

Decentralized Waste Governance and Local Implementation Challenges in Cambodia

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Abstract

Solid waste management is an increasing environmental and governance challenge in Cambodia, where decentralization has transferred responsibilities to subnational administrations without consistently providing sufficient authority, funding, or technical capacity. Although previous studies identify weaknesses at national and municipal levels, district-level implementation of Sub-decree No. 113 remains insufficiently examined. This study investigates implementation challenges, local responses, and policy needs in Leuk Daek District, Kandal Province. Using a qualitative design, it analyses open-ended survey responses from 45 household residents and 45 market vendors, together with five key informant interviews involving three district administrators and two waste collectors in Prek Dach, Prek Tanlop, and Kampong Phnom Communes. The findings reveal that low collection fees, inadequate bins and disposal sites, irregular services, unclear institutional responsibilities, limited fiscal transfers, insufficient technical guidance, and weak local capacity constrain implementation. However, the formation of a district waste-management committee and training on disposal-site management, composting, and the 3Rs indicate emerging local progress. The study contributes district-level evidence that implementation gaps result from the interaction of unclear delegation, resource constraints, and weak service arrangements. It concludes that effective decentralization requires clearer mandates, aligned fiscal support, stronger coordination, viable collection systems, and sustained community and private-sector participation.

Key Words: Solid waste management, decentralized environmental governance, local government capacity, waste collection services, community participation

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INTRODUCTION

Municipal solid waste management has become a pressing environmental and governance challenge in Cambodia. Rapid urbanization, internal migration, population growth, and changing consumption patterns have increased waste generation more rapidly than collection, treatment, and disposal systems have expanded. Cambodia's municipal solid waste volume is estimated to be growing by approximately 15 percent annually, placing increasing pressure on local infrastructure and public services, particularly in lower-income and rapidly urbanizing areas (Ministry of Environment 2020). Waste segregation remains limited among households and businesses, while knowledge of appropriate storage, recycling, and disposal practices is uneven (UNDP Cambodia 2021; Sahmakum Teang Tnaut 2024). As a result, substantial quantities of waste continue to be burned, buried, dumped on vacant land, or discarded in rice fields and waterways.

These problems are compounded by inadequate collection coverage and disposal infrastructure. Waste collection, transportation, and disposal services in Cambodian cities are commonly provided by private companies under the supervision of local authorities and relevant government agencies (UNESCAP 2017). However, many provincial towns, rural settlements, and emerging urban areas remain outside formal collection networks, requiring households and businesses to manage waste independently (iDE Cambodia 2024). Most disposal facilities remain open dumps rather than engineered sanitary landfills, creating risks of leachate contamination, methane emissions, and broader environmental degradation (World Bank 2018). Recycling is also limited, with only an estimated 4–10 percent of waste recovered, primarily through informal waste pickers.

The Cambodian government has responded by expanding waste-disposal infrastructure and developing modern landfill facilities. More than one hundred disposal sites reportedly operate nationwide, although many remain open-air facilities with limited technical infrastructure (Ministry of Environment 2023). Recent initiatives include plans for permanent landfills serving Phnom Penh and Kandal Province, the development of a modern landfill in Preah Sihanouk, and the construction of additional facilities in Kep, Kampong Chhnang, Pursat, Battambang, and Kampot Provinces (Vorn 2022; Open Development Cambodia 2023). These investments are important, but infrastructure alone cannot resolve persistent weaknesses in collection coverage, institutional coordination, enforcement, financing, service-provider accountability, and public participation.

Solid waste management in Cambodia is therefore not solely a technical or behavioural issue; it is fundamentally a governance problem. Since decentralization reforms began in 1999, responsibilities for several public services have progressively been transferred to subnational administrations. In the waste sector, this process was strengthened through Sub-decree No. 113, which transferred significant solid waste-management functions to municipal and district administrations (Royal Government of Cambodia 2015). The sub-decree aims to improve the effectiveness, transparency, and accountability of waste management while protecting public health and the environment. It authorizes subnational administrations to determine appropriate collection arrangements, regulate relationships between service providers and users, and develop locally suitable waste-management mechanisms (Vong 2016).

The implementation of Sub-decree No. 113 forms part of Cambodia's broader decentralization and deconcentration agenda. Within this framework, the Ministry of Environment works with the Ministry of Interior, the Ministry of Economy and Finance, and other government institutions to formulate regulations, guidelines, and administrative arrangements. Subnational administrations are expected to translate these national provisions into local plans, budgets, collection systems, monitoring arrangements, and enforcement practices. In principle, transferring responsibility to municipalities and districts should make waste services more responsive to local settlement patterns, economic conditions, and community needs. In practice, however, the transfer of formal responsibility has not always been accompanied by sufficient funding, personnel, technical expertise, institutional coordination, or enforcement authority.

Recent studies identify persistent weaknesses in Cambodia's municipal solid waste system, including inadequate collection, transportation, storage, and treatment; weak source separation and resource recovery; and limited enforcement of regulations against illegal disposal (Kham and Heilmann 2015; Meas, Kuok, and Promentilla 2022; Pheakdey et al. 2022). These operational deficiencies are compounded by fragmented institutional coordination, incomplete decentralization, constrained local budgets and personnel, unclear public-private responsibilities, and weak transparency and financial accountability in service provision (Spoann et al. 2018; Spoann et al. 2019; Lord and Prior 2024). Municipal and district administrations have frequently been assigned waste-management responsibilities without receiving the technical and financial capacity required to perform them effectively. Consequently, formal decentralization may increase local

obligations without producing the operational autonomy needed to deliver reliable services.

Despite growing scholarship on waste management in Cambodia, district-level implementation of Sub-decree No. 113 remains insufficiently examined. Existing studies largely focus on national policy, major municipalities, infrastructure deficiencies, household practices, or general subnational capacity constraints. Less is known about how district authorities interpret transferred responsibilities, incorporate waste management into planning and budgeting, coordinate with communes and national or provincial institutions, supervise service providers, mobilize financial and human resources, enforce regulations, and engage residents and businesses. Evidence is especially limited for districts transitioning from predominantly rural settlements toward denser markets and urbanizing residential areas.

Leuk Daek District in Kandal Province provides an important case for examining these processes. The district faces increasing waste-management pressures associated with population growth, commercial activity, expanding markets, and newly developed settlement areas. Improper waste storage and disposal, inadequate collection coverage, limited stakeholder participation, and constrained local-government capacity have contributed to waste accumulation and related social, environmental, economic, and public-health risks. Waste problems are particularly visible around markets and developing urban areas where service expansion has not kept pace with local demand (iDE Cambodia 2024). Leuk Daek is therefore analytically significant as an urbanizing district in which nationally transferred responsibilities must be implemented through comparatively limited administrative, financial, and service-delivery systems.

Against this background, this article examines the substantive challenges of solid waste management in Leuk Daek District and the district-level implementation of Sub-decree No. 113. Rather than explaining waste accumulation primarily in terms of inadequate public awareness or inappropriate household behaviour, it investigates how institutional capacity, intergovernmental coordination, financial resources, service-provider arrangements, infrastructure, stakeholder participation, and accountability shape local outcomes.

The study addresses two research questions: first, what institutional, financial, technical, behavioural, and service-delivery challenges affect solid waste management in Leuk Daek District, Kandal Province? Second, how has the Leuk Daek District administration interpreted and exercised

the solid waste-management responsibilities transferred under Sub-decree No. 113?

By answering these questions, the article provides district-level evidence on the implementation of Cambodia's decentralized waste-management framework. It contributes to broader debates on decentralized environmental governance by showing how implementation gaps emerge when formal policy responsibilities are transferred to local authorities without commensurate resources, institutional capacity, technical support, and enforcement mechanisms.

LITERATURE REVIEW

Municipal Solid Waste Management as a Governance Problem

Municipal solid waste management is often presented as a technical matter involving collection, transportation, treatment, recycling, and final disposal. Comparative research, however, shows that its effectiveness depends equally on governance arrangements: the allocation of authority, adequacy of local resources, regulatory enforcement, institutional coordination, service-provider accountability, and public participation. Differences between effective and underperforming systems therefore cannot be explained by infrastructure or technology alone. They also reflect governments' capacity to translate formal policies into reliable services and socially accepted waste practices.

Developed-country experiences demonstrate the importance of regulatory clarity, service coverage, financing, infrastructure, and public compliance. The United States combines broad collection coverage with continued reliance on landfills and incineration; Japan relies on segregation rules, community compliance, subsidies, and treatment infrastructure; and Germany emphasizes waste prevention, producer responsibility, household segregation, and controls on untreated disposal (U.S. Environmental Protection Agency 2020; Takaoka 2017; Amemiya 2018; BMUV 2023; European Environment Agency 2025). These cases show that effective systems require enforceable regulation, adequate administrative and financial capacity, accessible infrastructure, and sustained public participation.

Decentralization and Local Capacity in Developing Countries

In many developing countries, municipal solid waste management has been decentralized because local governments are considered better positioned to identify needs, regulate providers, engage communities, and

design locally appropriate services. Yet responsibilities are often transferred more rapidly than the authority, personnel, technical expertise, and financial resources needed to fulfil them, producing a persistent gap between formal mandates and implementation.

India's Urban Local Bodies are responsible for collection, segregation, transportation, and treatment, but limited infrastructure, financing, awareness, and skilled personnel constrain implementation (Ministry of Urban Development 2014; World Bank 2018). China likewise assigns implementation to local governments, yet compliance and recycling remain uneven, while treatment depends heavily on landfilling and incineration (Ren and Zuo 2024; Zhou and Schubert 2025). Similar tensions appear in Southeast Asia: segregation remains inconsistent in Indonesia; Thailand faces weak participation, inadequate treatment, improper disposal, and open burning; and Vietnam concentrates funding on collection and transportation while treatment, segregation, and rural coverage remain underdeveloped (Asia-Europe Foundation 2022; Pollution Control Department 2011; Areeprasert 2023; Nguyen 2010; Schneider et al. 2017).

These studies show that decentralization improves local responsiveness only when accompanied by adequate resources, operational authority, technical guidance, monitoring, and accountability. The issue is not simply whether functions have been transferred, but how subnational governments interpret, finance, coordinate, and implement them. Where capacity or economic incentives are weak, services may become fragmented, dependent on informal actors, or concentrated in profitable and densely populated areas.

Solid Waste Management and Decentralization in Cambodia

Cambodia reflects these wider governance challenges. Rapid urbanization, economic growth, migration, and changing consumption patterns have increased municipal solid waste, while collection remains uneven outside Phnom Penh and major urban centres. Private operators often concentrate where population density and user fees make services commercially viable, leaving rural communities, smaller markets, and newly urbanizing settlements unserved or underserved (Open Development Cambodia 2016; Pheakdey et al. 2022; Kaiser 2025).

Where formal collection is unavailable, households, market administrators, and community groups rely on burning, burial, informal collection, or uncontrolled dumping. Limited access to designated containers and separate bins restricts segregation and recycling. Informal waste pickers recover valuable materials but cannot compensate for the absence of an

integrated collection and treatment system. Uncontrolled disposal therefore reflects both rising waste volumes and the inability of formal institutions and service networks to manage them consistently (World Bank 2020).

Cambodia has progressively developed a legal and policy framework for municipal solid waste management. The Law on Environmental Protection and Natural Resource Management established the Ministry of Environment's regulatory role, while Sub-decree No. 36 of 1999 and later regulations addressed waste handling, collection, disposal, hazardous and electronic waste, plastic reduction, and sanitation (Royal Government of Cambodia 1999, 2015, 2025; Yim 2013). The Municipal Solid Waste Management Policy 2020–2030 and related circular-economy initiatives emphasize waste reduction, resource recovery, environmental sustainability, economic efficiency, and social acceptance.

The central reform for this study is Sub-decree No. 113 of 2015, which transferred substantial waste-management functions to municipal and district administrations. These include preparing plans and budgets, organizing or contracting collection, supervising service providers, establishing fees, allocating local funds, issuing legal instruments, cooperating with neighbouring administrations, delegating tasks, promoting waste reduction, and educating the public (Royal Government of Cambodia 2015). The reform seeks to reposition municipalities and districts as central actors in planning, regulating, financing, and monitoring local waste services.

In principle, this framework enables subnational authorities to design services according to settlement patterns, market activity, road access, population density, and community needs. Yet formal decentralization has not consistently produced effective implementation. Municipalities and districts often lack qualified personnel, technical facilities, reliable data, operational budgets, contract-management skills, and enforcement capacity (Pheakdey et al. 2022). Limited incorporation of municipal solid waste management into local development plans further suggests that some authorities have received responsibilities without adequate guidance or institutional support (World Bank 2020). Overlapping mandates among ministries, provinces, municipalities, districts, communes, and private operators complicate coordination and weaken accountability (Min 2016; Pheakdey et al. 2022).

The economics of collection create an additional constraint. In smaller towns and rural or peri-urban districts, dispersed settlements and limited willingness or ability to pay may make formal collection commercially unattractive. Local administrations may therefore depend on market tax collectors, community groups, informal operators, or household self-

disposal. These arrangements may provide limited services but can reduce coverage, weaken environmental oversight, and obscure responsibility for service quality. Cambodia's principal weakness is therefore not an absence of regulation, but uneven capacity to operationalize regulation through locally viable and accountable service arrangements.

Analytical Synthesis and Research Gap

Previous research establishes four important points. First, Cambodia has developed an extensive legal and policy framework for municipal solid waste management. Second, Sub-decree No. 113 assigns municipalities and districts substantial planning, regulatory, financial, supervisory, and service-delivery responsibilities. Third, implementation remains constrained by limited human, technical, institutional, and financial capacity. Fourth, weak collection coverage and limited economic incentives encourage informal disposal, particularly in rural, peri-urban, and rapidly urbanizing jurisdictions.

What remains underexplored is how these conditions interact within specific district administrations. Existing studies focus mainly on national policy, major cities, aggregate waste indicators, or general capacity limitations. They provide less evidence on how districts interpret transferred functions, incorporate waste management into planning and budgeting, coordinate with communes and provincial or national institutions, engage private and informal service providers, mobilize public participation, respond to complaints, and enforce local rules. The literature identifies an implementation gap but does not fully explain how that gap is produced through everyday district-level governance.

Leuk Daek District is especially relevant because it combines predominantly rural settlements with expanding markets, commercial activity, and newly urbanizing areas. Such districts face rising waste volumes and public expectations but may lack the population density, revenue base, infrastructure, and administrative capacity required for comprehensive services. This article therefore analyses waste management as a problem of decentralized environmental governance and examines how institutional capacity, financial resources, intergovernmental coordination, service-provider arrangements, stakeholder participation, and accountability shape the implementation of Sub-decree No. 113.

METHODS

Research Design and Scope

This article reports the qualitative component of a mixed-methods study of municipal solid waste management in Leuk Daek District, Cambodia. The study combined a questionnaire survey of residents and vendors with key informant interviews involving administrators and waste collectors. Although the questionnaire included closed-ended and open-ended items, this article analyses only the open-ended responses and interviews because the research questions concern how participants understand local waste-management challenges, assess the implementation of Sub-decree No. 113, and explain district-level actions.

Closed-ended data were excluded because they measured the distribution of awareness, attitudes, reported practices, and perceptions across predefined categories. These data address descriptive and correlational questions outside the article's interpretive focus. Accordingly, the findings identify recurring experiences, explanations, and institutional processes but do not estimate prevalence or test statistical relationships. They should be understood as a contextually grounded qualitative account rather than statistically generalizable evidence.

Research Setting and Participants

The study was conducted in Leuk Daek District, Kandal Province. Fieldwork focused on Prek Dach, Prek Tanlop, and Kampong Phnom Communes. These sites were selected because they experienced visible waste-management problems, including inappropriate household and commercial waste storage, uncontrolled disposal, limited collection coverage, inadequate containers, insufficient disposal facilities, and weak service coordination. They also contain residential, market, and increasingly urbanized areas suitable for examining decentralized responsibilities under differing local conditions.

The qualitative dataset comprised open-ended responses from 90 survey participants—45 household residents and 45 market vendors—and interviews with five key informants: three district administrators and two waste collectors. Tables 1 and 2 present their profiles.

Table 1 Profiles of the Survey Respondents

Variable	Category	Frequency	Percentage
Gender	Male	61	68
	Female	29	32
Age	26-35	20	22
	36-45	70	78
Type of respondents	Household residents	45	50
	Market vendors	45	50
Location	Kampong Phnom Commune	30	33
	Prek Dach Commune	30	33
	Prek Tanlop Commune	30	33

Source: The author(s)

Table 2 Profiles of the KII Participants

No	Participant codes	Gender	Age range	Participant types	Reason for selection
1	KII1	M	30-60	Waste collector	Work directly with waste collection and disposal
2	KII2	M	30-60	Waste collector	Work directly with waste collection and disposal
3	KII3	M	30-60	Leuk Daek district administrator	Committee member overseeing solid waste issues, progress, and challenges

Table 2 (Continued)

No	Participant codes	Gender	Age range	Participant types	Reason for selection
4	KII4	M	30-60	Leuk Daek district administrator	Committee member overseeing solid waste issues, progress, and challenges
5	KII5	F	30-60	Leuk Daek district administrator	Committee member overseeing solid waste issues, progress, and challenges

Source: The author(s)

Households and vendors were selected through simple random sampling across the three communes to reduce systematic selection bias. Household respondents were familiar with household waste practices, while vendors were directly exposed to market waste generation, storage, collection, and disposal. Together, they provided community- and market-level perspectives.

Key informants were recruited purposively and through referral-based snowball sampling. The EU-DAR project’s local governance adviser facilitated access to the district administration. Three administrators were selected because their responsibilities gave them direct knowledge of planning, policy implementation, coordination, and service provision. They referred the researcher to two waste collectors knowledgeable about collection operations. This enabled access to an occupational group without a complete sampling frame but may have privileged collectors known to district officials. The two collectors therefore do not represent all formal, informal, contracted, or independent collectors. Their accounts are treated as situated operational evidence complementing, rather than representing, the sector.

Data Collection

Data were collected through a face-to-face questionnaire survey and semi-structured key informant interviews. The questionnaire was developed from relevant literature and Cambodian government policies. It contained five sections: demographic information; three items on waste conditions; eight items on awareness and attitudes concerning policy, cleanliness, sanitation, environmental effects, and participation in campaigns or training; nine items on institutional roles and responsibilities; and ten open-ended questions on local challenges, progress, government actions, community practices, and recommendations. Only responses to the ten open-ended questions were analysed.

Questionnaires were administered in residential and market areas and took approximately 20–30 minutes. Before fieldwork, local administrators informed village chiefs about the study, facilitating community entry. Because data collection covered three communes, the researcher recruited two enumerators with assistance from the EU-DAR adviser. They received orientation on the objectives, eligibility criteria, random-selection procedures, questionnaire administration, informed consent, and accurate recording of open-ended responses.

Semi-structured interviews explored institutional responsibilities, operational challenges, implementation of Sub-decree No. 113, coordination, participation, service provision, progress, and recommendations. Each interview lasted approximately 45 minutes and was conducted in Khmer at an agreed location. With consent, interviews were audio-recorded and prepared for qualitative analysis. Detailed transcription and translation procedures were not fully documented; therefore, the study does not claim formal verbatim transcription, bilingual review, or back-translation. Quotations were interpreted cautiously.

Data Analysis

Open-ended responses and interview materials were analysed thematically using NVivo 12 Plus. The unit of analysis was the complete response to each open-ended question and each interview transcript. Closed-ended data were not imported and did not influence theme construction.

Analysis followed Braun and Clarke's (2006) six phases. First, researchers read and reread the materials and reviewed recordings when clarification was needed. Second, meaningful passages were coded around waste practices, service coverage, infrastructure, public awareness,

responsibilities, financing, enforcement, stakeholder coordination, policy implementation, and proposed improvements. Third, related codes were grouped into provisional themes. Fourth, themes were reviewed against coded extracts and the full dataset for coherence, distinctiveness, and relevance; divergent accounts were retained and examined. Fifth, themes were refined and defined, producing three overarching themes: challenges to solid waste management, progress in local implementation, and recommendations for improving waste governance. Sixth, themes were organized into an analytical narrative supported by selected extracts. NVivo facilitated organization, retrieval, and comparison but did not generate themes automatically; theme construction remained interpretive.

Trustworthiness, Limitations, and Ethics

Credibility, dependability, and confirmability were strengthened through procedures informed by Houghton et al. (2013). Source triangulation compared household, vendor, administrator, and collector perspectives. Agreements supported consistency, while differences revealed variation across community, institutional, and operational accounts. An audit trail documented data preparation, coding, theme development, refinement, and evidence selection. Peer debriefing reviewed links between the research questions, coded material, and final themes and encouraged alternative interpretations. Engagement with the field setting further supported contextual understanding and participant trust.

Three limitations delimit the claims. First, analysing only qualitative data prevents estimation of the prevalence of reported practices or implementation problems. Second, household and vendor evidence came from predefined open-ended questions rather than in-depth interviews and may be less detailed. Third, collector recruitment through district referrals may underrepresent less visible informal or independent actors. The study therefore offers an interpretive account of three communes rather than a statistically representative district assessment.

All participants provided informed consent and were informed of the study's purpose, voluntary nature, recording procedures, and right to decline questions or withdraw without penalty. Confidentiality was protected by removing identifying information and assigning key informants the codes KII1–KII5. Only information relevant to the research questions was reported.

RESULTS

The analysis generated three overarching themes: (1) challenges to solid waste management, (2) progress in local waste-management implementation, and (3) recommendations for strengthening the implementation of Sub-decree No. 113.

Challenges to Solid Waste Management

As summarized in Table 3, solid waste management in Leuk Daek District was constrained by five interrelated problems: inadequate service fees, insufficient infrastructure and collection coverage, unclear institutional responsibilities, limited financial resources, and insufficient understanding of Sub-decree No. 113 among local administrators.

Inadequate Waste-Collection Fees

Waste collectors in Prek Tanlop and Prek Dach Communes reported that the fees charged for collection services were insufficient to cover operating costs. Household fees ranged from approximately 6,000 to 10,000 Cambodian riel per month. According to the collectors, this amount did not adequately cover fuel, equipment, maintenance, and labor expenses, thereby limiting their ability to provide regular and effective services. One waste collector explained: “The service fee that I received from the company was too low, which did not encourage me to perform the collection work effectively. Moreover, there was insufficient equipment for collecting waste in the commune.”

These findings indicate that the financial viability of waste-collection services remains weak. Low user fees may make services more affordable for residents, but they also restrict the operational capacity of collectors and reduce the reliability and geographical coverage of collection.

Inadequate Infrastructure and Collection Coverage

Participants also identified a lack of designated dumping sites, public waste bins, and regular collection services across the three communes. In areas without adequate services, waste was commonly discarded in waterways, along roads, behind schools, on vacant land, and around markets. Waste accumulated particularly in locations where no appropriate storage facilities were available.

Improper packaging and prolonged waste accumulation produced unpleasant odors and raised concerns about sanitation and public health. Participants also reported that some residents had limited understanding of the environmental and health consequences of uncontrolled waste disposal. A market vendor described the lack of basic infrastructure: “There were no trash bins placed between the stalls inside the market, so most households and people in the market disposed of their waste outside the market.”

The findings therefore show that inappropriate disposal practices were not caused solely by individual behavior. They were also associated with the absence of accessible bins, designated disposal locations, and dependable collection services.

Unclear Responsibilities under Sub-decree No. 113

A further challenge concerned the interpretation and implementation of Sub-decree No. 113. Although the sub-decree transfers solid waste-management functions to subnational administrations, participants indicated that the division of responsibilities between district, provincial, and national authorities remained unclear.

District administrators continued to refer some waste-management problems to the provincial administration because they considered the district’s authority and responsibilities insufficiently defined. This suggests that the transfer of functions had not been fully operationalized at the district level. As one local administrator stated: “The sub-decree did not clearly state the roles and responsibilities. Therefore, the transfer of functions from the national to the subnational level was incomplete, and some matters still had to be referred to the provincial administration” (KII3).

The uncertainty surrounding institutional mandates weakened local accountability and made it difficult for district authorities to determine which level of government was responsible for planning, financing, implementing, and monitoring particular waste-management activities.

Insufficient Financial Resources

Local administrators consistently identified inadequate funding as a major barrier to implementation. Although district and commune administrations had been assigned responsibilities for solid waste management, the corresponding financial resources had not been transferred sufficiently.

Limited budgets affected the ability of local authorities to organize awareness campaigns, install waste bins, establish dumping sites, support collectors, and improve collection systems. Waste management also had to compete with other local development priorities for limited subnational funding. One administrator explained: “There was not enough budget to organize public events or awareness-raising activities in the community. More support was needed from the Ministry of Economy and Finance and the Ministry of Interior to accelerate the transfer of funding or to seek support from other stakeholders” (KII4).

The findings demonstrate that the formal transfer of responsibility was not matched by an equivalent transfer of financial capacity. Consequently, district authorities remained dependent on provincial or national institutions and external stakeholders.

Limited Understanding and Technical Capacity

Participants also reported that local administrators had limited knowledge of the provisions and implementation requirements of Sub-decree No. 113. The sub-decree introduced new responsibilities related to institutional roles, human resources, technical capacity, service provision, and local accountability. However, local authorities had not received sufficient guidance, training, or technical assistance to implement these responsibilities consistently. A local administrator observed:

“The sub-decree required further consultation so that relevant stakeholders, including local authorities and community members, could gain greater knowledge and understanding. The subnational administration still lacked clear implementation guidelines, technical support, and human resources” (KII5).

This finding suggests that decentralization requires more than the adoption of a legal instrument. It also depends on sustained policy dissemination, capacity development, implementation guidance, and technical support for the institutions expected to exercise the transferred functions.

Progress in Solid Waste Management

Despite these constraints, the study identified two important areas of progress: the establishment of a district solid waste-management committee and the provision of capacity-building activities for local authorities and waste collectors.

Establishment of a Solid Waste-Management Committee

As shown in Table 4, Leuk Daek District established a solid waste-management committee to coordinate responses to local waste problems. The committee was responsible for supporting planning and budgeting, clarifying administrative responsibilities, monitoring implementation, and promoting public awareness.

The committee also sought to educate residents and market vendors about waste management in public spaces and commercial areas. Its responsibilities included discussing the preparation of designated dumping sites and coordinating arrangements through which private collectors could transport waste outside populated areas.

Regular committee meetings provided a mechanism for communication among district and commune authorities. These meetings enabled members to discuss emerging problems, review implementation, and consider possible solutions across the district. A local administrator described the committee's contribution:

“The establishment of the solid waste-management committee in Leuk Daek District has been very helpful because it allows the district to monitor implementation more fully. It also enables the district administration to collaborate with international stakeholders in addressing the problem” (KII5).

The committee therefore represented an initial institutional mechanism for improving coordination, oversight, and stakeholder collaboration. However, its effectiveness continued to depend on the availability of funding, technical support, and clearly defined authority.

Capacity Building for Local Authorities and Waste Collectors

The second area of progress involved capacity-building activities for waste collectors and local authorities in the three communes. These activities were intended to strengthen participants' understanding of waste-management services and improve their ability to respond to local waste problems.

The training addressed the preparation and management of disposal sites, household composting, and the application of the 3Rs: reducing waste generation, reusing materials, and recycling recoverable waste. A district administrator explained:

“Waste collectors and local authorities in the three communes received capacity development to help them provide better waste-management services. The training focused mainly on the preparation of dumping sites, household composting, and the application of the 3Rs” (KII4).

These activities indicate growing recognition of the need to strengthen both technical knowledge and administrative capacity. Nevertheless, participants’ accounts suggest that isolated training activities were insufficient without continuing guidance, resources, equipment, and institutional support.

Recommendations for Strengthening Solid Waste Management

Participants proposed four principal measures for improving solid waste management and strengthening the implementation of Sub-decree No. 113: establishing regular intergovernmental dialogue, clarifying legal and institutional responsibilities, expanding partnerships with nongovernmental and private-sector actors, and strengthening public awareness and participation.

Establish Regular Intergovernmental Dialogue

Participants recommended establishing regular forums for dialogue between subnational administrations and national ministries. Such forums could help develop a common interpretation of transferred functions, clarify implementation problems, and improve coordination among different levels of government.

Participants also emphasized the importance of collaboration among neighboring districts because waste transportation, disposal, and environmental impacts frequently extend beyond administrative boundaries. Interdistrict cooperation could enable local administrations to share resources, coordinate regulations, identify common disposal arrangements, and improve service efficiency. As one administrator stated: “The district administration should cooperate with other districts to identify appropriate mechanisms for solid waste management, including regulations for addressing waste problems” (KII5). Regular dialogue would therefore help reduce institutional fragmentation and allow local implementation problems to be communicated more effectively to provincial and national authorities.

Clarify Legal Mandates and Institutional Responsibilities

Participants called for clearer ministerial guidance defining the respective responsibilities of national, provincial, district, commune, and service-provider institutions. They argued that district administrations could not be held fully accountable for waste-management outcomes unless they were given sufficiently clear authority over planning, budgeting, implementation, monitoring, and enforcement. One administrator explained:

“There should be clear guidelines for managing waste. The Ministry of Interior, the Ministry of Environment, and the Ministry of Economy and Finance should issue legal instruments guiding the implementation of solid waste management at the subnational level” (KII4).

Clearer legal and administrative guidance would also support the allocation of human and financial resources. In particular, the transfer of functions should specify which institution is responsible for planning services, supervising collectors, establishing fees, monitoring performance, enforcing regulations, and financing local activities.

Strengthen Partnerships with NGOs and the Private Sector

Participants further recommended stronger collaboration among local government, nongovernmental organizations, development partners, and private companies. Such partnerships could support public education, technical training, infrastructure development, service provision, and the promotion of waste reduction, reuse, and recycling. A local administrator stated: “The district administration should work closely with NGOs and the private sector on initiatives, activities, and committees established to solve waste problems” (KII3).

These partnerships were considered particularly important because district administrations had limited financial and technical capacity. However, collaboration would require clear responsibilities, transparent agreements, and mechanisms for monitoring the performance of external partners and service providers.

Expand Community Awareness and Participation

Finally, participants emphasized the need for sustained community education to improve waste-related behavior and public participation. Awareness activities should explain the environmental and health

consequences of illegal dumping, the importance of separating waste, and the appropriate use of designated disposal sites.

Schools, markets, streets, and residential areas were identified as important locations for awareness activities. Education should encourage residents and vendors to assume greater responsibility for cleanliness, sanitation, and proper waste disposal. One vendor recommended: "There should be small public activities conducted along the streets to explain plastic waste and its negative effects on the solid waste problem in Leuk Daek District."

The findings indicate that awareness campaigns should not be treated as isolated events. They should be integrated with accessible bins, reliable collection services, clear regulations, and consistent enforcement. Behavioral change is unlikely to be sustained when residents lack practical and affordable alternatives to uncontrolled disposal.

Overall, participants' recommendations show that effective implementation of Sub-decree No. 113 requires an integrated approach. Clear institutional authority, adequate financing, intergovernmental coordination, service infrastructure, stakeholder partnerships, and community participation must operate together. Addressing only one of these dimensions is unlikely to produce a sustainable district-level waste-management system.

DISCUSSION

Interpreting the Challenges of Decentralized Waste Management

The findings show that solid waste management in Leuk Daek District is constrained by interconnected operational, financial, and institutional problems. At the service-delivery level, low household collection fees were reported to be insufficient to cover fuel, labor, equipment, and transportation costs. This weakened the financial viability of collection services and contributed to irregular collection. In areas without dependable services, waste was frequently discarded in public spaces, vacant land, markets, roadsides, and waterways.

The relationship between low service fees and uncontrolled disposal illustrates that improper waste practices cannot be attributed solely to limited public awareness. Household and vendor behavior is also shaped by the availability, affordability, and reliability of formal services. Residents may be encouraged to dispose of waste properly, but compliance remains difficult when collection is irregular and designated bins or disposal sites

are unavailable. The absence of basic infrastructure therefore reinforces inappropriate disposal practices and reduces the effectiveness of awareness and enforcement activities.

These findings are consistent with previous research on municipal solid waste management in Cambodia. Pheakdey et al. (2014) found that unclear institutional mandates and inadequate fiscal transfers limited the capacity of local authorities to enforce waste-collection arrangements. Similarly, UNDP (2018) associated low willingness or capacity to pay service fees with irregular collection and illegal dumping. The World Bank (2020) also identified inadequate disposal sites and transportation infrastructure as recurring constraints across Cambodian provinces. The experience of Leuk Daek District therefore reflects broader structural problems within Cambodia's municipal solid waste-management system rather than an isolated local failure.

However, the findings also show how these national and institutional weaknesses are experienced through everyday district-level administration. Sub-decree No. 113 formally transfers substantial waste-management functions to municipalities and districts, but district administrators reported continuing uncertainty regarding the boundaries of their authority. Some waste-related problems were still referred to the provincial administration because district officials lacked clear implementation guidelines, technical support, and adequate financial resources.

This situation reveals a mismatch between formal responsibility and operational capacity. District authorities are expected to plan, coordinate, supervise, and improve waste services, but they do not necessarily control the resources or institutional instruments needed to fulfil those responsibilities. Decentralization has therefore transferred obligations more clearly than it has transferred financing, technical expertise, personnel, and effective decision-making authority. This weakens accountability because district administrations may be held responsible for outcomes that remain partly dependent on provincial and national institutions.

Contribution to Research on Sub-decree No. 113

The main contribution of this study is its district-level explanation of how the implementation gap under Sub-decree No. 113 is produced. Previous studies have established that Cambodian subnational administrations face financial, technical, and institutional capacity constraints. The Leuk Daek case extends this literature by showing the mechanisms through which these constraints affect implementation in an urbanizing district.

First, the study demonstrates that unclear delegation encourages upward referral. Instead of resolving waste-management problems autonomously, district officials continue to depend on provincial authorities when responsibilities, legal authority, or financial arrangements are uncertain. Second, the findings show that fiscal limitations affect not only infrastructure investment but also routine activities such as public education, service monitoring, support for collectors, and the provision of bins and disposal sites. Third, the study reveals how institutional uncertainty affects actors outside government. Waste collectors operate under financially weak service arrangements, while households and vendors encounter irregular services and limited disposal options.

The case therefore adds a more detailed account of the relationship between decentralization policy and local implementation. The central problem is not merely that local authorities lack capacity. Rather, the implementation gap is produced by the interaction of ambiguous mandates, incomplete fiscal transfer, limited technical support, commercially weak collection services, and inadequate infrastructure. These factors reinforce one another and make it difficult for district administrations to establish an accountable and sustainable waste-management system.

The study also identifies a partial institutional response to these constraints. The establishment of the Leuk Daek solid waste-management committee created a local mechanism for coordination, planning, monitoring, and stakeholder engagement. Its formation indicates that district authorities are not simply passive recipients of decentralization policy. They can develop local arrangements to coordinate communes, engage waste collectors, work with nongovernmental organizations, and discuss district-wide solutions.

Nevertheless, the committee's effectiveness remains dependent on resources, authority, and sustained institutional support. A committee can improve communication and coordination, but it cannot independently overcome insufficient budgets, inadequate infrastructure, unclear ministerial guidance, or weak service economics. The Leuk Daek experience therefore demonstrates both the potential and the limits of local institutional innovation under incomplete decentralization.

Policy Implications

The findings have several implications for the implementation of Sub-decree No. 113. First, the transfer of waste-management functions should be accompanied by clearer operational guidance. The Ministry of Interior,

Ministry of Environment, and Ministry of Economy and Finance should jointly clarify which level of government is responsible for planning, budgeting, contracting, fee setting, monitoring, enforcement, infrastructure development, and public education. Such guidance should specify not only institutional responsibilities but also procedures for coordination and dispute resolution.

Second, fiscal transfer should be aligned with transferred functions. District administrations require predictable funding for waste bins, disposal facilities, awareness activities, service monitoring, technical staff, and support for collection operations. Assigning responsibilities without corresponding financial resources creates formal decentralization without effective local autonomy. Funding arrangements should therefore reflect service coverage, population distribution, transportation distances, waste volumes, and the limited revenue base of rural and peri-urban districts.

Third, the financial sustainability of collection services requires attention. Service fees should be reviewed in relation to actual operating costs, household affordability, and the geographic conditions of the district. Simply increasing fees may exclude poorer households and encourage nonpayment. A more viable approach may combine affordable user fees with public subsidies, cross-subsidization, performance-based contracts, or targeted assistance for low-income communities. Collection agreements should also define service areas, schedules, performance standards, complaint procedures, and monitoring responsibilities.

Fourth, minimum local infrastructure should be established alongside awareness and enforcement activities. Public education is unlikely to produce sustained behavioral change when residents and vendors do not have access to bins, designated disposal sites, or reliable collection. Awareness campaigns should therefore be coordinated with visible improvements in services and infrastructure. Schools, markets, residential areas, and community organizations can be used to promote waste separation and the 3Rs, but residents must also be given practical alternatives to illegal dumping.

Fifth, the district waste-management committee should be institutionalized through a clear mandate, regular meetings, documented action plans, and measurable responsibilities. Its membership should include district and commune authorities, waste collectors, market representatives, community members, private operators, and relevant nongovernmental organizations. The committee could also facilitate cooperation with neighboring districts where shared collection routes or disposal facilities would be more efficient than separate district-level systems.

Practical Implications

At the district level, immediate action should focus on improving coordination between communes, mapping unserved areas, identifying locations for communal bins and temporary storage, and developing realistic collection schedules. The district administration should also assess the operational costs faced by waste collectors and determine whether existing fee arrangements can support minimum service standards.

Partnerships with nongovernmental organizations and private actors can support training, public education, composting, recycling, and infrastructure development. However, external partnerships should complement rather than replace government responsibility. Agreements should define responsibilities, expected outputs, reporting requirements, and arrangements for maintaining activities after external assistance ends.

Community participation should similarly be incorporated into service planning rather than limited to awareness campaigns. Household residents and market vendors can provide information about disposal patterns, collection failures, preferred service times, and locations where bins or collection points are most urgently required. Incorporating these perspectives may improve service responsiveness and increase public willingness to participate and pay for collection.

Limitations

This study has several limitations. First, the key informant component included only three district administrators and two waste collectors. Although these participants provided relevant institutional and operational perspectives, the small number of interviews limits the range of views represented. In particular, the two waste collectors were recruited through referrals from district administrators and may not reflect the experiences of all formal, informal, or independent collectors operating in the district.

Second, the study was limited geographically to Prek Dach, Prek Tanlop, and Kampong Phnom Communes. The findings provide a detailed account of these locations but should not be assumed to represent all communes in Leuk Daek District or other districts in Kandal Province. Administrative capacity, service arrangements, population density, commercial activity, and infrastructure may differ across localities.

Third, the analysis relied on self-reported qualitative data from household residents, market vendors, administrators, and waste collectors. Participants' accounts may have been affected by selective recall, institutional interests, social desirability, or differing interpretations of

Sub-decree No. 113. The study did not independently measure waste volumes, collection frequency, service costs, illegal-dumping locations, or the performance of waste contractors.

Fourth, this article analyzed only the open-ended survey responses and key informant interviews from the larger mixed-methods study. The closed-ended survey data were excluded because the article focused on participants' explanations and experiences. Consequently, the findings identify recurring patterns and implementation mechanisms but do not estimate the prevalence of particular attitudes, practices, or challenges among the wider district population.

Despite these limitations, the study provides contextually grounded evidence of how decentralized waste-management policy is implemented in an urbanizing Cambodian district. It shows that improving local waste management requires more than transferring formal responsibilities. Effective decentralization depends on aligning authority with financing, technical capacity, infrastructure, viable service arrangements, and mechanisms for local accountability.

CONCLUSION

This study shows that solid waste management in Leuk Daek District is constrained by interconnected financial, infrastructural, institutional, and capacity-related weaknesses. Low collection fees limit the operational viability of waste services, while inadequate bins, disposal sites, and transportation systems contribute to irregular collection and uncontrolled dumping. At the same time, the implementation of Sub-decree No. 113 remains incomplete because district and commune authorities lack sufficiently clear mandates, adequate fiscal transfers, technical guidance, and a shared understanding of their responsibilities. These findings indicate that decentralization has transferred important functions to subnational administrations without fully providing the authority, resources, and institutional support required for effective implementation. Addressing these problems requires clearer operational guidelines, stronger financial support, regular coordination between ministries and local administrations, and closer collaboration with NGOs, private service providers, and communities.

The study contributes to research on decentralized waste governance in Cambodia by showing how implementation gaps are produced at the district level through the interaction of unclear delegation, limited resources, weak service arrangements, and insufficient local capacity. Its

findings are limited by the small number of key informants, the focus on three communes in one district, and reliance on qualitative self-reported data. Future research should compare multiple districts, include a broader range of formal and informal waste-sector actors, and examine changes in implementation over time. Such studies would help determine whether stronger fiscal transfer, clearer institutional mandates, and sustained capacity development improve the effectiveness and accountability of decentralized solid waste management.

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