



Quality analysis of solid waste management services in Ghana: A gap score approach



Emmanuel Volsuuri^{a,b}, Ebenezer Owusu-Sekyere^{a,*}, Abubakari Zarouk Imoro^c

^a Department of Environment and Sustainability Sciences, Faculty of Natural Resources and Environment, University for Development Studies, Tamale, Ghana

^b Africa Environmental Sanitation Consult, P. O. Box 2516, Madina-Accra, Ghana

^c Department of Environment, Water and Waste Engineering, School of Engineering, University for Development Studies, Tamale, Ghana

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ABSTRACT

Ghanaian cities are caught in a double bind. On the one hand, their solid waste management (SWM) needs are rapidly growing; on the other hand, state-sponsored funding sources are unable to meet the increased demand for quality services. The alternative has been to incorporate the private sector lauded for operational capacity in service delivery. In Ghana, research on private sector participation has usually focused on capital injection, while service quality issues are infrequently discussed. In this study, the gap score analytical framework is used to assess the service quality provided by private SWM companies using 400 household heads who responded to a 23-item questionnaire on five quality dimensions. The gap score for all quality dimensions was -0.31 , indicating poor service quality though individual quality dimensions had variations. For instance, gap scores for Reliability, Responsiveness, Assurance, Empathy and Tangibles were -0.26 , -0.47 , -0.24 , -0.23 and -0.13 . These results, it is argued, provide food for thought in future engagements with private companies in national development.

Introduction

Sustainable waste management in Ghana necessitates complicated structures and processes, and involves many stakeholders (UN-Habitat, 2010; Owusu-Sekyere, 2019). The geographical and conceptual diversity of waste is even more ubiquitous than ever due to the complex dynamics of population increase and economic development, which are regarded as a function of garbage generation (Kyere et al., 2019; Alhassan et al., 2020). In Ghanaian cities, improper waste management has been a persistent concern for citizens and city authorities (Kapepula et al., 2007). The problem has piqued academic and policy interest throughout the years, not because governments are actively modifying their management strategies and policies (UNEP, 2012; Owusu-Sekyere and Nkuah, 2012), but because the various systems in place appear insufficient. This is demonstrated by piles of uncollected trash, clogged gutters, and beaches polluted with plastic debris. To address the problem, state authorities have agreed to the World Bank's cost-sharing suggestion and welcomed the private sector into the waste management system (UN-Habitat, 2011a, 2011b; Oteng-Ababio et al., 2017).

According to the World Bank, the private sector has the operational capacity to organize long-term waste management services in terms of

collection, transportation and final disposal (Post et al., 2003; UN-Habitat, 2010). Alhassan et al. (2020) indicated that door-to-door collection service for instance, has improved since the emergence of the private sector and that the general rate of waste collection, which stood at 40 % of total waste generation increased to over 67 % as of the year 2008. According to other studies, the private sector has introduced and is still implementing integrated waste management strategies throughout the waste management stream, from collection to haulage, transfer, sorting, and recycling (Oteng-Ababio, 2011). In the last fourteen years, private waste companies have constructed waste compost and recycle plants and have generated over one million jobs directly (Alhassan et al., 2020). Despite these useful studies, gaps still exist which require deeper investigation. Accessible data on the quality of service the private sector provides is sparse. Since privatization has become part and parcel of Ghana's development paradigm, there is a need to assess the quality of service the private sector provides. This study fills the gap identified in the literature. The study examines service quality provided by SWM companies in Ghana using the gap-score analytical framework, a robust customer-centric approach to service evaluation. The analysis is approached from the customer perspective since they are at the receiving end of service provision and can provide

* Correspondence to: P.O.Box 1350, Tamale.

E-mail address: osekyere@uds.edu.gh (E. Owusu-Sekyere).

a proper perspective on the performance of the companies (Chingang and Lukong, 2010). The organization of this paper is as follows: after the introduction, the second section explores the evolution of the concept of public-private partnerships in Ghana and also touches on service quality. Section three is devoted to the methodology. In section four, the results are presented and discussed. It is followed by the conclusion and some policy implications for development.

Literature review

The evolution of public-private-partnerships in Ghana

The public-private partnership (PPP) concept can be explained as an agreement between the public and private sectors in which shared responsibilities for service delivery (World Bank Institute; PPIAF, 2012). In such agreements, both parties lay specific objectives to be performed, often public services the third party is expected to perform effectively and efficiently (World Bank Institute; PPIAF, 2012). For PPP arrangements to work effectively, both parties must agree to and get committed to an agreed and workable legal and regulatory framework (UN-Habitat, 2011a, 2011b; World Bank, 2015). In Ghana, the adoption of PPP is underpinned by the principle of value for money which mandates the private sector to provide service commensurate with what customers are paying. The principle of accountability also features prominently in the PPP policy framework. In this case, the agreed processes regarding decisions and objectives must be committed. Other principles include transparency, competition, stakeholder consultation, affordability, and efficient risk allocation.

Historically, contracting out to private entities is deeply traced to Roman Empire when they used similar arrangements to transport grains to inhabitants via private ship owners (Worrell and Vesilind, 2012). However, in modern academic literature, contracting out public services to the private sector under strict rules and regulations is described as a modern development (World Bank Institute; PPIAF, 2012). The concept is closely associated with the New Public Management (NPM) for public services established in the 1980s in the United Kingdom and Australia to streamline public services for efficiency (World Bank Institute; PPIAF, 2012). According to Odier-Bio (2014). The urge to shift from state-managed infrastructure and service in Ghana stemmed from the macroeconomic breakdown resulting from high public debt in the 1970s and 1980s. The involvement of the private sector was believed to be the way to reduce waste in the public sector. However, by the mid-1990s, there was a slowdown in public-private contracting due to social backlash. The backlash was due to public agitation that the private sector players were overlooking the social agenda principle and were making an undue profit at the expense of the public. To forestall public confidence, the government of Ghana developed the first PPPs policy guidelines. These guidelines were, however, not used until 2011, when the present PPP policy framework was enhanced and harmonized with the guidelines (Odier-Bio, 2014).

In solid waste management, PPPs became prominent in the 1990s when the World Bank supported Ghana by implementing Urban Environmental Sanitation Project (UESP) in some major cities from 1997 to 2003 (World Bank, 2018). The project provided financial and technical assistance for private sector participation in solid waste management. Consequently, the project led to an increase in the number of private companies in waste management. Subsequently, it improved the collection rate of solid waste in Ghana from 10–60 % in 1997 to 7–77 % in 2004 (Odoro-Kwarteng et al., 2009). There are various forms of PPPs in solid waste management, including contracting, concession, and franchise (Cointreau-Levine, 1994). Each city adapts a mix of models that fit the local context and are capable of delivering the desired solid waste services.

Ghana's version of privatization has three main forms (UN-Habitat, 2010; World Bank, 2018). The first is contracting, where the government hires private companies to operate disposal sites and conduct

street sweeping, waste collection and other solid waste management services for a set period. Such contracts are usually awarded after a competitive procurement process is exhausted (Alhassan et al., 2017). According to the contract terms, the government reimburses the private enterprise for service performance. The second type is a concession, whereby the government gives a private business permission to build, operate, and own (BOO); or build, operate, own, and transfer (BOOT) waste treatment and disposal facilities (Dinye, 2006). The third form, franchising, allows the government to grant a private company a finite-term zone monopoly (franchise) to provide solid waste collection services (Kyere et al., 2019). An extensive qualification process is followed before the franchise award is given. The private company pays a license fee to cover government oversight costs and deposits a performance bond with the government (Owusu-Sekyere, 2020).

Understanding service quality

The two key concepts of service and quality must first be clarified to understand service quality. A service is an immaterial act that one person renders to another in exchange for a benefit without any transfer of ownership (Kotler and Keller, 2009; Tamilselve, 2016). Meeting customer needs is the primary goal of a service, which eventually results in satisfaction. Therefore, quality is the main factor buyers consider when choosing a service. According to Edvardsson (1998), service should be defined and viewed from the consumer's perspective. Customer satisfaction is the cornerstone of business since customers are seen as the ultimate beneficiaries and greatest judges of service quality. Quality can have several definitions depending on the viewpoint, focus, and context in which it is used (Agbemabiese et al., 2015; Sower and Fair, 2005; Wicks and Roethlein, 2009). Quality can be defined as a service's set of characteristics and properties that enable it to meet customer needs (Kotler et al., 2002). The degree to which service matches a customer's needs is its quality (Anabila et al., 2022). Additionally, it can be described as the magnitude and direction of the discrepancy between consumer perception and expectation (Parasuraman et al. 1985).

The idea of service quality has gone through numerous iterations and phases of refinement in the literature, with the contributions of numerous authors with varying points of view. Lehtinen and Lehtinen (1982) proposed three elements of service quality: interaction, physical, and corporate quality. Service quality was also seen by Gronroos (1984) as a three-dimensional structure composed of functional, technical, and reputational quality. Leblanc and Ngyen's (1988) five-dimensional structural internal organization, corporate image, physical system support, employee-customer interaction, and level of customer satisfaction were additional conceptualizations. Garvin's (1987) nine components were also included (Performance, Features, Reliability, Durability, Service, Conformance, Reliability, Response and Esthetics). Five service quality characteristics known by the acronym SERQUAL were conceived for services by Parasuraman et al. (1985): Tangibility, Assurance, empathy, and Responsiveness. The SERQUAL model for evaluating service quality was improved by Parasuraman et al. (1988).

Even though the model has suffered some criticisms in terms of validity (Carman, 1990), conceptualization (Cronin and Taylor, 1992) and functional orientation (Naik et al., 2010), it remains the most relevant and robust model in contemporary research on service quality (McCollin et al., 2011; Saraei and Amini, 2012). The SERVQUAL model continues to be the strong, legitimate, dependable and desirable version in literature (Rodrigues et al., 2011). Service Quality performance of private sector participation is based on the 3Es (Efficiency, Effectiveness and Equity), Customer Perception, Expectation and Satisfaction. While effectiveness relates to how well solid waste is collected and disposed of according to technical specifications, efficiency relates to how government and private waste company customers and contractors get value for money for the services provided in the field of waste disposal (efficiency). Equity indicates how accessible and affordable

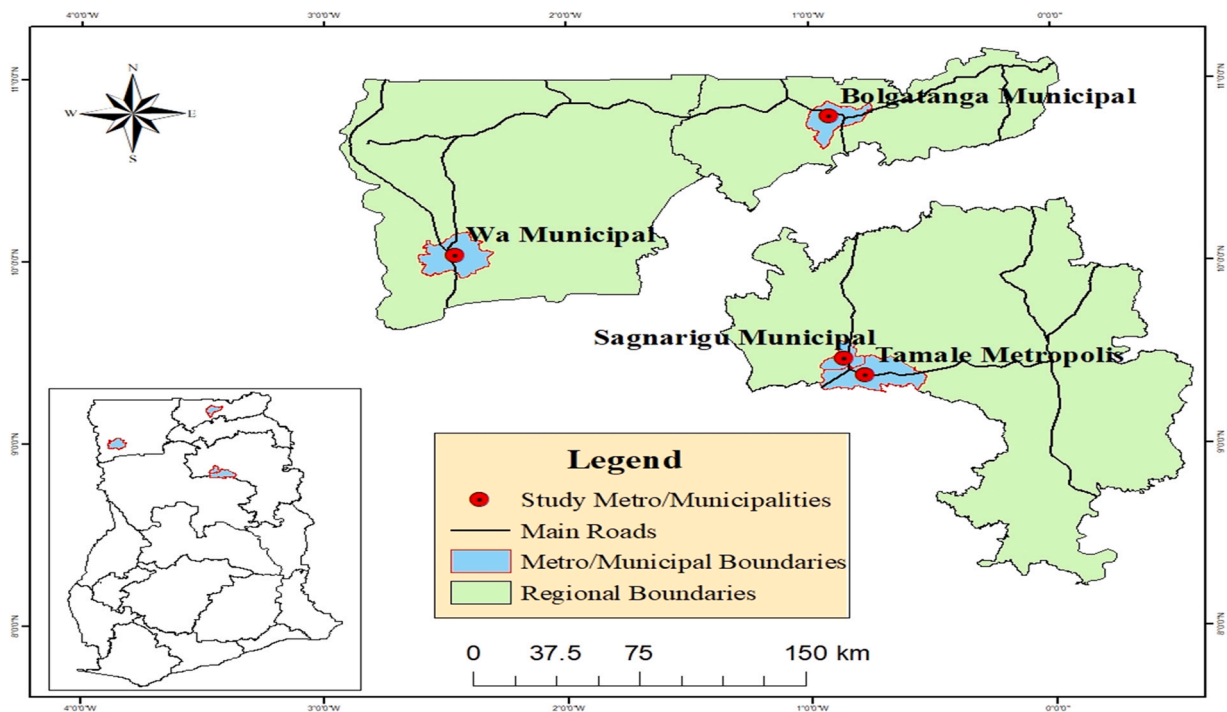


Fig. 1. Maps of Ghana showing the study communities.

solid waste disposal services are to all classes of the public (social efficiency). This research draws on SERVQUAL model with few modifications to assess service quality in the solid waste service industry that is still in its primordial stages of development in Ghana. Service quality is defined for this study as the extent to which waste service customers are satisfied with waste collection on their premises. The concept of quality of service begins with understanding customer expectations and how the perceived service meets expectations. When perceived service falls short of expectations, a gap is created. Analyzing how the gap arises and how it could be closed is the basis for the Gap Model of Service Quality (Odayor, 2003).

Methodology

Study area

The study was conducted in four cities in the Savannah ecological zone of Ghana. The cities are Tamale, Sagnarigu, Wa and Bolgatanga (Fig. 1). These cities were strategically chosen because of their high population, urbanization and economic activities. The four cities have a combined population of 729,609, representing 13 % 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). This trend shows a great future population increment posing possible problems in solid waste management in these cities.

Research design and data collection

As a cross-sectional design, a multistage sampling technique was employed to select communities and heads of households. This technique was used because it was difficult and resource-consuming to sample from all the households. In the first stage, the four communities with the highest population in the Northern ecological zone of Ghana, according to the 2021 population and housing census, were purposively selected. In the second stage, the four communities were each clustered into high-income, middle-income and low-income communities based on an already stratified settlements plan by city authorities. In all,

twelve (12) residential classes were selected. Simple random sampling was used in the third stage to select communities from each clustered residential class. In all, sixty (60) communities, thus five were selected from each of the twelve (12) residential classes within the four (4) study municipalities and metropolis. In selecting the communities, Excel's RAND function was used to generate random numbers for each community.

The total number of households for each sampled community was obtained from the Ghana Statistical Service regional offices. This was to ensure that the total household populations in the various sampled communities were accurate. The lists of the communities were then sorted in increasing order of their corresponding random numbers till the required number of communities within each residential class was selected. This was to remove researcher biasedness. Selected households within the sampled communities were chosen using the last stage of the multistage sampling. A systematic random selection technique was adopted to choose the households for the study. A sampling interval (a fixed periodic interval) was first determined by dividing the number of households in each community by the number of samples apportioned to that community to obtain the number of households to be administered the questionnaire. A convenient sampling technique was used to select houses with waste collection bins, and household heads that were available and willing to respond to the questionnaire.

Determination of sampling frame and sample size

The sample frame for the study was 18,847, which represents the number of households in the study communities with waste bins. With a known sample frame, $N = 18,847$, the sample size was determined through the application of Yamane's (1967) formula for sample size determination; $n = N/[1 + N(\alpha)^2]$, Where; n = sample size, N = Sample frame (all households in the selected study communities), and α = margin of error estimated at (0.05).

$$n = \frac{N}{[1 + N(\alpha)^2]}$$

Substituting the values into the formula,

Table 1
Table for allocation samples among municipalities/metropolis.

S/N	City	MMDA status	2021 population	Study communities	HHs with waste bins	HHs surveyed
1	Wa	Municipality	132,646	15	3773	80
2	Bolgatanga	Municipality	128,548	15	4029	85
3	Tamale	Metropolis	281,619	15	7006	149
4	Sagnarigu	Municipality	186,796	15	4029	86
Total			729,609	60	18,847	400

$$\text{Sample size } (n) = \frac{18,847}{1 + 18,847(0.05)^2} = \frac{18,847}{18,847(0.05)^2}$$

Sample size (n) = **400 households**

The sample was then allocated proportionally among the study municipalities/metropolis (Table 1) by $\frac{\text{No. of HHs for MMDA}}{\text{Total Number of HHs in MMDA}} \times 100\%$.

Data collection

During the data collection, one attribute (empty waste bins without damaging assets of customers) of the Tangibility dimension was added, and two attributes (deliver service without unnecessary noise and bad odor from trucks, deliver service with visually appealing trucks and waste bins) were modified to give a 23-item questionnaire to reflect important issues of waste management service. The selected 400 heads of households then responded to the modified questionnaire. As recommended by Verma and Sachdev (2004), a five-point Likert scale was adopted for the study Respondents scored each service attribute on a scale of 1–5; '1' indicating strongly dissatisfied, and '5' indicating strongly satisfied. Ethical approval and confidentiality principles were strictly followed. The purpose of the study was explained to all participants, and their permission was given before the data collection. The ethical review board of the Faculty of Natural Resources and Environment, University for Development Studies, cleared the tools for the data collection.

Model for service quality analysis

The SERVQUAL model (gap analytical framework) was adapted as the basic model for this study. It was adopted because it offers a strong customer-centric approach to service evaluation (Lin and Foo, 1999; Hebert, 1994). The model remains the most reliable, desirable, and legitimate tool for measuring service expectation and satisfaction (Ho and Lin, 2010; Kassim and Abdullah, 2010). The model provides key service gap information that managers can use to improve the overall performance of waste management service delivery (Rodrigues et al., 2011). Service quality dimensions considered in this study are Reliability, Responsiveness, empathy, Assurance and Tangibility. Reliability measures the service provider's ability to deliver the service as promised. The ability of a service provider to assist and react to consumer requests is known as Responsiveness. Empathy demonstrates how the business treats each client with care and particular attention. Assurance is the service provider and employee's ability to foster confidence and trust. The term "tangibility" describes how tangible things like buildings, machinery, people, and communication tools appear. Fig. 2 shows the service gap model with five gaps.

In applying the model, the gap of each service quality dimension was obtained by deducting the perceived (experienced) score from the expectation score. The SERVQUAL scores for each of the five dimensions' items were added, and the mean score was calculated by dividing that total by the number of elements that make up each dimension. An overall measure of perceived service quality was derived by averaging the SERVQUAL scores for the five dimensions. The following steps were used to determine service gaps:

- i. The average score for each service attribute of perception and expectation was determined by the equation:

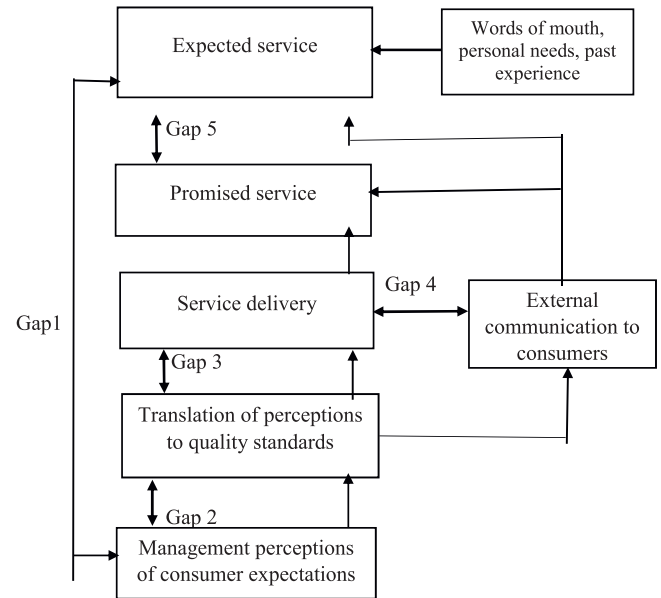


Fig. 2. Schematic representation of the service quality model.

$$\text{mean score} = \bar{X}_{score} = \frac{\sum_{i=1}^{n_j} X_{ij}}{n_j} \tag{1}$$

If the mean score < 0, perceived service is less than expected (negative gap). If the mean score > 0, then the perceived service is greater than expected (positive gap). If mean score = 0, then the perceived service is the same as expected (customers are satisfied).

- ii. The standard deviation for each service dimension was determined by the equation

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n_j} (X_{ij} - \bar{X}_j)^2}{n_j - 1}} \tag{2}$$

Where n_j is the number of attributes in the i th dimension.

- iii. The service gap (SG) for the attribute was determined by the equation:

$$SG_i = P_i - E_i, \tag{3}$$

where SG_i is the service gap for the i th attribute, P_i is the perceived quality for i th attribute and E_i is the expected quality for the i th attribute.

- iv. The Service quality for the i th dimension was computed by the equation:

$$SQ_j = \frac{\sum_{i=1}^{n_j} (P_{ij} - E_{ij})}{n_j}, \tag{4}$$

where: SQ_j is the service quality of dimension j , P_{ij} is the perceived quality of the i th attribute in dimension j , E_{ij} is the expected quality of the i th attribute in dimension j , and n_j is the number of attributes in dimension j . Also, respondents rated the relative importance of the service dimensions and indicated their overall satisfaction with the solid waste management service. Lastly, to obtain information on

systems and internal processes of service providers which affect services, nine officers were purposively drawn from finance, operations, customer service and technical departments across service providers for in-depth interviews. The interview data were analyzed thematically. This analytical approach explored the participants' views to understand and integrate the perspectives of households.

Data analysis

The researchers employed descriptive statistical analysis such as means, standard deviation and percentages. This analytical approach allowed researchers to present data in a structured, accurate and summarized format for easy interpretation. The association between service dimensions and their significance was determined by the Pearson Chi-square test. The Chi-square was used because the level of measurements of variables was ordinal, and the sample size of study groups was unequal. The Chi-square test is a powerful tool for providing information on the level of significance of observed means.

Results

To examine the quality of service provided by the private sector companies through the gap score analysis, we first examined customers' perceptions on services being provided. This was followed by the analysis of the expectations of customers of private companies. These two variables were then used to compute the gap between perception and expectation.

Customer perceptions

Table 2 measures customers' perception of all the five service quality dimensions in the four municipalities. The service quality dimensions covered are Reliability, Responsiveness, Assurance, empathy and tangibles. In the area of Reliability, it was observed that even though the mean and standard deviation results varied across all municipalities, the total Reliability of waste collection services in the four operational areas was rated by customers as sufficient (Mean value = 4.32, SD = 0.82). Regarding Responsiveness, the findings revealed that, across all operational municipalities, customers' perceptions of providers' service quality were considerably good (Mean = 3.63; SD = 0.65). It was nonetheless, low in comparison to their reliability score (Mean = 4.32, SD = 0.82). Similarly, customers' perception of service providers' Assurance remained good (Mean = 3.80; SD = 0.53) throughout all operational municipalities. There were however, variations in customer perception across all municipalities - Sagnarigu (Mean = 3.80, SD = 0.69); Wa (Mean = 3.77, SD = 0.53); Tamale (Mean = 3.55, SD = 0.75) and Bolgatanga (Mean = 3.48, SD = 0.60). The Empathy dimension of waste management service delivery was also probed. The results indicate that regardless of the variations, customers' perceptions of companies' empathy were positive (Mean = 4.21, SD = 0.89). Finally, in terms of tangibles, clients in the four operational municipalities rated the tangibles provided by waste management companies as good (Mean = 4.56, SD = 0.59), regardless of the variations among individual municipalities, Sagnarigu (Mean = 4.45, SD = 0.05), Tamale (Mean = 4.48, SD = 0.45), Wa (Mean = 3.88, SD = 0.60) and the Bolgatanga (Mean = 3.76, SD = 0.06).

Customer expectations about waste management service quality

The research also gauged expectation as the difference between the two will determine the extent of service quality. Table 3 summarizes the results of the expectations of customers. The total expected Reliability for all the operational areas was very high (Mean = 4.58, SD = 0.45). However, comparing the four operational areas, Wa (Mean = 4.32, SD = 0.24) had the highest expected Reliability, followed by Bolgatanga (Mean = 4.25, SD = 0.29), Sagnarigu (Mean = 4.24,

SD = 0.43), and then Tamale (Mean = 4.19, SD = 0.32). The very high ratings implied customers placed a high priority on the Reliability of waste collection services. On Responsiveness, the results showed that customers had high expectations for waste collection services (Mean = 4.10, SD = 0.34). Among the four operational areas, customers in Wa had the highest expectation (Mean = 4.31, SD = 0.31), followed by Bolgatanga (Mean = 4.26, SD = 0.51), Sagnarigu (Mean = 4.14, SD = 0.50), and then Tamale (Mean = 4.11, SD = 0.42) (Table 3).

Generally, customers expressed very high expectations on Assurance (Mean = 4.04, SD = 0.23). In relation to all the operational areas, respondents in Wa (Mean = 4.26, SD = 0.29), Tamale (Mean = 4.10, SD = 0.34), and Bolgatanga (Mean = 4.09, SD = 0.22) expected service providers to assure them more than those in Sagnarigu (Mean = 3.87, SD = 0.22) (Table 3). The results showed that respondents across all four operational areas had very high expectations (Mean = 4.45, S.D. = 0.57) for service providers to empathize with clients. Respondents in the Wa (Mean = 4.23, SD = 0.29), and those in Tamale (Mean = 4.01, SD = 0.46) expected more empathy from service providers, whereas in Bolgatanga (Mean = 3.98, SD = 0.19), and Sagnarigu (3.74, SD = 0.28), Empathy expectations were much lower (Table 3). Finally, compared to all dimensions, expected Tangibility was rated the highest. In terms of operational areas, customers in Sagnarigu (Mean = 4.60, SD = 0.31) had the highest Tangibility expectations, followed by Tamale (Mean = 4.58, SD = 0.31), Wa (Mean = 4.27, SD = 0.23) and then Bolgatanga (Mean = 4.23, SD = 0.18).

Using the same set of questions under the five SERVQUAL dimensions used in Table 2 but with a little tweak, Table 3 provides detailed results of customers' expectation on services provided by private waste management companies. Across all operational municipalities, customers had high expectations in the area of Reliability of service (Mean = 4.58, SD = 0.45); even though the extent of customer expectation was great, it varied across all four operational areas. On Responsiveness, the result showed that customers have high expectations for service providers to be responsive (Mean = 4.10, SD = 0.34). For instance, they expected providers to keep customers informed about when services would be delivered (Mean = 4.07, SD = 0.81), to be prompt (Mean = 4.26, SD = 0.76), to assist customers with their requests (Mean = 4.29, SD = 0.76), and to be ready to respond to customer needs at all times (Mean = 4.29, 0.69).

Again, respondents across all operational municipalities expressed very high expectations from waste management service providers in terms of Assurance (Mean = 4.04, SD = 0.23). On the Empathy dimension, the results showed that respondents across all four operational areas had high expectations (Mean = 4.69, S.D. = 0.36). The sum of the various service quality dimensions expected revealed that, while customers have very expectations for all service quality dimensions, Tangibility was the topmost priority they expected much from providers (Mean = 4.69), followed by Reliability (Mean = 4.58), empathy (Mean = 4.45), Responsiveness (Mean = 4.10). Assurance is the least (Mean = 4.04). Table 3 provides a detailed analysis of customer expectations about waste management service quality.

Overall customer GAP score

In Table 4, the overall SERVQUAL gap for all service dimensions was - 0.31, which showed that customers of waste management companies were not satisfied with the quality of service. All the service dimensions showed a negative gap (less than zero). Service providers therefore failed to meet customer expectations on all the service dimensions assessed. As a consequence, the study discovered significant relationship ($R = 1.00$, $p\text{-value} = 0.000$) between customers' perceptions and expectations. In terms of the individual SERVQUAL dimensions, Reliability, Responsiveness, Assurance, Empathy, and Tangibility, customers were substantially less unsatisfied with the service providers provided

Table 2
Perception of waste management service quality among external customers in northern Ghana.

Specific items/Service dimension	Sagnarigu (n = 87)		Tamale (n = 146)		Bolgatanga (n = 83)		Wa (n = 78)		Total (N = 394)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Reliability										
The company provides service as promised	3.29	1.532	3.43	1.237	3.59	1.048	3.76	1.009	3.50	1.23
The company is dependable in handling customers' service	3.14	1.047	3.34	.928	3.47	.967	3.79	.858	3.41	.972
The company provides service right the first time	4.28	.996	3.68	1.022	3.93	1.057	3.71	.968	3.87	1.037
The company provides service at the promised time	3.36	1.294	3.27	1.104	3.49	1.052	3.45	1.089	3.37	1.135
The company maintains error-free records	3.54	.643	3.18	.794	3.63	.893	3.22	.989	3.36	.848
Total	3.7663	.85077	3.6507	.71394	3.8514	.63278	3.8205	.63834	4.3162	.81797
Responsiveness										
The company keeps customers informed on when their services will be performed	3.18	1.581	2.69	1.257	3.23	1.233	2.62	1.16	2.90	1.34
The company delivers prompt services to customers	2.86	1.212	3.11	.955	3.28	1.086	3.24	.942	3.12	1.049
The company is willing to help customers	2.71	1.293	3.08	1.218	3.45	.978	3.71	.808	3.20	1.167
The company is always ready to respond to customers' request	3.44	1.361	3.30	1.013	3.28	1.203	3.62	.825	3.39	1.112
Total	3.2391	1.00410	3.2370	.75713	3.4458	.78481	3.4359	.54582	3.6278	.67729
Assurance										
Employees instil confidence in customers	3.61	.881	3.41	1.015	3.27	.964	3.63	.854	3.47	.952
The company makes customers feel safe in their transactions	3.80	.926	3.43	1.037	3.28	1.004	3.82	.936	3.56	1.008
Employees of the company are consistently courteous	3.80	.900	3.42	1.016	3.37	.851	3.71	.758	3.55	.924
Employees are knowledgeable in answering customers' questions	3.80	.887	3.49	.970	3.51	.817	3.72	.737	3.61	.885
Total	3.8046	.69079	3.5507	.75111	3.4843	.59602	3.7744	.53487	3.8011	.53355
Empathy										
Employees give customers individual attention	2.67	.858	3.16	1.131	3.23	.888	3.82	.849	3.20	1.039
Employees of the company deal with customers in a caring manner	2.69	.880	3.37	.961	3.52	.771	3.76	.825	3.33	.950
Company has their customers' interest at heart	2.71	.901	3.38	1.026	3.31	.679	3.72	.804	3.29	.950
Employees understand the needs of their customers	2.62	.825	3.42	1.107	3.20	.793	3.86	.801	3.29	1.015
The company provide service at the convenient business hour	2.93	.900	3.49	.991	3.06	.915	3.59	.904	3.29	.973
Total	3.1034	.63197	3.6370	.77994	3.5542	.51080	3.9573	.57575	4.2137	.88899
Tangibles										
The company uses modern equipment to deliver services	4.37	.794	4.48	.613	3.57	.952	3.76	.759	4.12	.855
The company uses visually appealing facilities to deliver services	4.44	.773	4.38	.600	3.64	.820	3.71	.870	4.10	.826
Employees of the company are neat and professional during service delivery	4.22	.993	4.34	.790	3.41	.797	3.73	1.089	3.99	.976
The company successfully delivers services without damaging the asset of clients	4.47	.587	4.34	.677	3.55	1.027	3.97	1.173	4.13	.922
There is no unnecessary noise, odor or emission from trucks during service delivery	4.36	.821	4.20	.987	3.40	.855	3.09	1.186	3.85	1.093
Total	4.4751	.50420	4.4543	.44744	3.7610	.60441	3.8761	.52391	4.5607	.59784

Table 3
Customers' expectations of waste management service quality in northern Ghana.

Specific items/Service area	Sagnarigu (n = 87)		Tamale (n = 146)		Bolgatanga (n = 83)		Wa (n = 78)		Total (N = 394)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Reliability										
The company should provide services as the promised	4.1379	0.61327	4.2260	0.54798	4.0361	0.52836	4.2179	.52589	4.1650	0.5578
The company should be dependable in handling customers' service performed	3.9770	.83495	3.7397	.66493	4.0723	.57981	4.0513	.48073	3.9239	.67246
The company should provide service right the first time	4.1954	.60692	4.0479	.61400	4.0241	.58385	4.1667	.52016	4.0990	.59072
The company should provide services at the promised time	3.9195	.57503	4.0068	.61584	4.1325	.55811	4.1795	.47656	4.0482	.57533
The company should maintain error-free records	4.1954	.69615	4.1164	.60470	4.2169	.56414	4.2949	.58352	4.1904	.61517
Total	4.2375	.42350	4.1895	.31235	4.2470	.28675	4.3184	.24053	4.5823	.44955
Responsiveness										
The company should inform customers on when services will be performed	4.1954	.84687	3.9178	.80949	4.3133	.76394	3.9744	.78912	4.0736	.81784
The company should deliver prompt services to customers	4.0575	.88075	4.1370	.73934	4.4337	.75212	4.5385	.52699	4.2614	.76180
The company should be willing to help customers with their requests	4.1379	.80943	4.2397	.71732	4.3494	.77197	4.5256	.71577	4.2970	.75876
The company should always be ready to respond to customers' requests	4.2874	.60824	4.2397	.72687	4.1928	.77236	4.5256	.59706	4.2970	.69578
Total	4.1356	.49696	4.1068	.41831	4.2578	.50705	4.3128	.31016	4.1018	.34218
Assurance										
Employees should instill confidence in the customers who patronize services	4.1379	.50973	4.3493	.61692	4.4940	.59209	4.5000	.57547	4.3629	.59493
The company should make customers feel safe in their transaction	3.8966	.40447	4.2603	.51266	4.1205	.39502	4.4487	.50058	4.1878	.49962
Employees should be consistently courteous to customers on their service demand	3.8276	.43687	4.0548	.48110	4.0000	.38255	4.1410	.38560	4.0102	.44559
Employees should be knowledgeable to answer customer questions	3.4713	.54643	3.8425	.75830	3.8434	.42718	4.1923	.55963	3.8299	.65694
Total	3.8667	.22343	4.1014	.34220	4.0916	.21931	4.2564	.29347	4.0428	.23426
Empathy										
Employees should give customers individual attention	3.0115	.70701	3.5137	.81568	3.7108	.53030	4.0000	.58109	3.5406	.76808
Employees of the company should deal with customers in a caring manner	3.8506	.44536	3.9178	.58140	3.9880	.45516	4.0128	.54638	3.9365	.52280
The company should have the customer's best interest at heart	3.7356	.51624	3.8699	.64609	3.6867	.49208	4.1026	.41372	3.8477	.56366
Employees should understand the needs of their customers	3.4253	.49725	3.9384	.70684	3.7831	.41462	4.2308	.60136	3.8503	.64631
The company should provide service at the convenient business hours	3.4368	.58471	3.8288	.73681	3.7108	.45613	4.0385	.65351	3.7589	.66557
Total	3.7433	.28280	4.0114	.46389	3.9799	.19373	4.2308	.29818	4.4460	.57807
Tangibles										
The company should use modern equipment to deliver service	4.4943	.60758	4.5753	.52306	4.1446	.47196	3.9487	.50703	4.3426	.58554
The company should use visually appealing facilities and materials to deliver service	4.6207	.51130	4.5411	.51363	4.0602	.50242	4.0385	.52080	4.3579	.57191
Employees of the company should be neat and professional during service delivery	4.4943	.50287	4.5479	.49941	4.0723	.37557	4.3590	.50899	4.3985	.51055
The company should successfully deliver services without damaging the assets of clients	4.5287	.50207	4.4110	.54673	4.1566	.39761	4.4231	.52271	4.3858	.51778
The company should deliver service without unnecessary noise, emissions, or odor from trucks	4.4713	.62578	4.4315	.56211	3.9277	.34156	3.8590	.55184	4.2208	.60066
Total	4.6015	.31475	4.5845	.30840	4.2269	.17573	4.2714	.23124	4.6991	.36165

Table 4
Customer GAP score analysis on service providers' service quality.

GAP analysis	Sagnarigu	Tamale	Bolgatanga	Wa	Total GAP	Paired correlation	
	Mean	Mean	Mean	Mean	Mean	Coefficient	P-value
Perceived Reliability	3.7663	3.6507	3.8514	3.8205	4.3162	0.869	0.000
Expected Reliability	4.2375	4.1895	4.2470	4.3184	4.5823		
GAP (P - E)	-0.4713	-0.5388	-0.3956	-0.4979	-0.2661	0.617	0.000
Perceived Responsiveness	3.2391	3.2370	3.4458	3.4359	3.6278		
Expected Responsiveness	4.1356	4.1068	4.2578	4.3128	4.1018	0.320	0.000
GAP (P - E)	-0.8966	-0.8699	-0.8120	-0.8769	-0.4740		
Perceived Assurance	3.8046	3.5507	3.4843	3.7744	3.8011	0.945	0.000
Expected Assurance	3.8667	4.1014	4.0916	4.2564	4.0428		
GAP (P - E)	-0.0621	-0.5507	-0.6072	-0.4821	-0.2417	0.895	0.000
Perceived empathy	3.1034	3.6370	3.5542	3.9573	4.2137		
Expected empathy	3.7433	4.0114	3.9799	4.2308	4.4460	1.000	0.000
GAP (P - E)	-0.6398	-0.3744	-0.4257	-0.2735	-0.2323		
Perceived tangibles	4.4751	4.4543	3.7610	3.8761	4.5607	0.895	0.000
Expected tangibles	4.6015	4.5845	4.2269	4.2714	4.6991		
GAP (P - E)	-0.1264	-0.1301	-0.4659	-0.3953	-0.1384	1.000	0.000
Perceived SERQUAL	4.3036	4.3496	4.2354	4.4156	12.7683		
Expected SERQUAL	4.8127	4.9064	4.8529	4.9904	13.0766	-0.3083	
GAP (P - E)	-0.5091	-0.5568	-0.6175	-0.5748	-0.3083		

(GAP Means = - 0.26; - 0.47; - 0.24; - 0.23; & - 0.13) with a p-value = 0.000. All the municipalities had a negative gap score in terms of operational areas. Sagnarigu municipality had a score of - 0.51, Tamale - 0.56, Bolgatanga - 0.62, and Wa - 0.57, all indicating poor service quality. Table 4 provides detailed results of the gap scores.

The relative importance of service dimensions

Finally, customers in all four operational areas ranked Reliability (24.7%), Responsiveness (23.9%), Assurance (19.4%), Empathy (17.5%) and Tangibility (14.5%) as 1st, 2nd, 3rd, 4th and 5th most important dimension respectively (Table 5). Ranking Reliability and Responsiveness as the most important was expected because hauling waste out of sight is generally desired than having to see nice waste collecting vehicles in one's compound.

Discussion

Using the gap score model, the findings show that households are not satisfied with the services provided by the private waste management sector. Though the sector is seen as a solution to poor waste collection delivery (Awortwi, 2004; Adama, 2016), the results revealed gaps between customer perception and expectation. There were mean and standard deviation scores across the different geographical regions. For instance, in terms of the responsiveness dimension ratings at Bolgatanga (Mean = 3.45, SD. = 0.78) and Wa (Mean = 3.44, SD. = 0.54) were viewed as higher than those at Tamale (Mean = 3.24, SD. = 0.76) and Sagnarigu (Mean = 3.24, SD. = 1.00). Responsiveness is the service provider's ability to respond promptly to customer concerns. It

focuses on promptly resolving customer complaints, inquiries, questions and problems. It is the period when customers have to wait for their concerns to be addressed after they have submitted complaints. Responsiveness also includes the service provider's ability and willingness to assist and adapt the service to the customer's needs (Ramya et al., 2019). These variations go a long way to support the assertion that the spatial and theoretical diversity of waste is even more pronounced in Africa, sub of the Saharan, than any other region due to the complex dynamics of population growth and economic development (Myers, 2005). The findings are similar to findings by Akateeba and Yakubu (2013), who recorded perceived Tangibility for waste collection in Wa Municipality as moderately higher than that of Tamale and Bolgatanga.

In general terms, the literature indicates that the introduction of the private sector leads the public sector with some form of inertia to build high customer expectation in private companies (Moshan et al., 2011; William and Naumann, 2011). It was therefore not surprising that the results showed that customers had very high expectations across the operational areas for all the service dimensions; Reliability (Mean=4.58, SD. = 0.45), Responsiveness (Mean=4.10, SD. = 0.34), Assurance (Mean=4.04, SD. = 0.23), empathy (Mean=4.45, SD. = 0.56) and Tangibility (Mean=4.70, SD. = 0.36). These findings are in sync with Zikry (2017) findings, where high expectations were recorded for Reliability, Responsiveness, Assurance, empathy and Tangibility. Again, the results are also in line with a similar study by Odayor (2003) in three cities (Durban, Pinetown, Richards Bay) in South Africa, which recorded moderately high customer expectations in all dimensions. The variations in our results from the different operational areas might have been caused by differences in social settings and

Table 5
Relative importance of service dimensions.

Dimension	Wa		Tamale		Bolgatanga		Sagnarigu		Mean
	RI (%)	Rank	RI (%)	Rank	RI (%)	Rank	RI (%)	Rank	
Reliability	25.9	1	23.9	2	23.8	2	25.1	1	24.68
Responsiveness	23.7	2	24.6	1	24.2	1	23.2	2	23.93
Assurance	19.5	3	18.7	4	19.1	3	20.3	3	19.40
Empathy	17.6	4	20.1	3	17.3	4	14.9	5	17.48
Tangibility	13.3	5	12.7	5	15.6	5	16.5	4	14.53
Total	100		100		100		100		100.00

RI = Relative Importance.

experiences of respondents in the study areas.

Additionally, while customers had very high expectations for all service quality dimensions, Tangibility was the topmost priority (Mean = 4.69), followed by Reliability (Mean = 4.58), Empathy (Mean = 4.45), Responsiveness (Mean = 4.10), and then Assurance (Mean = 4.04) as the least. During the study, it was discovered that there were new compaction trucks in all the operational areas. The compaction trucks might account for high expectations on Tangibility which influenced customer expectations of service providers. For instance, waste companies with state-of-the-art equipment may have higher customer expectations than companies with legacy waste treatment equipment. The professional appearance of refuse collection personnel, including clothing, uniform and personal hygiene, affects recognizability and customer expectation and perception.

The findings from the gap analysis showed that the service gaps for all dimensions were less than zero. Providers therefore failed to meet customer expectations on all the service dimensions assessed. In Gap analysis, if the gap score is 0, it means customer expectations are met; if it is less than 0, expectations are not met, creating a service gap. There was a perfect statistically significant positive relationship ($R = 1.00$, p -value = 0.000) between customers' perceptions and expectations. The implication is that as more is expected, more is perceived. While there was a strong significant positive association between expected and perceived Reliability, Responsiveness, Empathy and Tangibility, the association between expected and perceived Assurance was very weak ($R = 0.320$, p -value = 0.00). The implication is that an increase in expectations would very much lead to an increase in perceptions of Reliability, Responsiveness, Empathy and Tangibility. In contrast, an increase in expectation would very less increase perception for Assurance.

The results showed that Responsiveness and Reliability dimensions recorded the highest service. Reliability, for instance, is a measure of the service provider's ability to deliver the service as promised. This is important when evaluating service quality, as many customers like doing business with companies that deliver on their promises (Ramya et al., 2019). These findings affirmed the results of a study by Odayor (2003), which recorded the highest gaps in Reliability and Responsiveness and the lowest gaps in Tangibility. The implication was that customers were less concerned about the state-of-the-art equipment and empathy but more concerned about Reliability and Responsiveness of service (waste lifted away promptly from their premises). The results were expected because the more the service providers delayed in lifting waste, the more likely that waste would decompose and produce a bad odor since the waste is mixed. To close the service gaps and improve customer satisfaction, service providers must focus on improving Reliability and Responsiveness. All business processes and practices that improved Reliability and Responsiveness were key decision priorities for the management of waste management service companies.

The results showed that the Responsiveness and Reliability measured the highest service gaps whereas Tangibility and Empathy measured the lowest. These findings affirmed the results of a study by Odayor (2003), which recorded the highest gaps in Reliability and Responsiveness and the lowest gaps in Tangibility. The implication is that customers are less concerned about the state-of-the-art equipment and Empathy but more about Reliability and Responsiveness of service (waste lifted away promptly from their premises). The results were expected because the more the service providers delay in lifting waste, the more likely that waste will decompose and produce a bad odor since the waste is mixed. To close the service gaps and improve customer satisfaction, service providers must focus on improving Reliability and Responsiveness. All business processes and practices that improved Reliability and Responsiveness were key decision priorities for the management of waste management service companies. In terms of relative importance of service dimensions, respondents ranked Reliability and Responsiveness as the most important and Empathy and Tangibility as the least important. The ranking results affirmed the results of a

study on waste collection services in Selayang Municipality in Malaysia (Zikry, 2017). Ranking Reliability and Responsiveness as the most important was expected. This was because hauling waste out of customers' premises regularly and promptly was generally desired rather than being served by the most compassionate staff and nice waste collection vehicles.

Conclusion

This study assessed the quality service private companies are providing to customers. From the research, it is obvious that customers' expectations for all five service dimensions were not met, as gap scores were all negative. Responsiveness and Reliability measured the highest service gaps, whereas Tangibility and Empathy measured the lowest. The results, show that customers are less concerned about the state-of-the-art equipment and Empathy but more concerned about Reliability and Responsiveness of service. To close the gap and improve customer satisfaction, business processes that improve responsiveness and reliability dimensions should be given priority. When respondents' perceptions were compared to their expectations of the provider's waste management service delivery in the selected municipalities, it was discovered that customers were generally unhappy with the service level being provided. The administration of the expectation and perception versions of the instrument simultaneously in the same questionnaire presented a limitation to the study. The repetitive nature of the SERVQUAL statements created response fatigue, which could have slightly influenced respondents' views. The study focused on how service quality influenced customer satisfaction. We suggest that future studies should investigate how service quality may influence customer loyalty.

Policy implications

Service quality plays an important role in achieving customer satisfaction, as service quality significantly influences customer satisfaction and loyalty. The findings from the study reveal some very important issues for key stakeholders to consider in deciding to pursue PPP as the best approach for managing solid waste. The first is that service providers need to work on improving all five dimensions of service quality to improve customer satisfaction in the industry. Secondly, the government should perform its gate-keeping role without laxity to ensure service providers deliver on the agreed principles that can lead to customer satisfaction. Even though the often-overarching consideration is of the waste management companies to get waste out of site, it is important that customers are satisfied with the services they are paying.

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Data Availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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