



## Research article

## Rethinking solid waste governance in Ghana

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## ABSTRACT

Ghana's search for sustainable solid waste governance systems is far from complete. The State has adopted the private-public-partnership (PPP) governance policy as a gold standard solution. Guided by the wasteaware benchmark indicator framework, this article examined the extent of compliance with the nine key governance principles in the PPP framework. The results revealed that compliance with principles of competitiveness, accountability, transparency, and value for money was weak. There were also disconnections in policy focus and actions between national and local stakeholders. We argue that Ghana's case provides a good example for countries facing waste management problems by highlighting the void between theory and practice. It reinforces that waste governance in many countries has become a veritable buzzword, adopted uncritically to mask actions or inactions of key stakeholders who must comply with the agreed principles. The article contributes to the literature by enhancing the understanding of and expanding the World Bank's view that waste governance has a critically empowering character to ensure that the capacities and resources of waste management institutions match their responsibilities and desires.

## 1. Introduction

Until the dawn of the new millennium, waste governance and its related issues in Ghana had not been given much research attention (Oteng-Ababio et al., 2017; World Bank, 2021). At best, waste was considered trash that ought to be discarded from the immediate environment without considering the processes involved in getting it out of sight. As Scanlan (2005:9) rightly puts it: "waste was everywhere but, curiously, is mostly overlooked in what we took to be valuable from our lived experiences, and crucially, in the ways, we organized the world". From the governance perspective, waste management was seen as a technical problem for city authorities to solve. It was rarely recognized that the creation and management of waste could have political or cultural implications (Fagan, 2004). With the increase in population growth and consumption, city authorities are struggling to sustainably manage the corresponding increase in waste generation. Several policies have been espoused to deal with the problem, including private-public partnerships.

The private sector participation policy has nine key principles that stakeholders must operationalize and comply. The many studies on solid waste management (SWM) in Ghana in the context of private sector participation have often focused on capital injection, collection, disposal

and logistics (see, for example, Oteng-Ababio et al., 2017). The issues of how key stakeholders comply with the governance principles spelt out in Ghana's SWM policy are rarely articulated, thus creating some research gaps. The main question is: how are key stakeholders complying with the key governance principles outlined in Ghana's SWM policy? Aligning with earlier research (World Bank, 2021), this paper addresses the question by analyzing the extent of compliance with the governance principles guiding SWM in Ghana. The intention is to use Ghana's case study to stimulate debate on how compliance with well-crafted policies can enhance sustainable urban social service delivery (World Bank, 2021). The article has been divided into five parts. The theoretical frameworks follow the literature on waste governance. The methodology is amply explained with the results and discussion presented in themes. The final part considers the conclusion and recommendation.

## 2. Literature review

## 2.1. Theoretical framework

The systems theory underpins the study. The systems theory of studying SWM problems is similar to the integration of life cycle

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assessment (LCA), and multi-criteria decision-making (MCDM) approaches to assess the sustainability of SWM systems which [Torkayesh et al. \(2022\)](#) argue that only a few studies have attempted to do. The systems theory was adopted because [Ikhlayel \(2018\)](#) observed that waste governance is a system residing within a complex urban management system that needs certain fundamentals to attain sustainability. Sound decision-making on SWM should be based on systematic approaches to satisfy the different options for achieving the sustainability criteria. The sustainability criteria are defined by three dimensions: environment, society and economy ([Zhou et al., 2019](#)). These three dimensions are interconnected, and the systems approach, like the integration of the LCA and MCDM, suggested by [Torkayesh et al. \(2022\)](#), evaluates how these dimensions are interconnected and tries to create a balance to make informed decisions. [Torkayesh et al. \(2022: p1\)](#) argue that "decision-makers can benefit from systematic approaches to evaluate different waste management options considering multiple sustainability criteria".

The environmental aspects are composed of physical (hard) subsystems of equipment and infrastructure, while the society and economy are the (soft) subsystems of policies and institutions. These three must be governed effectively to achieve sustainability. Even though the environmental aspects of sustainable SWM can be analyzed using the LCA ([Laurent, 2014](#)), it should be noted that LCA is a part of a bigger system that encompasses the entire life cycle of a product or service, a view shared by [Wang et al. \(2015\)](#). The application of systems theory allows for integrated decision-making and is, therefore, appropriate for analyzing the governance of SWM. [Adams et al. \(2013\)](#) define a system as a complex of interconnected parts with relationships that allow the identification of a boundary-maintaining entity or process.

The systems theory is a multidisciplinary and theoretical perspective that analyses a phenomenon, focusing on the interactions between factors rather than the implications of the individual factors ([Capra, 1997](#); [Mele et al., 2010](#)). UN-Habitat (2010) emphasized the holistic view of waste management as a system by stating that:

"What most low and middle-income cities miss is the organization, specifically, a clear and functioning institutional framework, a sustainable financial system, and a clear process for pushing the modernization plan and improving the system's performance. If there is no overarching framework, the mixture remains a cluster of disjointed subsystems that do not function well together".

The quote underlines the importance of a functioning integrative waste governance system in which all components work and reinforce each other and the overall system. An effective waste governance system also integrates with and supports the city management system. In reviewing related literature on sustainable waste governance, the study concurs with the discussion of [Torkayesh et al. \(2022\)](#) that approaches such as the MCDM has been adopted for complex decision-making on SWM and offers solutions to problems involving highly diversified indicators. However, [Wilso et al. \(2019\)](#) argued that SWM is a complex issue that involves complex systems with several decision-making units at various levels.

### 2.2. Conceptual framework

[Wilson et al. \(2019\)](#) adopted the analytical framework for the study. It is built around the integrated sustainable SWM concept. To analyze solid

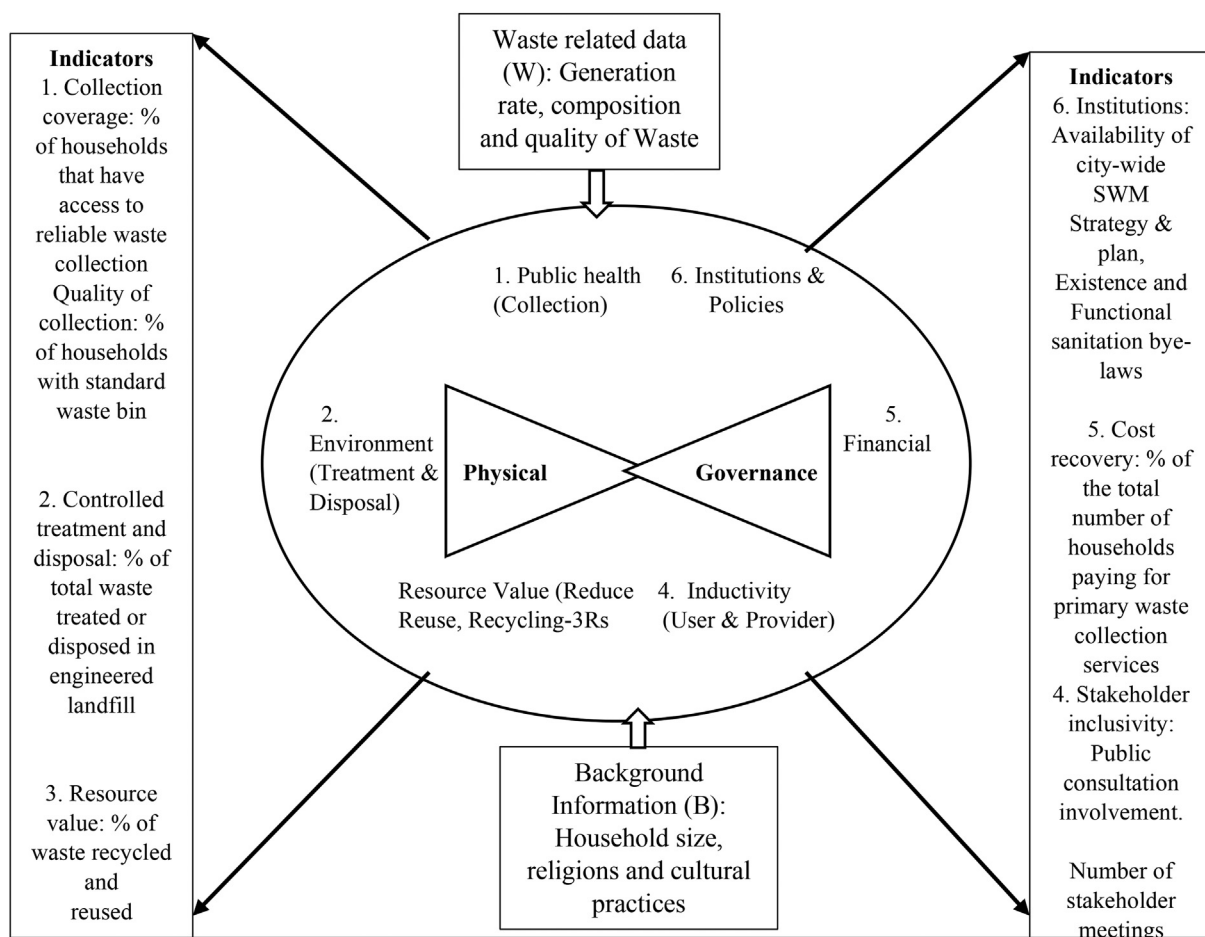


Figure 1. Conceptual Framework for Assessment of Integrated Solid Waste Management. Source: Wilson et al. (2015)

waste management systems, the UN-Habitat has summarized the framework into two: the physical components and the governance aspects (Wilson et al., 2012; Sim et al., 2013) (Figure 1). The interactions of physical (hard) and governance (soft) factors determine the quality of waste management in a city. The interactions of the factors are also influenced by the city's waste-related data and background characteristics. The main indicators for the governance subsystem are the availability of functional institutions and policies, stakeholder inclusivity and financial sustainability.

### 2.3. Solid waste governance in Ghana

In this paper, governance is used to contextualize the decisions on solid waste management systems in Ghana. Before independence, the State established agencies to manage solid waste sustainably because it was regarded as a public good. According to Salifu (2011), solid waste management services were organized in line with how towns and cities governed. Cities in Ghana at the time were governed according to the Municipal Ordinance act of 1859. The same Act established Municipalities in the towns along the Coast. In 1943, another Municipal Ordinance was promulgated, which introduced the establishment of town councils apart from the ones along the Coast to include Kumasi with elected members. The 1943 Municipal Ordinance also served as the guiding document for establishing Public Health Boards (PHB) in Accra, Cape Coast and Kumasi. The responsibility of the PHB was to ensure that communities observed the best hygienic principles as prescribed. The PHB was mandated to enforce all the sanitation regulations documented

in the 1943 Municipal Ordinance, and where people blatantly disobeyed, sanctions were to be applied (Owusu-Sekyere et al., 2017).

In 1961, the Local Government Act 54 further entrenched the State's role in solid waste management (World Bank 2021). Although the Act expanded the responsibilities of the central government, the responsibility of providing sanitation services and other social amenities in the local communities was retained at the local government level (Salifu 2011). The reason was that since social services were regarded as public goods, they should be the responsibility of the State to ensure that the welfare of its citizens was always protected (MSWR, 2020a). From the middle years of the 1970s, the economic fortunes of Ghana began declining as revenue from tax sources began dwindling to the point that sanitation services that depended on revenue from taxes could no longer be sustained. The economic downturn was characterized by low agricultural productivity, increased inflation, and higher levels of unemployment. At this point, local government agencies responsible for environmental sanitation services had virtually run into bankruptcy because the transfer of funds and equipment from the central government, which had been practised over the years, had ceased (Oteng-Ababio, 2020).

While Ghana's economic development stagnated, the population rate increased (Odiar-Bio, 2014). For instance, it is estimated that the urban growth rate increased from 23.1% in the 1960s to 32.0% by 1984 (Oteng-Ababio, 2020). The influx of people in the cities led to an unexpected increase in solid waste generation. For this reason, the few available waste disposal sites reached their capacity in no time. As of the 1980s, waste management services had dipped to the level that the sector

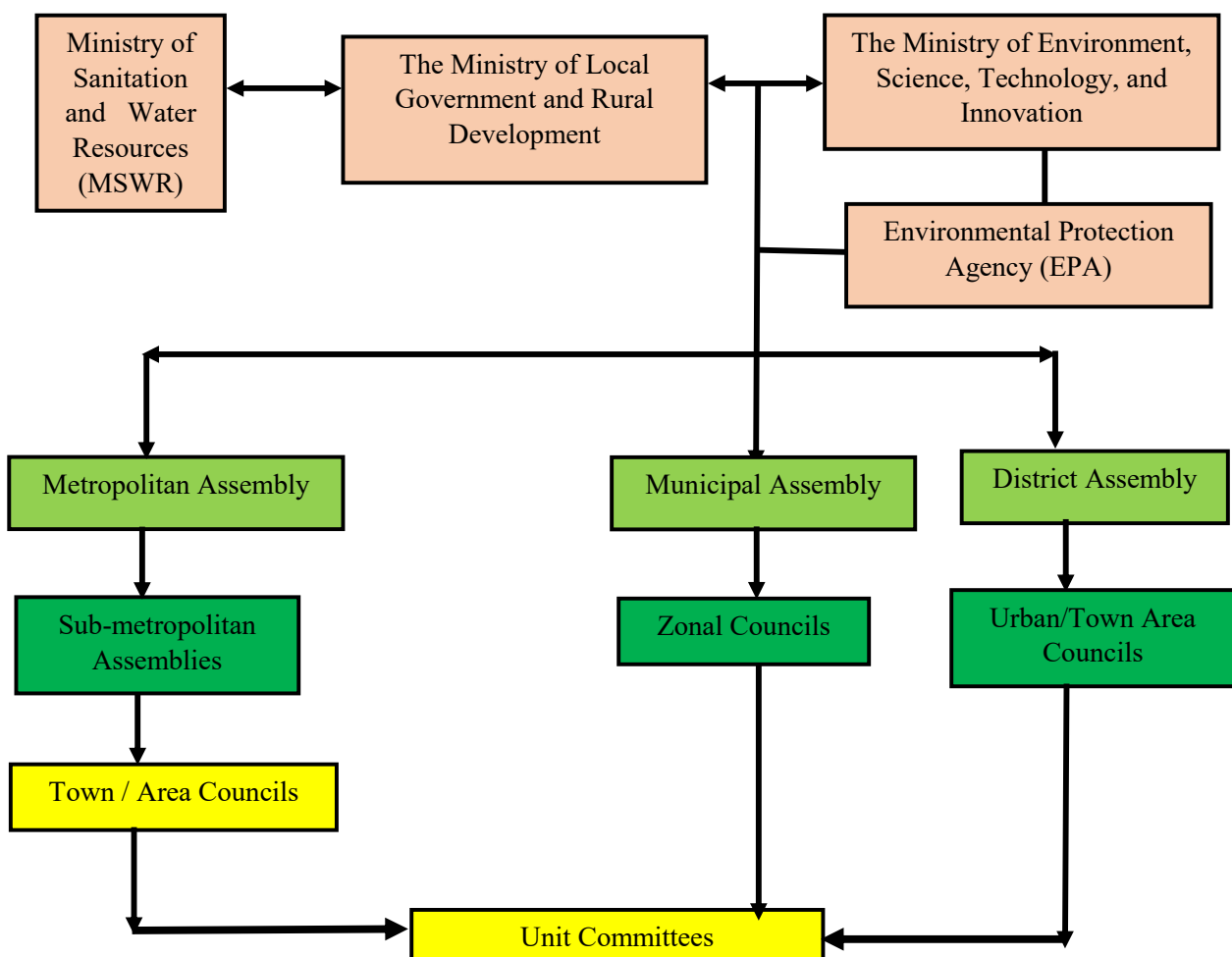


Figure 2. Institutional structure for Solid waste management in Ghana.

needed complete re-organization to return to an acceptable level. As a first step toward reforming the sanitation sector, an environmental sanitation policy was developed in 1999 and revised in 2010. Since the promulgation of the ESP in 2010, there has been significant institutional restructuring toward solid waste governance in Ghana. The institutional governance structure is complex and overlaid by national and sub-national institutions. The top level consists of sector Ministries (Figure 2). This layer provides policy and strategic directions for MSWM in Ghana. Before the formation of the Ministry of Sanitation and Water Resources (MSWR) in 2017, the responsibility for policy direction rested with the Ministry of Environment, Science, Technology, and Innovation (MESTI) and the Ministry of Local Government and Rural Development (MLGRD). The MSWR, which took on this responsibility, was supposed to harmonize all policies in the sanitation and waste sectors. The MESTI is responsible for the overall environmental compliance of the MSWM sector, performed through the Environmental Protection Agency (EPA) at the lower level. In contrast, the day-to-day oversight and monitoring of service delivery at the local level are managed by the Metropolitan, Municipal and District Assemblies (MMDAs).

The MLGRD supervises the MMDAs. The re-enacted Local Government Act (Act 936, 2016) mandates MMDAs to manage solid waste directly or through the private sector. MMDAs are expected to develop sub-national plans based on the national strategy. However, the essential function is often overlooked due to pressure from operational issues (World Bank, 2021). The management of solid waste through the private sector in Ghana is guided by the Public-Private Participation (PPP) Policy Framework, National Solid Waste Management Strategy (NSWMS) and the Environmental Sanitation Policy (ESP) (MoFEP, 2011; MLGRD, 2010; MSWR, 2020a,b). The MMDAs are also expected to enact bye-laws on sanitation to regulate local environmental conditions, including MSWM.

In Ghana, solid waste management is a collaborative activity between the public and the private sector (World Bank 2021; Oteng-Ababio, 2020). While the public sector sets the institutional and regulatory framework, the private sector, with the operational capacity, organizes

long-term waste collection, transportation, and final solid waste disposal. Ghana follows the "end-of-pipe approach" to SWM, where solid waste is collected and disposed of in landfills (World Bank, 2021). These final disposal sites are often located in ecologically sensitive neighbourhoods, including abandoned valleys without proper leachate or gas recovery systems (Oteng-Ababio, 2020). Therefore, their maintenance falls short of the legally set standards for safeguarding public health and environmental quality. These sites tend to be disturbingly degraded, but typically, environmental pollution becomes a veritable buzzword, adapted inadequately or uncritically to mask actions or inactions of the city authorities who ought to have done better (Owusu-Sekyere et al., 2017). Such an environment runs the potential of institutionalizing unsustainable structures, processes, and consequences; as a result, the emphasis must be shifted to comprehending these socio-ecological shifts and dynamics within the broader Ghanaian context.

### 3. Methodology

#### 3.1. Study area

The study was conducted in four cities in the Savannah ecological zone of Ghana. The cities are Tamale, Sagnarigu, Wa and Bolgatanga (Figure 3). These cities were strategically chosen because of their high population, urbanization and economic activities. The four cities have a combined population of 1,056,991 (Table 1), representing 21% of the entire population of Northern Ghana (GSS, 2021). The combined urbanized population in these cities is 83.4% compared to the national average of 56.7% (GSS, 2021).

#### 3.2. Research design, data collection, and analysis

The mixed research design (concurrent triangulation mixed method design) was adopted as a cross-sectional study. This design aimed to obtain different but complementary data to best understand the research problem (Morse, 1991). The concurrent mixed method design is used to

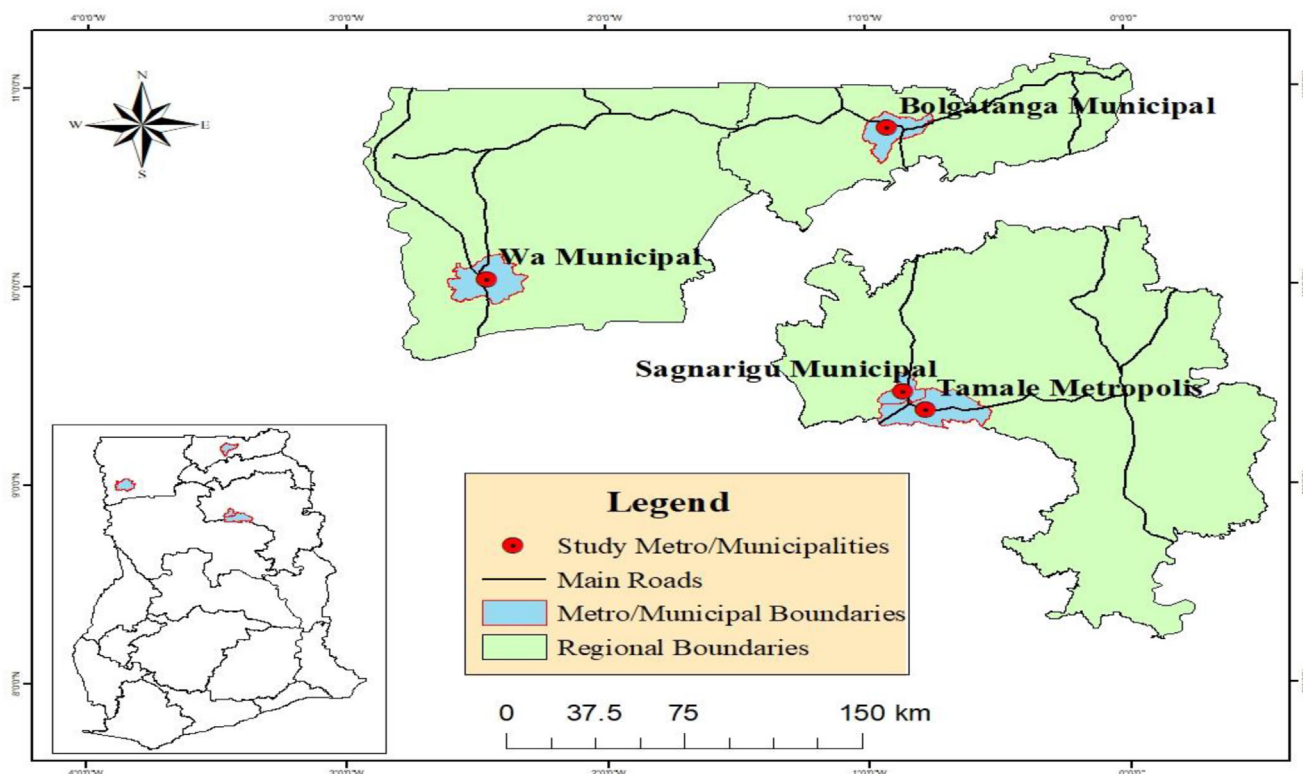


Figure 3. Maps of Ghana showing the study communities.



**Table 1.** Household waste generation trend in the study area.

Municipality	2010	Ton/day	2021	Ton/day
Bolgatanga	131,550	29	139,864	66
Wa	107,214	29	200,672	94
Tamale	371,351	127	374,744	176
Sagnarigu	-	-	341,711	161
<b>Total</b>	<b>610,115</b>	<b>182</b>	<b>1,056,991</b>	<b>497</b>

Source: Miezah et al. (2015); GSS, 2012, 2021.

better understand the research area. This is achieved by concurrently collecting both qualitative and quantitative data, analyzing them separately and merging the two results for interpretation (Terrel, 2012). Using the Wasteaware Benchmark Indicator Framework as a guide, data on governance were collected through a questionnaire administered to seventy (70) purposively selected respondents. The respondents were selected from the following departments/units/committees, as detailed in Table 2.

The departments and respondents were selected due to their direct involvement, deep expertise and knowledge of issues of solid waste governance. The key areas of governance and the number of indicators used were stakeholder inclusivity (12 indicators), financial viability and sustainability (4 indicators), national policy and institutional adequacy (8 indicators), and local institutional adequacy (11 indicators). Descriptive statistics were used to present the data. Association between viewpoints was analyzed using the Spearman correlation coefficient (Rho) at a 95% confidence interval. Independent t-test analysis was used to establish equality of means of governance indicators being adequate or inadequate among study municipalities. Leven statistics was used to test the homogeneity of variances for indicator measures of PPP principles for the analysis of variance (ANOVA).

**Table 2.** Departments and number of participants selected for the questionnaire.

Department/unit/Committee	Number of respondents	Designations	Remarks
Waste Management Companies	8	Regional Managers, Operation Managers	Two participants each from four companies
Waste Management Department (WMD)	2	Director of Waste Management and Solid Waste Officer	Two participants from Tamale Metropolis
Environmental Protection Agency (EPA)	4	Regional Directors/Scheduled officer	One participant each from four municipalities
Municipal Environmental Health Unit (MEHU)	8	Municipal Environmental Health Officer, officers in charge of solid waste	Two participants each from four municipalities
Environment and Social Services Committee	8	Chairman of the committee, deputy or any other member	Two participants each from four municipalities
Local Municipal Assembly	16	Assembly members	Four participants each from four municipalities
Regional Environmental Health Unit	4	Regional Environmental Health Officers (REHOs)	One participant each from four municipalities
Informal waste collectors	8	Operators of plastic buy-back centres	Buyers and pickers
Sachet water producers associations	4	Municipal chairpersons of associations	One participant each from four municipalities
Traditional Authorities	8	Major chiefs and queen mothers	Two participants in each of the four municipalities
<b>Total</b>	<b>70</b>		

In addition, qualitative data were collected through in-depth interviews with the research participants from waste collection companies, waste management departments, and environmental health units. The issues discussed are resource adequacy, waste management strategy and stakeholder participation. The interviews were audio-recorded and transcribed. The transcripts were validated against the audio files and imported to NVivo 11.0 software for analysis. Through the processes of induction and deduction, content analysis was done. The transcripts were thoroughly read to determine the patterns of views of participants. A follow-up process to classify views into sub-themes was undertaken. Through inductive analysis, sub-themes were merged into main themes. The results were presented as narratives supported by quotes from participants. Compliance with the guiding governance principles was based on a scale of 1 (very low) to 10 (very high). Nine (9) key principles were assessed, including value for money, accountability, competitiveness, broader stakeholder participation, service affordability, clear objectives and targets for agreements, roles and responsibilities for partners, length of the agreement, and general performance on service delivery. These nine principles are spelt out in the waste management policy to guide the operationalization of private sector participation in the waste management industry in Ghana. Ethical considerations of informant approval, confidentiality and consequences have carefully adhered. Permission was also sought from all the study participants. Consent was obtained from the ethical review board of the Faculty of Natural Resources and Environment, University for Development Studies.

## 4. Results and discussion

### 4.1. Stakeholder participation in MSWM

Stakeholder engagement is one of the mechanisms for building relationships with stakeholders in the waste management sector to gain their support for waste management policies, programs, and plans (US EPA, 2020). Stakeholder involvement has become an essential part of MSWM and one of the cornerstones for successful and sustainable waste management. Identifying stakeholders' roles, power, and relationships are useful in assessing the performance of municipal solid waste institutional governance. Table 3 shows the key stakeholders and their roles.

The research assessed the extent of key stakeholder inclusivity in the waste management process across all the municipalities selected for the study. Details of stakeholder inclusivity in waste management are shown in Table 4. Meetings, awareness, consultations, and collaborations were used to assess stakeholder involvement. Stakeholder meetings were organized quarterly. The involvement of stakeholders in the meeting was good but not effective. This is because meetings were organized to disseminate information on decisions on waste management policies and programmes instead of involving stakeholders in decision-making and planning.

Regarding consultation, customers were left out of solid waste management decisions and planning. Stakeholders, especially service users, were informed at the implementation stages of strategies and plans. This was a major weakness in the waste management governance system. Regarding collaboration, the informal sector, a major stakeholder in the industry, was not adequately recognized and situated within the management systems despite their enormous contributions (Table 4). These findings were corroborated by the Municipal Environmental Health Officer for Bolgatanga in an interview:

"The Assembly does not regulate the activities of informal waste collectors such as scavengers. They ravage the dumpsites, collecting anything they consider valuable. Most of them do not wear personal protective equipment, exposing them to cuts from sharps in the waste. What is disturbing about their operations is their engagement in illegal dumping. They play an important role in resource recovery and separation. I think it is time to regulate their activities to bring sanity into the waste management system."

**Table 3.** Key stakeholders and their roles in solid waste management.

Stakeholder	Examples	Roles	Interest
Waste generators	Households, institutions, industries	Pay for services	Good services
Waste companies	Zoomlion Ghana Limited, Waste Landfills Company Limited etc	Provide waste management services	Make profit
National government agencies	EPA, MLGRD, MSWR, MMDAs, MESTI	Formulate policies and regulations	Provide enabling environment for quality service delivery
Local government agencies	MMDAs, EPA	Supervision and monitoring of services according to standards	Compliance with set standards
NGOs	ESPA, CONNIWAS, UNICEF	Advocacy and sensitization	Behavioural change
Local Authorities	Assembly members, unit committee members	Community mobilization	Active participation of citizens
Traditional Authorities	Chiefs, Queen mothers, <i>Tendaabas</i>	Community mobilization	Obtain benefits for traditional area
Informal waste collectors	Scavengers, Tricycle waste collectors ( <i>Aboboyas</i> )	Recover materials from waste	Make livelihood

The results of this study were supported by a study in Accra by Oteng-Ababio in 2010. He observed that informal waste collectors were not included in the governance structure in Ghana. A study by Baud et al. (2004) identified the exclusion of informal collectors as a major issue. This was a major policy gap revealed by the research that has to be addressed to tap into the huge potential presented by the informal sector. In stressing the need for the involvement of the informal sector, Owusu-Sekyere (2019) indicates the regulation of the activities of the informal sector, such as scavengers and tricycle collectors and bringing them into the formal sector would greatly contribute to waste collection, sorting and source separation programmes. According to collaboration and synergy among various actors were necessary for improved performance. However, this was weak, especially between the government (MMDAs) and the informal sector.

Consultation and collaboration among stakeholders, especially customers (waste generators) and service providers, are fundamental for effective waste management. According to World Bank (2021), the consultation serves as the right of participation of stakeholders in waste management planning. Majority of respondents (73.7 % in Bolgatanga and 77.8 % in Wa) believed there was not adequate consultation of stakeholders in waste management planning and decision-making. These findings completely differed from Adongo et al. (2015), where 91% of stakeholders stated service providers adequately consulted them during decision-making. The variations may be due to the differences in the number and nature of participants in the study. While this study included a vast number of stakeholders (68) spanning a wide variety of backgrounds, Adongo et al. (2015) sought the opinions of 11 stakeholders.

Public education and awareness are fundamental in changing attitudes towards indiscriminate dumping and waste management programmes. Public sensitization creates support for waste management programmes and policies and helps to manage stakeholder expectations (World Bank, 2021; US EPA, 2020). On how often waste management companies conducted public sensitization, 46% of stakeholders said sensitization programmes were organized daily, 19% said monthly, and 36% said quarterly (Table 4). Adongo et al. (2015) found that 64% of stakeholder organizations in Tamale organized at least one workshop annually to sensitize stakeholders and that sensitization was mainly through mass media differed from the results of this study.

#### 4.2. National institutional adequacy

An effective institutional framework is a bedrock for delivering a well-functional integrated waste management governance at all levels (World Bank, 2021). The research assessed respondents' perspectives on national policy and institutional adequacy. Differences in views on all eight indicators of national policy and institutional adequacy among respondents and municipalities were not correlated or significant (Table 5).

Though waste management policies were believed to be largely comprehensive, major policy gaps negatively impacted governance and service delivery. There were no clear guidelines for executing national strategy at the local level. This gap created a misalignment in policy focus between national and local levels. In supporting this, a key informant from one of the waste management companies in Tamale indicated:

"Authorities of MMDAs at the local level were not abreast of the changing trend of the national policy environment. Though national policies were focused on recovery, processing and circular economy, many local level plans and actions were focused on addressing operational challenges in collection and disposal".

Weak coordination and collaboration among key institutions were identified as a policy gap. This view was confirmed in an interview with a Regional Environmental Health Officer for Upper West Region, who stated:

"Some policies are outdated and do not fit the current situation. There are also duplications of roles among sector ministries".

The issue of weak coordination and collaboration is in the report of the MSWR (2020a,b), which states:

"Various policies were situated within different ministries that do not coordinate effectively. For example, major solid waste contract SIP rested with MLGRD, while sectorial responsibility was with MSWR."

The World Bank (2021) indicates that national-level policies and institutions must be replicated locally to effectively coordinate MSWM activities. Table 6 presents the results of the regional institutional analysis.

From all indications, MSWM in the municipalities were largely not guided by municipal-level plans and strategies provided in the national strategy. For the municipalities with a plan (Tamale and Wa), implementation was either not done or poorly executed. It was found that waste management departments were inadequately resourced, and therefore, monitoring, supervision and evaluation of private service providers were ineffective. Oduro-Kwarteng (2009) corroborated these findings by stating assemblies had limited capacity and resources to monitor and supervise private collection contractors to deliver services according to the standards specified in the agreements. It also emerged that all municipalities had legal frameworks in the form of bye-laws to regulate waste management, but these were not adequately implemented. These findings reflected the reality on the ground as many Assemblies failed to prosecute residents who flouted waste management bye-laws. Boateng et al. (2019) reported that Ghana had a robust institutional and legal regime for solid waste management but is challenged by noncompliance and lack of enforcement issues. According to Lissah et al. (2021), the lack of action in enforcing laws is part of the motivation for indiscriminate dumping leading to inefficiency in waste collection.

#### 4.3. Financial management

It has been argued that the financing policy influences decisions on sourcing and expending funds for solid waste management. A good financing policy should clearly define issues of user charges, cost recovery, tariff regulation and subsidies (World Bank, 2021). Stakeholders

Table 4. Stakeholder inclusivity.

Statements	Responses	Municipality/Metropolis				Rho	P-value
		Sagnarigu	Tamale	Bolgatanga	Wa		
All sections of the town receive solid waste management service	No	8 50.0%	11 64.7%	17 89.5%	13 72.2%	-0.214	0.076
	Yes	8 50.0%	6 35.3%	2 10.5%	5 27.8%		
Customers of waste management services consulted in waste management	No	7 43.8%	7 41.2%	14 73.7%	14 77.8%	-0.308	0.010
	Yes	9 56.3%	10 58.8%	5 26.3%	4 22.2%		
A complaint redressal system is in place for the public	No	9 56.3%	8 47.1%	3 15.8%	13 72.2%	-0.049	0.687
	Yes	7 43.8%	9 52.9%	16 84.2%	5 27.8%		
Stakeholders' meetings organized	Monthly	4 25.0%	2 11.8%	2 10.5%	8 44.4%	-0.193	0.110
	Quarterly	11 68.8%	15 88.2%	17 89.5%	10 55.6%		
	Half-Yearly	1 6.3%	0 0.0%	0 0.0%	0 0.0%		
Sanitation sub-committee of the Assembly meet	Monthly	2 12.5%	3 17.6%	2 10.5%	8 44.4%	-0.119	0.328
	Quarterly	14 87.5%	13 76.5%	14 73.7%	8 44.4%		
	Half-Yearly	0 0.0%	1 5.9%	3 15.8%	2 11.1%		
How frequently does the waste management/ environmental health unit carry out public sensitization	Daily	4 25.0%	7 41.2%	13 68.4%	8 44.4%	-0.145	0.230
	Monthly	4 25.0%	4 23.5%	3 15.8%	2 11.1%		
	Quarterly	8 50.0%	6 35.3%	3 15.8%	8 44.4%		
Partners' participation in meetings of the environment and sanitation sub-committee	No	4 25.0%	3 17.6%	7 36.8%	5 27.8%	-0.071	0.561
	Yes	12 75.0%	14 82.4%	12 63.2%	13 72.2%		
Private partners consulted during annual budget preparation on waste management and sanitation	No	9 56.3%	8 47.1%	10 52.6%	9 50.0%	0.026	0.829
	Yes	7 43.8%	9 52.9%	9 47.4%	9 50.0%		
Informal waste collectors/scavengers are organized into an association, and their activities are regulated	No	16 100.0%	14 82.4%	17 89.5%	15 83.3%	0.141	0.244
	Yes	0 0.0%	3 17.6%	2 10.5%	3 16.7%		
The standard mechanism for the determination of waste collection fees in the Assembly	No	9 56.3%	11 64.7%	10 52.6%	15 83.3%	-0.162	0.179
	Yes	7 43.8%	6 35.3%	9 47.4%	3 16.7%		
Processes for contracting private waste management companies transparent	No	5 31.3%	4 23.5%	12 63.2%	15 83.3%	-0.443	0.000
	Yes	11 68.8%	13 76.5%	7 36.8%	3 16.7%		
Members of the Assembly have an idea of the processes involved in engaging private waste collectors	No	5 31.3%	3 17.6%	11 57.9%	17 94.4%	-0.523	0.000
	Yes	11 68.8%	14 82.4%	8 42.1%	1 5.6%		

**Table 5.** National policy and institutional capacity.

Statements	Responses	Selected Study Areas				Rho	P-value
		Sagnarigu municipal	Tamale metropolis	Bolgatanga municipal	Wa municipal		
Policies that govern solid waste management in Ghana	No	1 6.3%	5 29.4%	2 10.5%	4 22.2%	-0.077	0.529
	Yes	15 93.8%	12 70.6%	17 89.5%	14 77.8%		
Are the policies comprehensive	No	7 43.8%	12 70.6%	5 26.3%	8 44.4%	0.099	0.401
	Yes	9 56.2%	5 29.4%	14 73.7%	10 55.6%		
Gaps in the policies	No	5 31.3%	5 29.4%	17 89.5%	15 83.3%	-0.492	0.000
	Yes	11 68.8%	12 70.6%	2 10.5%	3 16.7%		
National strategy for addressing solid waste management	No	3 18.8%	5 29.4%	2 10.5%	2 11.1%	0.129	0.288
	Yes	13 81.3%	12 70.6%	17 89.5%	16 88.9%		
Clear guidelines for implementing the national strategy at the local level	No	8 50.0%	10 58.8%	5 26.3%	9 50.0%	0.073	0.550
	Yes	8 50.0%	7 41.2%	14 73.7%	9 50.0%		
A single institution that coordinates the implementation of a solid waste management strategy	No	4 25.0%	9 52.9%	12 63.2%	9 50.0%	-0.178	0.141
	Yes	12 75.0%	8 47.1%	7 36.8%	9 50.0%		
How effective institutions coordinates and collaborate in solid waste management	Not effective	15 93.8%	11 64.7%	8 42.1%	16 88.9%	0.072	0.554
	Effective	1 6.3%	6 35.3%	11 57.9%	2 11.1%		
A regulatory agency (EPA) enforces the legislation on solid waste management	No	11 68.8%	10 58.8%	15 78.9%	14 77.8%	-0.120	0.321
	Yes	5 31.3%	7 41.2%	4 21.1%	4 22.2%		

included in this study unanimously concluded that the yearly budget and revenue from waste services were inadequate to pay for the full cost of waste management services in the municipalities (see Table 7).

For solid waste funding to be sustainable, revenue from the sector should at least cover the cost-of-service provision (World Bank, 2021). Still, the contrary was the case for the study municipalities. A few people pay for waste collection services, and the rates barely cover the cost of services. In support of these findings, a Regional Manager of a private waste collection company explained that:

"The rates we currently charge are too low. This makes it extremely difficult to sustain our business. We currently charge between GHc30 and GHc50 per month for house-to-house collection with 240L waste bins. If we have to sustain our business and run profitably under current economic challenges, our rates should not be lower than GHc100 per month for servicing a waste bin".

This assertion gives credence to how unsustainable the existing funding arrangement for waste management services is. According to Kumar et al. (2017) and Yukalang et al. (2017), one of the key challenges of solid waste management is sustainable financing. In supporting this, (Boateng et al. (2019) opined that waste management companies do not realize enough revenue from services due to low rates and service users' unwillingness or inability to pay. These findings were also affirmed by the results of the study by Obirih-Opareh and Post (2002), who

concluded that one of the major drawbacks of the nature of privatization in the solid waste industry in Ghana is the lack of financial sustainability caused by low governmental support (Spearheaded by political promises.

#### 4.4. Overall performance of institutional indicators in solid waste governance

The research finally assessed the arithmetic scale findings for the overall performance of the institutional governance indicators (Table 8).

These results show that stakeholder inclusion in waste management was generally low in the study areas. In addition, the variation in respondents' views on stakeholder inclusivity was significant across all municipalities (rho = -0.397, p-value = 0.001). Financial arrangements for solid waste management were generally considered unsustainable in all municipalities. Despite some policy gaps, respondents ranked national and local institutional capacity very highly. Statistically, the variation in respondents' views among municipalities was significant (rho = -0.311, p-value = 0.009). The level of significance in perception between being adequate or inadequate of the governance indicators was established through an independent t-test (Table 9).

The results showed that stakeholder inclusion (adequate or inadequate) was significantly different among the four study municipalities. Also, there was a statistically significant difference in the mean between the selected study areas (municipalities) on the adequacy of local



Table 6. Local institutional adequacy.

Statements	Responses	Municipalit/Metropolis				Rho	P-value
		Sagnarigu	Tamale	Bolgatanga	Wa		
The function of the solid waste management service provider is concentrated in one department	No	6 37.5%	8 47.1%	10 52.6%	13 72.2%	-0.244	0.041
	Yes	10 62.5%	9 52.9%	9 47.4%	5 27.8%		
The waste management department is adequately resourced in human and equipment resources	No	13 81.3%	16 94.1%	18 94.7%	18 100.0%	-0.238	0.047
	Yes	3 18.8%	1 5.9%	1 5.3%	0 0.0%		
Municipality/metropolia have a solid waste management strategy	No	3 18.8%	5 29.4%	5 26.3%	7 38.9%	-0.139	0.251
	Yes	13 81.3%	12 70.6%	14 73.7%	11 61.1%		
A solid waste management strategy is implemented	No	8 50.0%	10 58.8%	5 26.3%	12 66.7%	-0.042	0.732
	Yes	8 50.0%	7 41.2%	14 73.7%	6 33.3%		
Data on solid waste is collected	No	4 25.0%	2 11.8%	3 15.8%	10 55.6%	-0.252	0.035
	Yes	12 75.0%	15 88.2%	16 84.2%	8 44.4%		
Mode of solid waste data collection	Manually	8 50.0%	8 50.0%	14 77.8%	15 100.0%	-0.452	0.000
		Electronically	0 0.0%	0 0.0%	3 16.7%		
	Both	8 50.0%	8 50.0%	1 5.6%	0 0.0%		
Solid waste service providers are effectively supervised and monitored	No	6 37.5%	8 47.1%	11 57.9%	15 83.3%	-0.334	0.005
	Yes	10 62.5%	9 52.9%	8 42.1%	3 16.7%		
Municipal Assembly has bye-laws on sanitation	No	3 18.8%	3 17.6%	4 21.1%	1 5.6%	0.113	0.350
	Yes	13 81.3%	14 82.4%	15 78.9%	17 94.4%		
Sanitization bye-laws are implemented	No	8 50.0%	11 64.7%	4 21.1%	12 66.7%	-0.015	0.900
	Yes	8 50.0%	6 35.3%	15 78.9%	6 33.3%		
Bye-laws are gazetted	No	4 25.0%	4 23.5%	7 36.8%	14 77.8%	-0.395	0.001
	Yes	12 75.0%	13 76.5%	12 63.2%	4 22.2%		
Copies of bye-laws are available and accessible	No	5 31.3%	12 70.6%	9 47.4%	16 88.9%	-0.332	0.005
	Yes	11 68.8%	5 29.4%	10 52.6%	2 11.1%		

institutional capacity. In terms of the factors examined, however, there was no significant difference between the two respondent groups of local institutional capacity being adequate or inadequate ( $p$ -value  $> 0.05$ ).

#### 4.5. Compliance with principles of solid waste management policies

The public-private partnerships policy in social infrastructure reflects the government's desire to provide quality, cost-effective and timely public infrastructure and services. The adoption of the policy also indicates the government's commitment to adhere to the requisite legal, regulatory financial, and administrative framework for eliminating

bottlenecks in public-private partnership arrangements (MOFEP, 2011). The existing social infrastructure governance structure has key principles for all key stakeholders to comply with, including value for money, accountability, transparency, competition, stakeholder consultation, and clear objectives and targets. Others include affordability, efficient risk allocation, fairness, local content and safeguarding of public interest and consumer rights. There are four governance areas all key stakeholders are expected to comply with regarding solid waste management. These are sanitation improvement package (SIP), waste and sanitation module (WSM), door-to-door waste collection franchise (DDCF) and landfill management (FLM). Table 10 presents the detailed result of compliance with the four governance areas.

**Table 7.** Results of sustainable and transparent financial arrangement.

Statements	Responses	Municipality/Metropolis				Rho	P-value
		Sagnarigu	Tamale	Bolgatanga	Wa		
The annual budget for waste management is adequate to cover the full cost of providing waste management services	No	16	14	19	18	-0.107	0.349
		100.0%	82.4%	100.0%	100.0%		
	Yes	0	3	0	0		
		0.0%	17.6%	0.0%	0.0%		
Assembly members have full and accurate information on the cost of solid waste management within the municipality	No	13	16	14	15	0.047	0.702
		81.3%	94.1%	73.7%	83.3%		
	Yes	3	1	5	3		
		18.8%	5.9%	26.3%	16.7%		
Solid waste management service fees are affordable	No	7	11	10	8	0.031	0.796
		43.8%	64.7%	52.6%	44.4%		
	Yes	9	6	9	10		
		56.3%	35.3%	47.4%	55.6%		
Those who cannot afford waste management services are catered for	Free Services	7	9	15	11	-0.171	0.156
		43.8%	52.9%	78.9%	61.1%		
	Subsidized Rate	9	8	4	7		
		56.3%	47.1%	21.1%	38.9%		

**Table 8.** Performance of institutional governance in solid waste management.

Theme	Scale	Municipality. Metropolis				Rho	P-value
		Sagnarigu	Tamale	Bolgatanga	Wa		
Stakeholder inclusivity	Low	8	8	12	18	-0.397	0.001
		50.0%	47.1%	63.2%	100.0%		
	High	8	9	7	0		
		50.0%	52.9%	36.8%	0.0%		
Sustainable financial arrangement	Low	14	15	15	16	0.015	0.904
		87.5%	88.2%	78.9%	88.9%		
	High	2	2	4	2		
		12.5%	11.8%	21.1%	11.1%		
National policy and institutional adequacy	Low	9	7	11	12	-0.156	0.213
		56.3%	43.8%	68.8%	70.6%		
	High	7	9	5	5		
		43.8%	56.3%	31.3%	29.4%		
Local institutional adequacy	Low	5	9	7	15	-0.311	0.009
		31.3%	52.9%	36.8%	83.3%		
	High	11	8	12	3		
		68.8%	47.1%	63.2%	16.7%		

Overall, the results suggested that compliance with service agreements was low. For instance, SIP, DDCF, and WSM agreements ranked slightly above average except for the principle of competitiveness which was rated exceptionally low ( $\geq 2.5$ ). LFM, on the other hand, ranked

below average in compliance except for the principle of local content. The implication of the results points to the lapses in the waste management governance structure, which include inefficient procurement processes, poor supervision, and monitoring and evaluation of private

**Table 9.** Independence T-test for Equality of Means of performance indicators on solid waste governance.

Indicators	Comparison Between	t	df	95% Confidence Interval of the Difference		p-value
				Lower	Upper	
Stakeholder inclusivity	Selected study areas	3.513	68	0.39356	1.42890	<b>0.001</b>
	Respondent category	1.115	68	-0.15296	0.54064	0.269
Adequacy of financial arrangement	Selected study areas	-0.131	68	-0.81315	0.71315	0.896
	Respondent category	0.916	68	-0.25514	0.68847	0.363
National policy and institutional adequacy	Selected study areas	1.257	63	-0.21190	0.92985	0.214
	Respondent category	0.285	63	-0.30873	0.41129	0.777
Adequacy of local institutional capacity	Selected study areas	2.682	68	0.17483	1.19119	<b>0.009</b>
	Respondent category	1.724	68	-0.04428	0.60638	0.089

**Table 10.** Results of compliance with Ghana's SWM governance principles.

Principle	Service Agreement	N	Mean	Std. Deviation	Std. Error
Value for money	SIP	68	7.00	0.816	0.408
	DDCF	68	7.25	0.957	0.479
	WSM	68	6.25	0.500	0.250
	LFM	68	3.75	1.500	0.750
Accountability	SIP	68	5.50	0.577	0.289
	DDCF	68	6.50	0.577	0.289
	WSM	68	6.00	0.816	0.408
	LFM	68	3.00	0.816	0.408
Competitiveness	SIP	68	2.00	0.816	0.408
	DDCF	68	2.50	1.732	0.866
	WSM	68	2.25	0.500	0.250
	LFM	68	2.00	0.816	0.408
Stakeholder consultation	SIP	68	6.50	0.577	0.289
	DDCF	68	6.25	0.957	0.479
	WSM	68	7.75	0.957	0.479
	LFM	68	5.00	0.816	0.408
Affordability	SIP	68	7.25	0.500	0.250
	DDCF	68	5.25	1.500	0.750
	WSM	68	6.00	0.816	0.408
	LFM	68	5.00	0.816	0.408
Local content	SIP	68	8.00	0.816	0.408
	DDCF	68	7.25	0.500	0.250
	WSM	68	6.00	1.414	0.707
	LFM	68	8.00	0.816	0.408
Clear objectives and targets	SIP	68	6.25	0.957	0.479
	DDCF	68	6.75	1.258	0.629
	WSM	68	6.25	0.500	0.250
	LFM	68	4.75	0.957	0.479
Clear roles and responsibilities of partners	SIP	68	6.50	0.577	0.289
	DDCF	68	6.25	0.500	0.250
	WSM	68	7.00	0.816	0.408
	LFM	68	4.50	0.577	0.289
Period of agreement	SIP	68	4.00	0.000	0.000
	DDCF	68	4.50	1.000	0.500
	WSM	68	2.50	1.000	0.500
	LFM	68	4.00	0.000	0.000
General Performance	SIP	68	6.75	0.957	0.479
	DDCF	68	7.25	1.258	0.629
	WSM	68	6.00	0.816	0.408
	LFM	68	2.25	0.957	0.479

partners by public agencies. Undoubtedly, a lack of compliance with agreed waste governance principles could reduce the outcome of privatization, a view shared by (Massoud and El-Fadel, 2002).

The key informant interviews unearthed issues with the application of funds that the government pays for waste collection services. Stakeholders believed there was no excellent value for money for waste collection services. In an explanation, a Metropolitan Director of the Waste Management Department at the Tamale Metropolitan Assembly said:

"The current solid waste collection contracts were based on several collection containers and trucks. This was not the best way to structure an agreement. The contract should have been based on the quantity of waste hauled, with the cost per ton of waste explicitly stated in the contract."

Findings of respondents' perception about the competitiveness of the processes in selecting private partners for the waste collection were extremely low for all the contracts. These perceptions confirmed the reality on the ground as the study revealed that one company (Zoomlion

**Table 11.** ANOVA between and within municipalities on compliance with waste governance principles.

ANOVA	Comparison	Sum of Squares	Mean Square	F	p-value
Value for money	Between Municipalities	30.688	10.229	10.020	0.001
	Within Municipalities	12.250	1.021		
Accountability	Between Municipalities	29.000	9.667	19.333	0.000
	Within Municipalities	6.000	0.500		
Competitiveness	Between Municipalities	0.688	0.229	0.200	0.894
	Within Municipalities	13.750	1.146		
Stakeholder consultation	Between Municipalities	15.250	5.083	7.176	0.005
	Within Municipalities	8.500	0.708		
Affordability	Between Municipalities	12.250	4.083	4.261	0.029
	Within Municipalities	11.500	0.958		
Local content	Between Municipalities	10.688	3.563	3.977	0.035
	Within Municipalities	10.750	0.896		
Clear objectives and targets	Between Municipalities	9.000	3.000	3.273	0.059
	Within Municipalities	11.000	0.917		
Clear roles and responsibilities of partners	Between Municipalities	14.188	4.729	11.947	0.001
	Within Municipalities	4.750	0.396		
General Performance	Between Municipalities	61.688	20.563	20.143	0.000
	Within Municipalities	12.250	1.021		

Ghana Limited) managed all four PPP contracts. These findings were not in sync with best practices for the solid waste contract. Cointreau-Levine (1994) and Obirih-Opareh and Post (2002) emphasized this point by concluding that the efficiency of private sector participation can be improved by building keen competitive mechanisms to avoid monopoly.

Analysis of variance (ANOVA) (Table 11) was conducted to determine the level of significance of respondents' perceptions between and within municipalities. The model fitness of variance difference was assessed using Levene's statistical test, which showed no homogeneity thus far; the ANOVA established compliance of indicators to PPP principles between and within the four municipalities.

The findings showed a significant statistical difference between and within municipalities in ensuring value for money, accountability, stakeholder consultation, local content, clear roles and responsibilities of partners, and improving general performance at a 95% confidence interval (Table 8).

### 5. Conclusion and recommendation

Without any doubt, Ghana is experiencing increasing growth generation of solid waste due to increasing population and economic development. The problem's core is developing an inclusive governance system that can lead to sustainable solid management practices. The article has sought to ground existing SWM governance approaches in an evidence-based manner by unearthing how unsustainable the current practice may be. The key issue that emerged was that SWM was not being governed

in an integrated manner. In other words, the individual interconnected units within the entire waste governance structure are not functioning effectively to give meaning to the system as prescribed by the systems theory. Even more intriguing is the noncompliance with the SWM governance principles all stakeholders have jointly developed and pledged to comply. Using the systems approach to understand the interconnectedness of the environmental, economic and social sustainability principles, we observed that the complementary roles of the key stakeholders that could foster a harmonious relationship among the three were missing. The findings indicate that although Ghana has comprehensive SWM policies, there are policy disconnections between national and local institutions regarding aspirations. There is also weak institutional coordination and collaboration among relevant state agencies and stakeholders. Finally, the weak involvement of the informal sector has negatively affected solid waste governance and service delivery.

We argue that Ghana's case provides a good example for countries facing SWM problems, highlighting the void between theory and practice. It reinforces that waste governance in the Ghanaian context has become a veritable buzzword, adopted uncritically to mask actions or inactions of key stakeholders who ought to comply with the agreed principles enshrined in the SWM policies. The article contributes to the SWM literature in several ways. First, it broadens the understanding of how noncompliance with SWM principles has the potential to affect waste management sustainability and secondly, it showcases the importance of re-aligning national plans and priorities with local-level strategies to achieve compliance. Finally, it offers practical insights for policymakers to streamline the roles and responsibilities of state actors to eliminate duplications. Finally, the article enhances the understanding of and expands the World Bank's position that waste governance has a critically empowering character to ensure that the capacities and resources of waste management institutions match their responsibilities and desires. Based on the key findings, we recommend that waste managers should begin to think of a collaborative governance system which combines several frameworks to reflect the diverse nature of SWM and which underpins current approaches to managing urban social services. Such an approach will allow the expertise of key formal and informal stakeholders to be tapped to ensure sustainable solid waste management. More importantly, local strategies and plans should align with national priorities. This alignment will lead to the co-production of strategies and foster shared ownership of knowledge that can help plan and deliver waste management services. This is important because, in the SWM industry, the co-production of strategies reflects the logic of togetherness, an ingredient needed for sustainable social service delivery. Finally, the research advocates for the need to streamline the roles and responsibilities of state actors to eliminate duplications, as, in the long run, duplications are costly with little or no efficient results.

## Declarations

### Author contribution statement

Ebenezer Owusu-Sekyer: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Emmanuel Volsuuri: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Abubakari Zarouk Imoro: Performed the experiments; Wrote the paper.

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Data will be made available on request.

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The authors declare no conflict of interest.

## Additional information

No additional information is available for this paper.

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