SUSTAINABLE ENVIRONMENT
2024, VOL. 10, NO. 1, 2383472
https://doi.org/10.1080/27658511.2024.2383472

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WASTE MANAGEMENT

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Service providers and program managers' perspectives on household waste segregation in Ujjain, India

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ABSTRACT

Improper disposal of household waste adversely affects both the environment and human health. Effective household waste segregation relies on the collaboration of program managers, service providers, and household members. This study focused on service providers' and program managers' perspectives on household waste segregation in India. We conducted 25 semi-structured interviews with 13 program managers and 12 service providers in Ujjain, Madhya Pradesh, India. Interviews were digitally recorded, transcribed, translated and analyzed through thematic analysis. Three key themes emerged: 1) Optimizing household waste segregation—observations from service providers and program managers, 2) Navigating the current landscape of household waste segregation, and 3) Unveiling the driving forces behind household waste segregation. Participants emphasized the need for a comprehensive strategy integrating incentives, community education, and engagement, along with the development of adequate infrastructure. Building provider-resident trust, equipping facilities, and ensuring timely waste collection were identified as crucial for public compliance. Program managers and service providers also stressed the importance of targeted educational interventions to enhance waste segregation skills through proactive community engagement.

ARTICLE HISTORY
Received 07 March 2024
Accepted 18 July 2024

KEYWORDS
Household waste; municipality, segregation and sorting; sustainable waste management

1. Introduction

Improper disposal of household waste adversely affects both the environment and human health (Alabi et al., 2019; Sahoo et al., 2022; Tait et al., 2020). With growing environmental, social, and economic concerns, waste management is increasingly recognized as a crucial issue globally (Mandal & Mandal, 2019; Marshall & Farahbakhsh, 2013). Service providers and program managers are key to effective solid waste management. Despite extensive research on solid waste management, little is known about how service providers perceive the reasons driving waste segregation practices in low- and middle-income countries (LMICs) (Elledge et al., 2018; Gutberlet & Uddin, 2017; Nepal et al., 2023; Zurbrügg et al., 2014).

In India, urbanization, industrialization, and economic growth have led to increased per capita waste generation, making solid waste management (SWM) a major issue (K. D. Sharma & Jain, 2019; Vij, 2012). Effective SWM is particularly challenging in over populated areas. To address this the Swachh Bharat Mission was launched by Government of India in 2014, followed by a second edition for urban areas in 2021 in collaboration with the Ministry of Housing and Urban Affairs (Bharat & Sarkar, 2016; A. Sharma et al., 2022). The annual Swachh Survekshan surveys aim to increase citizen participation and raise awareness about sanitation and cleanliness. Urban Local Bodies (ULBs) are responsible for SWM in their cities as per the Solid Waste Management Act, 2016, and they encourage the use of color-coded bins to separate waste at the source. Program managers are responsible for designing, planning, implementing, and monitoring the waste segregation program (Dickella Gamaralalage et al., 2022; Pheakdey et al., 2022). Service providers play a critical role in the operational aspects of waste segregation and management,

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including the collection, transportation, and processing of segregated waste. Effective collaboration between program managers, service providers, and household members is crucial for the successful implementation of the waste segregation program (Kalyanasundaram et al., 2021; Kumari & Raghubanshi, 2023; Sahoo et al., 2022).

Previous research has primarily focused on the technical aspects of waste management, policy frameworks, and household behaviours. However, there has been little exploration of the perspectives of those directly involved in implementing and managing these systems on the ground (Dutta et al., 2018; Khanal et al., 2023; Kwakye et al., 2024; Sahoo, 2008). By capturing the experiences and challenges faced by service providers and program managers, this study contributes to a critical understanding of the operational dynamics and practical challenges in waste segregation programs, as well as valuable recommendations for improving the effectiveness and sustainability of SWM initiatives. This study will fill a critical gap by focusing on service providers' and program managers' perspectives on household waste segregation in India.

2. Methods

2.1. Study design, settings and participants

This is a qualitative study of the experiences of managers and other service providers in urban waste management in an Indian city.

We sought to understand the insights of service providers and program managers regarding household waste segregation practices in Ujjain, Madhya Pradesh, India. The Ujjain Municipal Corporation has 54 administrative wards with 103,000 households and 560,000 population. Approximately one-fourth of the households are located in slums—low-income urban households (Census, 2011).

Approximately 226 tons of municipal solid waste is generated every day in Ujjain (N. Sharma & Dwivedi, 2018). Waste management system in Ujjain consists of waste segregation and collection, awareness, waste disposal and recycling. Each responsibility is divided and it is done in collaboration with four private companies. There is a head and two program managers to control and manage the whole process of collection and segregation. Furthermore, there are five zone supervisors to monitor and record the collection and segregation rate. A total of 115 waste collection vehicle drivers and 200–210 waste collection helpers are allocated for collection and transportation of waste from households. Awareness—Information, Education and Communication (IEC) is one of the most essential components to improve waste segregation at source. IEC responsibility is taken care of by two private agencies, their teams include a project manager, a team leader, an assistant team leader, two-zone supervisors and 81 field volunteers. About 75–80% field volunteers are male. The disposal and recycling team has one manager, a team leader and four field officers.

We recruited 25 participants for our study using purposive sampling, selecting those most able to answer the research question in key positions in waste management. This included 13 program managers—supervising and monitoring waste management in the city and 12 other service providers. All participants actively engaged in city waste management. The participants were employed with Ujjain ULB (one Swachh Bharat Mission consultant), and three private agencies. Their roles include team leaders ($n = 2$), project manager ($n = 3$), zone supervisors ($n = 7$), waste collection vehicle drivers ($n = 6$), and waste collection helpers ($n = 6$). The participants' average age was 33 years (range 19–48). Only two of the participants were female. Six of the thirteen program managers were postgraduates, while the other nine were graduates. Five of the twelve service providers had a high school diploma, six had primary education, and one had no formal education.

2.2. Data collection procedure

We conducted semi-structured interviews using a pre-tested interview guide developed based on previous studies and the research team's field experiences (Table 1). The interviews were conducted between January and June 2022. The list of participants with their contact information was obtained from the Ujjain Municipal Corporation. Each participant was contacted by phone and scheduled for an interview. We approached 15 program managers, two of whom were unable to participate due to their busy schedules; similarly, we approached 20 service providers, and after interviewing 12 of them, there was data saturation. The majority of the participants chose their workplace as the location for interviews. The authors KCS, VD and AP trained the field team in tool familiarity and data collection.

The interviews were conducted by two trained field investigators, who were native to the setting and fluent in the local language, with experience in waste segregation field activities and qualitative interviewing techniques. To avoid personal bias, the interviewers bracketed their pre-understanding. Interviews were conducted in a space at the respondents' working place that had no one else present. We did not conduct any repeat interviews. Each interview lasted between 18 and 55 minutes, with an average period of 32 minutes.

Table 1. In-depth interview guide – open-ended questions with probes

Q1: What is the provision for waste management in your area?
Probe on public dustbins, garbage collecting vans, cleaning of public toilets, road/street sweeping, sewage cleaning, clearing roadside grass and weed, sufficient human resources, etc.
Q2: Can you please explain the system of waste collection and management in your locality?
Probe on 1) How is the waste collected from the households? 2) distance of the local collection point from the household? 2) How is it segregated? 3) where is the waste taken after collecting it from the households? 4) how is it transported?
Sub question: Do you have a proper route map for the waste collection van? Are the vans covered?
What are the time schedules for emptying and replacing public bins? Condition of public bins/vehicles? The volume of waste generated daily? How do you deal with foul odour?
Q3: what is done with the segregated waste?
Q4: What are the problems faced in this work? How can the municipality address these problems?
Probe on morale and motivation of staff, transportation, public awareness, public co-operation, planning and execution, public bin and landfill management.
Q5: How many waste collectors and segregators work in the locality? What precautions do they take while handling waste? (usage of masks, gloves, boots etc).
Q6: what is the provision for collecting periodic feedback from the general public? How is it done?
Q7: Does the municipality experience seasonal variations in the generation of waste from households? How does it manage the excess waste generated?
Q8: What are the limitations of the current system?
Q9: What are your suggestions for better waste management and improving functioning? How can the Municipal department be made more efficient?

2.3. Data management and analysis

Study team conducted and recorded interviews in local language (Hindi). The data was transcribed, and the Hindi transcripts were translated into English for coding using the software. We used thematic analysis to analyse the data (Clarke & Braun, 2017). All transcripts were coded using open coding. All of the related codes were gathered together and categorised. The data was organised into similar groups, and themes were formed. For data selective coding, we used the MAXQDA Analytics Pro 2020 (VERBI GmbH Berlin) software. All authors contributed to the interpretation and analysis of the data.

During transcript analysis, we performed cross-checking processes, using vernacular (Hindi) and English transcripts to cross-check during the coding phase. We independently discussed our key findings with five participants to see if they agreed with our interpretation of the data, and refined our results as per their suggestions. We followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines when reporting the study (Booth et al., 2014). Ensuring the reliability, credibility, and effectiveness of data from qualitative interviews involves meticulous transcription, triangulation of data sources, member checking, and employing rigorous thematic analysis techniques.

2.4. Ethical considerations

The study was approved by Institutional Ethical Committee of the National Institute for Research in Environmental Health, Bhopal (NIREH/BPL/IEC/2020–21/41) and the Institutional Ethics Committee of R D Gardi Medical College, Ujjain (03/2020). Written informed consent was taken from the participants for the study and recording.

3. Results

Three themes emerged: 1) Optimizing household waste segregation – observations of service providers and program managers, 2) Navigating the current landscape of household waste segregation, and 3) Unveiling the driving forces behind household waste segregation. Table 2 depicts the detailed coding tree.

3.1. Theme 1: Optimizing household waste segregation – observations of service providers and program managers

3.1.1. Category: awareness of waste segregation among providers and the household members

The service providers and program managers emphasized that community awareness is the cornerstone of successful waste segregation programs. However, they recognized that awareness within their own staff is also crucial for ensuring adherence to established protocols and for promoting efficient waste segregation at the source. They believed that well-informed community members are more likely to actively participate in the process, and contribute to the overall effectiveness of waste segregation. Hence, they advocated for robust educational initiatives and communication strategies to enhance awareness among all stakeholders, ultimately leading to a cleaner, healthier, and more sustainable city.

According to the service providers, the door-to-door campaigns were organised at different times to inform the community members about household waste segregation into wet, dry, sanitary, and hazardous categories. The garbage collection vehicles have 4 compartments for the 4 categories of waste. Wet waste includes kitchen waste and garden waste and placed in green bins. Dry waste including items of paper, plastic, glass and metal to be disposed in the blue bin, while sanitary wastes such as sanitary napkins, diapers and

Table 2. Coding tree – themes, categories and codes

Themes	Optimizing household waste segregation – observations of service providers and program managers		Navigating the current landscape of household waste segregation		Driving forces behind household waste segregation	
Categories	Awareness of waste segregation among providers and the household member	Community members' skills and self-efficacy on waste segregation	The landscape of household waste management	Monitoring mechanism, and social support platform	Environmental consciousness, ethical and social responsibility, and legal mandates and regulations	Innovative strategies – community engagement, education and awareness campaigns, and economic incentives
Codes	• Adherence to established protocols • Awareness among staff • Community awareness • Door-to-door campaigns • Educating residents on waste source segregation • Pink campaign for women to dispose of sanitary waste • Robust educational initiatives and communication strategies • Waste segregation programs	• Collected all wastes in a single bucket • Generate compost from waste • Informed of the risks and benefits of hazardous • Lack of adequate waste classification abilities • Organised training programs • Separated mixed waste in front of residents • Use a double-bin system • Use of organic compost • Utilized plastic bags or cardboard boxes	• Collected directly from households • Collected waste from difficult sites, where vehicles cannot reach • Collection time depends on the ward size; • Door-to-door waste collection every day • Emphasises source segregation • Many localities were unhappy with vehicle timing • People cannot afford or have space for the different bins in their homes • Played a waste management-related motivational song • Transported to transfer stations • Utilising specialised municipal waste collection vehicles	• Digital monitoring systems • Expanding recycling programs • GPS – Global Positioning System tracking • Motivational music • Multiple rounds of waste collection during festival • Optimising collection routes • Organized rallies, street plays, and community awareness. • Readily available at all times to answer the residents' questions • Social media platforms for public awareness • Women's self-help groups prepared cloth bags	• Adequate facilities encourage public upgrading to adapt to changes • Composting techniques • Educational campaigns • Fear of legal penalties • Raising environmental awareness • Sense of ethical and social responsibility • Social responsibilities • Stressed the importance of trust between providers and residents. • Unorganized rag pickers	• Attempting to hire more women for IEC activities • Community engagement • Consulted religious leaders and political leaders • Door-to-door campaigning • Offered economic incentives • Plastic-free campaign • Quit Dirt Campaign • Taught the children about waste segregation • Women are trained to make creative things out of trash

other infectious materials to be disposed in the yellow bins. Hazardous wastes like sharps and chemicals to be disposed in red bins. However, most program managers acknowledged that many households were still not properly segregating waste; and hence they suggested specific educational interventions/programs to enhance the community's knowledge and waste segregation practice.

> Specific educational interventions or programs are needed to enhance the community's knowledge and waste segregation practice. (Zone supervisor)

Household waste management system teams in Ujjain included a waste collection vehicle driver and a helper, and a supervisor who would oversee all operations on the waste collection truck. Each ward had three IEC (Information, Education, and Communication) staff educating residents on waste segregation at source. They held meetings, campaigns, and door-to-door visits with the households. The service providers also conducted the 'pink campaign' for women to dispose of sanitary waste scientifically. Most IEC programs were conducted in the evening as more people were available after work. Urban local body also used social media platforms like Facebook and 'Health Forum', the government of India, for awareness. According to service providers, educational interventions that would encourage women to segregate their household waste would be more effective as they believed that women manage households and hence their understanding of waste segregation can affect family members, including children.

3.1.2. Category: community members' skills and self-efficacy on waste segregation

Earlier, households collected all wastes in a single bin, but after communication campaigns they use a double bin system to collect wet and dry wastes separately, according to service providers. It was later divided into four separate groups: wet waste, dry waste, sanitary waste and hazardous wastes. Some households utilised plastic bags or cardboard boxes because they could not afford to buy dustbins. However, many service providers and program managers stated that the majority of household members lack adequate waste classification abilities; they suggested that educational intervention be implemented to improve their waste segregation skills.

The service providers believed that communities have realised the use of organic compost. Demonstrations were done on how to make compost from wet waste through activities such as *'Kabaad se Jugaad* – resources from waste'. They also organised training programs on how to make household products out of waste. This can improve segregation, resource recovery, and employability. Residents were also informed of the risks and benefits of hazardous waste segregation by many providers. The service providers separated mixed waste in front of residents. The service providers were readily available at all times to answer the residents' questions. Occasionally, however, confusion can lead to improper waste segregation; for instance, in the case of packaged food items, if there were any leftovers, they were disposed of with dry waste.

> By mistake, if wet waste was mixed with the recyclables, we separated it, but we could not do it properly. (Zone supervisor)

3.2. Theme 2: Navigating the current landscape of household waste segregation

3.2.1. Category: the landscape of household waste management

The program managers informed that they had instituted door-to-door waste collection services in the residential areas. All the workers began door-to-door waste collection daily in the morning and played a waste segregation-related motivational song on their vehicle using digital sound system to encourage and alert people to bring their waste. They also used GPS (Global Positioning System) tracking. Service providers said that the time required for collection depended on the size of the ward; they estimated 4–5 hours to collect waste from a large ward. Utilising specialised municipal waste collection vehicles with four compartments, comprising of two compartments with a 40:60 ratio for wet and dry waste, and separate boxes for sanitary and hazardous, waste was collected directly from households. They advised the households to keep four separate bins for wet, dry, sanitary and hazardous waste at their home. They perceived that some people could not afford or have space for the different bins in their homes. To easily segregate waste, waste collection staff told them to put wet waste at the bottom of a box/bin and dry waste at the top. Providers stated that they collected waste from difficult sites, where vehicles could not reach, and even at night. They usually collected waste once a day, but during festival season, multiple rounds of waste were collected. Many service providers stated that waste collection from households located in narrow lanes was difficult. Many providers reported that some residents were unhappy with vehicle timing and disposed waste in open spaces/open drains before the vehicle collected the waste.

> Many people throw waste saying the vehicle didn't come; some people complained about the vehicle timing. We adjust the vehicle's timings with the timings of people. (Field volunteer)

3.2.2. Category: monitoring mechanism, and social support platform

The ULB regularly monitored waste collection and disposal systems. Monitoring led to optimisation of collection routes, expansion of recycling programs, and upgradation of disposal facilities. The program managers shared that there were enough vehicles, bins, collection teams, supervisors, and IEC teams to serve the city. One supervisor monitored all the processes from the collection from households to the transport to the transfer station. They also monitored the timings of collection, the route of collection, the amount of waste received, and the amount of unsegregated waste received. IEC was enhanced in the residential areas from where the amount of mixed waste was more. Rallies, street plays and other community awareness activities were organized in such areas.

Program managers and supervisors also shared about their monitoring system, which involves digital monitoring systems. Fines and penalties were levied on the employees in case they were not on time for waste collection, if the sound system (IEC message) in the collection vehicle was turned off, if they misbehaved with community members, or if they sold waste without notifying the authorities. To improve system efficiency, they implemented digital methods, such as the UMC Sewa app, which allowed the public to track vehicles and file complaints. Additionally, people could upload photos of drainage blockages, dirty

roads, and other issues to the Municipal Corporation's UMC Sewa app, which were then resolved. If a vehicle had a problem, the mechanic was notified, and another vehicle was dispatched to collect waste in time. Few self-help groups of women have been formed. The women from the self-help groups prepare cloth bags and sell them to reduce polythene use.

> We make an organization of the women in which a self-help group is formed. If a woman needs some kind of monitory help they get it from within the Self Help Group. (Program manager)

3.3. Theme 3: Unveiling the driving forces behind household waste segregation

3.3.1. Category: environmental consciousness, ethical and social responsibility, and legal mandates and regulations

The program managers realised that raising environmental awareness motivates community members to take action by segregating their waste to reduce its negative impact on the environment. They informed people about composting techniques and the use of natural fertilizers made from compost that can reduce the use of chemical fertilizers or pesticides on vegetables. The service providers said that people understand the benefits of segregation and the drawbacks of mixing waste. Many people, they believed, were motivated by a sense of ethical and social responsibility. They consider waste separation to be one of the most important social responsibilities. This moral obligation motivates them to make an intentional effort to separate waste.

In many regions, laws requiring waste segregation at the source have been enacted. Fear of legal penalties and fines prompts individuals and households to follow these regulations. Furthermore, these regulations are frequently accompanied by educational campaigns that raise awareness of the importance of waste segregation. Many providers supported municipal authorities proposing strict rules and penalties for improper waste disposal and non-segregation. Some providers believed that a fine should be the last resort when all other options fail. Many service providers also stressed the importance of trust between providers and residents. Providers believed that adequate facilities encourage public upgrading to adapt to changes. Providers emphasized the importance of IEC members making people comfortable, polite, and friendly, even when they are irritated.

> It appears that slowly and gradually, they have faith in us. (Zone Supervisor)

3.3.2. Category: innovative strategies – community engagement, education and awareness campaigns, and economic incentives

Providers elaborated on other community engagement and awareness activities like street plays, rallies, slogans, distributing pamphlets, community group discussions, workshops, and games involving the residents. IEC providers are conducting government initiatives like *Kabaad se Jugaad* (best from waste), *Gandgi Hatao abhiyan* (Cleanliness drive), and *Vaada Karo Abhiyan* (Pledge drive). During these campaigns, a special focus on women residents was given as they deal with more household activities than men as seen in the city of Ujjain. During these workshops, proper disposal of sanitary napkins was also explained.

The supervisors stated that they took feedback from residents to see how they felt about the waste collection process and the behaviour of the collection staff. They also met with all of the employees to discuss the problems encountered during waste collection. They realized that people preferred to speak with same-sex service providers. Because in majority of households women separated and disposed waste, program managers stated that they were attempting to hire more women for IEC activities and waste collection. Furthermore, to persuade community members, IEC personnel frequently consulted local influencers such as religious and political leaders, actors, and others. Few program managers, however, believed that instituting penalties would change the behaviour of those who improperly separated and disposed of waste.

> IEC approaches are of different ways – campaigns, meetings and discussions with influencers, use of posters and pamphlet etc. (Zone supervisor)

Many participants said that education and awareness campaigns are instrumental in driving waste segregation. According to them when people understand the benefits of waste segregation, including reduced environmental impact and resource conservation, they are more motivated to participate. They explained that information campaigns, workshops, and school programs are effective tools for disseminating this knowledge. The service providers also taught the children about waste segregation in community settings and sometimes in their schools, and the children would share the same with their family members. They arranged various games and competitions related to waste segregation among children.

According to the service providers, door-to-door campaigns play a significant role in educating households about proper waste segregation and monitoring and

convincing the communities. Thus, providers considered door-to-door campaigning the most effective behavioural change communication method. During such door-to-door campaigns, providers adopted various strategies to promote waste management. Plastic-free communities campaign was conducted by the service providers.

> Various artists in the costumes of Mahatma Gandhi, Goddess of cleanliness and married couple were a part of plastic-free campaign. They propagated the message of discouraging plastic use and segregating waste. (Service Provider)

The ULB offered economic incentives for households that participate in waste segregation programs. These incentives included reduced waste disposal fees, tax benefits, or even direct financial rewards for recycling certain materials. Such incentives encouraged individuals to segregate their waste to reap financial benefits. They promoted composting and recovery of waste to make different items. Women were trained to make creative things out of garbage in workshops conducted. Through that, they also ensure livelihood for people, especially women. ULB also provided certificates to people who segregate the waste properly.

4. Discussion

This study highlights waste management system through the lens of supply side personnels in the city of Ujjain. Through Swachh Bharat Abhiyan, the urban local body has been on a path to improve solid waste management system in Ujjain.

Program managers and service providers in Ujjain, India, believe that awareness is crucial for strengthening waste segregation at source. They believe that enhanced awareness, including from consumers and service providers, is necessary for active participation and effective segregation. They also believe that improving waste classification abilities of community members is necessary. Similar to our study, a study in Ghana showed that service providers believed that organisational factors, community factors and contextual factors influence effective household solid waste management practices (Lissah et al., 2021). Another study on key informant perspective in Iran also found that weak organisational systems along with lack of effective educational programs can affect waste management system adversely (Esmaeilizadeh et al., 2020). A study by Souza Piao in 2024 found that poor implementation of programs and weak enforcement of laws can prevent effective waste management. This finding comes from looking at the viewpoints of various people involved in the process (Souza Piao et al., 2024).

Waste segregation behaviour can be guided by environmental awareness through intrinsic values and moral obligations (Du et al., 2022), but they need to be reinforced by external factors such as publicity, education and infrastructure development to make them into behavioural social norms (Hou et al., 2020). A combination of the two strategies can work better, working on external factors for immediate change and on intrinsic factors for the long lasting behaviour change (Xiao, 2023). In the current study setting, it was found that infrastructure was developed and monitored routinely and route plans were studied and modifications were made as per the need of the people through various settings such as festivals and seasons. The service providers perceived that these infrastructure development and door stepping campaigns helped the communities engage with the service providers leading to building of a trust between the two and thus aiding the goal of source segregation of waste and that of clean Ujjain.

The service providers believed that their educational campaigns had improved waste segregation, but that community members could still improve their waste classification abilities. One of the primary challenges of behaviour change communication (BCC) in waste segregation is developing interventions that are tailored to the target population's specific context and needs. Various factors, including socioeconomic status, cultural norms, awareness, motivation, and convenience, can influence how people respond to BCC messages and incentives (Kwasnicka et al., 2016). As a result, prior to launching a large-scale BCC campaign, formative research and pilot testing are critical. BCC can have a positive impact on household waste segregation if it is well-designed, implemented, and tailored to the local context(Panter-Brick et al.2006). A Malaysian study discovered that 50.3% of households segregated their waste, and that waste segregation practices were associated with locality, age, and house type. The study concluded that designing waste separation programs to meet the needs of the target population can improve long-term solid waste management practices (Fadhullah et al., 2022). A well-planned BCC can help individuals improve their self-efficacy in classifying various waste items. Self-efficacy influences the intention to perform a task or behaviour; it also contributes to perceived behaviour control and aids in overcoming barriers, resulting in long-term pro-environmental practices (Moeini et al., 2023; Xu et al., 2017).

Empowering the community through appropriate knowledge and motivation, as well as creating an empowering environment and community engagement, can lead to better waste management practices at the household level (Akmal et al., 2023). Other studies have

found similar perceptions of increased trust between service providers and residents, as well as a positive effect on waste segregation participation (Ahmed & Ali, 2006; Briguglio, 2016). People are partners in solid waste management, and consultations with them, as well as well-researched contextual interventions, help to build trust, overcoming hesitation barriers, and motivating residents to cooperate more effectively.

The study on Ujjain, India's waste management practices suggests several policy implications for improving waste management. It recommends incentivizing source segregation through reduced disposal fees and taxes, enhancing education and awareness campaigns, investing in infrastructure, fostering trust between service providers and residents, and conducting regular monitoring and evaluation. These measures aim to strengthen waste management systems, promote sustainable practices, and create a cleaner, healthier environment for residents. The study emphasizes the importance of fostering trust and implementing robust monitoring mechanisms to ensure effective waste management.

The study primarily examined the viewpoints of service providers and program managers, encompassing a wide array of professionals in these roles. It is important to note that the perspectives of other significant stakeholders are notably absent, and their input is vital to the success of household waste segregation initiatives. The study's findings aim to be applicable and informative for similar urban areas in India and other contexts within Low- and Middle-Income Countries.

5. Conclusion

This study highlights the importance of community awareness and educational initiatives in optimizing household waste segregation. Service providers and program managers emphasized that both community members and staff need to be well-informed to ensure adherence to waste segregation protocols. Despite efforts such as door-to-door campaigns and the use of specialized waste collection vehicles, many households still struggle with proper waste segregation. Key strategies for improvement include targeted educational interventions, robust monitoring systems, and the involvement of community influencers. Additionally, environmental consciousness and legal mandates play a significant role in motivating residents to segregate waste. The study recommends policy measures to incentivize proper waste segregation, enhance education and awareness, invest in infrastructure, and foster trust between service providers and residents. Implementing these measures can strengthen waste management systems, promote sustainable practices, and create a cleaner and healthier environment.

Acknowledgements

The authors are grateful to all the study participants for their time and for providing valuable information. Authors are also thankful to Mr. Priynak Soni, Mr Ankit Garg for supporting in data collection. Mr Giriraj Singh, Mr. Vivek Vajpai, Mr Rajesh Rathore and Mr Anutosh Soni for supporting in translation and transcription work. We are also thankful to Ujjain Municipal Corporation for giving permission to conduct this study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The work was supported by Swedish Research Council [FORMAS] for Environment, Agricultural Sciences, and Spatial Planning [grant no: 2019–00439]. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Notes on contributors

Krushna Chandra Sahoo Conceived and designed the study plan, methodology development, analysed the data and wrote the first draft.

Madhanraj Kalyanasundaram Conceived and designed the study plan; analysed the data and review the manuscript.

Surya Singh Conceived and designed the study plan, supported in the analysis of data and review the manuscript.

Rachna Soni Supported in data collection supervision, data Analysis, supported in writing first draft.

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Public interest statement

Waste segregation at source is one of the most economical intervention for urban cities. Both consumers and service providers can play key role in sustiable waste management. Coordinated efforts between consumers and service providers are required. Therefore it is important to gain insights into the experiences of service providers and program managers regarding household waste segregation practices in the city. This qualitatvie exploratory study was condcuted in Ujjain city to understand waste service providers viewpoints on household waste segregation practices, aiming to gather information essential for the development of behaviour change communication material and intervention focusing on waste segregation.

Availability of data and materials

The data/information gather and/or analyzed during the current study is available from the corresponding author on reasonable request.

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