCC activities for PWM (A2) and capacity-building and training for PWM (A3). Figure A illustrates that 15 organizations have models



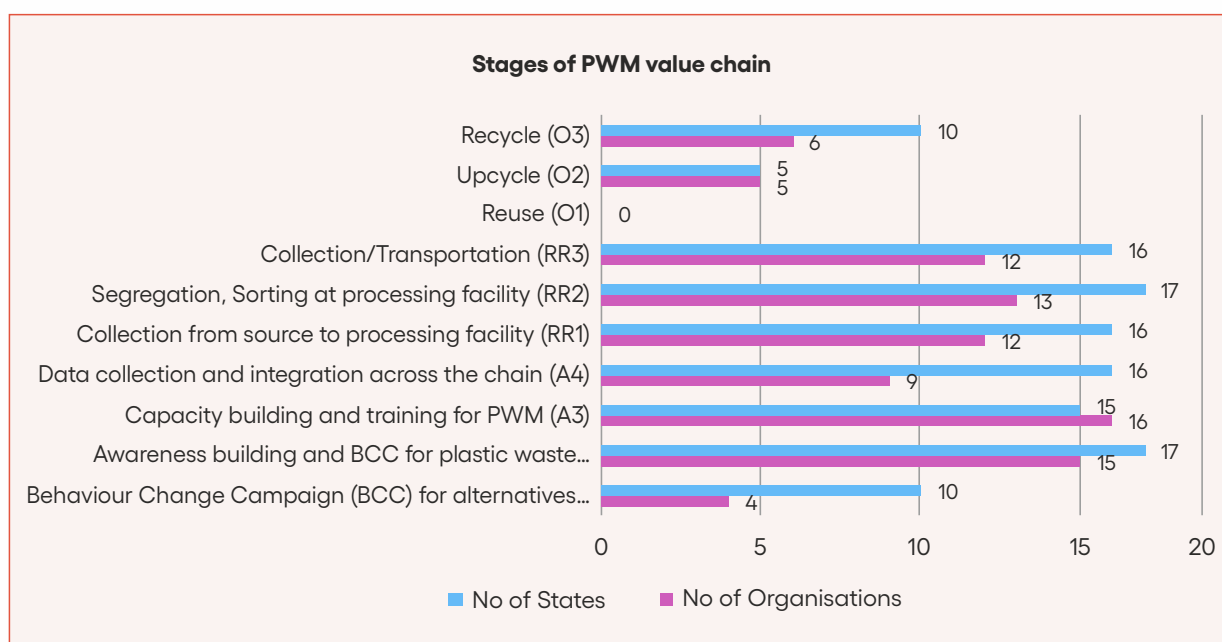


Fig A: Models covering various stages of plastic waste management value chain

where awareness-building and BCC activities for Plastic Waste Management (PWM) and/or capacity-building and training for PWM are integral components. These activities are being implemented in 17 and 16 states, respectively, which indicates a positive trend. However, there is a need to enhance focus on other aspects of the value chain.

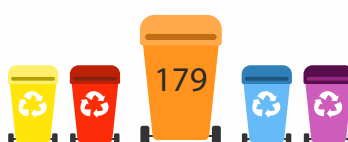
1.1. Data collection and integration across the value chain

It is observed that a substantial number of models focus on activities like collection to the processing facility (RR1) (12 models in 16 states), sorting and segregation at the processing facility (RR2) (13 models in 17 states), and collection/transportation to end-of-life processes (RR3) (12 models in 16 states) (refer to Fig A). However, the component of data collection (A4) appears to be lagging, as only 9 out of 20 models have integrated this component across the value chain. Despite this gap, it's noteworthy that these 9 models are being implemented across 16 states.

Take the example of the 'Power Loop' project implemented by Midway Journey. The project which emerged in response to Guwahati's plastic waste crisis, addresses five components of the Plastic Waste Management (PWM) value chain, including awareness building and BCC for PWM (A2), capacity building and training for PWM (A3), collection from source to processing facility (RR2), segregation, sorting at the processing facility (RR3), and collection/transportation to recyclers (RR4). However, it lacks data collection at any level of the PWM value chain. Implementing a digital platform/dashboard at each phase of waste management would enable them to streamline processes efficiently and improve the traceability of collected waste materials.

This emphasizes the importance of making data collection and integration mandatory, as it forms the backbone of a sustainable model in Plastic Waste Management (PWM) by enhancing transparency, traceability, and accountability. Additionally, it will aid in measuring the waste footprint of users, enabling to development of customised strategies and interventions.

The publication discusses interesting technologies employed for data collection and integration such as the 'Tracer' platform by Nepra and Saahas Zero Waste, the 'Sansadhan' platform by GIZ India, and the



use of Geo-tagging, Artificial Intelligence (AI), Machine Learning (ML), and advanced drone mapping techniques by Earth5R, among others. These technologies are not agnostic to any particular model or geography and can be adopted by all organisations to increase transparency, traceability, and efficiency.

1.2. BCC for alternatives to plastics

Moreover, there are gaps in areas like behaviour change communication (BCC) for alternatives to plastic products and integrating recycling/upcycling into the model. While organizations prioritize BCC for Plastic Waste Management (PWM), a critical area left unaddressed in dealing with the issue of plastic pollution is awareness generation for alternatives to plastic products and responsible plastic usage with only 4 organisations namely, GIZ India, HCL Foundation, ITC-Saharanpur, and CEE working on BCC for alternatives to plastic waste (A1).

The "Clean Noida" initiative, a collaborative effort between HCL Foundation and Noida Authority, exemplifies the integration of A1 component of the PWM value chain. Under this initiative, HCL Foundation has undertaken a comprehensive awareness generation program promoting the use of alternatives to plastic products. Through targeted training programs, the model successfully transforms textile and paper waste into economically viable cloth and paper bags, reducing plastic usage. This effort also generates sustainable livelihood opportunities for local women's groups. The campaign strategically places posters in market areas, encourages reusable bag usage, and employs innovative methods, such as the Plastic Heist campaign, the concept of 'Polyman' where a man dressed in an attire made from polybags interacted with the public, spreading awareness about reducing plastic consumption, and installing a sculpture of Mahatma Gandhi which was crafted from 1000kg of plastic waste, to emphasize waste circularity and the 3Rs (Reduce, Reuse, and Recycle). Executed through street plays, these multifaceted approaches involving local businesses and artistic installations contributed significantly to a sustainable shift from plastic reliance in Noida.

1.3. Integrated resource recovery chain

Presently, the common practice involves users selling high-value plastic waste to scrap dealers, while low-value waste goes to Material Recovery Facilities (MRFs). This setup makes running an MRF less profitable. Thus, if scrap dealers are incorporated into the MRF, both high-value and low-value waste can be processed in the same facility, boosting profitability. Additionally, for a model to be comprehensive and sustainable in the long run, it must include recycling/upcycling in its operations. This approach will also help in formalising waste workers and engaging them in different activities across the value chain.

Recykal's model for instance incorporates various components of the PWM value chain and attempts to close the loop by diverting the segregated waste to recyclers. However, there is no tracking mechanism to ensure that the waste is being efficiently managed by their partner recyclers. To ensure that the loop is closed sustainably, the organization must set up processing units (recycling centers) and integrate the local informal waste worker community, thereby formalising them and providing them with improved livelihood opportunities.

1.4. Standardised monitoring mechanism

As many models conclude after transporting waste to recyclers/incinerators, there is a lack of a standardized monitoring mechanism to guarantee responsible processing by these entities. Hence, there's a necessity to establish a centralized monitoring system that includes both citizens and the government, ensuring dual accountability and transparency. A replicable and scalable example is that



of GIZ-India, who have developed a digital portal- 'Sansadhan' to digitally monitor the waste collected, aggregated, and diverted into the recycled loop. This portal has been already adopted by MoHUA and will shortly be expanded to 10 cities across India. Establishing such centralized platforms will ensure data accessibility along with enhancing the efficiency of waste management systems in urban areas across India.

1.5. Use of advanced technology

Another significant finding is that technology usage is mostly confined to data collection, ensuring traceability, and sorting and segregation at the processing plant. This leaves room for a broader integration of technology across various components of the Plastic Waste Management (PWM) value chain. Earth5R's model employs technology for awareness and capacity building, utilizing an in-house mobile application called the 'Sustainability app' for training modules. Employing such innovative methods for capacity building could be an effective means of engaging larger groups in today's tech-savvy world.

Implementing environmentally friendly advanced technology in the sorting and segregation process, while ensuring cost efficiency, can enhance the effectiveness of processing plants. The model adopted by Shakti Plastics serves as a good example where technology has been integrated into all activities, with attention given to ensuring cost-effectiveness and environmental sustainability.

1.6. Role of government and corporates

The study reveals that while government support focuses on infrastructure development, awareness generation, capacity building, monitoring, and expanding operations to new geographies; corporates play a crucial role in funding operations and creating viable revenue sources. This highlights the significance of the Public-Private Partnership (PPP) model in ensuring the sustainability of any initiative.

The model implemented by ITC-Saharanpur, "Community-led Decentralized Waste Management Model for Plastic Waste Reduction, Reuse, and Recycling," effectively highlights the collaborative efforts of corporates, government, and the local community. Spearheaded by ITC Limited in collaboration with Saharanpur Municipal Corporation and the community, this initiative has empowered marginalized waste collectors and enhanced the overall well-being of the community. By leveraging infrastructure support from the municipal corporation, while ensuring sustainability and operational viability through community participation and ownership, ITC has been able to implement the program which stands as a testament to the power of community-led initiatives and public-private partnerships in creating lasting positive change in plastic waste management.

1.7. Creating a comprehensive model

Analyzing the closed-loop system and the involved organizations shows that only 30% have a comprehensive model. Yet, when looking at the states where these models were implemented, it's noteworthy that in 70% of these states, different organizations are addressing various components of the Plastic Waste Management (PWM) value chain, effectively closing the loop.

An excellent illustration is the implementation of PWM by the CEE in eight Indian cities. This model addresses every facet of the PWM value chain, concentrating on bridging gaps through the utilization of existing infrastructure/value chains and, when necessary, establishing new ones to establish a thorough system. Moreover, it serves as an excellent example of the PPCP (Public, Private, Community Partnership) model, where the government supplies significant infrastructure and collection/transportation vehicles, while the implementation partner bears the responsibility for the operation and maintenance of MRF and MRCs, along with transportation costs.





In states where the loop remains open, there should be a greater emphasis on awareness and capacity building for PWM, data collection and integration, and recycling/upcycling components of the closed-loop system. Therefore, if efforts are made (with government support) to bring all these organizations on a common platform, their strengths can be harnessed, avoiding duplication of efforts.

2. Outlining the Role of the India Sanitation Coalition

The India Sanitation Coalition (ISC) is an inclusive platform that supports cross-learning, sharing of good practices, and works through partnerships and collaborations. It encourages multi-stakeholder dialogue and creates interfaces between corporates, government, development partners, media, SMEs, and communities.

Linkages are critical for success. Mapping of partners has been a priority for the ISC, as we work to support collaborations across similar verticals in sanitation, and along similar geographies. Through the collaborations it supports, ISC works to leverage the strengths of each of the partner organizations to optimize impact. For this, often idea generation is critical.

ISC has a unique perspective of being able to view sanitation through the lens of different stakeholders, and use that experience to identify gaps, understand where the strengths are, and understand a new way forward.

Sanitation's landscape is changing. India is changing. India Sanitation Coalition is proud of the work that it is achieving with its partners, and looks forward to more success stories.



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