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Comprehensive Evaluation of Sustainable Municipal Solid Waste Management (SMSWM) Practices in Rourkela

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ABSTRACT

Effective management of municipal solid waste (MSW) is essential for ensuring sustainable urban development, especially in rapidly industrializing cities like Rourkela. This review paper provides a comprehensive evaluation of current municipal solid waste management (MSWM) practices in Rourkela, Odisha, with a focus on sustainability. Drawing upon a combination of local case studies, technological assessments, and comparative global frameworks, the study highlights the status, challenges, and opportunities for enhancing MSWM in the region. Particular emphasis is given to the recycling and utilization of industrial waste from the Rourkela Steel Plant, fly ash management, and the potential role of green technologies such as mechanical-biological treatment. The review also explores institutional frameworks, policy initiatives, stakeholder involvement, and public-private collaborations. It identifies critical gaps in waste segregation, informal sector integration, and long-term planning while proposing strategic interventions aligned with sustainable development goals (SDGs). This paper aims to contribute to the formulation of more efficient, inclusive, and environmentally sound waste management policies in Rourkela and similar Indian cities.

KEYWORDS

Rourkela, Municipal Solid Waste Management (MSWM), Sustainability, Recycling, Industrial Waste, Green Technology, Urban Planning, Fly Ash, Smart City, Circular Economy

INTRODUCTION AND BACKGROUND

As many of these urban areas have been experiencing rapid urbanization, MSWM has become one of a most critical environmental challenges in developing countries, particularly in those urban areas that are emerging as rapidly growing economy like India. As India urbanizes, industrializes, and becomes more densely populated, its cities are struggling to deal with the volume and diversity of waste that is produced daily. Municipal solid waste (MSW) is composed of biodegradable waste, recyclable materials, inert materials and hazardous materials generated from households, commercial buildings, institutions and industries. Poor and ineffective handling of MSW not only results in environmental degradation, but it also presents serious threats to public health and urban sustainability (Anuardo et al., 2022). Sustainable MSWM is vital for Indian Smart Cities Mission, Sustainable Development Goals (SDGs), and Swachh Bharat Abhiyan.

A sustainable MSWM entails systems that reduce the environmental footprint and incorporate the concepts of resource recovery, circular economy, and pro-poor governance. This includes not just the correct process of waste pick up, its separation, treatment and disposal, but also the social inclusion of informal waste workers, the awareness of the public, decentralised infrastructure (Thakur et al. In India, Swatch Bharat Campaign and the Solid Waste Management Rules (2016) are the two policy changes that highlighted scientific waste management, segregation at source and extended producer responsibilities. However, adoption has been highly variable across cities due to infrastructure, institution, and behavior related barriers. This emphasises the relevance of adapting sustainable MSWM practices to the socio-economic and geographic context of individual cities.

Rourkela, a major industrial and educational centre of Sundargrah district in Odisha, has some peculiar position in relation to the practice of MSWM. Largest integrated steel plant of India, Rourkela Steel Plant (RSP) is located at Rourkela, which makes it a hub for industrial activity and generates a huge amount of solid waste, both municipal and industrial. Rourkela is an ever-growing city with urban sprawl and burgeoning population and the city generates a considerable amount of waste every day, a part of which remains unprocessed and mismanaged fundamentally because of segregation, lack of infrastructure to treat and involve the public for the maintenance (Kar et al., 2018). RSP alone largely contributes to the waste stream of the city especially fly ash, slag and other industrial by-products which if not safe disposal -reused properly, may have long term impact on ecological system (Biswal et al., 2019).

The Smart Cities Mission has ushered new opportunities in rejuvenating urban infrastructure and waste management system is one of them. But ensuring their success requires the policy, technology and community to pull it off. In this context, an in-depth assessment of present MSWM scenario in Rourkela is urgently needed to reveal existing strengths, weaknesses and render options for sustainable MSWM. The existing literature, policy and strategies practiced locally on MSWM in Rourkela have been reviewed here to bridge this lacunae.

The general aim of this review is to evaluate the sustainability of the MSWM practices in Rourkela, through the comparison of findings in selected academic papers, policy documents, and technical reports. This paper analyses different stages of waste generation, collection, segregation, treatment and disposal, and assesses the integration of industrial waste reuse and recycling. It also seeks to determine the main obstacles in the areas of infrastructure, legal-institutional setup and public behavior that obstruct the city to transform towards sustainable MSWM. The review also discusses the influence of green technologies such as mechanical-biological treatment (MBT) and energy generation systems on environmental benefits (Chauhan et al., 2015). In the end, the study aims to present constructive and applicable suggestions that are consonant with Rourkela's local social-industrial situation and can be considered by other medium-sized Indian cities under similar circumstances.

The geographical area under review is confined with in the municipal boundary of Rourkela city and it covers mainly the solid waste representing the waste from households, business establishments, institutions, industry especially the RSP. The types of hazardous or biomedical waste streams are not discussed in specific by waste

behaviour but there will be reference to these where appropriate to the waste landscape. For the purpose of current relevance, we consider articles published in the last 10 years but have included 'classic' studies as appropriate. Qualitative and quantitative dimensions of waste management are considered, ranging from community practices to institutional responsibilities, from technological innovations to environmental impacts.

Method of literature review In terms of the literature used in the review, this paper is based on a narrative review of literature mostly obtained from academic journals, conference papers, government publications and theses. Prominent sources include indexed papers relating to green technology and sustainable framework (Anuardo et al., 2022), industrial waste recycling in Rourkela through case study (Kar et al., 2018), technical papers on fly ash utilization (Biswal et al., 2019), and policy reviews of national and state regulations with respect to solid waste management in India (Thakur et al., 2022). Moreover, grey literature (i.e. local municipal reports, planning documents, NGO publications) are consulted in order to fill empirical data gaps. Particular focus is placed on research that connects waste management to wider topics in urban governance, public health and environmental justice.

The narrative synthesis is organised under four key headings: current practice in waste generation and management, technological and institutional opportunities, policy framework and practice, and community attitudes and behaviour. In each theme, the paper provides a comparison between the practices followed in Rourkela and the best practices reported in literature, both national and international, for doing benchmarking and contextual analysis. For instance, successful reuse of industrial waste in form of construction materials or feedstock for generation of fly ash bricks provides best practices that could be adapted for waste from steel plant of Rourkela (Swain et al., 2018). In the same manner, treatment with low-cost biosorbents of heavy metals has been reported from other parts of India indicating potential adaptation and scalability of the technology in the local water treatment and leachate management (Bayuo, 2021).

To summarize, introduction and background set the context with a strong motive for sustainable MSWM in India and identifies Rourkela as a proxy representative urban-industrial area that warrants specific case study. This section provides a clear definition of the objectives, scope, and methodology, which form the basis for a thorough assessment of the city's system of waste management, and offer practical proposals for the improvement of its sustainability and liveability.

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STATUS OF MUNICIPAL SOLID WASTE MANAGEMENT IN ROURKELA

It is an important urban-industrial complex existing in the mixed urban industrial pattern comprising further to large extent of residential, commercial and heavy industrial use. This variety of land uses directly affects the forms and origins of MSW produced in the city. The contents of refuse are typical of in a mixture of biodegradables, plastics, metals, inert materials and combustibles as well as problematic industrial waste. In molluscan species Kitchen waste, Food residues, Packing materials, Papers, and Clothes are the major waste streams from residential zones, and the presence of non-degradable like multi layered plastic and e-waste is increased as the lifestyle changes (Singh & Kumar, 2023). Organic waste and packaging waste are the major waste from commercial places such as markets, restaurants, and retailers, and paper, plastic, and canteen wastage are the main waste from institutional sources.

But it is the industrial sector – more specifically, the Rourkela Steel Plant (RSP) – that looms large as it were on the refuse profile of the city. a unit of Steel Authority of India Limited (SAIL); it is one of the largest integrated steel plants in the country that creates a large amount of solid waste such as slag, fly ash, iron oxide scales, mill scale, and dust from the air pollution control devices (Kar et al., 2018). We also note that while industrial in character, these waste streams are in several ways linked with the municipal system, such as disposing of non-hazardous waste and recycling some by-product for construction and road-building. For example the RSP's captive power plants fly ash is used for the production of fly ashes bricks and as a soil conditioner in agriculture, however, the amount used is small (Biswal et al., 2019). The rest is being disposed into ash ponds or landfills, adding to the pollution of the environment and pressure on the use of land.

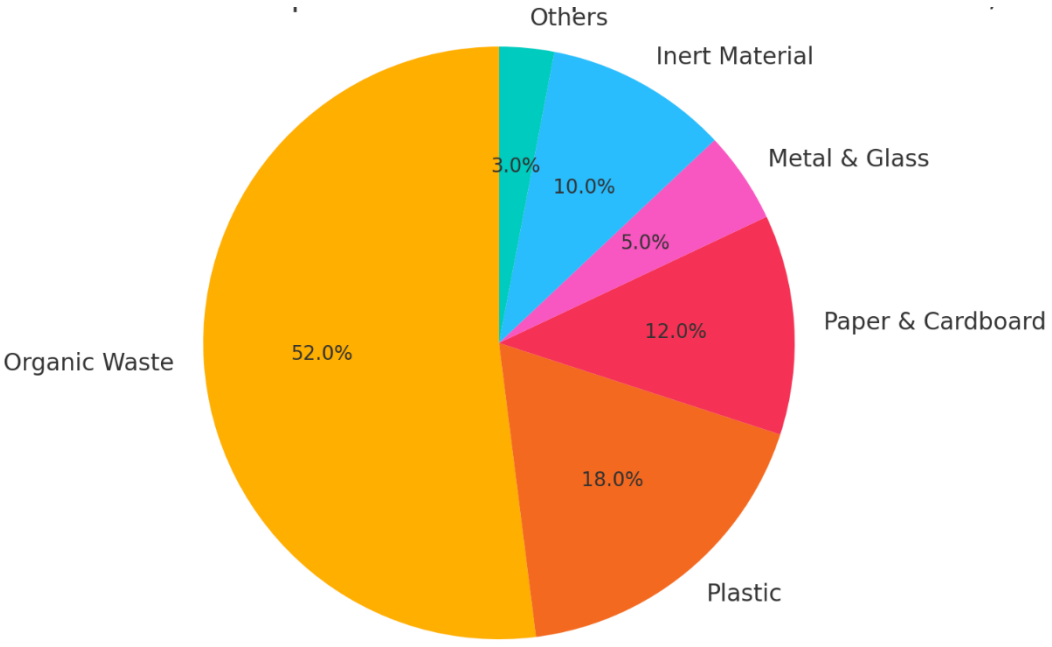

Figure 1. Estimated composition of municipal solid waste in Rourkela, 2023. Organic waste forms the majority, highlighting the potential for composting and biogas generation (Singh & Kumar, 2023).

In terms of volume, municipal areas of Rourkela city generate about 120–150 metric tonnes of MSW per day, depending upon the season and the population dynamics of the corporation (Bisoyi, 2006). Nonetheless, there is little disaggregated publicly available data on actual sources of waste, which makes planning difficult. The grand

total of likely could be more because there is no documentation on informal settlements and open dumpsite and no weigh-bridge based monitoring is found in majority of the wards. Household waste in the city is usually collected via door-to-door collection systems in areas of the city, however this coverage is incomplete. Open bins and roadsides are yet common, especially in the market and unpoised areas, where secondary littering and unhygienic conditions are prevailing (Singh, 2021).

Solid waste The Rourkela Municipal Corporation (RMC) controls the solid wastes in the city. The operational system of the SWM comprises primary collection from the household and commercial premises, secondary storage at various bins or intermediate points, and disposal at dumping (onland or landfill) site. However, the system is unable to collect animal remains regularly as scheduled, insufficient coverage with garbage vehicles, and an inefficient use of restricted manpower. Meanwhile, tipper trucks, compactor machines, GPS-enabled waste carriers, which were introduced as part of the Smart Cities initiative, have revamped some wards' logistics, and yet, hand collected waste still prevails in fringe areas (Barik et al., 2024). RMC also does not have an exclusive sanitary landfill where never-ending dumps are made without scientific lining or leachate control leading to degradation of groundwater and public health hazards.

The city has yet to roll out source segregation city-wide. Awareness drive through Swachh Bharat Mission and distribution of color-coded bins in some wards notwithstanding, segregation of biodegradable, reusable and hazardous waste at source has hardly taken off in the city. Segregated waste is mixed during collection or transportation by waste handlers owing to the lack of collection vehicles and enforcement (Thakur et al., 2022).

On the other hand, informal waste pickers and recycling agents continue to play an essential, but undervalued, role in the MSWM system of the city. These people, most of whom work in landfills and dumps along the roadside, pick, process and sell substantial amounts of plastic, metal, paper and glass to local scrap dealers. In addition to their role in recycling and reducing landfilling volumes, informal workers are exposed to occupational risk, they are denied legal recognition and most of the times are not considered in formal waste management planning. They have not been integrated into RMC functions, which represents a lost opportunity for inclusive and economical sustainability (Swain et al., 2018).

The efficiency of the waste generation and disposal system depends heavily on the behavior of the public. Virtually, There is no community participation in MSWM in Rourkela and people are ignorant and careless about detrimental effects of open dumping of garbage. Open dumping, littering, and burning of garbage are common in many areas, particularly in communities with infrequent or inefficient municipal services (Singh, 2021). There is also a lack of public confidence in government systems, with citizens avoiding participating in composting or recycling. While promotions have been carried out in schools and community halls, they cannot be scaled up or achieve permanent changes in behaviour.

However, on a positive side, few responses have indicated that there are emerging changes in sight with youth-led green initiatives, inter-disciplinary collaborations with academicians, lime-shell, and pilot decentralized waste treatment studies by RMC. For instance, decentralized composting plants and WTE pilot projects have been set up in some ward in collaboration with private parties (Chauhan et al., 2015). The challenge The problem is that these are still isolated experiments and need to be institutionalized to have wider reach.

In general, the status of MSWM in Rourkela is one of a fragmented and imperfectly performing system with areas of novelty. It is an important dimension that the RSP have in the generation of industrial waste that is partially reused, the municipal waste streams, however, are very poorly covered in terms of segregation, collection, and processing. The authors argue that system-wide change is required, including increased institutional co-ordination, community involvement, and evidence-based planning processes, to promote sustainability.

Moving forward The road to sustainable SWM in Rourkela will have to be paved with robust baseline data, streamlined planning, inclusive stakeholder engagement and gradual integration of environmentally benign technologies. Only then may the city begin to align its activities with federal regulations and global sustainability goals as well as improve the health and well-being of its citizens.

SUSTAINABLE TECHNOLOGIES AND POLICY FRAMEWORKS

In order to achieve environmentally friendly and economically viable systems for the management of solid waste, it is becoming necessary to involve sustainable technologies. Considering the industrial and urban nature of the city, adoption of viable integrated waste treatment technologies like MBT and other green technologies would be an attractive option for Rourkela. MBT is a developing waste treatment technology, most appropriate for urban areas with diverse waste fractions. MBT refers to the mechanical sorting of recyclable fractions of waste from MSW and biological treatment, usually decomposition into residual waste through composting or anaerobic digestion. This split-phase system minimizes landfill disposal, enhances the recycle component and allows for partial energy recovery (Chauhan et al., 2015).

The MBT model is especially first for cities such as Rourkela where source separation is yet to be started and mixed waste make the primary component of the municipal solid waste. Well-applicable, MBT can lead to a significant reduction in waste for ultimate disposal, and to allow the production and recovery of compost/fuel-grade materials. As piloted in other Indian cities, MBT [1] of waste resulted in landfill load reductions of 40–60%, and realised revenues from sales of recyclables and compost. Rourkela being a potential smart city, there is no operating MBT plant in the city. Implementation of the above system is anticipated with the potential to redress the existing deficiencies in waste management operation and check dependence on the open dumping sites which are still prevailing and contributing towards the environmental menace and health emergency (Singh & Kumar, 2023).

In addition to MBT, other sustainable technologies such as biogas plants, decentralized composting processes, and RDF production present routes for material recovery and energy production. Such technologies are crucial in dealing with organic waste, which is a major component of the total municipal waste generated in the City. Institutional campuses, markets, and residential colonies, equipped with small scale biogas plants, can convert wet waste into methane-rich biogas and turn it into a quality cooking fuel, thereby reducing methane emissions from landfills. Decentralized composting units can also serve to reduce the burden of transportation and provide means to engage communities for solid waste management, provided properly maintained (Anuardo et al., 2022).

The other important component of sustainable waste management in Rourkela is the re-use of the industrial waste especially the fly ash and other by-products of Rourkela Steel Plant (RSP). Rourkela is one of the major industrial cities in Odisha and fly ash, the waste generated during coal combustion in thermal power plants, also accounts for a substantial part of the industrial waste. If fly ash is not disposed off properly, it can cause severe environmental problems, including air pollution and the pollution of water and soil. Fly ash, however, also has pozzolanic qualities so it is used in the building and land development industries as well. At Rourkela, the fly ash generated is partly consumed for production of fly ash bricks and as a road laying material. Research reveals that fly ash bricks have superior durability and are also cheaper that mud bricks, and are a sustainable substitute for common construction materials (Biswal et al., 2019).

However, the large portion of fly ash is used sparingly and dumped as waste in ash ponds or low-lying areas. This points towards the establishment of specific instruments in institutions to maximize full use of fly ash in the circular economy paradigm. The Steel Plant has also been recycling blast furnace slag and other by-products into cement and filling material for abandoned mines. This is in line with the objectives of sustainable industrial ecology but needs better documentation so that they can be replicated across industries (Swain et al., 2018).

There has been a paradigm shift in the policy space for municipal solid waste management in India following the notification of Solid Waste Management Rules (2016) by the Ministry of Environment, Forest and Climate Change. These rules specify for source segregation, door-to-door collection, and scientific processing and treatment of waste and also make provision for awareness generation and stakeholder involvement. They also acknowledge the informal waste pickers' role and stress the need for decentralized waste management systems. There are strong provisions of law for improvement of MSWM services in cities such as Rourkela in the rules. But capacity, a lack of funds and broken lines of institutional responsibility make implementation a challenge (Thakur et al., 2022).

Smart City Mission was a clever entry for Rourkela in 2015 to have a planned modernized system of waste management leveraging technology, innovation and public -private partnership. Under the programme, several projects are in the pipeline, including the setting up of integrated waste management facility, smart bins, waste-to-compost plants, and better collection logistics. ".We have to continue with a campaign to educate the public."Some of the measures including fleet monitoring of garbage vehicles through GPS and public awareness campaigns, which we have taken, have started to show results. However, the lack of any comprehensive and executable waste management policy is still a bottleneck for the systemic change (Singh, 2021).

Strengths	Weaknesses	Opportunities	Threats
Established industrial base	Lack of source segregation	Fly ash-based industries	Urban sprawl
Smart City funding	Open dumping	Decentralized composting	Groundwater contamination
Technical institutions (e.g., NIT	Poor informal sector integratic	Policy alignment with SDGs	Climate-related flooding

Figure 2. SWOT analysis of municipal solid waste management in Rourkela. This visualization highlights institutional, technical, and social factors influencing sustainability outcomes (Thakur et al., 2022).

A SWOT analysis is useful in analyzing the opportunities and threats inherent in the present waste management system of Rourkela. The city's strong industrial base, adequate availability of fly ash and other recyclable materials and its coverage under national services such as Swachh Bharat and Smart City Mission are among the factors that have contributed to the selection. They offer resources as well as policy support for improving MSWM systems. Technical institutions like NIT Rourkela provide scope to collaborate for research and develop innovations in waste management (Kar et al., 2018).

However, the mechanism has some disadvantages. These factors include poor source segregation, no sanitary landfills, heavy dependence on open dumping, inaccurate monitoring of waste generation, and inadequate participation of informal waste pickers. Add to that, there is little public consciousness and house composting or recycling has low participation. These problems are compounded by a lack of implementation of the existing rules and fragmented governance (Barik et al., 2024).

There is potential in the rise of green technologies, the global demand for recycled building products, and public awareness of environmental issues. Many opportunities exist in fly ash based construction industries, biogas generation and community based composting. Further, institutional alignment under the Smart Cities and AMRUT missions can ease access to central resources and technical knowledge (Anuardo et al., 2022).

Risks On the downside, these liabilities encompass: more population growth (with more waste), settlements on waste dumps, risks resulting from the climate change like the flooding of waste dumps, and the risk of health epidemics due to unmanaged waste. Without subsequent improvements to the waste processing infrastructure, industrial growth can exacerbate the city's environmental impact.

Finally, Rourkela presents an interesting cross-road upon which a better management of MSW for the future depends largely on the successful introduction of sustainable technologies and whether appropriate policies are put in place. Mechanical-biological waste treatment, fly ash recycling and decentralized which provide technically feasible habitat-friendly alternatives. The Solid Waste Management Rules (2016) and the Smart City Mission serve as the institutional cup and saucer underpinning these solutions. Yet, only with multi-stakeholder collaboration, consistent community involvement and the political will to drive change can one have a chance of success. What is needed to be a minimum change in policies and thrust from 'end of the pipe phenomenon' to 'cradle to cradle' philosophy for Rourkela to be in the path of sustainable solid waste management.

CHALLENGES, GAPS, AND STRATEGIC RECOMMENDATIONS

Though numerous policy measures and isolated technological adoptions have been implemented, receivers of domestic solid waste in Rourkela Metropolitan Area (RMA) grapple with a number of physical and functional deficiencies. These are a result of obsolete technology, lack of application of relevant technology, little regulatory vigilance and poor community participation. A fast developing city, with high pattern of urbanization coupled with an industrial hub, generation pattern of Raurkela is becoming more and more intricate with this, necessitating appropriate advance and comprehensive collection, treatment and disposal systems. The current waste management system is, however, still predominantly based on archaic activities like open dumping and non-segregated collection, which are counterproductive to operations and environmentally detrimental (Thakur et al., 2022).

One of the recurring problems is lack of infrastructure and underutilization of existing technology. While a few mechanized vehicles and systems using GPS to track waste have been brought in under the Smart City project, their usage is confined to certain wards and the city continues to rely on manual till date as well as ad-hoc waste transport network. And, then we do not have a proper landfill (scientific). In place, Rourkela still depends on open dumping grounds, which do not have good lining, leachate management and gas collection facilities which lead to the contamination of soil and groundwater (Singh, 2021). Further, the lack of functional treatment plants of composting, bio-gas, waste-to-energy at municipal level leads to the loss of precious organic content for converting into resource material. A small number of decentralized composting programs tend to be poorly maintained and poorly attended by the public.

Secondly, among the major gaps in MSWM of Rourkela is the non-practice of source segregation of waste in most areas of the city. - Segregation is the first step in any waste management system and an elemental part that requires recycling, composting and recovering the sources. Awareness campaigns and pilot projects are in place, yet the level of adherence to the practice of segregation at source among households and institutions is low. This is in part because of the absence of mass communication of sustained behavior change and also due to implementation constraints. Even in cases of segregation attempted by the resident, the waste gets mixed in the segregation at the time while collection or tansit due to the unavailability of bunkered vehicles and the production of sufficient labour force (Barik et al., 2024). This undermines the efforts of the public, and demoralizes and discourages future participants.

The informal sector is indispensable in the waste ecosystem of Rourkela, but it is not acknowledged or assisted by formal structures. There are numerous waste pickers, scrap dealers and recyclers who collect large volumes of plastic, metal and paper waste from dumpsites, streets and markets in the city. They greatly contribute to waste reduction, resource recycling, and landfill avoidance. But these workers are working in unsafe environments without protective gear or health insurance, government or access to government welfare programs (Swain et al., 2018). They are not invited to discussions about policymaking and planning waste systems, and this undermines

the quest for an inclusive and fair waste governance. Formalizing and incorporating the informal sector via cooperatives of private-public partnerships might raise the recycling rates and simultaneously create income and workplace with better conditions.

There are also institutional deficiencies that limit the potential for an effective MSWM system in Rourkela. The Rourkela Municipality Corporation (RMC) as a leading waste handling agency mostly with technical deficiency, financial constraints and involves lack of inter departmental coordination leading the services to less desired shape. There are toe tussles on considering of industry authorities and Continue reading "Making the policy work" Cities Policy Hindustan Times. Furthermore, systems to monitor and collect data are inadequate and do not allow for real-time monitoring of waste generation, processing efficiency, or compliance. This effectively puts the city on the back foot when the opportunity arises to make decisions based on evidence and obtain funding at state and national levels (Anuardo et al., 2022).

Addressing these challenges requires a multi-faceted approach that involves capacity development as well as policy reform. The infrastructure for waste collection and transportation must be upgraded to include the acquisition of dual-compartment vehicles for segregated transportation, the expansion of material recovery facility and the establishment of a sanitary landfill with resource recovery. Public infrastructure will need to be supported by decentralized units for organic waste treatment – especially in markets, institutions and housing colonies. Technologies like decentralized biogas and compost pits can help in reducing the weight of organic waste as well as producing beneficial by-products such as compost and biogas (Chauhan et al., 2015).

Second, in policy terms, behaviour change communication and public engagement should have higher priority. Continued awareness drives, education and monitoring at school level and community level can be implemented to imbibe the practice of source segregation. Incentive- based actions such as lowering user fees for sorted households or rewards for composting effort can also apply. Simultaneously, workers and informal recyclers need to be trained and mobilised to take up the cause of segregation and recycling. Continuing workshops and training can enhance their performance and bring more respect and acknowledgment for their labours.

Thirdly, the informal sector should be formally included in the waste value chain management. This can be done through the formation of cooperatives of rag pickers, access to sorting centres and tie-ups with local industries for supplying recovered materials. Identity cards will have to be given to these ragpickers, safety gear will have to be supplied and micro-finance options will have to be worked out to help them expand their operations – all of which can be supported by the RMC. These participatory models have proven to be successful in the other Indian cities like Pune and Bangalore and Rourkela can modify the same in their own requirement (Kar et al., 2018).

Fourth, robust data systems need to support strategic planning. Digital tools for waste tracking, mapping of dumping hotspots, and performance tracking of collection and processing operations shall form part of the RMCs investments. The data would allow for the industrial users sector to optimise collection routes, identify under-served areas and assess contractor performance. Integration with GIS-based systems and transparentise dashboards can also help to increase transparency and trust of citizens.

Lastly, Rourkela has to prepare an integrated and sustainable long-term plan for MSWM. The roadmap goes along the objectives of national policies like SWM Rules (2016) and Smart City Mission. It must specify time frames, responsibilities, budgets, and success factors between relevant parties. There should be a public consultation process within the framework of the planning system to cater for the local and regional requirements. Focus should be on process of circularity use of material, reduction of landfill dependency, converting into the zero waste city model with time (Singh & Kumar, 2023).

It can be inferred from above discussion that Rourkela's problems for solid waste management exists in its incomplete infrastructural system, institutional fragmentation, and lack of people's participation. Their solution needs a systemic, integrated approach that combines technology innovation, public policy, stakeholder engagement and behavioural change. With targeted investments and concerted governance effort, the city can not only improve its Solid Waste Management (SWM) outcomes but also set an example for medium-sized industrial cities in India that have not made the strides that they ought to have.

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