



Waste to resilience: Grassroot governance and community action in Sultan Bathery municipality, Kerala, India

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Abstract

The generation and management of waste is a crucial indicator of resilience in the era of climate change. Every citizen has a duty to take responsibility for the creation and disposal of waste. The main organisation in charge of this is the Local Self-Government at the grassroots level. In order to provide sustainable waste services, Sustainable Development Goals (SDGs) 11 and 12 place a strong emphasis on sustainable waste management. The shift from waste to resilience entails not just waste reduction but also seeing refuse as a resource, thereby enabling communities to effectively manage it in the face of diverse problems. In Kerala's Wayanad district, the town of Sultan Bathery is one such example of a decentralised waste management strategy incorporating the idea of waste to resilience. It serves as an illustration of how to manage the waste produced by adhering to stringent laws and regulations and turning trash into an opportunity. The study adopted a qualitative case study methodology with unstructured interviews and document analysis. Using a qualitative case-study of Sultan Bathery Municipality, this paper examines strategies, challenges, and opportunities in decentralized waste management, showing how stakeholder collaboration enabled a shift from waste to resilience.

Keywords: Local Self-Government, Decentralized Waste Management, Participatory Approaches, Waste-to-Resilience, Sustainability

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1 Introduction

1.1 Background and Significance of Waste Management

‘For many anthropologists and other social scientists, waste is a mirror of humanity, a means or intermediary by which to reflect on ourselves (Knechtel, 2007, as cited by Reno, 2015). This is the legacy of Mary Douglas’s (1996) influential definition of “dirt” as that which challenges and reaffirms a given cultural system (Reno, 2015)’. On the other hand, waste is considered as something ‘useless’, while its potential for reuse and recycling is overlooked. Waste was described as an ‘unwanted’ but not avoided output, while its creation was not avoided either because it was not possible or because one failed to avoid it (Pongrácz, 2002). At the same time, definition of waste is subjective and context-dependent. ‘Your waste may contribute to my wealth: long ago in the Netherlands, China, or Japan, enterprising people bid for the right to carry a town’s faeces to the countryside

to sell as fertilizer to eager farmers. Waste is a thing, but the creation of waste is a physical and psychological process’ (Doron and Jeffrey, 2018).

There are many different types of waste generated, such as hazardous waste, municipal solid waste, industrial non-hazardous waste, agricultural and animal waste, medical waste, radioactive waste, construction and demolition debris, extraction and mining waste, oil and gas production waste, fossil fuel combustion and sewage waste (US EPA, 2018). Industrialization, urbanization, and changing lifestyles have greatly increased both the amount and complexity of these wastes, making it harder to protect human health and the environment. *‘The higher the material turnover and the more complex and diverse the materials produced, the more challenging it is for waste management to reach the goals of “protection of men and environment” and “resource conservation”’ (Brunner and Rechberger, 2015).*

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Unsustainable consumption and production patterns result in increasing quantities of waste, which directly cost society. Waste presents serious environmental risks, including air, water, and soil pollution, climate change, and disease transmission as a byproduct of human activity. The health of both people and animals is seriously threatened by the possibility of toxic waste seeping into the ground (Patil et al., 2024). The Global Waste Management Outlook published by the United Nations Environment Programme also indicated that waste contributes to environmental impacts like climate change, biodiversity loss, and pollution, adversely, affecting both people and planet due to the uncontrollable waste generation.

Despite these risks, waste is frequently mismanaged; specifically, it is discarded instead of being reused. It is managed in land disposal units such as landfills, land treatment, land farming and underground injection (US EPA, 2018). Landfills are one of the most common methods of waste disposal, and they are designed to minimize the risk of environmental pollution and however increase vulnerability to human health. When soil erosion occurs in and around landfills, it can lead to severe consequences such as environmental pollution, structural damage, and the destruction of natural habitats. This will create harmful effects on the social ecology (Bell, 2023).

Thirty eight percent of the Municipal Solid waste generated globally in 2020 is uncontrolled. Data suggests that in 2020 the total global costs to society of waste and its mismanagement amounted to US\$361 billion. While humans have been dumping and burning waste since prehistoric times, both population and waste growth along with the increasing complexity of materials mean that today uncontrolled waste disposal practices are increasingly problematic (Lenkiewicz, 2024). Consequently, the environmental, social, and health implications of waste underscore the significance of waste management.

Waste management involves the processes and practices aimed at collecting, transporting and disposing of garbage, sewage and other waste products. Proper waste disposal plays a determining role in maintaining human and environmental health. It has the potential to provide numerous benefits, such as environmental protection, pollution reduction, conservation of resources, enabling a circular economy and economic benefits. Once the waste is generated, then it must go through the process of reuse, recycling, storage, treatment and energy recovery. There are many ways for waste disposal, such as landfills, recycling, composting and incineration (India Today, 2020).

The first Global Waste Management Outlook, published in 2015, calls for action from the international community to recognize waste and resource management as a significant contributor to sustainable development and climate change mitigation. Similarly, the Global Waste Management Outlook 2024 calls for scaling up actions for waste reduction and ensuring that all unavailable waste is managed safely (Lenkiewicz, 2024). The management of waste plays a pivotal role in achieving the Sustainable Development Goals (SDGs) set by the United Nations through both direct and indirect linkages. Directly, waste management issues are addressed in four SDGs (6, 11, 12, 14), while

land filling issues are mentioned in SDG 6 reflecting water quality in connection with waste dumping. Indirectly, waste management and land filling influence various SDGs ranging from 4 to all 17 SDGs depending on the literature reference. Therefore, in short, the effective waste management focuses on climate action, responsible consumption and production, sustainable cities and communities, and clean water and sanitation (Kopecká et al., 2024). This interdependence highlighted the importance of integrated and sustainable waste management strategies at both the national and international levels.

India holds its own plan of action in waste management. Cleaning up India is a top priority of the government, and Prime Minister Narendra Modi declared “Toilets first, temples second” (pehle shauchaalaya, phir devaalaya in Hindi). He announced the Clean India Mission – Swachh Bharat – in Hindi. The goal was to make India clean and initiated many programs to encourage public sanitation (Doron and Jeffrey, 2018). The Clean India Mission aims to eliminate open defecation and improve solid waste management. The state governments took part in the mission with support from the Ministry of Drinking Water and Sanitation and the Ministry of Housing and Urban Affairs. They streamlined various programmes focusing social and behavioral change with the support of different stakeholders. Regardless of international and national strategies and actions, the ground level experience reveals a more complex picture of how people see and experience waste. Local self-government is a vital organ that connects with the experiences and realities of grass roots.

1.2 Linking Resilience and Governance Theory

Governance theory is a broad framework for comprehensive understanding of how different stakeholders interact with each other to manage public issues. According to this theory, public service system such as waste management can be considerably shaped by decentralized governance. Decentralized governance brings the people and the most impacted areas closer to the decision-making process. Decentralization is intended as a means to enhance local participation in resource management and tailor environmental policies to specific ecological and social contexts in the sphere of environmental governance. Consequently, it has the potential to improve the resilience and adaptability of systems facing environmental shocks and social changes. Theoretically, decentralized structures can be more resilient to disturbances and better equipped to respond to localized crises by allocating decision-making and resources (Sustainability Directory, 2025a).

Complementing decentralization, collaborative governance offers a theoretical lens that prioritizes cooperation, partnership, and inclusive decision-making among diverse stakeholders, encompassing government agencies, non-governmental organizations, private sector companies, and individuals. Collaborative governance in waste management and environmental sustainability, involves a coordinated effort by governmental entities, waste management entities, environmental organizations, industries, local communities, and individuals to create innovative solutions and effectively implement strategies for waste reduction, recy-

cling, and disposal. The aforementioned approach acknowledges the multifaceted nature of waste-related concerns, which involve a variety of linked challenges such as the overflow of landfills, the proliferation of plastic pollution, the proper disposal of hazardous waste, and the depletion of resources (Valentina et al., 2025).

Further, adaptive governance has been referred to as a vehicle for putting resilience theory to mitigate uncertainty through ongoing and iterative learning. Theoretically, adaptive governance hypothesizes that the more adaptive a governance system is to social-ecological system functioning and change, the more resilient that governance system is, making it more likely to achieve normative goals, e.g., sustainability. Adaptive governance is premised on understanding how formal institutions, informal networks, and individuals at multiple scales are linked for resilient collaborative environmental management (Partelow et al., 2020).

Governance theory provides the institutional and collaborative framework, within which the concept of resilience is operationalised. In an era characterized by increasing resource consumption and heightened environmental consciousness, the concept of waste resilience is becoming more significant. At its core, waste resilience involves creating systems that are not merely reactive to waste issues but are intrinsically designed to minimize waste and manage it effectively under various pressures. Historically, waste management has followed a linear process: resources are extracted; products are manufactured, consumed, and then discarded, resulting in landfills and environmental pollution. This linear model is inherently fragile, vulnerable to resource depletion, price volatility, and the environmental costs of disposal. In contrast, waste resilience advocates for a circular approach (Sustainability Directory, 2025b).

Waste Resilience can be achieved through simple, community-driven efforts. It envisions a framework where waste is reduced at every phase, from design and production to consumption and disposal. By establishing these essential elements, societies can shift from fragile, linear waste systems to more resilient and sustainable models. The academic discipline of waste resilience is dynamic and continually developing. Academic perspectives on Waste Resilience analyze its ecological, social, economic, and technological aspects, offering a comprehensive understanding of its complexities. It also investigates the potential of urban green infrastructure, decentralized waste treatment systems, and climate-resilient waste infrastructure to enhance urban Waste Resilience (Sustainability Directory, 2025b).

Governance and resilience theories are formulated as a complementing framework within the domain of decentralized waste management. That is, the form of institutional arrangements and behavior of stakeholders is critical to cope with the risks. Integrating these theories is vital for developing a thorough knowledge of how roles and responsibilities allocation influences the resilience-building process.

1.3 Kerala Model of Decentralized Waste Management

Kerala in India is a state that has achieved notable advancements in social indices and implements effective waste

management practices. Hence, the Kerala Model of Decentralized Waste Management exemplifies these theoretical perspectives, where low tiers of government playing a significant role. It entails the segregation and processing of waste at source to the maximum extent possible and followed by community-level processing. Solid waste management is carried out by Grama Panchayats, municipalities and municipal corporations. The institutional framework for solid waste management in the state according to The State of Decentralized Solid Waste Management in Kerala Report 2021, each stakeholder having a defined role:

1. *The Local Self Government: this is the primary agency and stakeholder for service delivery and enforcement.*
2. *Suchitwa Mission: this agency mandated to provide technical backstopping and financial support to the LSGIs for effective and efficient waste management service provision.*
3. *Clean Kerala Company: To undertake commercial handling of non-biodegradable waste.*
4. *Kudumbashree for Haritha Karma Sena (HKS) A trained team of women entrepreneurs from the Kudumbashree fold were recruited to provide technical services and solutions on waste management projects, responsible for collection, transportation, storage, segregation processing, disposal, and management of waste in collaboration with the respective LSGs.*
5. *MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme) for infrastructure development such as establishment of Material Collection Facilities (MCFs); Ayyankali Urban Employment Guarantee Scheme (AUEGS) in urban areas for the same purpose.*
6. *Haritha Keralam Mission for techno-managerial support, campaigns, monitoring, and coordination.*

According to the report, building of sustainable systems and behavioral changes are two critical aspects of proper waste management adopted by Kerala (KILA, 2022). The LSGs are the primary stakeholder of performing waste management services. They perform services such as waste removal, waste storage and waste disposal in accordance with the Kerala Municipalities Act and Kerala Panchayat Raj Act. The Solid Waste Management Rules, 2015, of the Government of India further stated that LSGs responsibility in waste management services and their jurisdiction of collecting user fees from individual households and institutions for such services. The rules also mandate the segregation of waste at source. The National Green Tribunal (NGT) established guidelines pertaining to the waste management, as per which the LSGs are supposed to keep track of the waste generated as well as the quantities of waste handled and segregated to provide information to the NGT as and when needed.

According to the State of Decentralized Solid Waste Management in Kerala Report 2021, effective waste man-

agement is increasingly recognized as an essential public service for the sustainable development of spaces, communities and resources. This is also reflected in several global policy frameworks, including the Sustainable Development Goals (SDG), with waste management prominently featuring in the targets and indicators of both SDG 11 and 12. Both the goals notably include commitments to prevent, reduce, recycle and reuse, as well as to properly collect and discharge solid waste by 2030. Effective means of solid-waste management for the increasingly urbanized rural areas, as in enhancing the capacities of LSGs to manage and treat effectively the growing quantities of solid waste generated daily, as per the 73rd and 74th constitutional amendments, empower the local self-governments viz., panchayats and urban local bodies, to undertake the task of waste management (KILA, 2022).

The foundation of the Haritha Karma Sena (HKS) in 2016 was a significant step towards developing a sustainable waste management system. The HKS is a women-led, women-owned network of micro-enterprises that undertake collection from houses, institutions and other sources and perform waste storage and segregation activities. This "Green Task Force," is a squad of trained waste management women professionals formed under Kerala's Suchitwa Mission, the state's cleanliness project. It represents a strategic shift in Kerala's waste management practices, focusing on a comprehensive system of waste reduction, segregation, and recycling rather than just disposal. HKS is able to serve as a service provider and a catalyst for social change since its members receive training in waste collection and segregation as well as public waste management (Kumar, 2024). These women are playing an important role in educating people regarding the proper waste management strategies along with door-to-door waste collection. So there is a shared responsibility of all stakeholders in achieving sustainable waste management. Many LSGs of Kerala have become role models in various aspects of waste management with the support of different stakeholders like HKS. Some of the instances are:

- * *Sanchikk oru Saree – Sarees were collected from over 300 households in Edavaka Grama Panchayat of Wayanad District to upcycle them into cloth bags.*
- * *Pen booths in all schools – Padiyoor Grama Panchayat in Kannur District have installed pen booths in all the schools. Plastic pens that cannot be reused also collected from all schools for proper recycling.*
- * *Green Check Post – Checkpoints where single-use plastics are collected from vehicles, especially those of tourists who often end up littering scenic spots with plastic waste, were set up in Vagamon, Idukki District.*
- * *'Collectors @ School' Campaign – Ernakulum District is also running a 'Collectors @ School' Campaign to promote segregation of waste and create awareness in students. 'Upcycling Challenge' in partnership with schools, colleges and Kudumbashree NHG units to incentivize and promote upcycling of materials that are*

often discarded as waste. It also aims at behavioral changes in their households about the need and necessity of segregation of waste" (KILA, 2022).

Therefore, this study explores a case of decentralized waste management to analyze the role played by local self-governments in waste management. This study is structured around the following research questions:

- How do local-self governments implement decentralized waste management strategies?
- What strategies are employed in the decentralized waste management process?
- What challenges do local self-governments and other stakeholders face when implementing strategies in decentralized waste management process?
- What opportunities arise from decentralized waste management in enhancing resilience?

2 Methodology

As per the report of the Local Self Government Department of Kerala, Wayanad has done exceptionally well in the waste management; the inspection team did not find garbage heaps in the public at all in the entire district. Apart from this being sheer chance, it could also be because the source-level management of waste is working fairly well. At the district level, except for Wayanad and Kozhikode, which have fewer than 10 local bodies where garbage in water bodies was spotted, all other districts have an average of 18-22 local bodies that have water bodies contaminated with garbage as of 2022. In this regard, Sultan Bathery Municipality in the Wayanad district sets an example of effective waste management with multi-stakeholder participation. Sultan Bathery is a town and municipality and the biggest transport hub in the Wayanad district in the state of Kerala (Figs. 1a, 1b). The genesis of the waste management program in the municipality can be traced to the former municipal council headed by C. K. Sahadevan in 2018.

The study employed a qualitative case study research methodology to thoroughly explore decentralized waste management. Given that the initiative is in its early stages, this case study primarily seeks to understand the various activities undertaken by the municipality for waste management and to identify its opportunities and challenges. The researcher collected data through unstructured interviews and document reviews, including the report on Decentralized Waste Management of Kerala. The qualitative single case study design allowed for a flexible sample size, leading to the selection of a purposive sample of five participants based on their roles, experiences and direct involvement in the decentralized waste management process. Interviews were conducted with municipal representatives and members of the Haritha Karma Sena, who could provide rich, context-specific data and diverse insights. The data analysis employed qualitative thematic analysis, with themes such as strategies, challenges, and opportunities in decentralized waste management emerging inductively from the data.



Fig. 1a. Sultan Bathery Municipality office **Source:** Mediaone (2019).



Fig. 1b. Flowers are planted in the pavements of Bathery town. **Source:** Joseph (2018).

3 Results and Discussion

3.1 Waste to Resilience: Sultan Bathery Municipality

Everyone on the planet generates some kind of waste. Therefore, the waste management is the responsibility of every individual, those who clean the streets, collect wastes, authorities who make decisions about the communities all matters in the waste management. It means people are the key to societal change. Sultan Bathery implemented different strategies towards waste management with multi-stakeholder participation.

Fig. 2 depicts that the municipality implemented a decentralized waste management system that included both household and institutional levels. This is accomplished through HKS, an essential component of developing a sustainable waste management system. These enterprising women, who are largely from neighbourhood groups (NHGs), are members of Kudumbashree in Kerala. They play a significant role in collecting, segregating, and man-

aging waste in the town. There are 53 Haritha Karma Sena members in the municipality, with two of them are men. Men drive vehicles and ladies went for door-to-door waste collection.

Here in the municipality, the HKS members conducted a survey initially among households and institutions. So that it would give primary information about the consumers and the amount of waste generated. The following step required people to segregate the wastes like plastics, glass, clothes etc at sources. These segregated wastes are collected by HKS members and keep it in the MCFs, a decentralized waste treatment facility. Then a final segregation of wastes was done and categorized them as reusable and recyclable (Fig. 3).

The effectiveness of waste management process depends upon the strategies implemented at the local level. Therefore, the subsequent section illustrates the various strategies adopted to convert these processes into practice (Fig. 4).

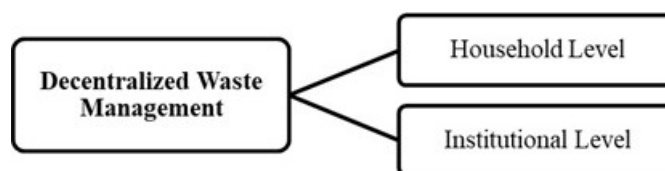


Fig. 2. Decentralized Waste Management.

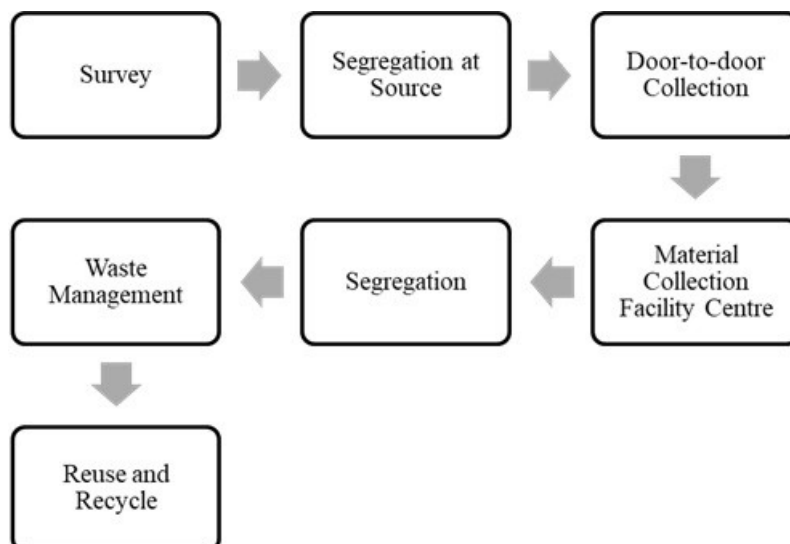


Fig. 3. Basic process of waste management at Sulthan Bathery, Kerala, India.



Fig. 4. Strategies implemented in the process of waste management in Sulthan Bathery, Kerala, India.

3.2 Collection of Wastes

Different stakeholders of the municipality were involved in the waste collection, segregation and management process. According to a Harita Karma Sena member, *‘the door-to-door collection of wastes from the houses and institutions starts from 9 am. The wastes were collected from houses monthly and weekly from the institutions in accordance with the calendar prepared by the municipality. This calendar is available for all houses and institutions. The types of wastes collected from houses and institutions are plastics, clothes, chappals, e-wastes etc. The wastes are segregated at the*

Material Collection Facility centre. The day’s waste segregation and handling would end at 5 pm’.

User Fee. User Fees is one of the most critical components for the sustainability of the HKS Model. The income of Sena members and the profitability of HKS micro firms are determined by the amount of user fees received from homes and institutions, as well as the amount of non-biodegradable and degradable waste collected by the Sena from doorsteps each month. The 2015 Rules allows the collection of user fees from individual households and institutions based on the rates fixed by LSGs. A HKS member

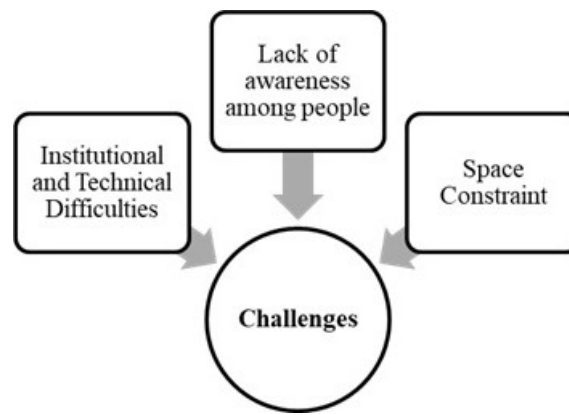


Fig. 5. Challenges of implementing waste management strategies in Sulthan Bathery, Kerala, India.

stated, “We collect 70 rupees from the houses and 100 from the institutions. It is estimated for a single sack. The collected fee is a remunerative option for us”.

Cleaning Drive. The initial step towards effective waste management by the municipality was a cleaning drive in town. As part of the program, 13 clogged drains were cleared up. The accumulated wastes were removed from the drains. Similarly, the municipality took actions for clearing all the growth of wild plants on the roadside. The cleaning staffs of the civic body clean the town in fixed intervals and making it as lovely and clean as houses.

Round-the clock Vigilance. The municipality is cautious against violations of waste management rules. Authorities stated that ‘the surveillance is not possible without the support of the town’s residents. Locals, businesses, and taxi drivers alert us about the rule violation. These combined initiatives contributed to the continuation of waste management initiatives’. Spitting in public is punishable by a Rs.500 fine under Section 341 of the Kerala Municipalities Act. The same fee is imposed for blowing nose, open urination, and open defecation in town and public places.

Ban on Plastic. The burning of plastics is banned in public places. Similarly, as a tourist destination the use of plastic bottles are not encouraged by the hoteliers of the town. Another remarkable characteristic is the removal of banners and flags within 24 hours after the meetings and functions.

Potted Flowering Plants (Fig. 1b). The town has now transformed into a flower-filled garden. The municipality’s cleaning staffs, as well as the residents of the town, are careful about the plants placed on the pavements. A shopkeeper commented, ‘These potted flowering plants gave a fresh experience for us. Even the people came from outside the town and tourists are very much fascinated by these plants’.

The various strategies identified in this case study align with scholarly literatures. Scholars are emphasizing the significance of integrated and participatory strategies in waste management process. Efficient waste management requires active participation from communities not solely the responsibility of governments and industries. Community engagement and education play a vital role in promoting sustainable waste management practices. Citizens can learn about proper waste segregation, recycling methods, and the im-

portance of reducing single-use plastics through awareness campaigns, workshops, and educational programs. When communities are well-informed and engaged, they are more likely to participate in recycling programs, composting initiatives, and other waste reduction efforts. Furthermore, involving local communities in decision-making processes regarding waste management initiatives fosters a sense of ownership and responsibility, leading to more effective and sustainable outcomes (Singh, 2023).

3.3 Challenges in the process of Waste Management

While the circular economy presents a compelling framework for sustainable waste management, significant challenges must be addressed to fully realize its potential. Understanding these challenges is crucial for developing effective strategies that promote sustainable practices across industries and communities. Some of the problems encountered during the waste management process include inadequate infrastructure, consumer behaviour patterns, outdated policies, and the economic viability of circular practices (Kotyal, 2023).

These observations in the literature provide insights on the challenges faced by the municipality in the selected case, which similarly struggled with behavioral, technical and logistical barriers (Fig. 5).

Lack of awareness among people. Regardless of the approaches taken, behavioral change among individuals is critical for effective waste management. This was the town’s first major challenge. People are less aware of proper waste disposal and recycling methods. According to a HKS member, ‘the support from the people, both households and shops, is inadequate in the early stages of the cleaning drive and waste management. They are not bothered about the waste generated on their premises. A culture of use and throw was largely prevalent. As a result, waste minimization was not given enough priority. Similarly, individuals are not ready to segregate waste at the source.’ Lack of awareness was a gap in the functioning of waste management process. It was both a behavioral and governance issue affecting the resilience.

Institutional and Technical Difficulties. One of the HKS members stated, ‘The effort began with a survey of households and institutions in the municipality, which

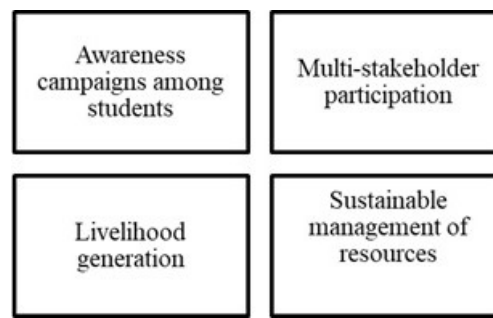


Fig. 6. Opportunities in waste management.

was a large task for us. Similarly, using QR codes to collect user fees was first difficult'. This shows how limited digital literacy and lack of training became a challenge in the early stages of implementing waste management strategies. They also confront difficulties due to procedural lag from higher-level governmental bodies in implementing various projects for effective waste management. It highlights the importance of administrative support in implementing various strategies.

Space constraints. During the field visit, respondents discussed the issue of inadequate infrastructure. Space constraints limit the scalability of waste management system and the potential of introducing effective strategies. The construction of a new building for the waste management has started. So, they are hoping to launch various waste management activities in the new building.

By fostering collaboration, investing in technology, and developing supportive policies, society can overcome these barriers and pave the way for a more sustainable and circular waste management system. This transformative shift will not only reduce waste generation but also contribute to a more resilient economy and a healthier environment (Kotyal, 2023).

3.4 Reimagining Waste as a Resource

Despite the challenges associated with the transition to a circular economy, there are numerous opportunities for innovation, economic growth, and environmental sustainability. Opportunities such as innovation in recycling technologies, circular business models, job creation and economic growth and climate change mitigation. By embracing these opportunities, stakeholders can contribute to a more resilient and sustainable waste management system (Kotyal, 2023).

Similarly, this present case study reveals opportunities that can contribute to overall resilience of waste management process. The municipality was ready to consider and execute new waste management solutions. They recognized that with adequate community participation, waste could be turned into a resource that would provide several opportunities (Fig. 6).

Awareness campaigns among students. A HKS member pointed, 'From 2022 until the present, we have observed a favorable improvement in the local population's attitude towards waste management. So, we want to pass it down to the next generation. Therefore, awareness gen-

eration classes are held in schools and we also take them with us when we collect waste. We are attempting to foster a culture of being responsible for what they consume'. This initiative was done in collaboration with school and college managements and as well as various clubs. The engagement of various stakeholders in the awareness campaigns can enable collaborative relationships. Hence, effective coordination between local governments and community actors are possible in the implementation of decentralized waste management strategies.

Multi-stakeholder participation. Participation of a community can lead to a certain decentralization of responsibility, which can also contribute to reduction of costs to the municipality (Singh, 2015). The participation of numerous stakeholders is at the heart of this initiative. Waste management is a labour-intensive process, and each program demonstrates the involvement of several departments, shops, and municipalities. It has enormous potential to provide income and livelihoods to individuals involved at various stages (collection, storage, segregation, processing, recycling, etc.). This demonstrates how participatory waste collection promotes civic responsibility and gender-based resilience. The collective participation of multiple stakeholders could create a positive environment for the effective implementation of decentralized waste management strategies. It also enhances the adaptive capacity of system to counter emerging challenges.

Livelihood Generation. HKS women were getting wages for the waste management and able to take part in different income generation activities as a team. According a HKS member, 'we started flower cultivation as part of a floriculture project in 2023, aiming for the Onam season. Everyone is very excited to take part in the cultivation, which is something new to us. Municipality supported us with their resources, so we could also find an additional income source. Similarly, some of our members got trained in cloth bag making, so hopefully we could start such initiatives too'. They also perform charity work together, such as assisting individuals in need. Exploring creative alternatives, such as micro-enterprises, could enhance their income from managing waste. It could also encourage others to join the initiative. This demonstrates how waste management can help people to achieve economic self-sufficiency. Further, it could improve waste-management outcomes along with socio-economic development.

Sustainable management of resources. Exposure

to waste can also provide opportunities for the recovery of wealth from what otherwise would be disposed of. In all stages of the waste management, like during cleaning, collection, sorting, and disposal, the wastes can be recovered, remade, and given life as part of a new creative process. Recycling is the first and foremost goal of waste management. Reduce waste by preventing it in the first place is very essential. The authorities also said, there are project proposals given to authorities to make handicraft products and sustainable bags from the waste in future. Therefore the effective waste management is an essential factor in providing healthy quality of life. Further from a disaster risk reduction standpoint, sustainable management of resources minimize the risks, provide clean and safer environment.

One of the most critical opportunities offered by the circular economy is its potential to help mitigate climate change. Sustainable waste management practices can significantly lessen greenhouse gas emissions by reducing the extraction of raw materials and minimizing waste. Methods such as composting, material recovery, and energy-from-waste contribute to reducing emissions associated with land filling organic waste and utilizing fossil fuels (Kotyal, 2023).

A solid waste management case study of selected communities in the Philippines demonstrated the interconnectedness of climate change, disasters, and waste for a resilient and sustainable community. A thorough understanding of sustainable waste management could contribute to shape future policy creation and action on Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR). This viewpoint is also linked to the (SDGs). Recently, waste pollution, particularly plastics that end up in the ocean or rivers, have attracted a lot of global attention. This attention implies the presence of rising policy momentum towards a solution, which attracts a flow of capital and intellectual resources. Understanding the intersection between waste management, CCA, and DRR is, thus, critical in the sustainable development rather than focusing on a single issue (Yoshioka et al., 2021).

There are global case studies highlighting notable success in circular waste management strategies. For instance: the Advanced Recycling System of Sweden where 90% of household waste recycled or converted to energy. The Amsterdam Circular Strategy of Netherlands aiming for 50 percent reduction in raw material reliance by 2030. The Sound Material-Cycle Society of Japan implemented strict waste sorting laws and effective e-waste management. The Circular Economy Program of Finland is promoting resource efficiency and reduces waste (Kotyal, 2023).

The waste management system of Bathery Municipality aligns with the theoretical principles of governance and resilience theory. The study's findings indicate that successful waste management is achieved through governance quality, collaborative participation, and adaptive governance, alongside various strategies. Local self-governments, as decentralized authorities, played a coordinating role by assigning roles and responsibilities to different stakeholders. The successful implementation of strategies, facilitated by the community's collective engagement, reflects the collaborative governance observed in the case study. Through the lens of adaptive governance theory, the waste manage-

ment system strives to remain functional despite challenges. Consequently, the overall resilience of the waste management process can be strengthened. From a Disaster Risk Reduction perspective, a resilient waste management system is crucial for effective response, recovery, and overall preparedness during future disasters.

4 Conclusion

Waste is not something 'useless' or 'unwanted'. It is a resource which offers a range of opportunities. The case study of Sultan Bathery municipality presents how waste provides livelihood opportunities and became a part of new creative process. The initiative spearheaded by the municipality, later joined by sanitation workers, HKS, traders, auto-taxi drivers and households. The range of activities mobilized by the town helped to create a behavioral change among the local people and generate a collective spirit towards waste management. People are more aware about the patterns of segregation and proper disposal systems. They sorted the wastes in compliance with the calendar provided by the municipality. This makes easier for the members of HKS to collect the wastes from households and institutions.

The potted flowering plants provide a new experience to the people and roads are super clean which also prohibits the people from putting the wastes in public places. Along with the sanitation workers, traders and auto-taxi drivers are joined in caring the various species of plants in the road sides. The local people are vigilant on the violation of rules even though there are fines and legal punishments imposed for the same. Thus, it underlined the significance of collective obligation and how these shared responsibilities are helping to continue the process of waste management. The HKS members are excited to begin micro-enterprises such as floriculture project. So they are not just work in waste collection and segregation, but involved in various women-led activities. Thus, they could contribute to the sustainable management of resources and to their capacity development. The study found that the core of waste reduction efforts is a change in consumer behavior. It also shows the role of environmental awareness is significant in achieving a clean, eco-friendly spaces around us.

The process of waste management is a multi-layered complex problem. The concerted efforts of different stakeholders are significant in solving these problems. It needs an understanding of waste is a resource. It is an opportunity to create something new. Here Sultan Bathery holds its significance by nurturing a new culture of opportunities in waste management with multi-stakeholder participation. Thus, it can be called as a community driven initiative of decentralized waste management. It also presents a model for contributing to a healthier environment in the face of climate change and disasters by reducing waste generation and adopting sustainable practices. Ideally, these innovative trends in effective waste management will encourage public participation and foster collaborations with private sectors and non-governmental organizations. By integrating the theoretical principles of governance theory, this case study illustrates how the convergence of different stakeholders catalyzed the transition from waste to resilience. The

challenges encountered in the waste management process were transformed into opportunities for strengthening resilience, reducing risk, and promoting sustainability.

5 Recommendations

1. Education and information dissemination programs are needed for desired behavioral and attitudinal changes.
2. Greater emphasis must be placed on upstream waste reduction strategies.
3. Providing incentives will increase the participation of local people in various phases of waste management. As an ongoing process, continuous evaluation of programmes is needed. Make appropriate changes according to the evaluation and feedback.
4. Future research should incorporate Participatory Action Research (PAR) frameworks to collaboratively develop waste management strategies and enable continuous monitoring with the active participation of all stakeholders.
5. Longitudinal studies are crucial for assessing participation patterns, behavioral changes, and the overall efficiency of waste management. Additionally, combining qualitative and quantitative research will provide a comprehensive understanding of decentralized waste management.

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