

Perspective Article

Open Access

Integrated Plastic Waste Management in Rural & Urban Areas of Samastipur District, Bihar, India

Singh Yogendra and Kumar Arvind*

Temasek Foundation International Water Leadership Fellow, 2018, National University of Singapore, India

*Corresponding author

Kumar Arvind, Temasek Foundation International Water Leadership Fellow, 2018, National University of Singapore, India.

Received: April 22, 2024; **Accepted:** May 16, 2024; **Published:** May 23, 2024

The project aims to promote a more integrated approach for maximizing materials use efficiency across the plastics waste to encourage a sustainable, and a safe environment. In this project the inclusivity of small aggregators and waste pickers (Safai Mitras) will be institutionalized and within the respective governance mechanism made to affect improved social conditions. Project's target at the end of period is have a systemic approach and investments into better management of dry waste in a more circular economy approach in the City of Samastipur, Bihar, India.



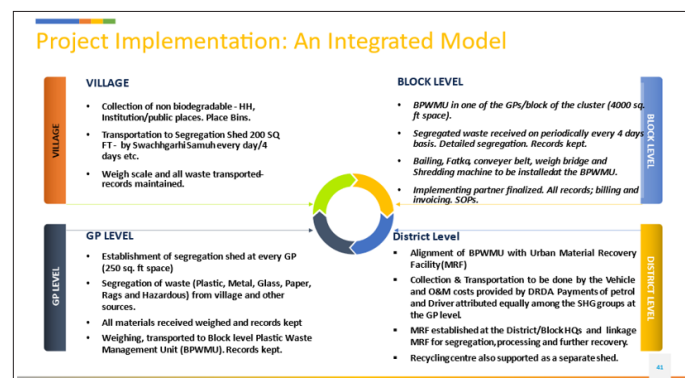
Figure: Bihar, India 1st 10 TPD (Tonne Processing Plant / Day) especially for Dry Waste

Introduction

Samastipur is one of the thirty-eight districts of Bihar in India. The district occupies an area of 2904 km² and has a population of 4,261,566. There are 29 Wards in Municipal corporation (Urban Areas) & 20 block, 149 panchayats in rural areas. Every day 110 Metrictonne Solid waste (65 Metric tonne Organic, 45 Metric inorganic (9 Metric Tonne Plastic Waste) generated in Samastipur in Urban areas & 9 Metric tonne in Rural Areas. But its management was big challenges due to lack of any infrastructure of collection, Processing & Community engagement for Segregation at sources.

Samastipur Administration has initiated to establish the infrastructure for collection, transportation & Processing of Waste on every step: Waste Processing unit at Panchayat level, Block Plastic Waste Management Unit at Block or cluster level &

Material recovery facility at district level under the Swachh Bharat Mission 2.0 Urban (Government of India Flag ship programme) & Lohiya Swachh Bharat Abhiyaan (Government of Bihar Swachhta Abhiyaan). Simultaneously initiated social behaviour & Communication activities & IEC (Information, education & Communication) activities to Engage community & Citizens to promote segregation at Sources.



The Project's Main Aim is to Establish

- Set up of sustainable dry waste management and recycling center (SWACHH CENTRE/ Material recovery Facility) - to promote ULBs for better segregation of different dry waste, including plastics, further recycling of various rigid plastics, thin and multilayered and getting the granules also processed into products. Creating job creation and impact livelihoods for the informal sector stakeholders. Ensuring efficient processing systems through both collection and purchase of the materials in the supply chain to strengthen collection of all types of plastics.
- Create Decentralized Waste Collection Centers (DWCCs) and mainstreaming small aggregators - in the City Wards with a focus on small aggregators by resourcing them with investments in machinery to create entrepreneurial habits. Supporting them with more formal systems approach.
- Mainstreaming Waste Pickers individually and SHGs-Safai Mitras (SM) individually or through self-help groups (SHGs) by norming and forming their enterprises in the waste sector. This will open new opportunities and lead to more sustainable ways of collection, segregation, and processing of plastics. Deliver better social security measures, job creation and

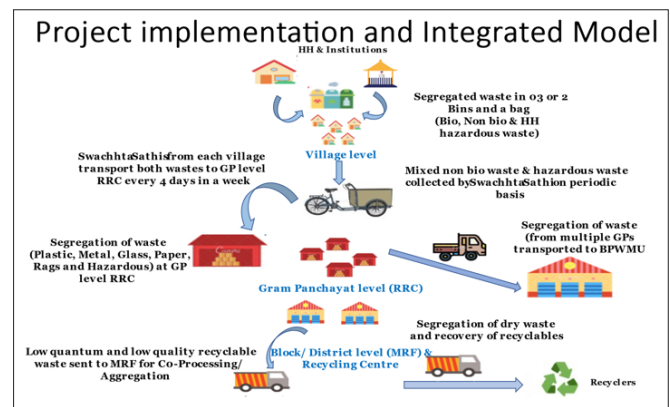
- impact livelihoods for the informal sector stakeholders.
- Creates technology applications - to integrate the material flow efficiencies through digital app-based models for better traceability and transparency of materials.
 - Capacity Building and Experiential Learning – focus on larger trainings and exposure visits for all the stakeholders in the plastics supply chain. Focus on safety at the Swachh Centers shop floor, and remain safe systems approaches to combat COVID and its resurgence, emerging use of compostable plastic packaging, which is not a blanket solution, but rather one for specific, targeted applications.

Project Vision

- Project envision a world free of plastic pollution. To make this a reality, we need to spark a fundamental paradigm shift and reimagine the way we produce, consume, and dispose plastics, and radically change the way we do our work and live our life. Through policy support, innovation, demonstration of successful use reduction and management models, capacity development, advocacy/networking, partnerships, and financing, we are planning to support both the Government of India's Swachh Bharat Mission I (urban areas in cities) and Swachh Bharat Mission II (across rural spaces - villages-panchayats-blocks-district levels) through safe and scientific disposal of all non-biodegradable and biodegradable waste through small pilots.
- Project would also like to synergize the ideas from other countries, and from ongoing successful approaches/ models in India. On a topic that is as urgent, complex, and multidimensional as the plastic crisis, dialogues like these are vital to strengthening engagement and momentum needed for international cooperation. Partner with Donors in India to learn and address plastic pollution, while improving human health and livelihoods and empowering local communities to promote a circular economy.
- Project believes that it will bring ownerships through community representatives to policy formulation, all stakeholders along the supply chain to recognize the impact plastic waste has on health and the environment. We believe in vertical integration of upstream and downstream solutions.
- We adopt and implement a system thinking approach to plastic pollution, integrating actions at global, national, and local levels across various sectors through the entire plastic value chain to move the world towards zero plastic pollution. Urge Governments to support essential in setting up effective collection infrastructure, facilitating the establishment of related self-sustaining funding mechanisms, and providing an enabling regulatory and policy landscape.
- Informal sector investments, integrating focus on waste pickers (safaimitras), small aggregators and informal recyclers inclusivity, health and livelihoods and their children's education, financial inclusion and expanding to more cities. More emphasis that through their work on COVID health insurance, Aadhar Card etc.

Process Followed

Establish the Infrastructure & strengthen the Supply chain system for segregation, collection, Transportation, Processing & linkages from the government registered recyclers.



Technology: Swachh Centre/Material Recovery Facility– Recovery, Recycling and Product making Operations

Swachh Centre (SCs) defined as “integrated dry & plastic waste recovery and recycling centers” for processing all types of plastic; (PET, HPDE, LDPE, PVC, PP, PS and others). which is collected with support from Samastipur City Municipal Corporations (JMC) s) and from the DWCCs established in the 10 wards on pilot basis through the kabadiwallahs network, small aggregators, waste pickers and others. The Plastic Circular approach as in table is defined how from Citizens to Recovery Swachh Centre and later into the Recycling Swachh Centre.

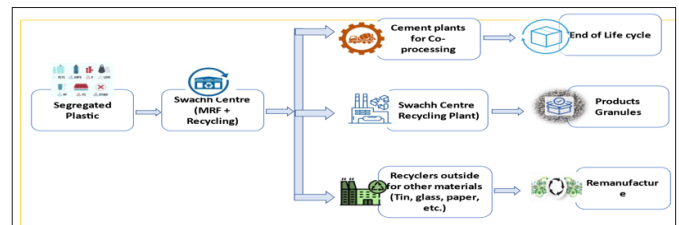


Table 1: Plastic Circular Approach in a CITY

The Swachh Center (SC) enable segregation of all types of plastics, adds product value, considers recycling options, washing lines and the urges for products formulation for increased incomes for the Safai Mitras from the purchase of different plastics and dry waste.

The outputs of segregated waste in SC will be picked by the Swachh Recycling (and the product making) Centre. (SRC). The SC will also directly collect materials from the waste collectors with recyclers along the value chain particularly for the low-grade, thin plastic litter bags, multi-layered plastics, PET, rigid plastics of all types in the city. The value addition will be done on the collected plastic waste on the parameters of thickness, their qualities; and re-processed (e.g. granules making, gatta making, then using various processes in making the Bags through blower machines/inject molding machines, shredding for the road making, etc.) as per the requirements as explained in Table.

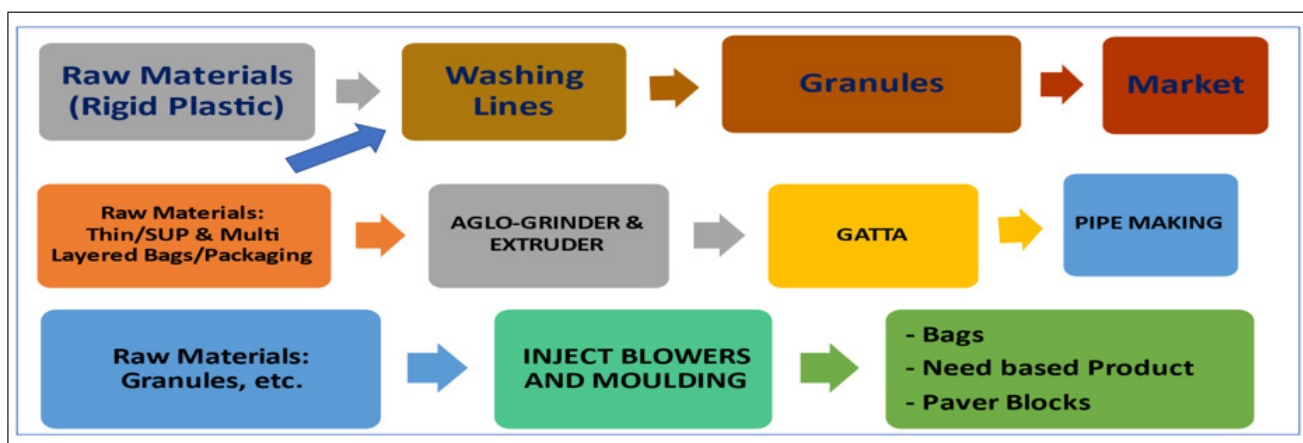
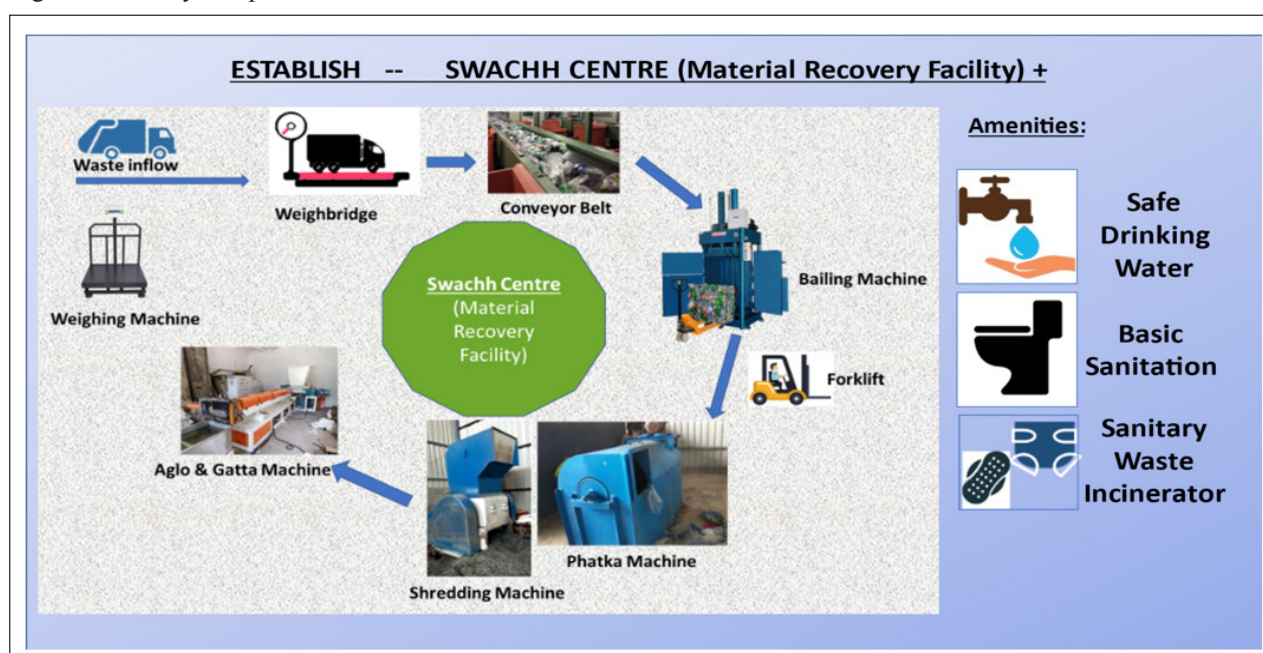


Table 2: SWACHH Recycling and Product Development Centre

The SCs are largely, integrated within the existing systems and can cater more than 08-10 MTs of plastic waste per day. This can be done as explained above and in the Figure below. The SC will specially focus on collection, segregation of low-grade, thin plastic litter, bags and multilayered plastics.



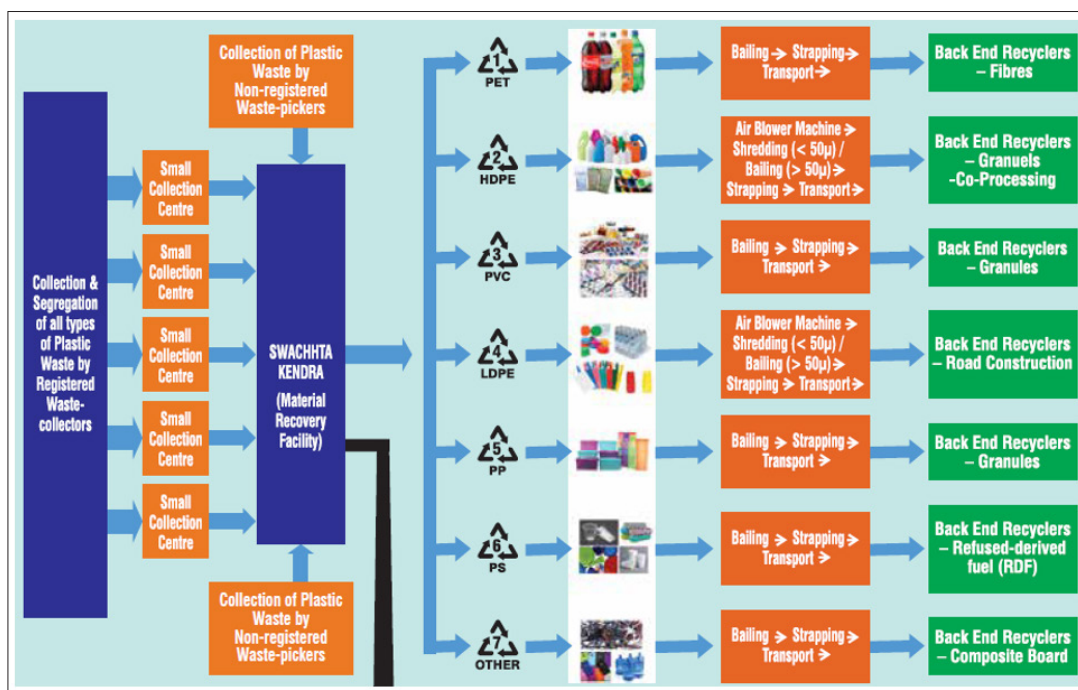
A Design of the Machine's Ion the MRF in the City

Conclusion

Our Material recovery Facility (Swachhta Kendra) was inaugurated on 14th January, 2023. Right now, in Samastipur waste processing facility is available on village leve, Panchayat level, Block level & District level. 1st this kind of district in bihar, india. Till now we have processed 2753 Metric tonne Plastic & generated revenue of Rs (Indian Currency): 22,40,000 in Rural areas &Rs 29,00,000 in urban areas.

Annexure 1

Swachhta Kendra Waste Supply Chain










Annexure 2

Swachhta Kendra Layout of Machines



Annexure 3

Proposed Machineries at Swachhta Kendra

No	Equipment	Photos	Working Details
1	Dry waste sorting Conveyor Belt system		This is a slow moving wide Flat conveyor. The plastic/waste which can be monetized will be picked from the conveyor and will be dumped on any side of the conveyor. All the waste which of value will be hand sorted and the rest will go for removal of dust.
2	Fatka Machine		A High-pressure machine used to separate dust from the plastic waste to be recycled. All the collected waste is loaded in to the machine for removal of dust. There is also a dust arrestor put in front to check the dust harming the persons at the machine.
3	Baling Machine		Vertical type pressing balers will be needed to compress the cleaned plastic waste and then linked to be transported to the Cement Factories and Power Plant boilers.
4	Shredding Machine		Shredder machine is required to shred the polyethylene plastic bags (shredded aggregates), including multi-layered packets less than 100 microns to 2.4 mm sizes to be further supplied for the Road Laying applications
5	Aglo-Gatta Machine		Selected grades of plastics are mixed high temperatures to convert HDPE, LDPE and PE etcin to more dense plastic. In this Styrofoam is also mixed at 10-15% ratio. Its output is the feed of the Extrusion machine
6	Extrusion Machine		The output from the Aglo is the feed to extrusion which in turn gives lumps of agglomerated plastic that can further be used for remolding, making granules, etc.
7	Weighing Scale		Electronic weighing scale for taking care of the incoming and outgoing materials and data maintained throughout.

Copyright: ©2024 Kumar Arvind. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.