

INCLUSIVE PATHWAYS TO WASTE RESILIENCE: COMMUNITY-BASED DECENTRALISED SOLID WASTE MANAGEMENT IN BALASORE, ODISHA

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Image Source: Balasore Municipality

1. INTRODUCTION

Balasore, a Class-I town in Odisha, has undergone rapid spatial and demographic expansion, with peripheral settlements emerging around its municipal core. Like many second-tier Indian cities, it historically depended on a centralised waste management system that was overburdened, under-resourced, and weakly connected to local communities — leading to poor segregation and unsanitary disposal practices (Joshi & Ahmed, 2012).

In response, the state government initiated a shift in 2019 toward decentralised, community-driven solid waste management, in alignment with national policy frameworks under the Solid Waste Management Rules, 2016 (MoEFCC, 2016). Balasore became one of the early adopters of

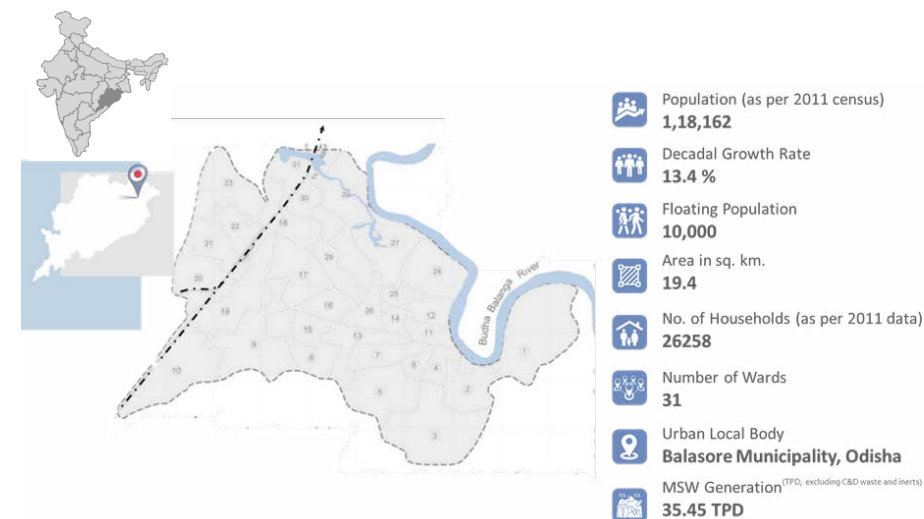


Figure 01 Overview Balasore Municipality (Illustrated by author)

this approach, pioneering a network of locally sited “Wealth Centres” that reframe waste as a resource while linking service delivery with livelihoods and resilience-building.

This case study analyses how Balasore’s decentralised model integrates technical efficiency with social inclusion — particularly through the participation of women’s Self-Help Groups and transgender workers — and how such a system contributes to broader goals of circular economy and urban resilience.

2. PROJECT BACKGROUND: TRANSFORMING WASTE MANAGEMENT IN BALASORE

Balasore’s Wealth Centres combine Micro Composting Centres (MCCs) and Material Recovery Facilities (MRFs) as compact, cluster-based processing hubs. Co-location reduces haul distances and facilitates the simultaneous treatment of both wet and dry streams. The model explicitly formalises the informal workforce by engaging Mission Shakti self-help groups, women’s collectives, and transgender workers in operations, outreach, and management roles.

Operationally, the system pairs daily source-segregated collection (using battery-operated BoVs and community crews) with local processing, route rationalisation, and digital monitoring through the AMA SAHARA app. Initial public investments covered infrastructure and training; ongoing revenues from user fees and material sales are intended to move the system toward financial sustainability. With a municipal population (2011 census) of ~118,000 and an indicative MSW generation of ~35 TPD, the cluster design provides a modular way to manage spatial and compositional diversity across wards.

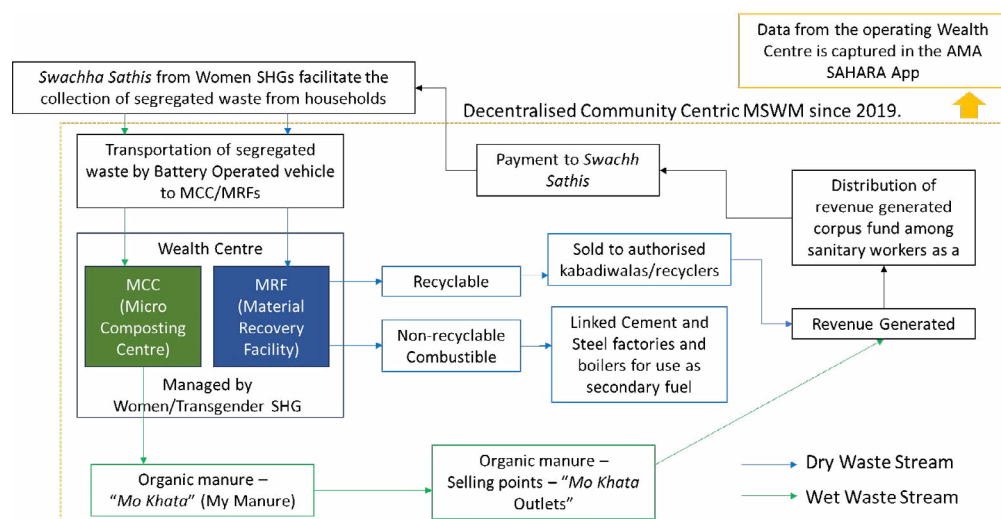


Figure 02 Decentralised Community-driven MSWM in Balasore (Source: Author)

Across the Global South, similar decentralised and community-based waste systems have emerged to address service inequities, informality, and financial constraints. In Boa Morte (São Tomé City), the Bairro Limpo project operates a neighbourhood-led collection service using motor tricycles, funded through small user fees, which demonstrates strong community engagement but limited economic self-sufficiency. (Fernández-Braña & Dias-Ferreira, 2023) In Pune, India, the SWaCH model integrates waste pickers through a pro-poor public-private partnership, granting them formal collection rights and social protection, thus embedding equity into urban governance. (Harhare, 2021) Likewise, Indonesia's Waste Bank programs transform waste into economic and environmental assets by encouraging household segregation, composting, and craft production (Utami, Istiqomah, & Corsita, 2024).

Balasore's decentralised "Wealth Centre" approach synthesises elements of these diverse models: like Boa Morte, it is community-proximate and small-scale; like Pune, it formalises marginalised workers through structured partnerships; and like Indonesia, it couples circular economy principles with livelihood creation. Its distinctive contribution lies in operational integration—linking decentralised infrastructure, digital governance, and social inclusion within a municipal framework. This hybrid governance model positions Balasore as a replicable case for emerging Indian cities seeking to balance efficiency, resilience, and equity through decentralised solid waste management.

3. METHODOLOGY AND APPROACH

This research employed a qualitative systems approach to examine the decentralised municipal solid waste management (MSWM) model implemented in Balasore. A key challenge was the limited availability of

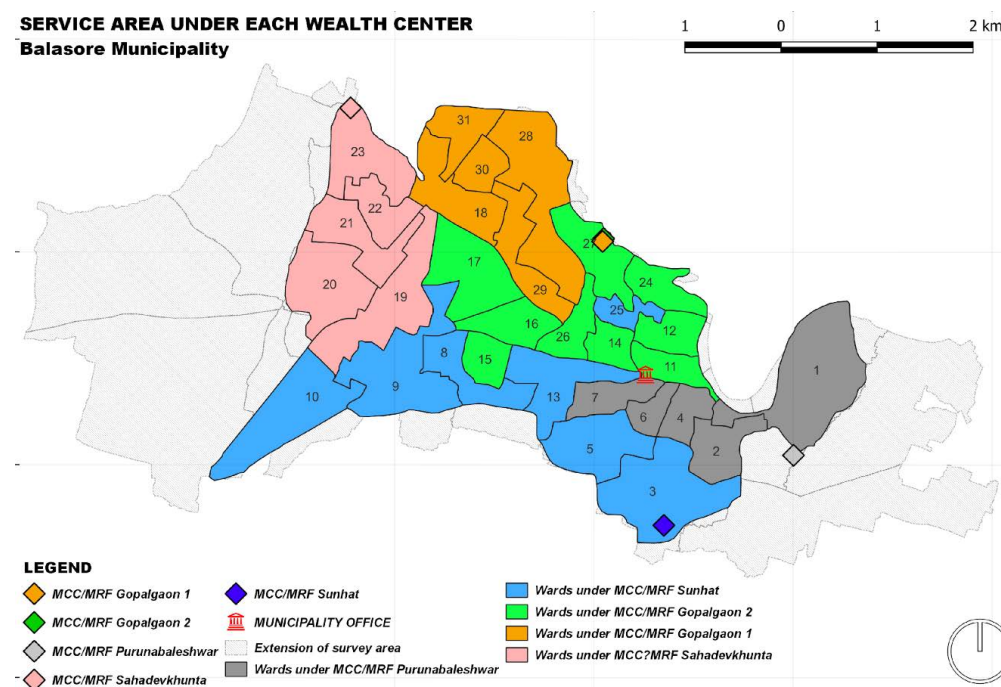


Figure 03 Map of Balasore Municipality showing service area under each wealth centre (SBM, Balasore Municipality)

published literature and systematically recorded data on Balasore's waste management practices, despite its status as an emerging urban centre experiencing rapid growth.

Secondary data were primarily drawn from the Swachha Bharat Mission (SBM) division of Balasore Municipality, including operational reports and baseline documentation. To complement these, the study adopted a multi-method primary data framework conducted between December 2023 and April 2024, comprising:

- Field observations during multiple site visits across selected wards;
- Semi-structured interviews with stakeholders across the MSWM value chain, including informal sector workers, community members, and private sector actors;
- Review of local reports, guidelines, and circular economy frameworks under the Solid Waste Management Rules, 2016 (MoEFCC, 2016).

In total, eight Swachha Karmis, 50 households (representing diverse socio-economic profiles across three wards), three Swachha Sathis, and several municipal officials were interviewed. Key informants included: Shubhokanto Naik (Junior Sanitation Expert, SBM, Balasore Municipality), Dr Biswajeet Patra (Fakir Mohan University), Karmakar Parhi (Green Circle Environment), operational personnel from Shakti Plastic Industries, volunteers from Sankhyam Charitable Trust, and Ashrubindha (Swachha Supervisor, Wards 16, 17, and 29). Respondents were selected through purposive and snowball sampling to ensure representation across

Staff Distribution for Solid Waste Management carried out by Safaimitra Women Self-help group in Balasore.

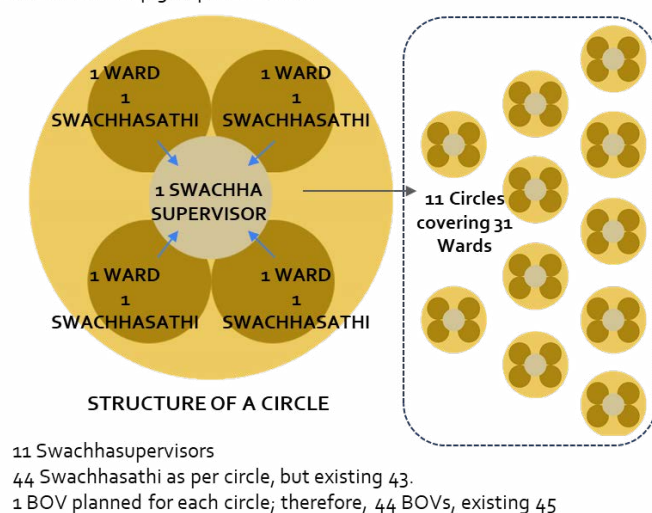


Figure 04 Division of staff based on circles in the Municipality for effective management (Source: Author)

institutional, community, and private-sector perspectives.

Ethical protocols were observed throughout: all participants provided informed consent, anonymity was ensured where requested, and participation remained voluntary.

Triangulation was central to the research design, ensuring validity through the convergence of municipal records, interview responses, and field observations. Interview transcripts and field notes were thematically coded to identify recurrent patterns. The data were then synthesised through a systems analysis framework, constructing cause-and-effect linkages within Balasore's MSWM processes to reveal both technical efficiency and socio-governance dynamics (Gibson, 2023; Haraldsson, 2004).

This mixed-method, systems-oriented framework provides a holistic understanding of Balasore's community-driven decentralised waste management model, capturing its institutional, social, and environmental dimensions within an urbanising, resource-constrained context.

4. KEY FEATURES OF THE MODEL

4.1 SYSTEMS RESILIENCE AND COMMUNITY PARTICIPATION

The decentralised municipal solid waste management (MSWM) system implemented in Balasore significantly improves community participation and system resilience. The framework adopted by the Balasore Municipality actively engages diverse stakeholders, particularly those from marginalised backgrounds, such as informal waste workers, Mission Shakti Self-Help

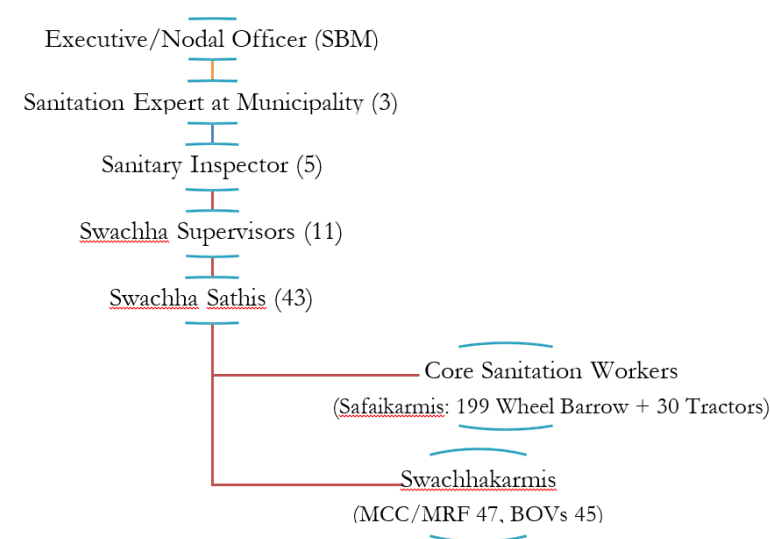


Figure 05 MSWM Staff Hierarchy (Source Author)

Groups (SHGs), and transgender groups, integrating them into formal waste management processes.

A core feature of this system is the role of Swachha Sathis, who serve as grassroots change agents nominated from local SHGs. These individuals are critical in fostering behaviour change among households, promoting source segregation, and ensuring compliance with waste collection protocols. Their role extends to community mobilisation, education campaigns through Information, Education, and Communication (IEC) and Behaviour Change Communication (BCC) strategies, and supporting grievance redressal processes.

In addition, the system's feedback loops—linking households, Swachha Karmis, supervisors, and municipal authorities—provide a dynamic and adaptive management structure. These loops ensure rapid resolution of operational bottlenecks, improve responsiveness to citizen concerns, and sustain the participation of residents in maintaining a clean urban environment.

These processes have enhanced social resilience, strengthened community ownership of waste challenges, and promoted trust in municipal systems. Transitioning from a passive waste-disposal culture to active community-driven waste stewardship marks a significant achievement. The inclusion of traditionally marginalised communities has created pathways for their socio-economic empowerment, thereby improving livelihoods and reinforcing their role in local governance (Priti & Mandal, 2019).

TABLE 1: RESPONSIBILITIES OF STAKEHOLDERS ACROSS THE SWM VALUE CHAIN

Stakeholders	Source Segregation	Collection & Transportation	Processing	Disposal	Citizen awareness
Sr. Sanitation Expert					
Sanitary Inspector/ Health Inspector					
Swachha Sathis*					
Swachha Supervisors					
Swachha Karmis* with Collection Vehicles					
Wealth Centre- Nodal Officer					
Wealth Centre Incharge/Manager					
Swachha Karmi* at Wealth Centre					

* are from Mission Shakti Groups/ Transgender Groups/ Waste Picker Groups (Source: Balasore Municipality)

4.2 CIRCULAR ECONOMY ACHIEVEMENTS

The Balasore municipal solid waste management (MSWM) system strongly aligns with circular economy principles by promoting resource recovery, minimising landfill disposal, and fostering a culture of waste valorisation. The decentralised model, centred around Wealth Centres consisting of Micro Composting Centres (MCCs) and Material Recovery Facilities (MRFs), has significantly advanced local material cycles.

Key achievements include:

Organic Waste Composting: MCCs have successfully processed wet waste into high-quality compost marketed as 'Mo Khata', closing nutrient loops and promoting sustainable agriculture in peri-urban and rural areas surrounding Balasore.

- **Dry Waste Recovery:** MRFs recover recyclables across 18 waste categories, facilitating their reintegration into recycling value chains. Revenue from the sale of these materials supports the system's self-sustainability.

- **Co-processing of Rejects:** Non-recyclable dry waste is baled and sent to cement factories for co-processing, contributing to energy recovery while preventing residual waste from reaching landfills.

- **Zero Landfill Vision:** The system aims for minimal disposal through a structured waste treatment hierarchy, supporting Odisha's "Swachha Odisha, Sustha Odisha" mission and the 2016 SWM Rules.

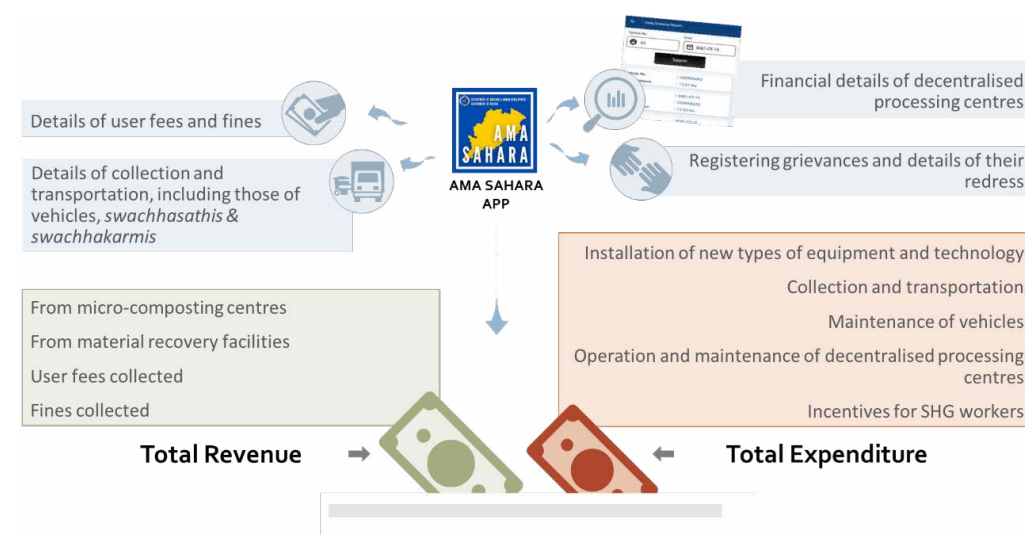


Figure 06 Expanding Ama Sahara App Features and incoming-outgoing finances (Source: Author)

These initiatives have shifted Balasore from a conventional "collect and dump" approach to a circular, decentralised, community-driven waste economy. The combination of compost sales, recyclable revenues, and reduced environmental impacts supports a robust, financially viable, and replicable circular economy model.

4.3 GOVERNANCE, INSTITUTIONAL AND TECHNICAL INNOVATION

The decentralised MSWM system of Balasore is underpinned by an innovative governance framework that integrates multiple stakeholders with technology, clear accountability structures and performance management tools.

Key governance innovations include:

- **Inclusive stakeholder architecture** engaging Mission Shakti, Women Self-Help Groups, transgender groups, informal waste picker collectives, NGOs, private sector recyclers, and municipal authorities, ensuring a collaborative ecosystem.

- **A clear staff hierarchy** ranging from the Executive/Nodal Officer (SBM) to Swachh Supervisors, Swachh Sathis, and core sanitation workers, each with defined roles and reporting lines.

- **Cluster-based management** through Wealth Centres (MCCs + MRFs), providing decentralised service delivery hubs that improve responsiveness and accountability at the local level.

- The introduction of the **AMA SAHARA App** is a robust digital performance monitoring and citizen grievance redressal platform that captures data on waste quantities, compost sales, user fee collection, complaints, and daily operations, ensuring transparency and timely corrective actions.

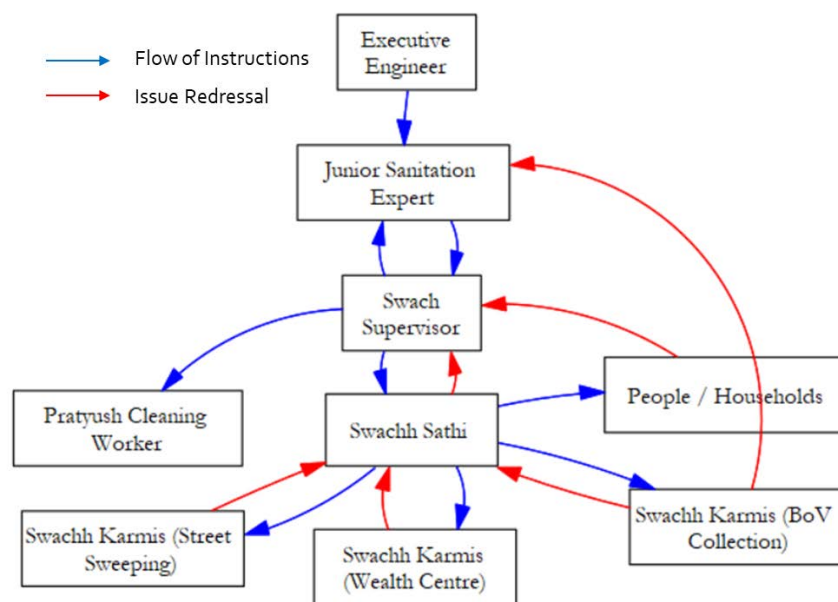


Figure 07 Feedback loop Diagram for information and instruction flow (Source: Author)

Feedback loops have been institutionalised to enable problem-solving on the ground, for example:

- Segregation issues flagged by Swachh Sathis to households,
 - Collection breakdowns reported through Swachh Karmis to maintenance teams,
 - Drain blockages escalated from citizens to the NGO partners.
- Regular assessment, retraining, and performance-linked incentives for front-line staff like Swachh Sathis and Swachh Karmis help maintain motivation and service quality.
- The **state-level monitoring cell** continuously reviews system performance and ensures adherence to standards.

In support of this, the Balasore decentralised MSWM system has introduced several other innovations to overcome the challenges of conventional waste management. These technical innovations include:

- Battery Operated Vehicles (BoV), branded as Swachha Sabari, for door-to-door collection, ensuring low-emission, noise-free operations.
- Route rationalisation mapping, improving service coverage and operational efficiency by optimising collection routes and reducing fuel and time costs.
- Digital tracking through the AMA Sahara App integrates weighbridge data, daily operations, user fee collection, and grievance redressal in a unified platform.



Figure 08 Expanding Ama Sahara App Features and incoming-outgoing finances (Source: Author)

- Cluster approach for siting Wealth Centres, ensuring each cluster serves a manageable population catchment and reducing transport distances
- Segregation and processing into 18 dry waste categories at MRFs, which boosts material recovery rates and maximises resource recovery.
- Quality composting techniques at MCCs, including stink-bag tests, systematic aeration, and leachate control, ensuring marketable compost and minimising environmental nuisances.

These innovations demonstrate a shift from top-down, engineer-led solid waste management toward a participatory, technology-supported governance framework, laying the foundation for a sustainable, zero-landfill, community-owned system—a best practice for other emerging cities to emulate.

4.4 SCALABILITY AND REPLICABILITY

The Balasore model demonstrates that decentralised, community-driven solid waste management (SWM) can be effective in small but rapidly urbanising cities. Its core features—decentralisation, social inclusion, low-cost modular infrastructure, and embedded community partnerships—make it adaptable to diverse urban contexts, especially in second-tier and resource-constrained cities across India and the Global South.

Key enablers for replication include:

- **Policy and Governance:** Local bylaws mandating segregation at source, decentralised processing, and user fee systems are essential. Embedding such frameworks into state SWM policies and national missions (such as SBM 2.0) institutionalises replication.
- **Financing Mechanisms:** Low-cost, modular facilities like Micro Composting Centres (MCCs) and Material Recovery Facilities (MRFs) reduce capital barriers. Replication can be supported through blended financing—combining municipal allocations, user fees, CSR, and Extended Producer Responsibility (EPR) funds.
- **Social Mobilisation:** Balasore's success rests on strong local participation, with SHGs, women's collectives, and transgender groups managing operations and outreach. Systematic inclusion of such groups in replication efforts ensures social legitimacy, employment generation, and behavioural change.

- **Technology and Transparency:** Digital platforms (e.g., AMA SAHARA app) enhance monitoring and accountability. Similar low-cost tools can be customised elsewhere for performance tracking and citizen feedback.
- **Urban Typology Suitability:** The cluster-based decentralisation approach is most suited to small and medium-sized cities (Tier 2/3) with limited infrastructure and growing populations, and as pilot nodes within larger metropolitan regions.

A phased roadmap for replication:

1. Baseline assessment of waste generation, composition, and institutional capacity.
2. Pilot implementation at ward or cluster level to demonstrate feasibility.
3. Capacity building for municipal staff, informal workers, and community organisations.
4. Institutionalisation through state-level policy integration, long-term financing, and formal recognition of informal workers.
5. Scaling through iterative learning, real-time data systems, and inter-municipal peer exchange.

By embedding flexibility, inclusivity, and accountability into governance, the Balasore model provides a scalable framework for sustainable urban transformation in emerging cities.

4.5. ENVIRONMENTAL AND SOCIO-CULTURAL OUTCOMES

4.5.1. SOCIAL INCLUSION AND EMPOWERMENT

A defining feature of Balasore's decentralised solid waste management model is its emphasis on social inclusion as both a governance and operational strategy. Rather than treating marginalised groups as beneficiaries, the system positions them as active partners in service delivery, embedding empowerment within the city's waste infrastructure.

Recruitment pathways such as Women's Self-Help Groups (SHGs) under the Mission Shakti initiative play a central role in managing Micro Composting Centres (MCCs) and Material Recovery Facilities (MRFs). The recruits of these groups, who previously were engaged in informal waste handling or other low-income informal activities, now operate under structured contracts that ensure fair wages, occupational safety, and regular training in segregation, composting, and bookkeeping. This transition has provided economic stability and elevated social recognition for women who were once invisible within the municipal system.

Similarly, Balasore has pioneered the inclusion of transgender groups in municipal waste management — one of the few cities in Odisha to do so. Their engagement through formalised roles in collection, sorting, and monitoring represents a critical step towards gender diversity in urban governance. The municipality's collaboration with local NGOs and social

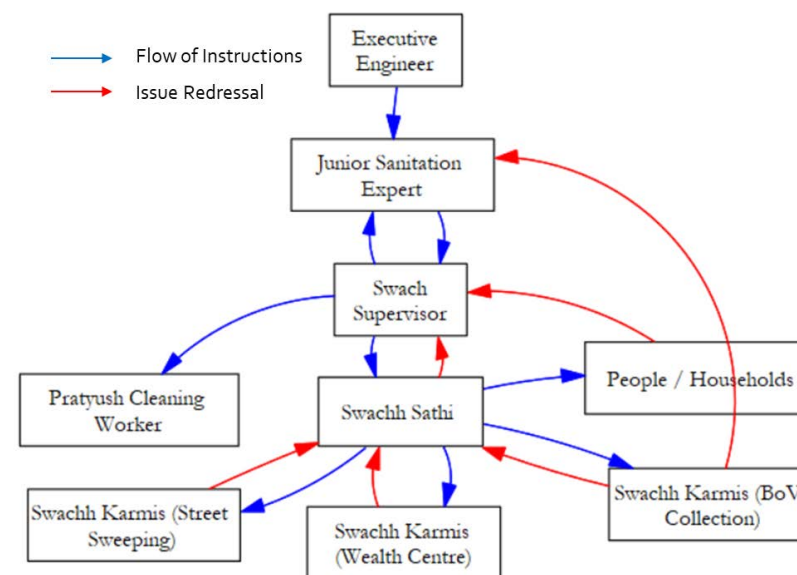


Figure 09 Causal Loop Diagram of various variables, subsystems and their relationships (Source: thor)

enterprises has enabled targeted capacity-building programmes that address social stigma and promote equal participation.

This participatory employment framework not only enhances equity but also improves the operational effectiveness of the system. Workers drawn from local communities tend to demonstrate a higher commitment to maintaining segregation norms and ensuring service continuity. Their direct engagement with residents — through awareness campaigns, door-to-door interactions, and feedback loops — has improved compliance and accountability at the neighbourhood scale.

From a planning perspective, Balasore's model reframes social inclusion as a driver of resilience. By integrating gendered and marginalised perspectives into service design, it transforms waste management into a platform for livelihood creation, social justice, and collective urban stewardship. The experience underscores that decentralisation and empowerment are mutually reinforcing — together enabling cities to build waste systems that are not only efficient but also socially cohesive and equitable.

4.5.2. ENVIRONMENTAL BENEFITS

Composting of wet waste at Micro Composting Centres (MCCs) has significantly reduced the volume of organic waste headed to landfills. This decreases methane emissions and returns valuable nutrients to agricultural soils through the sale of "Mo Khata" compost.

Co-processing non-recyclable dry waste (e.g., low-value plastics) in cement kilns has diverted significant quantities away from open dumping or incineration, promoting circular economy principles and reducing landfill burden.

The reduction in transport-related emissions due to cluster-based decentralisation has led to a decrease in long-haul waste transport, resulting in a decrease in fossil fuel use and a decrease in air pollution.

5. OUTCOMES AND IMPACTS

Balasure's community-based decentralised solid waste management (SWM) model demonstrates measurable outcomes across the dimensions of environmental resilience, operational efficiency, and social inclusion. The results collectively indicate that decentralised systems can deliver sustainability and equity at scale, even within the constraints of a second-tier urban context.

5.1 RESILIENCE DURING DISRUPTIONS

The cluster-based, decentralised design proved highly resilient during systemic shocks such as the COVID-19 pandemic. Unlike centralised disposal systems, Balasure's network of Micro Composting Centres (MCCs) and Material Recovery Facilities (MRFs) maintained uninterrupted operations, even amid local workforce shortages and restricted mobility. This redundancy in the system ensured continued waste collection and public health protection, demonstrating the value of spatially distributed infrastructure in crisis response.

5.2 ENHANCED PUBLIC PARTICIPATION AND SOCIAL INCLUSION

Building on the social empowerment framework outlined in Section 4.5.1, the inclusion of women's Self-Help Groups, waste picker communities, and transgender collectives has substantially improved the inclusiveness of municipal service delivery. These groups, now engaged as Swachha Sathis and Swachha Karmis, have shifted from informal, insecure labour to recognised municipal partners. Incentives tied to segregation performance and outreach activities have strengthened accountability and fostered behavioural change at the household level.

This participatory framework has created tangible socio-economic benefits — stable income, improved dignity of labour, and greater representation in decision-making processes — transforming waste management from a technical service into a platform for empowerment and social resilience (Kumar & Agrawal, 2020).

5.3 ENVIRONMENTAL AND OPERATIONAL IMPACTS

The model has achieved measurable improvements in waste diversion and resource recovery. Approximately 35.45 tonnes per day of municipal solid waste (MSW) are managed within the decentralised framework, with compost yield averaging 20% of wet waste inputs and a consistent rise in segregated recyclable recovery. Reduced reliance on long-haul transport and open dumping has minimised carbon emissions and lowered landfill



Figure 10 Swachhakarmis collecting waste (Source: Balasure Municipality)

dependency, advancing the city's transition toward a near-zero-landfill vision.

Digital tools, such as the AMA SAHARA app, have enhanced accountability through real-time data on collection routes, compost sales, and grievance redressal, thereby embedding transparency and citizen oversight within daily operations.

5.4 EVIDENCE FOR SCALABILITY

The outcomes from Balasure suggest that the cluster model can be adapted to similar second-tier or peri-urban municipalities. However, successful replication depends on three key enablers: (i) institutionalising inclusive workforce models, (ii) ensuring steady financing and user participation, and (iii) adopting digital monitoring to improve data quality. The Balasure experience thus provides a replicable governance blueprint that links decentralisation, inclusivity, and circularity into an integrated planning framework for emerging Indian cities.

6. ANALYSIS AND DISCUSSION

6.1 ALIGNMENT WITH RESILIENCE AND URBAN PLANNING GOALS

Balasure's decentralised, community-led waste management model aligns closely with the emerging urban planning discourse on resilience,



Figure 11 Processing Compostable Waste at MCC (Source: Author)

inclusivity, and adaptive governance. Unlike traditional, centralised infrastructure systems, its distributed “Wealth Centre” network integrates spatial redundancy and social capital as co-drivers of resilience.

The system’s strength lies not only in technical decentralisation but also in social diversification. By embedding women’s Self-Help Groups, waste picker collectives, and transgender communities into core service delivery, Balasore operationalises resilience through social inclusion — a principle often overlooked in conventional planning. These groups act as social stabilisers, maintaining continuity of service and local trust during disruptions such as the COVID-19 pandemic.

This demonstrates a critical planning insight: resilience is not merely infrastructural redundancy but a function of social systems that can adapt, collaborate, and respond to change. Balasore’s case illustrates how equity-driven participation reinforces system durability, creating an integrated model of inclusive resilience that can inform future planning frameworks across rapidly urbanising contexts.

6.2 LESSONS FOR PLANNING UNDER UNCERTAINTY

Planning for second-tier and emerging cities in India frequently encounters uncertainty, especially given outdated demographic and waste data. In Balasore, using 2011 census data initially underestimated waste generation, yet the decentralised cluster model proved flexible enough to adapt to higher-than-expected loads.

Tools like the AMA SAHARA app and community-based route rationalisation

and feedback loops helped address these planning uncertainties. The municipality was able to continuously update its operations and identify gaps in coverage or segregation. This approach demonstrates that feedback-driven, participatory governance models are better equipped to handle dynamic, uncertain urban environments than traditional centralised systems.

Moreover, the model’s cluster structure — in which each Wealth Centre operates semi-independently — ensures that if one processing hub faces technical or financial issues, the rest of the network continues functioning. This decentralised redundancy is a crucial risk management strategy for future-ready urban planning.

6.3. INSTITUTIONAL INNOVATION

Balasore’s approach reflects a shift in the institutional paradigm of municipal service delivery — from a state-centric to a co-produced governance model. The municipality’s collaboration with Mission Shakti SHGs, transgender collectives, and waste picker groups redefines waste management as a domain of shared responsibility, formalising the role of community actors as institutional stakeholders.

This innovation extends beyond inclusion; it challenges entrenched hierarchies between “formal” and “informal” systems. The structured engagement of marginalised groups has improved operational reliability and accountability, while simultaneously redistributing power within local governance. Performance-based payments, training initiatives, and clear recognition under the Swachha Odisha framework have enhanced the social legitimacy of workers who have historically been excluded from urban governance systems.

From a planning perspective, Balasore exemplifies how institutional innovation emerges from inclusion — where empowerment becomes both a social and operational strategy. The city’s model thus represents not just a technical advancement, but a redefinition of planning practice — one that situates resilience, gender equity, and participatory governance as mutually reinforcing pillars of sustainable urban transformation. (Singh & Gupta, 2016).

6.4. POTENTIAL BOTTLENECKS AND SOLUTIONS

While Balasore’s decentralised model showcases innovation and resilience, scaling it up reveals structural and systemic challenges that require careful attention.

Constraint	Impact	Strategic Response
Data Gaps	Inaccurate facility planning and performance monitoring.	Institutionalise periodic waste audits, integrate GIS-based dashboards and digital waste trackers.
Financial Uncertainty	Irregular user fee collection and limited municipal budgets.	Develop hybrid revenue models through CSR partnerships, EPR contributions, and micro-enterprise models led by SHGs.
Behavioural Barriers	Low segregation compliance and public apathy.	Implement sustained IEC and school-level behaviour change programs; incentivise compliance through user rebates.
Worker Integration Fragility	Informal workers remain vulnerable without contracts or benefits.	Formalise employment through structured contracts, capacity training, and inclusion in urban welfare schemes.
Variable Administrative Capacity	Replication depends on local governance capability.	Establish state-level technical cells to provide model templates, performance benchmarks, and capacity-building modules.

Addressing these constraints through feedback-driven governance and iterative adaptation will enable Balasore's model to evolve into a robust template for sustainable, inclusive waste management. This adaptive strategy can guide other Tier-2 and Tier-3 cities transitioning from centralised, inefficient systems toward decentralised and socially empowered urban ecosystems.

7. RECOMMENDATIONS AND CONCLUSION

Balasore's decentralised Wealth Centre model offers planners and policymakers a replicable pathway to resilient, community-driven waste systems. Prioritising decentralisation over large, centralised landfills enhances service continuity during disruptions while empowering local actors such as Self-Help Groups, informal workers, women's collectives, and transgender groups.

Formalising partnerships among diverse stakeholders through incentives, contracts, and co-management frameworks can strengthen participation and ownership. Moreover, sustained behaviour change campaigns and continuous skill development—especially for marginalised and underrepresented groups—can deepen social equity and foster public cooperation. As institutional partnerships mature, investing in real-time data systems and adaptive governance structures will enable responsive planning in the face of demographic or seasonal changes.

The modular, low-cost design of Wealth Centres makes this model replicable in other Indian towns or Global South contexts, provided demographic audits, continuous capacity building, and secure financing are maintained.

Ultimately, Balasore demonstrates that decentralised, inclusive waste management can advance both environmental and social resilience. By embedding gender and identity inclusivity within operational and planning processes, the model reframes circular economy transitions as opportunities for empowerment, not just efficiency—offering a valuable framework for just and sustainable urban transformation.

8. REFERENCES:

- Bhuiyan, S. (2010). A crisis in governance: Urban solid waste management in Bangladesh. *Habitat International*, 34(1), 125–133. <https://doi.org/10.1016/j.habitatint.2009.08.002>
- Chaturvedi, B., & Singh, N. (2020). Solid Waste Management in Urban India: Imperatives for Improvement. Observer Research Foundation Occasional Paper No. 283. <https://www.orfonline.org/research/solid-waste-management-in-urban-india-imperatives-for-improvement-67458/>
- Ministry of Environment, Forest and Climate Change. (2016). The Solid Waste Management Rules 2016 (as amended to date). Government of India. Retrieved from www.swachhbharaturban.gov.in
- Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development. (2016). Swachh Bharat Mission Municipal Solid Waste Management Manual. Government of India.
- OECD. (2017). Systems approaches to public sector challenges. OECD Publishing. <https://doi.org/10.1787/9789264279865-en>
- Johal, R. K. (2020). Local governance for sustainable solid waste management: A case study of Chandigarh (Union Territory), India. In *Sustainable Waste Management: Policies and Case Studies* (pp. 91–105). Springer Singapore. https://doi.org/10.1007/978-981-15-2554-7_7
- Mandpe, A., Paliya, S., Gedam, V., Patel, S., Tyagi, L., & Kumar, S. (2023). Circular Economy Approach for Sustainable Solid Waste Management: A Developing Economy Perspective. *Waste Management & Research*, 41(3), 410–424. <https://doi.org/10.1177/0734242X221145456>
- Utami, Titis Istiqomah, & Lieza Corsita. (2024). Implementation of Community-Based Waste Management to Improve Environmental Health in Villages. *Sustainable Applied Modification Evidence Community*, 1(2), 1–8. <https://doi.org/10.69855/samec.v1i2.90>
- Harhare, M. (2021). Transforming waste management by empowering informal waste-pickers in Pune. Resilient Cities Network. <https://resilientcitiesnetwork.org/downloadable-resources/UR/UO/case-study-pune-01-.pdf>