



OPEN ACCESS

EDITED BY

Amalia Zucaro,
Italian National Agency for New
Technologies, Energy and Sustainable
Economic Development (ENEA), Italy

REVIEWED BY

Wael Salah Fahmi,
Helwan University, Egypt
Akash Phillip,
IIMT University, India

*CORRESPONDENCE

Haliza Abdul Rahman
✉ dr.haliza@upm.edu.my

RECEIVED 18 August 2025

REVISED 01 February 2026

ACCEPTED 09 March 2026

PUBLISHED 30 March 2026

CITATION

Yiming H, Zaremohzzabieh Z, Abdul
Rahman H, Ismail SNS and Ahrari S
(2026) Prioritizing the role of
environmental social workers in
promoting community engagement in
Zhanjiang's urban waste management
using thematic analysis and fuzzy
SWARA. *Front. Sustain. Cities* 8:1686610.
doi: 10.3389/frsc.2026.1686610

COPYRIGHT

© 2026 Yiming, Zaremohzzabieh, Abdul
Rahman, Ismail and Ahrari. This is an
open-access article distributed under the
terms of the [Creative Commons
Attribution License \(CC BY\)](#). The use,
distribution or reproduction in other
forums is permitted, provided the
original author(s) and the copyright
owner(s) are credited and that the
original publication in this journal is
cited, in accordance with accepted
academic practice. No use, distribution
or reproduction is permitted which does
not comply with these terms.

Prioritizing the role of environmental social workers in promoting community engagement in Zhanjiang's urban waste management using thematic analysis and fuzzy SWARA

He Yiming ^{1,2}, Zeinab Zaremohzzabieh ³,
Haliza Abdul Rahman^{2*}, Sharifah Norkhasijah Syed Ismail ⁴ and
Seyedali Ahrari³

¹School of Social and Public Administration, Lingnan Normal University, Zhanjiang, China, ²Institute for
Social Science Studies, Universiti Putra Malaysia, Serdang, Malaysia, ³Women and Family Studies
Research Center, University of Religions and Denominations, Qom, Iran, ⁴Faculty of Medicine and
Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

Background: Rapid urbanization in China has exacerbated the challenges of solid waste management (SWM), necessitating innovative, community-based interventions. Environmental social workers (ESWs) have emerged as critical actors in fostering community engagement and environmental education, particularly in rapidly growing cities such as Zhanjiang, where waste infrastructure is under increasing strain. This study aimed to explore and prioritize the roles, learning processes, structural enablers, and Green Social Work (GSW) principles—justice, sustainability, human rights, and equity—that ESWs employ to advance sustainable SWM practices.

Methods: A qualitative case study design was employed, involving semi-structured interviews with 13 ESWs (7 males, 6 females; aged 22–45 years) purposively selected for their direct involvement in community-based SWM initiatives. Thematic analysis was conducted using a conceptual “Framework for Environmental Social Work in Urban Waste Management,” categorizing findings into roles (inner layer), processes (middle layer), enablers (outer layer), and cross-cutting GSW principles. To determine the relative significance of identified themes, the Step-wise Weight Assessment Ratio Analysis (SWARA) method was applied.

Results: Results indicated that, among roles, Material Incentives ranked highest ($w_j = 0.1905$), while Interactive Educational Sessions ($w_j = 0.2082$) emerged as the most influential learning process. Collaborative Governance Mechanism was the most critical structural enabler ($w_j = 0.2644$), and Inclusion of Vulnerable Groups was the most prominent GSW principle ($w_j = 0.2644$). These findings underscore the importance of integrated strategies that combine economic motivators, experiential learning, institutional collaboration, and equity-focused interventions.

Conclusion: Policy implications highlight the need to institutionalize ESW-led initiatives within urban governance structures to promote sustainable waste management. Future studies should validate these findings with larger and more diverse samples, as well as examine longitudinal impacts.

KEYWORDS

community engagement, environmental social workers, green social work principles, solid waste management, SWARA method, urban sustainability

1 Introduction

Urban waste management is a critical component of sustainable development, directly contributing to several Sustainable Development Goals (SDGs), particularly those related to health, environmental protection, and sustainable cities (Elsheekh et al., 2021; Roy et al., 2023). Effective waste management not only addresses immediate concerns regarding pollution and public health but also supports long-term objectives in climate change mitigation, urban wellbeing, and the promotion of a circular economy. As cities grow and industrialize, the pressure on waste systems intensifies, making it imperative to develop innovative solutions that meet the needs of expanding populations while minimizing environmental harm. The Zero Waste approach—emphasizing prevention, reduction, reuse, and recycling—has been successfully implemented in several cities worldwide and is widely recognized as a promising model for sustainable urban waste management (Sutisna, 2024). This model encourages communities to reassess their relationship with waste by promoting environmentally sound practices that strengthen urban resilience. Achieving this vision requires active collaboration among governments, industries, and citizens (Ram and Bracci, 2024). However, barriers such as insufficient regulation, low public motivation, and behavioral inertia persist, underscoring the need for approaches that integrate technical innovation with robust governance and inclusive community participation (Sutisna, 2024).

In China, rapid economic growth and urbanization have exacerbated the challenges of municipal solid waste (MSW) management. As industrialization and population density increase, the volume of MSW has risen dramatically. Between 1980 and 2006, MSW in China grew from 31.3 million tons to 212 million tons, with per capita waste generation nearly doubling from 0.50 to 0.98 kg/day (Zhang et al., 2010). The waste stream is characterized by a high organic content—particularly kitchen waste—which presents additional challenges for conventional disposal systems (Meng et al., 2022). Although landfilling remains the dominant method, alternative treatments such as composting and incineration are increasingly adopted (Chen et al., 2022). Nonetheless, regulatory enforcement, fiscal resources for local governments, and public engagement remain inadequate. Growing consumerism and urban population pressures have further strained infrastructure, leading to significant environmental and public health consequences. To address these issues effectively, researchers have called for integrated frameworks that combine regulatory mechanisms, technological innovation, and public awareness campaigns (Szpilko et al., 2023).

Environmental social workers (ESWs) have emerged as important actors in addressing these challenges, particularly in underserved communities most affected by waste mismanagement. Positioned at the intersection of technical solutions and community needs, ESWs facilitate participation, education, and advocacy. Their initiatives have improved awareness and compliance with waste policies (Pandey et al., 2024) and have contributed to socially just waste management practices through policy advocacy and grassroots engagement (Fajri et al., 2025). Given that waste mismanagement exacerbates climate change and degrades living conditions, ESWs address underlying causes by promoting sustainable behaviors—such as reducing, reusing, and recycling—and by protecting the rights of marginalized groups, including waste pickers (Gouveia, 2012). In doing so, they advance environmental justice by advocating for inclusive policies that prevent disproportionate burdens on vulnerable populations.

Community engagement and education are central to sustainable waste management. Public participation has been shown to improve practices such as waste segregation, composting, and recycling (Pandey et al., 2024). ESWs employ community-based approaches and social learning strategies to instill a sense of shared responsibility, foster long-term environmental stewardship, and empower citizens to act for the benefit of their communities (Fajri et al., 2025). Effective waste strategies must address behavioral, infrastructural, and technological factors. In developing contexts, challenges such as inadequate collection systems, poor disposal infrastructure, and limited citizen involvement intensify the problem. By mobilizing and educating local communities, ESWs can enhance participation, improve recycling systems, and support sustainable waste practices (Brotosusilo et al., 2020).

While research on urban waste management in major Chinese cities such as Shanghai and in participatory models from Zhejiang and Hubei provinces is extensive (Ariyaningsih et al., 2024; Huang et al., 2025; Yuan et al., 2025), a significant gap remains in understanding the specific role of ESWs. There is comparatively limited scholarly attention to how ESWs operate within the unique socio-political and infrastructural contexts of smaller urban centers like Zhanjiang. Furthermore, much of the existing literature emphasizes technical, policy, or behavioral aspects in isolation, often neglecting the integrated, on-the-ground processes through which ESWs synergize community engagement, education, and advocacy to implement sustainable waste frameworks. This study specifically aims to fill this dual knowledge gap. It investigates the central research question: How do ESWs in Zhanjiang, China, promote and structure public participation and learning to advance sustainable urban waste management? By focusing on their roles, processes, structural enablers, and guiding principles, the

findings aim to advance both academic understanding and practical strategies for strengthening sustainable urban waste practices.

2 Literature review

2.1 Community engagement in sustainable waste management in urban areas

Community engagement and education are essential pillars of sustainable waste management (SWM) in urban environments. As cities grow, waste management systems face increasing pressure to become more inclusive, efficient, and environmentally friendly. Studies show that informed and actively involved communities contribute more effectively to waste reduction, recycling, and composting initiatives (Hapuarachchi, 2024). These efforts foster a shared sense of responsibility among citizens. However, a critical examination of the literature reveals that the success of these interventions is highly context-dependent. While Hapuarachchi (2024) emphasizes behavioral improvements in Sri Lanka, Etim (2024) and Pandey et al. (2024) argue that without addressing structural deficiencies, such as inadequate infrastructure, educational interventions alone yield diminishing returns. This suggests a tension in the literature between behaviorist approaches, which focus on individual attitudes, and structuralist approaches, which prioritize systemic capacity.

To address these challenges, community-based approaches, including educational programs and social learning frameworks, are employed to empower individuals. Critically, scholars such as Sunart et al. (2023) contend that these programs often fail because they are designed as top-down dissemination exercises rather than genuine dialogues. This critique aligns with the broader discourse on participatory governance, which warns against the “tokenism” of public consultation (Woldesenbet, 2021). Consequently, there is a growing consensus that effective engagement requires a shift from informing communities to empowering them to co-design waste solutions.

Globally, participatory methods such as workshops and neighborhood campaigns have shown promise, yet the literature presents a nuanced picture of their efficacy. For instance, while Gutberlet (2015) and He et al. (2024) highlight the success of participatory methods in achieving Sustainable Development Goals (SDGs), other studies point to the fragility of these gains. Muller et al. (2002) observed in cities like Bamako and Bangalore that while participation fosters social cohesion, it often struggles to maintain momentum without continuous institutional backing. This highlights a critical gap in the literature: the lack of long-term longitudinal studies that track the durability of community engagement outcomes after initial project funding ceases.

Regional case studies further illustrate the divergence in implementation strategies. In the Global South, such as Nigeria, Arini (2024) demonstrates that low-cost, community-specific solutions are effective, yet these often operate informally outside state regulation. Conversely, comparative studies from China, Japan, and Malaysia (Brotosusilo et al., 2020) suggest that high levels of engagement are contingent upon technological integration

and strict enforcement. This contrast underscores a debate in the field regarding whether sustainable waste management is best achieved through informal, grassroots adaptation or formal, state-led technological modernization.

Educational efforts are widely recognized as influential, but recent critiques challenge the assumption that knowledge automatically translates into action. Subri et al. (2025) found that while knowledge improves, it does not always correlate with practice due to convenience factors. This “knowledge-action gap” suggests that literature focusing solely on awareness campaigns is insufficient. Instead, Yang and Fang (2024) advocate for models that integrate psychological drivers and social norms, moving beyond the information-deficit model that has historically dominated the field.

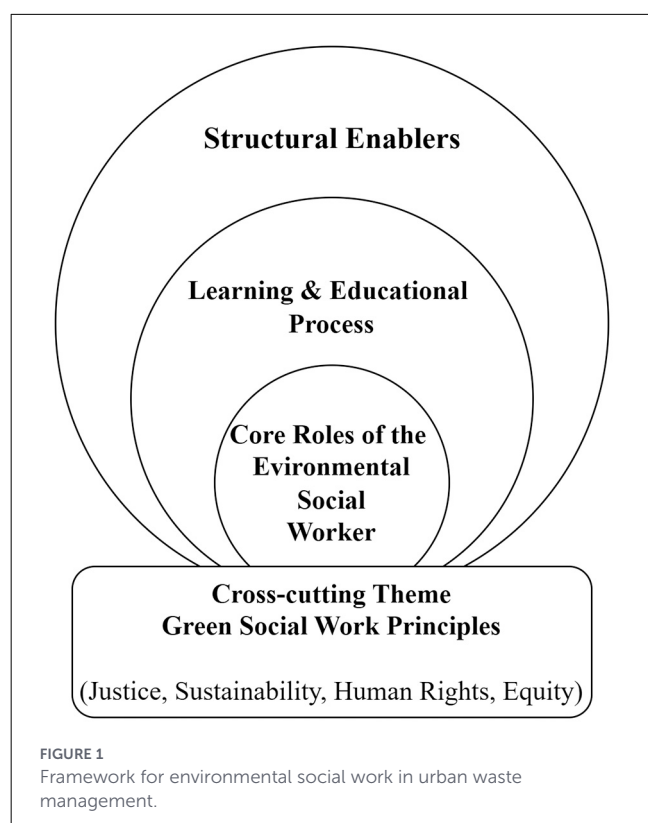
China’s experience offers a critical case study of the tension between rapid infrastructure development and social adoption. Since the 1980s, China has pursued a top-down, infrastructure-heavy strategy (Zhou and Luo, 2024). While this has resulted in impressive metrics such as operating 2,561 disposal facilities (Zhou J. et al., 2022) critics argue that this approach has marginalized the social dimension of waste management. Chung and Lo (2008) note that local governments often prioritize cleanliness metrics over genuine community empowerment, treating residents as passive recipients of services rather than active partners. This technocratic focus has led to a situation where, despite rising recycling rates (Ma et al., 2020), the “soft infrastructure” of community trust and behavioral change remains underdeveloped.

Furthermore, the literature on China reveals a significant constraint on civil society. Xie et al. (2022) observe that NGO involvement is often stifled by government oversight, limiting the potential for independent community advocacy. This creates a unique challenge for urban waste management in China: how to foster genuine participation within a centralized governance structure. While grassroots initiatives are emerging (Lakhout, 2025), the literature suggests they remain fragmented and dependent on state tolerance.

Thus, while the literature universally acknowledges the importance of community engagement, it is marked by a lack of consensus on the “how.” The field is characterized by a dichotomy between those advocating for technical, state-led solutions and those promoting grassroots, social-driven approaches. Moreover, there is a notable paucity of research that integrates these social aspects with the professional role of social workers, a gap this study aims to address.

2.2 Roles of environmental social workers

Environmental social work is a holistic and transdisciplinary practice. The literature in this domain has evolved significantly, moving from a peripheral interest to a central paradigm shift. Dominelli’s (2012) seminal work formally introduced “green social work” (GSW), critiquing the traditional anthropocentrism of the profession. However, subsequent scholars have debated the practical application of GSW. While Dominelli (2023) advocates for a radical restructuring of practice to prioritize ecological justice,



Ramsay and Boddy (2017) argue that for many practitioners, this remains a theoretical ideal with limited integration into daily casework. This critique highlights a implementation gap between the high-level theory of GSW and the operational realities of social work agencies.

The historical context of social work in waste management, exemplified by Jane Addams' role as Garbage Commissioner in Chicago (Powers et al., 2021), is often cited to legitimize the profession's involvement in sanitation. Yet, modern critics suggest that contemporary social work has largely retreated from these physical environmental concerns, focusing instead on individual or family pathology. This retreat is increasingly challenged by scholars like Odeku (2022), who frame environmental degradation as a social justice issue. This reframing is crucial; it moves waste management from the realm of "technical services" to "human rights," arguing that vulnerable populations disproportionately suffer the impacts of poor waste systems.

Despite this growing recognition, the literature reveals a disconnect between environmental policy and social work practice. Deepak and Mathbor (2022) point out that in developing countries, social workers are often excluded from waste management planning, which is dominated by engineers and municipal officials. This exclusion is problematic because, as Kumari and Raghubanshi (2023) note, technical solutions fail without addressing the social barriers of low public awareness and lack of stakeholder integration. Therefore, the literature calls for a transdisciplinary approach where social workers act not just as educators, but as mediators between technical systems and community realities.

2.3 Theoretical framework

This study adopts an integrative theoretical framework. The decision to combine these four theories—GSW Theory, Experiential Learning Theory (ELT), the Community Environmental Education Model (CEEM), and Social Capital Theory (SCT)—is a response to the fragmented nature of the existing literature. Individually, these theories offer valuable but partial insights. For instance, ELT explains the cognitive process of individual behavior change but lacks the structural analysis required to understand community dynamics. Conversely, SCT explains group cohesion but offers little insight into the pedagogical mechanisms of learning. By integrating these lenses, this study addresses a critical theoretical gap: the lack of a comprehensive model that simultaneously accounts for individual learning, community structure, and professional ethics in the context of urban waste management (Figure 1).

2.3.1 Experiential learning theory

To begin, ELT provides a foundational lens for understanding how learning occurs within community-based waste management initiatives. Originally developed by Dewey (1938) and expanded by Kolb (1984), ELT proposes that effective learning emerges through a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation. ESWs can utilize this model to promote transformative, hands-on education. Community members engage in real-world waste-related activities such as household audits, clean-up drives, and composting workshops that ground their understanding in lived experience. These are followed by structured reflection sessions, where participants analyze the outcomes, identify systemic barriers, and conceptualize potential solutions.

This iterative cycle not only builds knowledge but also strengthens agency, empowering communities to test context-specific interventions such as improved sorting practices or local recycling networks. Neuroscience research (Immordino-Yang and Damasio, 2007) suggests that emotional engagement deepens learning, making the affective component critical. ESWs foster this through storytelling, local case studies, and public recognition of community achievements, thereby reinforcing both emotional commitment and cognitive understanding. The ELT approach enables a whole-person learning model integrating cognitive, behavioral, and emotional domains that transforms waste management from a task-oriented practice into a meaningful social process and civic responsibility.

2.3.2 Community environmental education model

Building upon the experiential foundation of ELT, the Community Environmental Education Model (CEEM) offers a complementary pedagogical framework that emphasizes participatory and culturally responsive approaches. Grounded in three foundational principles including an ecological worldview, participatory decision-making, and strategic communication

(Monroe et al., 2008), CEEM reframes environmental education as a collaborative process. ESWs act not as traditional instructors but as facilitators who co-create knowledge with communities. Drawing on Paulo Freire's concept of conscientization (Freire, 1972), CEEM encourages communities to critically examine their environment and take collective ownership over local challenges such as inadequate waste infrastructure or limited access to services.

The model recognizes that environmental education must be embedded within local culture, values, and traditions. Thus, practitioners use a combination of civic education, life skills training, and localized content delivery to promote environmental literacy and build confidence. CEEM rejects deficit-based approaches and instead mobilizes local knowledge, assets, and intergenerational wisdom aligning with both indigenous knowledge systems and global sustainability frameworks. Case studies from Cyprus and New Zealand demonstrate how participatory education leads to long-term improvements in waste literacy, community cohesion, and sustained environmental behavior change. In Zhanjiang, this approach helps create community-driven solutions that are adaptable, inclusive, and resilient.

2.3.3 Social capital theory

While ELT and CEEM explain the educational processes and community dynamics, Social Capital Theory adds a critical structural dimension by highlighting the relational assets that sustain collective action. Initially articulated by Coleman (1990) and Putnam (1993), social capital encompasses bonding (within-group ties), bridging (across-group connections), and linking capital (vertical relationships with institutions). In the context of waste management, social capital is essential for building community cohesion, facilitating public-private collaboration, and ensuring the flow of information across different levels of governance.

Empirical evidence from voluntary waste initiatives in Bangladesh to decentralized models in Latin America shows that communities with high levels of trust and civic participation are better able to implement and sustain integrated waste systems. In Zhanjiang, environmental social workers leverage existing social networks to mobilize participation, mediate stakeholder relationships, and advocate for inclusive policy change. By embedding social capital within the Integrated Solid Waste Management (ISWM) framework, practitioners can bridge technical, institutional, and community-level interventions, leading to more equitable and effective systems. This is particularly important in heterogeneous urban contexts where fragmented services and social disparities require strong relational infrastructure for collective impact.

2.3.4 Green social work theory

Tying these frameworks together is GSW Theory, which provides a normative and ethical foundation for environmental social work practice. GSW is rooted in principles of environmental

justice, human rights, and systemic equity (Dominelli, 2021). It reframes environmental degradation not merely as a technical or ecological issue, but as a manifestation of social injustice particularly for marginalized and vulnerable populations. Within this paradigm, social workers are positioned as ethical actors who must address both environmental harm and its social consequences.

This translates into roles such as advocating for waste justice, mediating between community and state actors, and designing interventions that are sustainable, inclusive, and rights-based. GSW challenges traditional boundaries of practice by integrating environmental concerns into core social work values. It offers a critical lens for evaluating policies and practices that may reproduce inequalities—such as unequal access to waste services or the stigmatization of informal recyclers. By centering justice and equity, GSW ensures that community-based waste management efforts are not only environmentally sound but also socially transformative.

This integrated theoretical framework provides a robust foundation for analyzing how environmental social workers enhance community engagement and education in the context of urban waste management. By combining normative, pedagogical, participatory, and structural perspectives, the framework allows for a multi-scalar understanding of ESWs that links individual learning, community action, and institutional transformation. It also aligns local practice with broader goals such as China's national waste policy reforms and the United Nations SDGs, particularly Goal 11 (Sustainable Cities and Communities) and Goal 12 (Responsible Consumption and Production). Ultimately, this model supports the development of resilient, inclusive, and sustainable urban waste systems rooted in social justice and community empowerment.

2.4 Research questions

RQ1. What specific roles do ESWs in Zhanjiang identify as essential for motivating community engagement in solid waste management (SWM)?

RQ2. How do ESWs in Zhanjiang implement learning and educational processes to enhance community participation in SWM?

RQ3. What structural enablers do ESWs in Zhanjiang consider critical for supporting community engagement in SWM?

RQ4. How do GSW Principles influence the strategies ESWs in Zhanjiang use to promote sustainable community engagement in SWM?

3 Methods

3.1 Study design

This study employed a qualitative case study design to explore how ESWs support community participation in SWM in Zhanjiang, China. This particular method was chosen over other options, such as quantitative surveys or purely historical reviews, because it

allows for the discovery of complex social dynamics and the capture of individual interpretations of experiences within a real-life context (Creswell and Poth, 2016; Yin, 2018). Qualitative methods were chosen for their ability to uncover complex social dynamics and capture individual interpretations of experiences, particularly in under-researched contexts (Jeanfreau and Jack, 2010). An inductive approach allowed themes to emerge organically from the data, avoiding preconceived hypotheses. The case study framework focused on the Shawan community, providing a detailed, context-specific examination over time (Creswell and Poth, 2016; Merriam and Tisdell, 2016). This design facilitated a nuanced understanding of ESWs' roles, interactions with residents, and leadership in SWM efforts. The study is grounded in core qualitative research methodology literature, emphasizing constructivist inquiry where meaning is co-constructed between the researcher and participants (Patton, 2015; Charmaz, 2017).

The study began with a literature review to identify key themes, informing a semi-structured interview guide. To ensure the guide was comprehensive, it was reviewed by two academics specializing in environmental social work and community development for clarity and relevance. Furthermore, the design was informed by established community-based SWM frameworks, such as the Integrated Sustainable Waste Management (ISWM) framework (Scheinberg et al., 2011) and the Community-Based Social Marketing (CBSM) approach (McKenzie-Mohr, 2011), to ensure that the inquiry aligned with recognized structural and behavioral drivers of waste management. Their feedback refined the guide to align with the Lv Xing Plan's objectives and stakeholder needs.

3.2 Setting

The study was conducted in the Shawan Residential Committee area within Zhanjiang, Guangdong Province, China (Figure 2). This region features a diverse urban landscape,

including residential estates (open stairwell apartments and gated communities), commercial properties, and public institutions such as a primary school, junior high school, and kindergarten. With a population of approximately 26,712 across 3.68 square kilometers. Despite ongoing urban development, Zhanjiang's domestic waste management system remains incomplete, characterized by outdated transfer stations, substandard compression equipment, and underdeveloped waste sorting infrastructure, underscoring the need for enhanced community participation through ESWs. The unique local setting of Zhanjiang—a city undergoing rapid industrialization while retaining traditional community structures—presents specific political and cultural constraints. ESWs in this context must navigate a top-down administrative hierarchy while fostering bottom-up participation, a dynamic that critically shapes their strategies and limitations.

3.3 Participants and procedures

The target population comprised ESWs participating in the Lv Xing Plan, a 3-year community environmental governance project funded by the Vanke Foundation and implemented by the Shangyi Social Work Service Center in collaboration with the Shawan Community Committee. Based in Zhanjiang's Chikan District, these ESWs are pivotal in promoting public participation in SWM and fostering a green community. As key informants, their expertise in program design, implementation, and advocacy offered critical insights into engagement strategies. Participants' ages ranged from 22 to 45 years. The sample included seven males and six females. Most participants ($n = 11$) held a bachelor's degree, and two held a master's degree. Participants with 8–10 years of professional experience were typically involved in strategic planning, program coordination, and stakeholder engagement. In contrast, participants with 1–3 years of experience primarily focused on community outreach, environmental education, and

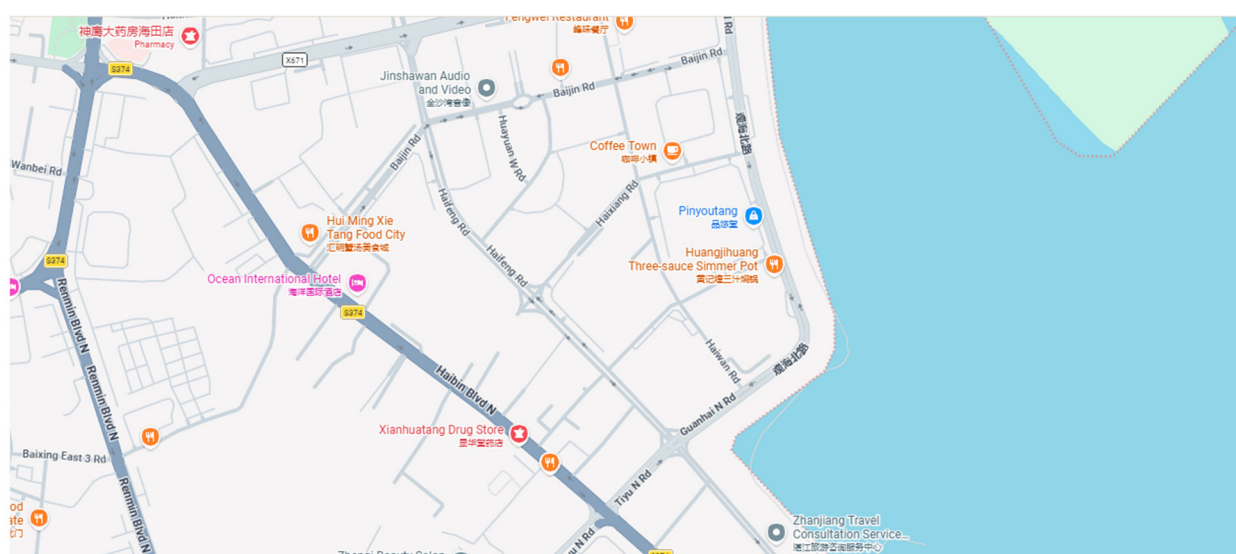


FIGURE 2
Map of Zhanjiang city, Guangdong Province, China, extracted from Google Maps.

mobilizing household participation in waste management activities. Table 1 presents the demographic characteristics of the participants.

A two-stage non-probability sampling strategy was utilized to ensure data relevance. First, canonical case sampling selected the Shawan community as a representative and information-rich case, leveraging its history of environmental interventions and the researcher's established ties for access and trust. Second, purposive sampling identified 13 participants based on inclusion criteria: at least 1 year of social work experience, active involvement in the Lv Xing Plan, and willingness to participate. The sample included one Director of the Shangyi Social Work Service Center, one Lv Xing Plan Leader, five social workers managing sub-projects, and six social workers engaged in daily SWM activities, balancing strategic and operational perspectives. Due to the lack of a complete regional database, purposive sampling focused on individuals with direct environmental social work experience (Strydom, 2011). The Shawan community's relevance to the research topic, rather than convenience, guided selection, with clear criteria minimizing bias and ensuring a diverse, information-rich dataset.

Data collection employed a qualitative design, using semi-structured interviews as the primary method, supplemented by document analysis and observations. Triangulation was implemented by cross-verifying findings from these three distinct sources. Documents (policy papers, project reports) provided the official narrative; observations (field notes from community activities) provided behavioral context; and interviews provided subjective interpretations. Discrepancies between these sources were investigated to deepen the analysis (Flick, 2022). Initial data were sourced from policy documents and program reports, followed by field observations of community engagement activities. Interviews with 13 participants, selected for their direct SWM involvement, were conducted face-to-face at workplaces or local meeting spaces, lasting 45–60 min. With participant permission, all interviews were audio-recorded using a digital voice recorder to ensure accuracy. Following the interviews, recordings were transcribed verbatim by the researcher, translating any local dialect into standard written English while preserving the original meaning. To ensure coding rigor, the researcher first engaged in open coding of the first three transcripts to generate an initial codebook. Subsequent transcripts were coded using this book, with new codes added inductively as they emerged. The coding process was supported by NVivo 12 software to manage data and ensure consistency.

The open-ended interview guide explored ESWs' roles as facilitators, educators, advocates, and network builders. The specific questions asked included:

1. Can you describe your daily activities and responsibilities regarding waste management in the Shawan community?
2. How do you approach educating residents about waste sorting, and what challenges do you face?
3. In your opinion, what are the most critical factors motivating residents to participate in SWM?
4. How do you collaborate with local authorities or other stakeholders?

Informed consent was obtained, and data saturation was determined systematically. The researcher continued interviewing

until no new themes or codes emerged from the data. Saturation was concretely achieved by the 12th interview, as the analysis of transcript 12 yielded no new codes compared to the previous 11 interviews. A 13th interview was conducted to confirm this stability, resulting in redundant data that validated the saturation point (Guest et al., 2006).

3.4 Data analysis

Data analysis commenced alongside collection, using a hybrid approach combining thematic analysis with the Step-wise Weight Assessment Ratio Analysis (SWARA) method. This mixed-method approach was chosen to add value to the interview findings by moving beyond a simple thematic description to a systematic prioritization of factors. While thematic analysis organizes qualitative data into themes and subthemes, SWARA, a multi-criteria decision-making (MCDM) tool, was adapted to rank factors influencing participation based on frequency counts post-coding (Šarić and Abramović, 2025).

The SWARA method typically requires expert scoring based on comparative importance. However, in this study, frequency was treated as a proxy for importance for two primary reasons. First, in the context of community engagement, factors mentioned frequently by a diverse group of practitioners are likely to represent the most pervasive and critical issues in the field (Braun and Clarke, 2006). Second, this adaptation mitigates potential cognitive bias associated with direct ranking, as it reflects the natural salience of topics in the participants' narratives rather than forced comparisons. While alternative MCDM tools such as the Analytic Hierarchy Process (AHP) or Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) were considered, they were deemed unsuitable because they require *a priori* criteria or complex pairwise comparisons that are difficult to implement with qualitative interview data (Saaty, 2008). The adapted SWARA method allows for a data-driven weighting of criteria that emerges directly from the qualitative content.

To mitigate potential bias with this frequency-based approach, the study acknowledges that frequency does not always equal depth. Therefore, the analysis prioritized themes that were both frequent and supported by rich, descriptive quotes, ensuring that high-frequency “buzzwords” did not overshadow nuanced but less frequent critical insights. This mixed method integrated qualitative depth with systematic prioritization, enhancing the study's robustness.

3.5 Pilot study

A pilot study with two participants tested the interview guide's clarity and feasibility, requiring no modifications. These interviews were included in the final dataset, confirming instrument reliability (Strydom, 2011) (Table 1).

3.6 Validation and reliability

Validity was ensured through triangulation (data, methodological, and theoretical), member checking, and peer review, aligning with Merriam's (1998) criteria. Reliability was supported by an audit trail, researcher positionality disclosure, and consistent coding, ensuring dependability (Denzin and Lincoln, 1994).

3.7 Researcher's role

As the primary instrument, the researcher shaped data collection and analysis through interpretive skills, cultural sensitivity, and contextual understanding (Merriam and Grenier, 2019). A short paragraph about the authors' background is included here to provide reflexivity. The lead researcher has a background in social work and a strong interest in environmental sustainability. This perspective shaped the study by focusing on the intersection of social welfare and waste management. While this viewpoint facilitated an understanding of social work nuances, the researcher remained mindful of the risk of over-emphasizing social interventions at the expense of technical or political constraints. To manage this, the researcher engaged in reflective journaling throughout the process to bracket assumptions and focus on the participants' lived realities.

A semi-structured interview guide was developed based on study objectives and theoretical frameworks, with background research on Shewan's cultural norms conducted to avoid misunderstandings. Formal access was secured via local authorities and community leaders, and rapport was built through informal conversations. Interviews used neutral, clear questioning with bridging and clarifying prompts, managing non-verbal cues to foster openness. Neutrality was maintained by avoiding leading questions or emotional bias, with reflective notes documenting the process for transparency and intersubjectivity (Merriam, 2015).

3.8 Ethical considerations

Ethical clearance was obtained from the Ethics Committee for Research Involving Human Subjects at Universiti Putra Malaysia (JKEUPM-2022-1023). Participation was voluntary, with informed consent secured, and the right to withdraw communicated. Confidentiality was maintained using pseudonyms and secure data storage, addressing all ethical considerations prior to data collection.

4 Results

4.1 Thematic analysis

Analysis of the interview data revealed multiple interrelated themes that address the four research questions (Table 2), illustrating how ESWs in Zhanjiang approach community engagement in SWM. In relation to RQ₁ (Inner Layer), participants

TABLE 1 Demographic characteristics of participants (N = 13).

Code	Age	Sex	Education	Experience (years)
A	45	F	Master	10
B	32	M	Bachelor	8
C ₁	24	M	Bachelor	2
C ₂	27	M	Bachelor	4
C ₃	26	M	Master	3
C ₄	23	M	Bachelor	2
C ₅	28	M	Bachelor	5
D ₁	22	F	Bachelor	1
D ₂	23	F	Bachelor	1
D ₃	24	M	Bachelor	2
D ₄	22	M	Bachelor	1
D ₅	23	M	Bachelor	1
D ₆	25	M	Bachelor	3

identified a spectrum of roles centered on *Awareness and Education*, *Community Development*, *Economic Incentives*, and *Policy and Regulatory Support*. Strategies included top-down community campaigns, promotion of “green life” concepts, environmental education programs, and media outreach. ESWs also emphasized fostering social capital and a sense of community while offering material incentives and implementing government policy frameworks to encourage participation. Regarding RQ₂ (Middle Layer), themes of *Experiential Learning and Education* and *Participatory and Community-Centered Approaches* emerged strongly. Interactive educational sessions, workshops, community clean-up drives, youth-focused education, and participatory planning were described as key vehicles for enhancing residents' waste sorting knowledge and engagement. Notably, initiatives such as localized leadership development, inclusivity in community projects, and the involvement of environmental organizations and universities were seen as essential to sustaining community-driven momentum.

In relation to RQ₃ (Outer Layer), the data underscored the importance of *Policy and Institutional Frameworks*, *Resource Mobilization and Infrastructure*, and *Community Capacity and Social Cohesion* as structural enablers. Participants pointed to the need for clear organizational responsibilities, collaborative governance mechanisms, public-private partnerships, and adequate funding to ensure SWM initiatives are both feasible and sustainable. Physical infrastructure—such as composting facilities, recycling centers, and smart garbage sorting equipment—was also viewed as vital for long-term success.

Finally, RQ₄ (Cross-cutting Theme) highlighted how *GSW Principles* inform strategies across all layers. This included promoting environmental justice through the inclusion of vulnerable groups, conflict resolution, and advocacy; advancing sustainability via circular economy initiatives and composting; upholding human rights through equitable education and stakeholder engagement; and ensuring equity by addressing socio-cultural contexts and creating feedback loops for continuous

TABLE 2 Themes and subthemes.

RQ ₁	RQ ₂	RQ ₃	RQ ₄
Theme: awareness and education	Theme: experiential learning and education	Theme: policy and institutional frameworks	Theme: promoting environmental justice
- Top-down community campaigns (4)	- Interactive educational sessions (5)	- Government policies and regulations (4)	- Inclusion of vulnerable groups (4)
- Green life (3)	- Workshops and seminars (4)	- Organizational structure and responsibilities (8)	- Conflict resolution (4)
- Community environmental education (3)	- Community clean-up drives (6)	- Collaborative governance mechanism (6)	- Advocacy and representation (8)
- Media outreach (4)	- Knowledge of waste sorting (7)	Theme: resource mobilization and infrastructure	Theme: advancing sustainability
Theme: community development	- Community children and youth education (5)	- Community funding (3)	- Waste reduction initiatives (7)
- Social capital (3)	Theme: participatory and community-centered approaches	- Public-private partnerships (ppp) (5)	- Circular economy initiatives (3)
- Sense of community (3)	- Participatory education (4)	- Environmental organizations and universities (7)	- Composting and organic waste management (3)
Theme: economic incentives	- Community planning (6)	- Expert involvement (4)	Theme: upholding human rights
- Material incentives (6)	- Inclusivity in community projects (3)	Theme: community capacity and social cohesion	- Job creation (4)
Theme: policy and regulatory support	- Resident-driven initiatives (7)	- Capacity building (4)	- Needs assessment (2)
- Government policies and regulations (3)	- Localized leadership development (4)	- Social cohesion and community engagement (3)	- Resource assessment (3)
- Action plans and proposals (3)	Theme: social and cultural engagement	- Vulnerable groups (5)	Theme: ensuring equity
	- Social capital (6)	Theme: cultural and socio-political context	- Transdisciplinary collaboration (4)
	- Cultural mediation (2)	- Transdisciplinary approach (6)	- Stakeholder engagement (5)
	- Impact of traditional festivals (7)	- Stakeholders (4)	- Educational equity (2)
	- Community needs and asset assessment (6)	- Cultural and socio-political factors (5)	
	Theme: advocacy and communication strategies		
	- Advocacy communication (5)		
	- Media outreach (4)		
	- Environmental benefits communication (2)		
	- Feedback loop creation (2)		
	- Program translation (6)		
	Theme: resource and infrastructure support		
	- Composting facilities (2)		
	- Recycling centers (3)		
	- Smart garbage sorting equipment (5)		
	- Community gardens and public spaces (2)		
	- Environmental organizations, university partnerships, expert involvement, volunteer engagement (2)		

(Continued)

TABLE 2 (Continued)

RQ ₁	RQ ₂	RQ ₃	RQ ₄
	Theme: incentives and governance mechanisms		
	- Incentives for participation (6)		
	- Community funding (4)		
	- Job creation (4)		
	- Collaborative governance mechanism (7)		
	- Community rules and government policies (2)		
	- Long-term engagement strategies (4)		

NRQ₁: What specific roles do ESWs in Zhanjiang identify as essential for motivating community engagement in SWM? (Inner Layer), RQ₂: How do ESWs in Zhanjiang implement learning and educational processes to enhance community participation in SWM? (Middle Layer), RQ₃: What structural enablers do ESWs in Zhanjiang consider critical for supporting community engagement in SWM? (Outer Layer), RQ₄: How do GSW Principles influence the strategies ESWs in Zhanjiang use to promote sustainable community engagement in SWM? (Cross-cutting Theme).

improvement. Collectively, these themes suggest that ESWs operate within a multi-layered framework that blends education, participatory engagement, institutional support, and principles of social and environmental justice to foster sustainable community involvement in SWM.

4.2 The SWARA results

The SWARA method, as outlined by Keršuliene et al. (2010), prioritizes subthemes based on frequency counts for all research questions, reflecting their prevalence in qualitative data from ESWs. The process involves:

- Initial Attribute Prioritization: Subthemes are ranked in descending order of frequency counts. Ties (equal frequencies) are assigned the same rank, with subsequent ranks adjusted accordingly.
- Determine the Coefficient (k_j k_{j-1}): For the highest-ranked subtheme, $k_j = 1$ $k_{j-1} = 1$ $k_j = 1$. For subsequent subthemes, $k_j = S_j + 1$ $k_{j-1} = S_{j-1} + 1$ $k_j = S_j + 1$, where S_j S_{j-1} S_j is the relative importance score, calculated as the difference in frequency counts between the current and previous subtheme.
- Determine the Recalculated Weight (q_j q_{j-1} q_j): $q_j = q_{j-1}/k_j$ $q_{j-1} = q_{j-2}/k_{j-1}$ $q_j = q_{j-1}/k_j$, starting with $q_1 = 1$ $q_{j-1} = 1$ $q_1 = 1$.
- Determine the Relative Weight (w_j w_{j-1} w_j): $w_j = q_j/\sum q_k$ $w_{j-1} = q_{j-1}/\sum q_k$ $w_j = q_j/\sum q_k$, where $\sum q_k$ $\sum q_{j-1}$ $\sum q_k$ is the sum of all recalculated weights for each research question, ensuring $\sum w_j = 1.00$ $\sum w_{j-1} = 1.00$ $\sum w_j = 1.00$.

For RQ₁, subthemes under Awareness and Education, Community Development, Economic Incentives, and Policy and Regulatory Support were ranked by frequency counts (Table 3). Material Incentives emerged as the most effective role ($w_j = 0.3077$, frequency = 6), followed by Top-Down Community Campaigns and Media Outreach (both $w_j = 0.1026$). Subthemes with frequency 3, such as Green Life and Community Environmental Education (both $w_j = 0.0513$), play a secondary role.

For RQ₂, subthemes were ranked by frequency counts, with Knowledge of Waste Sorting, Resident-Driven Initiatives, and Impact of Traditional Festivals ranking highest ($w_j = 0.1429$ $w_j = 0.1429$ $w_j = 0.1429$, frequency = 7) (Table 4). Subthemes like Community Clean-Up Drives and Community Planning (both $w_j = 0.0714$ and $w_j = 0.0714$, frequency = 6) follow, emphasizing experiential and community-centered approaches. Lower-ranked subthemes, such as Composting Facilities ($w_j = 0.0045$, frequency = 2), have less prominence.

For RQ₃, Organizational Structure and Responsibilities ranked highest ($w_j = 0.2439$, frequency = 8), followed by Environmental Organizations and Universities ($w_j = 0.1220$, frequency = 7) (Table 5). Collaborative Governance Mechanism and Transdisciplinary Approach (both $w_j = 0.0610$ and $w_j = 0.0610$, frequency = 6) highlight the importance of governance and cross-sector collaboration. Subthemes like Community Funding ($w_j = 0.0076$, frequency = 3) are less prioritized.

For RQ₄, Advocacy and Representation was the top-ranked subtheme ($w_j = 0.2564$, frequency = 8), followed by Waste Reduction Initiatives ($w_j = 0.1282$, frequency = 7) (Table 6). Subthemes like Inclusion of Vulnerable Groups and Conflict Resolution (both $w_j = 0.0214$ $w_j = 0.0214$, frequency = 4) reflect the focus on environmental justice. Lower-ranked subthemes, such as Educational Equity ($w_j = 0.0053$, frequency = 2), have lesser influence.

5 Discussion

This study highlights the diverse and interconnected roles of ESWs in promoting community engagement in SWM in Zhanjiang. The findings present a multi-layered framework that combines education, community development, economic incentives, infrastructure support, and policy alignment. The strong influence of material incentives as a motivator is consistent with evidence from Shanghai, where incentive-based recycling systems significantly increased the volume of recyclables collected during pilot projects (Zhou J. et al., 2022). These results suggest that financial rewards can effectively drive initial participation,

TABLE 3 SWARA prioritization of subthemes for ESWs’ roles in motivating community engagement in SWM in Zhanjiang (RQ1).

Rank	Subtheme	Frequency count	Sj (relative importance)	kj (coefficient)	qj (recalculated weight)	wj (relative weight)
1	Material incentives	6	–	1.00	1.0000	0.3077
2	Top-down community campaigns	4	2 (6–4)	3.00	0.3333	0.1026
3	Media outreach	4	0 (equal)	1.00	0.3333	0.1026
4	Green life	3	1 (4–3)	2.00	0.1667	0.0513
5	Community environmental education	3	0 (equal)	1.00	0.1667	0.0513
6	Social capital	3	0 (equal)	1.00	0.1667	0.0513
7	Sense of community	3	0 (equal)	1.00	0.1667	0.0513
8	Government policies and regulations	3	0 (equal)	1.00	0.1667	0.0513
9	Action plans and proposals	3	0 (equal)	1.00	0.1667	0.0513

TABLE 4 SWARA prioritization of subthemes for learning and educational processes in SWM by ESWs in Zhanjiang (RQ2).

Rank	Subtheme	Frequency count	Sj (relative importance)	kj (coefficient)	qj (recalculated weight)	wj (relative weight)
1	Knowledge of waste sorting	7	–	1.00	1.0000	0.1429
2	Resident-driven initiatives	7	0 (equal)	1.00	1.0000	0.1429
3	Impact of Traditional Festivals	7	0 (equal)	1.00	1.0000	0.1429
4	Community clean-up drives	6	1 (7–6)	2.00	0.5000	0.0714
5	Community planning	6	0 (equal)	1.00	0.5000	0.0714
6	Community Needs and Asset Assessment	6	0 (equal)	1.00	0.5000	0.0714
7	Program translation	6	0 (equal)	1.00	0.5000	0.0714
8	Interactive educational sessions	5	1 (6–5)	2.00	0.2500	0.0357
9	Community Children and Youth Education	5	0 (equal)	1.00	0.2500	0.0357
10	Advocacy communication	5	0 (equal)	1.00	0.2500	0.0357
11	Workshops and Seminars	4	1 (5–4)	2.00	0.1250	0.0179
12	Participatory education	4	0 (equal)	1.00	0.1250	0.0179
13	Localized leadership development	4	0 (equal)	1.00	0.1250	0.0179
14	Inclusivity in community projects	3	1 (4–3)	2.00	0.0625	0.0089
15	Cultural mediation	2	1 (3–2)	2.00	0.0313	0.0045
16	Environmental benefits communication	2	0 (equal)	1.00	0.0313	0.0045
17	Feedback loop creation	2	0 (equal)	1.00	0.0313	0.0045
18	Composting facilities	2	0 (equal)	1.00	0.0313	0.0045

especially when supported by strong promotional campaigns. However, a critical comparison with research in Dongying reveals a potential contradiction in the literature: while incentives drive initial behavior, studies indicate they may lose effectiveness over time, leading to a “crowding out” of intrinsic motivation (Sun and Asari, 2024). Our findings align with this critique, suggesting that while ESWs utilize incentives as necessary entry points, they face the ongoing challenge of transitioning residents from extrinsic rewards to intrinsic environmental values. This tension between short-term compliance and long-term internalization is a recurring theme in community-based SWM literature that our study explicitly validates (Sun and Asari, 2024).

Our findings also emphasize the importance of knowledge-based and participatory strategies, particularly interactive

sorting education and resident-led initiatives. This aligns with experiential learning models, such as Sipos, Battisti and Grimm (2008) “head, hands, and heart” framework, which integrates cognitive, practical, and emotional learning pathways. The lower weight given to infrastructure-related enablers, like composting facilities, reflects persistent gaps in physical accessibility. Similar challenges have been reported in Beijing and Shenzhen, where infrastructure availability has been shown to strongly influence waste management behaviors (Li et al., 2020). However, our study offers a nuanced interpretation: the low prioritization of infrastructure by ESWs may not indicate its unimportance, but rather a recognition of professional boundaries. ESWs may view infrastructure as a technical municipal responsibility outside their direct control, choosing instead to focus on the “soft”

TABLE 5 SWARA prioritization of subthemes for structural enablers supporting community engagement in SWM by ESWs in Zhanjiang (RQ3).

Rank	Subtheme	Frequency count	Sj (relative importance)	kj (coefficient)	qj (recalculated weight)	wj (relative weight)
1	Organizational structure and responsibilities	8	–	1.00	1.0000	0.2439
2	Environmental organizations and universities	7	1 (8–7)	2.00	0.5000	0.1220
3	Collaborative governance mechanism	6	1 (7–6)	2.00	0.2500	0.0610
4	Transdisciplinary approach	6	0 (equal)	1.00	0.2500	0.0610
5	Public-private partnerships (ppp)	5	1 (6–5)	2.00	0.1250	0.0305
6	Vulnerable groups	5	0 (equal)	1.00	0.1250	0.0305
7	Government policies and regulations	4	1 (5–4)	2.00	0.0625	0.0152
8	Expert involvement	4	0 (equal)	1.00	0.0625	0.0152
9	Capacity building	4	0 (equal)	1.00	0.0625	0.0152
10	Stakeholders	4	0 (equal)	1.00	0.0625	0.0152
11	Community funding	3	1 (4–3)	2.00	0.0313	0.0076
12	Social cohesion and community engagement	3	0 (equal)	1.00	0.0313	0.0076

TABLE 6 SWARA prioritization of subthemes for GSW principles influencing ESWs' strategies in SWM in Zhanjiang (RQ4).

Rank	Subtheme	Frequency count	Sj (relative importance)	kj (coefficient)	qj (recalculated weight)	wj (relative weight)
1	Advocacy and representation	8	–	1.00	1.0000	0.2564
2	Waste reduction initiatives	7	1 (8–7)	2.00	0.5000	0.1282
3	Stakeholder engagement	5	2 (7–5)	3.00	0.1667	0.0427
4	Inclusion of vulnerable groups	4	1 (5–4)	2.00	0.0833	0.0214
5	Conflict resolution	4	0 (equal)	1.00	0.0833	0.0214
6	Job creation	4	0 (equal)	1.00	0.0833	0.0214
7	Transdisciplinary collaboration	4	0 (equal)	1.00	0.0833	0.0214
8	Circular economy initiatives	3	1 (4–3)	2.00	0.0417	0.0107
9	Composting and organic waste management	3	0 (equal)	1.00	0.0417	0.0107
10	Resource assessment	3	0 (equal)	1.00	0.0417	0.0107
11	Needs assessment	2	1 (3–2)	2.00	0.0208	0.0053
12	Educational equity	2	0 (equal)	1.00	0.0208	0.0053

infrastructure of human behavior and social capital where their agency is strongest.

At the structural level, the emphasis on organizational partnerships particularly with environmental NGOs and universities supports [Ansell and Gash's \(2008\)](#) collaborative governance model, which highlights institutional collaboration as a driver of policy success. In China, increased social capital, including inter-organizational networks and trust, has been shown to improve waste separation behaviors, as seen in Jiangxi province ([Teng et al., 2024](#)) and in national surveys ([Zhou C. et al., 2022](#)). These results reinforce the value of community assessments and academic–organizational partnerships in tailoring SWM strategies to local needs. These findings contribute to Social Capital Theory by demonstrating how “linking capital”—connections between communities and formal institutions—is operationalized in a Chinese context. In Zhanjiang, ESWs act as brokers who convert bonding capital (neighborhood trust) into bridging and linking capital (access to resources and policy makers). This supports and

expands existing ideas by showing that social capital is not merely a static resource but a dynamic outcome of professional mediation. Without the ESWs' intervention to bridge these vertical gaps, the trust inherent in the community might not translate into effective waste governance.

Furthermore, the study offers critical insights into GSW theory. While GSW advocates for structural change and justice ([Dominelli, 2021](#)), our findings reveal the practical constraints of applying these ideals in a top-down political system. The positioning of ESWs as systemic change agents aligns with Asset-Based Community Development (ABCD) ([Kretzmann and McKnight, 1993](#)) and [Freire's \(1970\)](#) critical pedagogy, situating their practice at the intersection of top-down policy and grassroots mobilization. However, the data suggests a tension: ESWs must balance the radical agenda of GSW (empowering the marginalized) with the pragmatic requirements of the state (meeting waste sorting quotas). This challenges the Western-centric view of social work as always oppositional; instead, our findings suggest a “hybrid” role where

ESWs work *within* the system to achieve incremental social change. This expands GSW theory by illustrating how it can be adapted to non-Western, authoritarian governance structures without losing its core value of social justice.

Policy frameworks, such as the Extended Producer Responsibility (EPR) system, also play a critical role. Subsidy mechanisms have helped expand formal e-waste recycling systems, increasing material recovery rates and reducing emissions (Awasthi and Li, 2017). However, our results indicate that community-level funding is underused, raising concerns about the long-term financial sustainability of SWM initiatives. Finally, the study underscores the relevance of GSW principles, especially environmental justice and sustainability. While the inclusion of vulnerable groups was identified as a priority, its relatively lower ranking suggests that equity considerations could be more strongly integrated into SWM strategies. This reflects a broader trend in both Chinese and global contexts, where equity-focused participation remains critical but often underdeveloped.

In conclusion, this study teaches us that GSW in the context of urban waste management is less about direct service provision and more about “institutional brokering.” The findings challenge the traditional separation of technical waste management and social welfare, arguing that effective SWM requires the integration of social capital theory into environmental governance. By explicitly answering how ESWs navigate the constraints of the Chinese administrative state, this study contributes to broader thinking in the field by proposing a context-sensitive model of GSW that prioritizes the building of “linking social capital” as a prerequisite for sustainable community engagement.

6 Implications

6.1 Implications for environmental social workers

The findings emphasize the vital role of ESWs in connecting community needs with institutional waste management policies. ESWs serve as mediators, translating technical policies into culturally relevant, practical actions especially in areas where environmental awareness and civic participation are still developing. Through participatory methods such as community mapping, focus group discussions, and co-design workshops, ESWs can promote local ownership of waste management initiatives. They are also well-positioned to build trust among diverse stakeholders including municipal authorities, sanitation workers, NGOs, and community leaders by ensuring that all perspectives are heard and incorporated into decision-making.

Environmental education is another key area of practice. ESWs can tailor programs to specific socio-cultural contexts, linking environmental awareness with tangible benefits. For instance, in rural or peri-urban settings, recycling-based entrepreneurship can be integrated into educational activities, creating both economic and environmental incentives for participation. The results also point to the importance of capacity building not only for community members but also for frontline sanitation staff. By equipping these workers with communication and problem-solving

skills, ESWs can foster collaborative governance, break down hierarchical barriers, encourage two-way dialogue, and support long-term behavioral change toward sustainable waste practices.

6.2 Implications for sustainable waste management

The results highlight the need to embed collaborative governance principles into SWM systems to achieve long-term sustainability. In many urban and peri-urban areas, top-down waste management strategies fall short because they overlook local cultural norms, informal waste economies, and the socio-economic realities that shape waste-related behaviors. A participatory model built on trust, shared decision-making, and co-created solutions can improve compliance and efficiency in waste segregation, collection, and disposal. This approach also enhances accountability, as responsibilities are shared and progress is jointly monitored. From an operational standpoint, SWM can be strengthened by institutionalizing multi-stakeholder platforms where community representatives, municipal authorities, environmental NGOs, and private sector actors work together regularly. Incorporating local knowledge into planning can produce solutions that fit the context, such as decentralized composting systems or community-run recycling stations. Long-term partnerships also help reduce dependence on short-term projects, ensuring that infrastructure investments are supported by ongoing community engagement and maintenance. By combining technical innovations with social inclusion, SWM systems can shift from reactive, problem-driven models to proactive, resilience-oriented frameworks that not only manage waste effectively but also advance environmental justice and urban sustainability.

7 Limitations and future directions

This study offers valuable insights into the role of ESWs in promoting sustainable waste management, but several limitations should be noted. These limitations have a direct impact on the conclusions drawn, particularly regarding the perceived success of participatory strategies and the generalizability of the theoretical framework. First, the research was conducted in one urban area of China, which may limit its applicability to rural settings or other countries with different cultural, political, and institutional contexts. Waste management practices are highly context-dependent, shaped by governance systems, economic conditions, and public attitudes. The specific context of Zhanjiang—a city with strong traditional community structures—implies that the “linking capital” strategies identified here may be less effective in more transient or fragmented urban centers. Therefore, caution is needed when applying these findings to other settings, as the conclusions regarding the efficacy of social capital in waste management are deeply embedded in this unique local setting.

Second, regarding the sample, the study relied exclusively on professional ESWs. While this provides depth regarding professional perspectives, it omits the viewpoints of residents and local officials. This limitation significantly impacts the

study's conclusions on the "success" of community engagement. Because the study did not interview residents, the effectiveness of participatory strategies is viewed solely through the professional lens of the ESWs. It is possible that residents perceive these "participatory" activities as mandatory obligations rather than genuine empowerment. Consequently, the conclusion that ESWs effectively foster "ownership" may be optimistic; including residents might have revealed discrepancies between ESWs' perceptions of success and residents' actual experiences of the interventions. Similarly, the absence of officials' perspectives limits the ability to fully assess the bureaucratic constraints ESWs face, potentially leading to an overestimation of the ESWs' agency in policy advocacy. Third, regarding data, the interviews are self-reports of professionals describing their own work. This introduces the risk of social desirability bias, where participants may emphasize their successes and downplay failures or structural barriers. The reliance on ESWs' self-reports may have therefore emphasized the successes of educational and social strategies while underplaying technical or political barriers. As a result, the conclusion that educational and social capital-building approaches are the primary drivers of success may be skewed by the participants' desire to highlight their professional contributions.

Fourth, regarding the methodological approach, using frequency counts as the main way to decide what is important has limitations. It may overemphasize common problems while overlooking unique but critical issues that only one or two participants mentioned. Consequently, the study's conclusions regarding the hierarchy of influential factors (e.g., prioritizing incentives over infrastructure) reflect the prevalence of topics in discussion rather than their objective impact. This means that while the identified factors are relevant, their relative ranking in the analysis should be interpreted as a reflection of professional discourse rather than an objective measure of effectiveness. Finally, although the qualitative design was effective in capturing detailed perspectives, the study relied on a relatively small sample. The study's reliance on interviews, observations, and document analysis means the findings were shaped by the scope of available data. Without a longitudinal follow-up, it is difficult to assess the long-term impacts of community engagement and policy interventions. In addition, limited use of quantitative measures such as waste diversion rates, recycling efficiency, or participation levels restricted the ability to validate and strengthen the qualitative results. Therefore, the conclusion that these strategies lead to sustainable waste management remains prospective and requires further validation through performance-based metrics.

For future research, several directions are recommended. Comparative studies across different cities and countries could reveal how varying governance models, resources, and cultural norms influence the environmental social work approach to waste management. Mixed-methods designs could combine qualitative insights with quantitative performance indicators for a more robust understanding. Longitudinal research would help track the sustainability and scalability of collaborative waste management efforts over time. Future studies could also examine how emerging technologies such as digital reporting platforms, AI-assisted waste sorting, and blockchain-based recycling incentives can be integrated into community engagement strategies. While

these innovations may enhance transparency, efficiency, and participation, their social implications are not yet well understood. Finally, more attention should be given to the role of marginalized groups, including low-income households, migrants, and informal waste workers, to ensure waste management initiatives are both inclusive and equitable

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Universiti Putra Malaysia (JKEUPM-2022-1023). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

HY: Conceptualization, Resources, Validation, Writing – original draft. ZZ: Data curation, Methodology, Software, Writing – original draft. HA: Investigation, Software, Supervision, Writing – original draft, Writing – review & editing. SI: Conceptualization, Validation, Visualization, Writing – original draft. SA: Data curation, Formal analysis, Resources, Visualization, Writing – original draft.

Funding

The author(s) declared that financial support was not received for this work and/or its publication.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was not used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of

artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the

reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/frsc.2026.1686610/full#supplementary-material>

References

- Ansell, C., and Gash, A. (2008). Collaborative governance in theory and practice. *J. Public Admin. Res. Theory* 18, 543–571. doi: 10.1093/jopart/mum032
- Arini, L. S. (2024). Building community awareness in waste management. *Int. J. Social Health* 3, 518–524. doi: 10.58860/ijsh.v3i8.231
- Ariyaningsih, Zhao, R., Sarkar, C., Jiang, Y., Zhang, Y., and Shaw, R. (2024). "Social innovation to enhance waste management: case from Zhejiang and Hubei Province, China," in *Disaster Risk Reduction and Rural Resilience*, eds. S. Mitra and R. Shaw (Singapore: Springer Nature Singapore), 241–265. doi: 10.1007/978-981-97-6671-0_13
- Awasthi, A. K., and Li, J. (2017). Management of electrical and electronic waste: a comparative evaluation of China and India. *Renew. Sustain. Energy Rev.* 76, 434–447. doi: 10.1016/j.rser.2017.02.067
- Braun, V., and Clarke, V. (2006). Using thematic analysis in psychology. *Qual. Res. Psychol.* 3, 77–101. doi: 10.1191/1478088706qp0630a
- Brotoosilo, A., Nabila, S. H., Negoro, H. A., and Utari, D. (2020). The level of individual participation of community in implementing effective solid waste management policies. *Global J. Environ. Sci. Manage.* 6, 341–354.
- Charmaz, K. (2017). Constructivist grounded theory. *J. Posit. Psychol.* 12, 299–300. doi: 10.1080/17439760.2016.1262612
- Chen, Z., Feng, Q., Yue, R., Chen, Z., Moselhi, O., Soliman, A., et al. (2022). Construction, renovation, and demolition waste in landfill: a review of waste characteristics, environmental impacts, and mitigation measures. *Environ. Sci. Pollut. Res.* 29, 46509–46526. doi: 10.1007/s11356-022-20479-5
- Chung, S. S., and Lo, C. W. (2008). Local waste management constraints and waste administrators in China. *Waste Manage.* 28, 272–281. doi: 10.1016/j.wasman.2006.11.013
- Coleman, J. S. (1990). *Equality and Achievement in Education*. New York, NY: Routledge.
- Creswell, J. W., and Poth, C. N. (2016). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches, 2nd Edn*. Thousand Oaks, CA: Sage Publications.
- Deepak, A. C., and Mathbor, G. M. (2022). "Climate change, environmental justice, and sustainable development in social work," in *Social Work and Climate Justice*, eds. D. Madhanagopal, and B. R. Nikku (New York, NY: Routledge), 39–54. doi: 10.4324/9781003200390-3
- Denzin, N. K., and Lincoln, Y. S. (1994). *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage Publications, Inc.
- Dewey, J. (1938). *Experience and Education*. New York, NY: Macmillan.
- Dominelli, L. (2021). A green social work perspective on social work during the time of COVID-19. *Int. J. Soc. Welfare* 30, 7–16. doi: 10.1111/ijsw.12469
- Dominelli, L. (2023). *Social Work Practice during Times of Disaster: A Transformative Green Social Work Model for Theory, Education and Practice in Disaster Interventions*. London: Routledge. doi: 10.4324/9781003105824
- Elsheekh, K. M., Kamel, R. R., Elsherif, D. M., and Shalaby, A. M. (2021). Achieving sustainable development goals from the perspective of solid waste management plans. *J. Eng. Appl. Sci.* 68:9. doi: 10.1186/s44147-021-00009-9
- Etim, E. (2024). Bridging the gap: transforming waste management awareness into action. *Clean. Waste Syst.* 9:100173. doi: 10.1016/j.clwas.2024.100173
- Fajri, H., Saputra, B., Pegi, A. L., Renaldi, I., Halawa, H. S., and Wahyuni, N. (2025). "Realizing green city: Padang City Government innovations for sustainable environmental management" in *IOP Conference Series: Earth and Environmental Science* (Bristol: IOP Publishing), 012046. Available online at: <https://iopscience.iop.org/article/10.1088/1755-1315/1454/1/012046/meta> (accessed August 10, 2025).
- Flick, U. (2022). "Revitalising triangulation for designing multi-perspective qualitative research," in *The SAGE Handbook of Qualitative Research Design* (SAGE Publications), 652–664. doi: 10.4135/9781529770278.n40
- Freire, P. (1970). The adult literacy process as cultural action for freedom. *Harvard Educ. Rev.* 40, 205–225. doi: 10.17763/haer.40.2.q7n227021n148p26
- Freire, P. (1972). Education: domestication or liberation? *Prospects* 2, 173–181. doi: 10.1007/BF02195789
- Gouveia, N. (2012). Solid urban waste: socio-environmental impacts and prospects for sustainable management with social inclusion. *Ciencia saude coletiva* 17:1503. doi: 10.1590/S1413-81232012000600014
- Guest, G., Bunce, A., and Johnson, L. (2006). How many interviews are enough?: an experiment with data saturation and variability. *Field Methods* 18, 59–82. doi: 10.1177/1525822X05279903
- Gutberlet, J. (2015). More inclusive and cleaner cities with waste management co-production: insights from participatory epistemologies and methods. *Habitat Int.* 46, 234–243. doi: 10.1016/j.habitatint.2014.10.004
- Hapuarachchi, H. (2024). Community participation in municipal solid waste management: special reference to Gampaha municipality. *Int. J. Sci. Res. Arch.* 11, 1153–1158. doi: 10.30574/ijrsra.2024.11.2.0574
- He, Y., Zaremohzzabieh, Z., Rahman, H. A., Ismail, S. N. S., and Bin-qiang, J. (2024). Applying participatory research in solid waste management: a systematic literature review and evaluation reporting. *J. Infrastruct. Policy Dev.* 8:5072. doi: 10.24294/jipd.v8i5.5072
- Huang, Q., Zhao, T., Lin, M., Li, W., Zhou, Q., and Chen, C. (2025). Insights and practices for industrial solid waste management under "zero-waste city" construction in China. *Circular Econ.* 4:100155. doi: 10.1016/j.ccc.2025.100155
- Immordino-Yang, M. H., and Damasio, A. (2007). We feel, therefore we learn: the relevance of affective and social neuroscience to education. *Mind Brain Educ.* 1, 3–10. doi: 10.1111/j.1751-228X.2007.00004.x
- Jeanfreau, S. G., and Jack, L. (2010). Appraising qualitative research in health education: guidelines for public health educators. *Health Promot. Pract.* 11, 612–617. doi: 10.1177/1524839910363537
- Keršulienė, V., Zavadskas, E. K., and Turskis, Z. (2010). Selection of rational dispute resolution method by applying new step-wise weight assessment ratio analysis (SWARA). *J. Business Econ. Manage.* 11, 243–258. doi: 10.3846/jbem.2010.12
- Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice-Hall.
- Kretzmann, J. P., and McKnight, J. (1993). *Building Communities From the Inside Out*. Available online at: http://narda.org.ua/files/726406_823724.pdf
- Kumari, T., and Raghubanshi, A. S. (2023). "Waste management practices in the developing nations: challenges and opportunities," in *Waste Management and Resource Recycling in the Developing World* (Elsevier), 773–797. doi: 10.1016/B978-0-323-90463-6.00017-8
- Lakhouti, A. (2025). Revolutionizing urban solid waste management with AI and IoT: a review of smart solutions for waste collection, sorting, and recycling. *Results Eng.* 25:104018. doi: 10.1016/j.rineng.2025.104018
- Li, J., Zuo, J., Jiang, W., Zhong, X., Li, J., and Pan, Y. (2020). Policy instrument choice for construction and demolition waste management: the case study of Shenzhen, China. *Eng. Construct. Architect. Manage.* 27, 1283–1297. doi: 10.1108/ECAM-11-2019-0632
- Ma, M., Tam, V. W., Le, K. N., and Li, W. (2020). Challenges in current construction and demolition waste recycling: a China study. *Waste Manage.* 118, 610–625. doi: 10.1016/j.wasman.2020.09.030

- McKenzie-Mohr, D. (2011). *Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing*, 3rd Edn. New Society Publishers. Available online at: [https://books.google.com/books?hl=en&andlr=andid=g6D3POVUkfmC&doi=fndandpg=PP1anddq=McKenzie-Mohr,+D.+\(2011\).+Fostering+sustainable+behavior:+An+introduction+to+community-based+social+marketing+\(3rd+ed.\).+New+Society+Publishers&dots=M2oFzp3Sxwandsig=WaZLnXt4hdvBZKcgdPyPW63Fq3g](https://books.google.com/books?hl=en&andlr=andid=g6D3POVUkfmC&doi=fndandpg=PP1anddq=McKenzie-Mohr,+D.+(2011).+Fostering+sustainable+behavior:+An+introduction+to+community-based+social+marketing+(3rd+ed.).+New+Society+Publishers&dots=M2oFzp3Sxwandsig=WaZLnXt4hdvBZKcgdPyPW63Fq3g) (accessed September 9, 2025).
- Meng, Q., Liu, H., Zhang, H., Xu, S., Lichtfouse, E., and Yun, Y. (2022). Anaerobic digestion and recycling of kitchen waste: a review. *Environ. Chem. Lett.* 20, 1745–1762. doi: 10.1007/s10311-022-01408-x
- Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education. Revised and Expanded from "Case Study Research in Education"*. San Francisco, CA: Jossey-Bass. Available online at: <https://eric.ed.gov/?id=ED415771> (accessed October 17, 2024).
- Merriam, S. B. (2015). "Qualitative research: designing, implementing, and publishing a study," in *Handbook of Research on Scholarly Publishing and Research Methods*, ed. V. Wang (Hershey, PA: IGI Global Scientific Publishing), 125–140. doi: 10.4018/978-1-6684-4144-2
- Merriam, S. B., and Grenier, R. S. (2019). *Qualitative Research in Practice: Examples for Discussion and Analysis*, 2nd Edn. San Francisco, CA: John Wiley and Sons.
- Merriam, S. B., and Tisdell, E. J. (2016). *Qualitative Research: A Guide to Design and Implementation*. Hoboken, NJ: John Wiley and Sons, Inc.
- Monroe, M. C., Andrews, E., and Biedenweg, K. (2008). A framework for environmental education strategies. *Appl. Environ. Educ. Commun.* 6, 205–216. doi: 10.1080/15330150801944416
- Muller, M. S., Iyer, A., Keita, M., Sacko, B., and Traore, D. (2002). Differing interpretations of community participation in waste management in Bamako and Bangalore: some methodological considerations. *Environ. Urban.* 14, 241–258. doi: 10.1177/095624780201400219
- Odeku, K. O. (2022). Climate injustices due to the unequal and disproportionate impacts of climate change. *Perspect. Law Public Admin.* 11, 103–110.
- Pandey, S., Pandey, P. C., Costache, R., Arora, A., Ranjan, P., Chamoli, A., et al. (2024). "An overview of machine learning applications in disaster waste management," in *Geo-information for Disaster Monitoring and Management*, eds. P. C. Pandey, R. Kumar, M. Pandey, G. Giuliani, R. K. Sharma, and P. K. Srivastava (Cham: Springer International Publishing), 469–499. doi: 10.1007/978-3-031-51053-3_21
- Patton, M. Q. (2015). *Qualitative Research and Evaluation Methods*, 4th Edn. Thousand Oaks, CA: SAGE Publications.
- Powers, M., Rinkel, M., and Kumar, P. (2021). Co-creating a "sustainable new normal" for social work and beyond: embracing an ecosocial worldview. *Sustainability* 13:10941. doi: 10.3390/su131910941
- Putnam, R. D. (1993). The prosperous community: social capital and economic growth. *Am. Prospect* 356, 4–6.
- Ram, M., and Bracci, E. (2024). Waste management, waste indicators and the relationship with sustainable development goals (SDGs): a systematic literature review. *Sustainability* 16:8486. doi: 10.3390/su16198486
- Ramsay, S., and Boddy, J. (2017). Environmental social work: a concept analysis. *Br. J. Soc. Work* 47, 68–86. doi: 10.1093/bjsw/bcw078
- Roy, S., Bose, A., Basak, D., and Chowdhury, I. R. (2023). Towards sustainable society: the sustainable livelihood security (SLS) approach for prioritizing development and understanding sustainability: an insight from West Bengal, India. *Environ. Dev. Sustain.* 26, 20095–20126. doi: 10.1007/s10668-023-03456-x
- Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *Int. J. Serv. Sci.* 1, 83–104. doi: 10.1504/IJSSCI.2008.017590
- Šarić, J., and Abramović, B. (2025). Using SWARA for the evaluation criteria of connecting airports with railway networks. *Systems* 13:428. doi: 10.3390/systems13060428
- Scheinberg, A., Spies, S., Simpson, M. H., and Mol, A. P. (2011). Assessing urban recycling in low-and middle-income countries: building on modernised mixtures. *Habitat Int.* 35, 188–198. doi: 10.1016/j.habitatint.2010.08.004
- Sipos, Y., Battisti, B., and Grimm, K. (2008). Achieving transformative sustainability learning: engaging head, hands and heart. *Int. J. Sustain. Higher Educ.* 9, 68–86. doi: 10.1108/14676370810842193
- Strydom, H. (2011). "The research process with reference to the research method section," in *Social Work Theories and Methodologies* (Dubrovnik: North-West University), 1–26. Available online at: https://iuc.hr/lucAdmin/Server/downloads/Herman_Strydom_South_Africa_.pdf (accessed August 11, 2025).
- Subri, U. S., Ghani, N. M., Rus, R. C., and Affandi, H. M. (2025). Waste no more: empowering communities through education and participation in sustainable waste management. *Multidiscipl. Rev.* 8:2025204. doi: 10.31893/multirev.2025204
- Sun, J., and Asari, M. (2024). Economic incentive in enhancing community waste separation and collection: a panel data analysis in China. *Waste Manage. Res.* 42, 158–166. doi: 10.1177/0734242X231178215
- Sunart, S., Zebua, R. S. Y., Tjakraatmadja, J. H., Ghazali, A., Rahardyan, B., Koeswinarno, K., et al. (2023). Social learning activities to improve community engagement in waste management program. *Global J. Environ. Sci. Manage.* 9, 403–426. doi: 10.31219/osf.io/jvtwr
- Sutisna, M. A. R. (2024). Strategi pengelolaan sampah kota terintegrasi menuju zero waste [Integrated urban waste management strategy towards zero waste]. *Waste Handling Environ. Monitor.* 1, 41–50. doi: 10.61511/whem.v1i1.2024.631
- Szpilko, D., de la Torre Gallegos, A., Jimenez Naharro, F., Rzepka, A., and Remiszewska, A. (2023). Waste management in the smart city: current practices and future directions. *Resources* 12:115. doi: 10.3390/resources12100115
- Teng, Y., Li, N., Yang, J., Liu, Y., and Liu, C. (2024). Study on the impact of social capital on the rural residents' conscious interpersonal waste separation behavior: evidence from Jiangxi province, China. *Front. Environ. Sci.* 12:1363240. doi: 10.3389/fenvs.2024.1363240
- Woldesenbet, W. G. (2021). Stakeholder participation and engagement in the governance of waste in Wolkite, Ethiopia. *Environ. Challenges* 3:100034. doi: 10.1016/j.envc.2021.100034
- Xie, L., Zhu, J., and Benson, D. (2022). Partnership building? Government-led NGO participation in China's grassroots waste governance. *Geoforum* 137, 32–41. doi: 10.1016/j.geoforum.2022.10.004
- Yang, C., and Fang, Z. (2024). The impact of education expenditure on environmental innovation. *Heliyon* 10, 1–13. doi: 10.1016/j.heliyon.2024.e32446
- Yin, R. K. (2018). *Case Study Research and Applications*. Thousand Oaks, CA: SAGE Publications.
- Yuan, A., Lv, Y., and Yuan, H. (2025). "Development and evolution of China's zero-waste city construction based on LDA approach," in *ICCREM 2024* (Guangzhou: American Society of Civil Engineers), 1623–1632. doi: 10.1061/9780784485910.155
- Zhang, D. Q., Tan, S. K., and Gersberg, R. M. (2010). Municipal solid waste management in China: status, problems and challenges. *J. Environ. Manage.* 91, 1623–1633. doi: 10.1016/j.jenvman.2010.03.012
- Zhou, C., Huang, N., Yang, G., and Ma, S. (2022). Assessing the sustainability of municipal solid waste management in China 1980–2019. *Sustain. Horizons* 2:100020. doi: 10.1016/j.horiz.2022.100020
- Zhou, J., Li, L., Wang, Q., Van Fan, Y., Liu, X., Klemes, J. J., et al. (2022). Household waste management in Singapore and Shanghai: experiences, challenges and opportunities from the perspective of emerging megacities. *Waste Manage.* 144, 221–232. doi: 10.1016/j.wasman.2022.03.029
- Zhou, J., and Luo, D. (2024). The global governance of marine plastic pollution: rethinking the extended producer responsibility system. *Front. Mar. Sci.* 11:1363269. doi: 10.3389/fmars.2024.1363269