UNIVERSITY OF CAPE COAST

AN ASSESSMENT OF PUBLIC-PRIVATE PARTNERSHIP AND SPATIAL DISTRIBUTION OF SOLID WASTE COLLECTION SERVICES IN THE TEMA METROPOLIS.

BY

BERNARD ADJEI-ASOMANI

Thesis submitted to the Department of Integrated Development Studies of the School for Development Studies, College of Humanities and Legal Studies, University of Cape Coast in fulfilment of requirements for the award of Master of Philosophy Degree in Development Studies.

JULY 2021

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature ……Date: ……..

Name: Adjei-Asomani Bernard

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis was supervised in accordance with guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature…… Date: ……..

Name: Dr. Owusu Boampong

Co-Supervisor's Signature……Date: …….

Name: Dr. Harriet M.D. Potakey

ABSTRACT

Solid waste management as a public good is expected to be distributed equally across space, though under the Public-Private Partnership policy strategy. The achievement of this objective may help improve environmental sustainability. Hence, the study investigated the spatial distribution of solid waste collection service within the context of Public-Private Partnership in the Tema Metropolis. A mixed method research approach was used while the descriptive survey design constituted the study design. The sample size was 363 respondents selected using a multi-stage sampling technique and 4 key informants via purposive sampling. Data was collected using an interview schedule and guide. Analysis of data was done through the application of descriptive statistics, chi-square test of independence, Geographic Information System-thematic mapping and thematic analysis. The study found that the spatial distribution of the solid waste collection service vary in terms of the quality of service distributed between the selected communities by the private waste companies. Lastly, it was established that the variation experienced is as a result of some external factors such as the regulatory capacity of the Metropolitan Assembly and the unavailability of infrastructural facilities. The effects of the variation on the sustainable development, however, showed the communities being clean with fewer health issues experienced by the people. Therefore, it was recommended that to solve the variation problem the Metropolitan Assembly should incorporate the informal waste collectors into the waste collection system so they may help bring equity in the collection of waste.

ACKNOWLEDGEMENTS

I would like to express my profound gratitude and appreciation to all those who directly or indirectly contributed to the completion of my thesis paper. My greatest appreciation goes to my supervisors Dr. Owusu Boampong and Dr Harriet M.D. Potakey for their patience, resourceful assistance, constructive criticisms, encouragement and direction throughout the study.

Furthermore, I register my sincere thanks to all Research Fellows and Lecturers at the School for Development Studies, University of Cape Coast for their assistance throughout my period of study. In no particular order, special thanks to Mr. Richard Ametefe, Mr James Kwabena Bomfe Jnr, Mr. Wisdom Quarcoo, Mr. Ibrahim Abu and all postgraduate students at the School for Development Studies.

Moreover, my appreciation equally goes to the staff of the Waste Management Department and the Physical Planning Department of the Tema Metropolitan Assembly, for their corporation and assistance throughout the data collection, and to the heads (representatives) of the private waste collection companies (Meridian Waste Management Ltd, Asadu Royal Seed and Waste Company and J. Stanley Owusu Waste Collection Company), for granting me time for the interview amid their tight schedules.

Finally, I would like to express my sincere gratitude to my family. Without their support and encouragement the study would not have been possible. I say God bless you.

DEDICATION

To my late parents, Mr Edmund Nyarko-Asomani and Mrs Felicia Obiri Asomani

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ACRONYMS

AMA	Accra Metropolitan Assembly
BOO	Build-Operate-Own
BOOT	Build-Operate-Own-Transfer
BTO	Build-Transfer-Operate
CCC	Communal Collection Container
DBO	Design-Build-Operate
DBFO	Design-Build-Finance-Operate
EPA	Environmental Protection Agency
GPS	Global Positioning System
HCZ	High Class Zone
ILGS	Institute of Local Government Studies
IMF	International Monetary Fund
LCZ	Low Class Zone
MA	Metropolitan Assembly
MILGRD	Ministry of Local Government and Rural Development
MMDA	Metropolitan, Municipal and District Assembly
PPP	Public Private Partnership
PAYT	Pay-As-You-Throw
PNDC	Provisional National Defence Council
SWM	Solid Waste Management
SPSS	Statistical Package for the Social Sciences
SERVPERF	Service Performance model

SERVQUAL	Service Quality model
SDGs	Sustainable Development Goals
TMA	Tema Metropolitan Assembly
UNEP	United Nations Environment Program
UNCTAD	United Nations Conference of Trade and Development
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

The management of solid waste is more challenging in developing countries and mostly in urban areas (Amoah & Kosoe, 2014). In Ghana, urban areas such as Accra, Tema, Kumasi, and Sekondi-Takoradi suffer from ineffective solid waste management because of inadequate financial and technical skills of local authorities (Baabereyir, O'Hara, & Jewitt, 2012). Solid waste management, according to Pessoa (2006), is a public good and for that matter a social justice issue as indicated by the social justice theory (Mathiesen, 2015). Different strategies have been put in place to address this menace and one of such strategies is the introduction of Public-Private Partnership (PPP) according to the neoliberal and public choice theories (Cointreau-Levine, 1994). Some studies have assessed the effectiveness and efficiency of PPP (Oteng-Ababio, 2010; Zohoor & Ghani, 2017). However, little attention has been paid to the equity dimension of PPP and its ability to ensure equitable distribution of services across space, hence, the motivation for this study.

Background of the Study

Solid waste management is a major challenge that confronts most countries in the world (Kapepula, Colson, Sabri, & Thonart, 2007; Okot-Okumu & Nyenje, 2011). In 2006, it was estimated that about 2.01 billion metric tons of solid waste was generated around the world, suggesting that about 0.7 kg of solid waste was generated per person per day (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018). The problem of increasing solid waste generation, according to some studies (Pai, Rodrigues, Mathew, & Hebbar,

2014; Oteng-Ababio, Arguello, & Gabbay, 2013), can be attributed to the scale of urbanization with its increase in population and the resultant increase in demand for goods and services.

According to UN-Habitat (2010), a solid waste challenge seems more daunting in developing countries. The rate of urbanization in developing countries was estimated at an average of five million people monthly, which accounts for 95 per cent of the world's population growth (United Nations Conference of Trade and Development [UNCTAD], 2017). Besides, the problem seems to be compounded by the introduction of environmentally unfriendly materials, changing consumer consumption patterns, lack of political commitment, insufficient budgetary allocations and the inadequate data for the enactment and implementation of effective policies (Oteng-Ababio, 2011).

Solid waste is defined as all domestic, commercial and industrial waste that are non-liquid, non-gaseous and non-hazardous products of human activities and are considered as being useless (Babayemi & Dauda, 2009; United Nations Environment Programme [UNEP], 2009). Solid waste generation and its composition in most developing countries and specifically in Africa constitute organic waste (Karak, Bhagat, & Bhattacharyya, 2012). For instance, a study by Mohamed (2013) reveals that solid waste composition in Egyptian cities are made up of 60 per cent of organic waste, while the rest of the 40 per cent constitutes plastic, paperboard, and glass as well as metal wastes. Similarly, a study conducted in Accra to characterize household solid waste revealed that 61percent of solid waste was organic and households in

the high-income zones (Miezah, Obiri-Danso, Kádár, Fei-Baffoe, & Mensah, 2015) mostly generated it.

Collection of solid waste as an aspect of its management is seen as a challenging duty in most developing countries (Zohoor & Ghani, 2017). In these developing countries, it is estimated that about 20-50 per cent of their budget is spent on solid waste management, yet, only 20-70 per cent of the solid waste is collected (Zerbock, 2003; UNEP, 2014). The problem is much worse in urban areas, as it is characterized by inefficient collection methods, insufficient coverage of the collection systems and improper disposal of solid waste (Onu, Price, Surendran, & Ebie, 2012; Olukanni, Akinyinka, Ede, & Akinwumi, 2014).

The collection of solid waste is, for the most part, inadequate in the middle- and low-income areas of the urban centres (Oteng-Ababio et al., 2013). This situation usually leads to serious public and environmental health hazards (World Health Organisation [WHO], 2017) which have a ripple effect on the sustainable development of urban areas. As such, the inefficient collection of the solid waste compounds the inability of government authorities to achieve Sustainable Development Goals (SDGs) – specifically, goals 3 (Good Health and Wellbeing), 6 (Clean Water and Sanitation) and 11 (Sustainable Cities and Communities).

As a public good, solid waste management is viewed as services that are non-rivalled and non-exclusive (Cointreau-Levine, 1994), which indicates the need and responsibility of the national or local government authority to provide these services irrespective of the age, race, gender and location of the citizens (Kubanza, Das, & Simatele, 2017). However, due to financial and

non-financial factors such as cost recovery, finance, economies of scale, efficiency and public accountability, institutional management as well as legislation, solid waste management service delivery has become a daunting issue for authorities (Massoud & El-Fadel, 2002; Yeboah-Assiamah, Asamoah, & Kyeremeh, 2017). As a result, PPP has emerged as an alternative to improve solid waste management performance in developing countries (Pessoa, 2006).

According to Savas (2005), PPP is an arrangement between a government and a private entity (either profit or non-profit) to jointly perform a public activity. However, the study align itself to the definition by Massoud and El-Fadel (2002). They define PPP as the transfer and control of a good or a service, which is supposed to be provided by the public sector, to the private sector. The introduction of PPP in public service provision in many developing countries is meant to improve the efficiency, equity and quality of the service through increasing competition and active participation of the private sector (Oteng-Ababio, 2010). The effectiveness of the partnership between the public and private sectors rests on some assumptions.

The first assumption is a change in roles between the two sectors where there is a shift in the duties of both public and private entities – with the private sector in-charge of service delivery and the public sector handling the supervisory role (Boampong & Tachie, 2017). Secondly, it is assumed that there is a sustained collaborative effort between the partners with the sole aim of achieving a common objective (Pessoa, 2006). Lastly is the assumption on the interests of each partner been different – where the private sector's interest is of returns on their investment whiles the public sector's interest is on the net

benefit to the state and the economy as a whole (Byiers & Rosengren, 2012). Many researchers (Oteng-Ababio, 2010; Yeboah-Assiamah et al., 2017) have given reasons why PPP is essential in the delivery of quality solid waste management service. Most of these reasons – such as efficiency, effectiveness, and equity - are traceable to some elements in the neoliberal and public choice theories.

Abenza (2015) states that the main argument of the public choice theory can be premised on the basis that a higher level of efficiency in delivering public services can be achieved when managed by the private sector as compared to the public sector. As such, it advocates for a shift of public service management from the public to the private sector (Nordtveit, 2004). The theory in consonance with the neoliberal theory, believes in a minimal state intervention because of the rent-seeking attitude of politicians and other public officials (Corrales, 2012). These theories are further explained in the literature review section of the study with their weaknesses.

Mutandwa (2015) argues that as per the principles of public choice theory, it is the responsibility of the state to institute policies that efficiently deliver public services that improves the wellbeing of its citizenry. The outcome of the failure of the government in the provision of the service will lead to many adverse effects, including inequalities in the spatial distribution of the service, which renders some areas to receive adequate service whiles others do not and by so doing leads to social and environmental injustice (Jones, 2009). The effects of the unequal distribution of the solid waste management services weighs on the entire society, leading to a wide range of

social, economic and health effects. However, residents in low-income areas are mostly affected (UN-Habitat, 2010).

In Ghana, problems associated with Solid Waste Management (SWM) are mostly felt in and around urban areas (Douti, Abanyie, & Ampofo, 2017) because there is a high rate of urbanisation leading to an increase in production and consumption patterns. The problem seems dire in these places because of the financial constraints placed on local and national level authorities to implement an effective SWM strategy to cope with the ever-increasing generation of waste (Oteng-Ababio, 2011). As a result, these urban areas are characterized by unauthorized littering of refuse in drains, roadsides, bushes, beachside, and rivers (Oteng-Ababio et al., 2013). Yet, social, economic and health effect of poor service delivery is mostly felt by the poor, who live in low-income settlements (UN-Habitat, 2010).

In terms of public health implication, poor environmental sanitation such as the non-collection of solid waste is seen as one of the causes of many diseases (Yoada, Chirawurah, & Adongo, 2014). Ministry of Local Government and Rural Development [MLGRD] (2010) posits that 6 out of 10 deadly diseases in Ghana are related to poor sanitation with malaria, diarrhoea and typhoid making up about 70-85 per cent of it. Additionally, it has been postulated that about 1.7 million children perish yearly because of the polluted environment (WHO, 2017).

Furthermore, poor SWM places a heavy burden on the economy of the nation (Oteng-Ababio, 2011). Specifically, the Accra Metropolitan Assembly, according to their composite budget (Accra Metropolitan Assembly [AMA], 2016), reveals that the Assembly requires about GH₵ 550,000.00 every month

to pay waste collection contractors. This becomes a problem when some of the residents (about 20%) refuse to pay for the service (Alhassan, Donkoh & Boateng, 2017). As such for the Assembly to keep Accra safe and healthy it is required of them to spend about 65 per cent of its revenue collected (AMA, 2016). Similarly, the Tema Metropolitan Assembly in the year 2016 spent around GH₵ 12,123,496 to collect its solid waste generated which was around 70,797 tons. Out of this only 56.2 per cent of the solid waste was collected while the rest of the waste dumped in unauthorized areas (Abalo, Peprah, Nyonyo, Ampomah-Sarpong, & Agyemang-Duah, 2018).

Adama (2012) posits that the introduction of PPP in the collection of solid waste has led to some spatial inequalities. Thus, the service is usually limited to high and commercial areas while people living in poor neighbourhoods receive little to none of the services in terms of frequency, reliability and satisfaction. However, solid waste management under the guidance of welfare philosophy stipulates that every person in a society irrespective of status or gender is required to receive adequate service delivery to safeguard their health and safety (UN-Habitat, 2010; Kubanza et al., 2017).

In the Tema metropolis, different actors within the context of PPP (Oduro-Kwarteng, 2011) do solid waste management services. The private waste companies through a franchise model service the high-class communities where households who are serviced with a house-to-house collection of waste are charged fees (Tema Metrolitan Assembly [TMA], 2016). Either a private waste company through a service contract model or the local assembly also services the other communities. The metroplis is seen as one which has fully incoporated the PPP system into its waste collection,

hence, the hope of waste as a public good been universally collected. However, there exist some discrepancies between the generation and collection rate (Oteng-Ababio, 2010), as well as the spread of the collection service across the different socio-economic communities within the metropolis (Oduro Kwarteng, 2011).

Statement of the Problem

The Ghana Local Government Law (1988), Provisional National Defence Council Law 207 and the Local Government Act 262 (1993) claim that solid waste management is the responsibility of the Metropolitan, Municipal and District Assemblies (Ayee,1996). Having failed to live up to that responsibility, the government of Ghana solicited for private sector participation in the delivery of services such as solid waste collection in the 1980s (Asare & Frimpong, 2013). The envisaged objective included the improvement of efficiency and effectiveness, as well as the equitable distribution of the service as indicated by the public choice theory (Kalimullah, Ashraf & Ashaduzzaman, 2012) so that the citizenry will enjoy an appreciable level of satisfaction that had eluded them for years.

The public choice theory is guided by the principle that the introduction of the private sector in the provision of public service is efficient as compared to the public sector provision. As such, there is the need for a shift of public service from a public to a private provision (Abenza, 2015). This leads to the achievement of equity, quality and coverage objectives of MMDAs (Savas, 1978). However, the theory, in setting benchmarks for the measurement of performance of the PPP policy failed to account for the user's perspectives (Oduro-Kwarteng, 2011; Yeboah-Assiamah et al., 2017),

especially when communities without effective waste collection services suffer social injustice as proposed by the social justice theory (Baabereyir et al., 2012).

The social justice theory argues for goods and services to be distributed according to the equitable principle of sufficiency (Mathiesen, 2015). Concerning solid waste management, it has been advocated for its distribution to be done in a manner that all beneficiaries will receive sufficient service delivery (Savas, 1978; Environmental Protection Agency [EPA] - Ghana, 2014). Despite this objective, there are still heaps of solid waste materials dumped in unauthorised places. This has created unsanitary conditions in Ghanaian cities – Tema metropolis included (Oduro-Appiah, Scheinberg, Mensah, Afful, Boadu & de Vries, 2017). These uncollected solid waste materials undermine people's rights to environmental and social justice. The heaps of solid waste also facilitate the spread of diseases such as cholera, diarrhoea and malaria as noted earlier because they carry disease-causing organisms and also lead to difficulties in realising the Sustainable Development Goals goal 3 and 6 (UNEP, 2014).

The situation is worse in poor urban communities where they have to cope with uncollected waste materials for weeks without any attention from authority's in-charge (Adu-Boahen, Atampugre, Antwi, Osman, Osei, Mensah, & Adu-Boahen, 2014). In this regard, many households resort to unfriendly disposal practices to make up for the delay of the solid waste collection services (Amoah & Kosoe, 2014). According to a basic sanitation report by EPA-Ghana, 2800 metric tons of municipal solid waste is generated per day in Greater Accra, out of this 2200 metric tons are collected leaving a

backlog of 600 metric tons uncollected (EPA-Ghana, 2014). According to the study these uncollected waste are mostly located in the middle and low-income areas in the Greater Accra. This evidence suggests that there is variation in the distribution of solid waste collection services in cities and towns in the Greater Accra Region where they receive the different quality of solid waste collection service.

The unequal distribution of SWC service across space has been established by some studies (Oteng-Ababio, 2010; Oduro-Kwarteng, 2011; Amoah & Kosoe, 2014). To these studies the spatial distribution of SWC service usually varies according to the service providers' collection logistics distribution across the different socio-economic classes. Thus, the variation was established by looking at the differences in number of solid waste collection logistics provided by the service providers. For instance, studies conducted in the Tema Metropolis by Oduro Kwarteng (2011) and Aziale and Asafo-Adjei (2013) revealed that high-class communities within the metropolis received adequate collection logistics compared to low-class communities. However, the number of collection logistics distributed to a community may not imply that the community is satisfied with the service received. As such it is important to measure the satisfation level of the different socio-economic communities in order to ascertain whether the distribution is equal or varied. One way of measuring the satisfaction level of the beneficiraies of the service is by knowing the perception of the beneficiaries on the quality of service they receive (Savas, 1978).

Furhermore, it was established in the studies (Oduro Kwarteng, 2011; Aziale & Asafo-Adjei, 2013) that the distribution of the SWC service is

always influenced by certain factors. Thus, for the distribution to be equal or varied factors such as the operational capacity of the firm, the regulatory role of the government or infrustructure facilities availability affect it. However, these factors seem contextual usually according to the area or space the varitaion or equality have been established. Hence the study examine factors that will help explain the distribution within the Tema metropolis. Lastly, it was observed that most studies did not look at the effect of the distribution on sustainable development. This is important because the introduction of a sustainable solid waste management system such as PPP in solid waste collection services is for the purpose of achieving an environment that could serve both the present and future needs of the people (Morelli, 2011). Hence, the study ascertained the effects of the distribution on the sustainable environment.

Objectives

The study set out to assess the spatial distribution of quality of solid waste collection service within the context of PPP in the Tema Metropolis. Specifically, the study:

1. Describe the spatial distribution of the quality of service delivered by the private solid waste collection companies in the selected communities in Tema metropolis.
2. Examine the factors underlying the spatial distribution of the quality of solid waste collection services in the Tema metropolis.
3. Ascertain the effects of the spatial distribution of the quality of solid waste collection service on the sustainable development in the Tema metropolis.

Research Questions

1. What is the spatial distribution of the quality of service delivered by the private solid waste collection companies in the selected communities in Tema metropolis?
2. What factors explain the spatial distribution of the quality of solid waste collection services in the Tema metropolis?
3. How does the spatial distribution of the quality solid waste collection service affect the sustainable development in the Tema metropolis?

Significance of the Study

Improving sanitation and health of the people are major developmental concerns in Ghana (EPA, 2014). This study, which focuses on the spatial distribution of solid waste collection services within households in the Tema metropolis, is of concern as it helps assess the quality of service delivered by the private waste companies and its effects on the sustainable environment. The outcomes from this study will, consequently, be useful for policy formulation towards the achievement of improving environmental sanity which will eventually reduce the health risk of the people. The findings will also throw more light on the type of collection methods, the responsibilities of the actors in the collection of waste and the human and capital capacity needed for achieving equity in the waste management industry.

Furthermore, the study contributes theoretically to the debate on whether the introduction of PPP in the provision of public service leads to an equal or fair distribution of the service delivered, as explained by the public choice and the social justice theories. This serves as a basis for further studies on the inequalities in delivery of public service. Findings from the research

will again help government and policymakers in their quest to formulating policies for the achievement of SDGs, specifically, goal 3, 6 and 11.

Scope of the Study

The study focuses on investigating the spatial distribution of solid waste collection services. Attention will be paid to issues including the Public-Private Partnership, Solid Waste Management, the spatial distribution of the solid waste collection service and the factors that affect the distribution of the service. Again, the effect of such spatial distribution on the sustainable environment will also be investigated.

The geographic scope of the study is limited to the Tema Metropolis. The study's target population are the beneficiary households in specific communities in the Tema metropolis. Again, the study gathered information from officials of the Waste Management Department in the Tema Metropolis and the private waste companies working in the metropolis. As part of the actors, the private waste company's officials interviewed were from the Meridian Waste Management Limited, J. Stanley Owusu Waste Collection Company and Asadu Royal Waste and Seed Company Limited.

Limitation

The study was fraught with some setbacks. The setbacks were mostly felt during the colletcion of data. Most of the data collected were from the households as such the researcher and his team had to visit these households either in the early morning before respondents leave for their workplaces or at night when they are back from work. This caused some delays in the data collection though all 363 interview schedules were completed. Similarly, the private waste firms in setting appropriate times for the interviews delayed the

researher. On one occasion the introductory letter presented to one of the firms was mistaken as an attachment letter and so sent to the human resource manager instead of the operations manager. This caused a delay in the collection of the required data in time and as such prolonged the writing of the report.

Organisation of the Study

The study is organised into five chapters. The first chapter presents the introduction which focuses on the background of the study, statement of the problem, study objectives, research questions, the significance of the study, the scope of the study and organisation of the study. The second chapter deals with the review of related literature on theories, conceptual issues, empirical studies and the conceptual framework of the study. The third chapter looks at the study methodology which constitutes the study area, study design, sources of data, target population, sample size, sampling procedure, data collection and analysis. Chapter four presents the results and discussion of the data collected. The last chapter discusses the summary, conclusions and recommendations of the study as well as areas for further study.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter looks at the theories, definition of concepts and review of some empirical studies as well as the conceptual framework for the study. The neloiberal theory is used to explain the reason for the introduction of PPP into public service delivery. However, theory omits the equality aspect of the public service delivery as such the public choice theory was introduced. The public choice theory explains why there is a need for equitable distribution of public service under PPP policy strategy. Yet, the public choice theory overlooks the effects of the equitable distribution of the service on sustainable development so the social justice theory was employed. Furthermore, conceptual issues examined are Public-Private Partnership, Solid Waste Management, and Spatial distribution of private solid waste collection.

Theoretical Review

The theoretical review is essential to this research. It spells out the main idea and strategies for completing the entire research work (Neuman, 2014). The review will entail the examination of the neoliberal, public choice and the social justice theories. These theories were utilised to explain the underlying principles that informed the focus of the study.

The neoliberal theory

The first theory employed was the neoliberal theory. According to neoliberalism, to achieve economic growth and development, countries are required to deregulate, privatise and lower taxes while reducing big government and too much official developmental aid (Roskin, Cord,

Medeiros, Jones & College, 2014). Some important precursors of the neoliberal-theory are Milton Friedman, Frederick von Hayek, Gary Becker and John Nash. Prominent among them is Milton Friedman, an American economist, who in his study in 1962 advocated free trade and the deregulation from complete government control of the market (Friedman, 1962).

The rationale of the theory is that of a belief in sustained economic growth as the means to achieving human progress that relies on a free market as the most efficient allocation of resources (Neilson, 2014). Kotz (2015) states that to ensure a free market system, minimal state intervention in economic and social affairs, and the commitment of the state to the freedom of trade and capital is crucial. Neoliberalism gained appeal towards the end of the nineteenth century as approval for liberalism waned because of the increasing demand of 'social reform' which was brought about by the mounting awareness of social problems (Clarke, 2005). The theory is known to have gained its foundation from the thinking of classical liberal theorists such as Adam Smith and John Keynes (Thorsen, 2010).

According to Roskin et al. (2014) proponent of the classical liberal thinking believe that the meddling and control of governments in the economy of monopolies, subsidies, and tariffs affects the efficiency and effectiveness of the provision of public service. For this reason, neoliberal theorists claim the superiority of the private sector to service delivery as against public sector provision. Hence, they proclaim that for improved efficiency and competition there is the need for limited intervention by the government (Ayee, 2013).

Again, neo-liberalists claim that for an economy, its political, social and economic relations can best be formed through formally free choices and

by rational actors who seek to advance their ideal interest in an institutional framework (Jessop, 2002). This assertion has been affirmed by Harvey (2005) arguing that human well-being can best be advanced by freeing individual entrepreneurial freedoms and skills within an institutional framework through strong private property rights, free market and free trade.

Thus, with the introduction of free choice and competition in the economy, where governments' responsibility shift towards regulation, efficient producers will prosper while the inefficient producers will die out. By so doing, the consumers or citizens will benefit from the provision of the service and this will ultimately improve the welfare of the entire society (Asare & Frimpong, 2013). Again, the neoliberal theory posits that the inefficiency of governments in their provision of service can be traced to their lack of capacity to run large industrial and commercial enterprises. For such reason, governments should only be tasked with core duties such as income distribution, public defence, and administration of justice (Roskin et. al, 2014).

The neoliberal theory is prone to condemnation even when the market forces function optimally. According to Gilpin (1987), even when the introduction of the market competition helps to reduce partially or completely inefficiencies and bring about new ways of production, it may end up destroying traditional social relations and institutions. For instance, Yeatman (2017) argued that neoliberalism seeks to erase the very idea of public services by redesigning it on business lines.

Similarly, Corrales (2012) asserts that markets that are usually governed by self-serving interests usually do not take into account the community values or even what they see as efficient. This may lead to the

introduction of some distorted prices and quantities, giving birth to a new level of discrimination against the vulnerable group in society. In sum, the neoliberal theory advocates for private take-over of public service delivery because of efficiency and effective reasons. However, the theory omits what the people's choice would have been which is always based on equity reasons. This weakness can be accounted for by the public choice theory

The public choice theory

The public choice theory proposes the application of the market competition to public service provision, while regarding prevailing government official provision of service as a poor way of service delivery (Buchanan & Tullock, 1962). Thus the theory is founded on the basis of free trade and competition. Affirming this, Green and Shapiro (1994) are of the view that public choice theory is used to explain how outcomes of political decisions conflict with what the people would have wanted. The public choice theory was propounded by James Buchanan, an American economist in 1962 based on his study on 'The calculus of consent', which was co-authored with Gordon Tullock (Buchanan & Tullock).

The theory's central argument assumes that people are motivated by self-interest in their decision-making and as such make choices taking into consideration what is best for them (Abenza, 2015). In making these choices, it is assumed that the behaviour of the people is rational and as such engages in a cost-benefit analysis of each choice before making a final decision so it maximises a given utility function (Hay, 2004).

Furthermore, the public choice theory claims that the pursuit of self-interest sometimes benefits the common interest usually when dealing with

private goods but contrary to public goods (Abenza, 2015). This is because not all buyers or users of the public good maybe willing to pay for the service. As such in terms of public services like solid waste management, the theory advocates for competition in its provision to help improve efficiency and choices for the beneficiaries (Buchanan & Tullock, 1962). In this regard, governments are supposed to regulate the private sector to avoid exploitation of consumers because most public services such as waste management are supposed to serve everyone in the interest of equity and social justice (Anazodo, Okoye & Ezenwile, 2012).

In the bid to regulate the private sector, governments opt for public-private partnership in the provision of services of which solid waste management services is no exception (Yeboah, 2017). This collaboration between the private and the public sector restrain the latter's influence. As argued by Asare and Frimpong (2013), there is the need to restrain the public sector while private property right and market transactions are adopted whenever one is dealing with individual preferences. This is because if the public sector is allowed to partake in providing the good, the self-interest of the politician - manipulating budgets and expanding their public sector empires - may render it inefficient (Hepple, 1989 cited in Asare & Frimpong). As such the private sector which seems more dynamic, resilient, creative, innovative and vibrant looks more favourable in the provision of public services. However, just like the neoliberal theory, the public choice theory agrees on minimal participation of the government and advocated for their focus to be on a regulatory and supervisory role.

More importantly, with this study, the public choice theory holds that the regulatory role of the government in solid waste management shall be to promote an efficient and effective public-private partnership that will ensure the equitable distribution of solid waste collection service (Nordtveit, 2004). Savas (1978) indicates that the equity within the distribution will be experienced in terms of the service quality, affordability, accessibility and good customer service.

Multiple criticisms have been raised against the public choice theory. Interventionist scholars such as Lewis-Beck and Shapiro claim that the theory has less empirical evidence to suggest that private agents are more self-interested and rational than they are in practice (Lewis-Beck, 1990; Green & Shapiro, 1994). Again, they believe that not all public goods managed by individual bureaucrats for the benefit of the society become inefficient and as such, there is no need to employ the private sector for all public services.

Furthermore, the libertarian school of thought argues that the rational argument of the theory is itself irrational, in the sense that its argument about social contract avoiding free-riders because of the non-rivalry and non-exclusivity of public goods is irrational. This is because these goods usually end up consumed by the privileged few, who paradoxically become free-riders (Lemieux, 2015).

Lastly, the fixing of the public service market through the introduction of PPP under the mechanism of public choice may enhance social welfare but may not necessarily promote equity and environmental justice (Esty, 1999). The neoliberal and public choice theories helped explain why the management of solid waste is under the PPP governance system – thus, its potential of

distributing the service equally so to mimic its public service characteristic. However, the effect of this on equal distribution in space is not accounted for; hence the social justice theory is employed to explain this gap.

The social justice theory

The social justice theory centres on the fair and equitable distribution of power, resources, and obligations in society to all people regardless of race or ethnicity, age, gender, ability, status, sexual orientation and religious or spiritual background (Van den Bos, 2003). Sue (2001) had earlier argued that the principles underlying this theory include values of inclusion, collaboration, cooperation, equal access and equal opportunity. These values are also seen as the foundation of democratic and egalitarian societies. Proponents of this theory can be traced to the 18th century to the works of Augustine of Hippo and Thomas Paine. Later in the 20th century, researchers established that the central philosophy of social contract is the social justice theory as explained in the work of John Rawls and David Miller (Rawls, 1971; Miller, 1999).

The social justice theory is associated with several positive terms – such as fairness, equality, inclusion and diversity. The theory is assumed to be based on the notion that society is made up of independent parts which are governed by an institutional structure with its impact affecting each member equally (Miller, 1999). In the work of Miller, social justice can be likened to distributive justice, where it is explained as the fair distribution of benefits and burdens among the members of a given association or society (Miller; Young, 2011).

Thus, justice is served in a society when each member irrespective of status or class receives an equal portion of benefit in the society and its

burdens (Andre & Velasquez, 1990). For instance, a society that manages well its solid waste may have its members receive equal good health in relation to waste management health matters; conversely, if that society mismanages its solid waste its burdens such as the outbreak of diseases may affect all the members of the society equally.

In the distribution of the benefits and burdens, the theory argues about which strategy it should be based – on either the merit or need of the good (Miller, 1999). About this, those who believe that distributive justice should be strict argue for the distribution to base on merit principle while those who see the distribution as a means of improving the wellbeing of the vulnerable in society subscribe to the need principle (Flew, 1999). Thus, the concept of social justice is one which advocates for fairness and equity and rejects discrimination of any kind based on variables such as class, gender, ethnicity, or culture (Johnston, Gregory, Pratt & Watts, 2000). However, to Miller, the distribution will be equitable if it follows the principle of need rather than merit.

However, in developing countries where development is spatially concentrated in few places while a large part of these countries remains undeveloped, Johnston et al, (2000) assume that the under development of the countries is as a result of unequal distribution of goods and service. This, according to studies (Chen 2010; Baabereyir et al., 2012; Oduro-Kwarteng & Van Dijk, 2013), occurs because of some welfare factors including; economic factor – income, social factors – educational level, the age composition of the society and unemployment rate, and geographical factors – population density and urbanisation of the regions.

To contend this theory, Frederick Hayek (1899-1992) the late Austrian economist and political philosopher seems the most ardent as he views social justice as a concept which should be left in the hands of the individual to practice rather than having it practised by a regulatory body (Novak, 2000). Again, social justice to him should be the distribution of goods and services based on merit not according to any system of justice as advocated by David Miller. Hayek further critiqued that most users of the term social justice have no idea what it means but use it anyway (Lister, 2013).

Lastly, Hayek believes that social justice is a misleading term for there is no justice in the distribution of benefit and burdens in society (Lister, 2013). However, some writers have refuted these criticisms. For instance, Flew (1999) and Behr (2005) both disagree with Hayek's assertion that the term social justice has no meaning, saying that the meaning is always understood by the practitioners of the term. To understand the theoretical framework, there is a need to discuss some relevant concepts guiding the study. As such, the next section will discuss the conceptual issues of the study.

Conceptual Issues

Reviewing the major concepts underpinning the study is essential as it helps choose and define appropriate variables of interest in the study as well as getting to know how analysis of data will be done (Yin, 2003). Thus, reviewing the concepts guide the researcher in identifying the required research design and data to be collected, thereby easing the difficulty of the study (Griffee, 2012). Concepts to be reviewed include PPP, solid waste management and the spatial distribution of private solid waste collection service.

Public-private partnership

The concept of Public-Private Partnership has gained much recognition as a key mechanism for public policy since the 1980s. Public-private partnership was initially started by western countries in the form of 'financial engineering' for public policies (Walker & Walker, 2000; Wettenhall, 2007). In developing countries, however, PPP began by being imposed as a key strategy for delivering public services because of their indebtedness to western countries and international development agencies like the World Bank and the International Monetary Fund (IMF) (Fiszbein & Lowden, 1999).

Definitions of PPP have always moved similarly. According to Wang, Xiong, Wu, and Zhu (2018), most definitions are based on the argument that PPP is a cooperative institutional arrangement between the public and private sectors. Key information revealed among the definitions includes the mutual agreement between public and private sectors; public service delivered by the private sector, and the objective as being achieving an efficient, effective and equitable service provision.

In the view of Savas (2005), PPP is an arrangement between a government and a private entity (either profit or non-profit) to jointly perform a public activity. Thus, it is a cooperative union that involves one government unit and a private firm(s) whose aim is to build a large, capital intensive, long-lived public infrastructure or to undertake public development work. Similarly, Dube and Chigumira (2011) defined it as a contract between the public sector and a private firm, for which the latter provides a public service by assuming the financial, technical and operational risks in the project. In simple terms, a typical PPP arrangement involves a government agency

working hand-in-hand with a private firm to purposefully renovate, construct, operate, maintain and or manage a facility or system, in whole or in part, that provides a public service (Guevara, 2015).

It could be inferred from the definitions above that PPP is a form of partnership, agreement or contractual arrangement that involves two actors, a government unit and a private party in the production of goods and services for public usage and for which both parties enjoy mutual benefits. The arrangement affords the means of both parties (public and private) to combine their unique characteristics that provide advantages in a specific aspect of service delivery (Yeboah, 2017).

Public-Private Partnerships are different from privatisation because of some distinguishing features. Although PPP finds itself embedded in privatization, according to the Institute of Local Government Studies (2011) the features of PPP include: firstly, the sharing of potential risk and rewards that comes out of the delivery of goods and services – risk includes financial risks, responsibilities and quality assurances for the beneficiary; secondly, with PPP, the government entity involved in the contract retains control and ownership of the good or service; thirdly, the arrangement may produce some new and better product or service which no single organisation in the cooperation can produce alone; and lastly, the cooperation usually involves a longer-term commitment which usually spans from 10 to 30 years while privatisation will mean the private firms will own the project (ILGS).

Models of public-private partnership

Models of PPP are numerous and can be differentiated by the degree of involvement of the private sector and period of the contract (Yeboah, 2017).

Some of these models are the management contract, concession, lease, and Franchise (Stottman, 2000).

The management contract model covers a wide range of contracts including technical assistance contracts, operation and maintenance agreements and many more (Stottman, 2000). The contract goes through a process which starts with the awarding authority engaging a contractor to manage a range of activities for a relatively short period (2 to 5 years) (Chowdhury, Jomo, Platz & Sharma, 2016). This contract type is task-specific and focuses on the input, not output. The management contract model is advantageous, firstly to the contractor as he or she suffers no investment risk as remuneration is paid by the awarding authority. Again, the model helps the contractor in managing a wide range of activities in a short term. However, the model is disadvantageous to the contractor as the operational risk associated with the contract is borne by the contractor only. Lastly the model limits the potential of improving efficiency and performance of the operators.

The second PPP model is the concession model. The model provides a situation where there is a direct link between the private partner and the beneficiary of the service provided (Roehrich, Lewis, & George, 2014). The private entity becomes the operator responsible for the delivery of the service, its operation, maintenance, collection, management, construction and charging users for the service provided. With concession, the public sector is expected to provide performance standards and ensuring that the service meets the requirements. Normally the concessional model is associated with a long period (25-30 years) (Mouraviev, Kakabadse, & Robinson, 2012). This modelis advantageous as it helps the private sector amortize their investment

while focusing on the output of the operation (perfomance). On its demerits, asserts gained from the contract goes to the awarding authority and sometimes monies collected are not enough to meet the investment made.

The third PPP model is the lease or affermage model. This model seems similar to the concessional model except for the financing and investment that is usually the responsibility of the public sector and not the private sector. This form of PPP is appropriate when there exists already the infrastructure and as such, the risk premium of transferring the responsibility to the private sector is high (Yeboah, 2017). This model is advantageous as the operator is assured of its fees as they design and manage the investment made. On the demerit, the operator tends to bear greater operating risk and fee collection risk.

The fourth PPP model is the franchising model. This form of PPP arrangement gives an exclusive right to a franchiser or a private firm with significant experience in operating a service to deliver the service in a defined community and to collect fees directly from the beneficiaries (Roehrich, et al. 2014). Again, the government in-turn taxes the firm and also fixes prices for the service to maintain control (Awortwi, 2004). Out of all these models, the Tema metropolis adopts the franchising model in the delivery of its solid waste collection service. This is because of its advantages as compared to the other models. These advantages include the fact that with franchising, the cost of provision and maintenance of the project or service are saved. It allows the beneficiaries the choice to refuse to pay for the service if it does not meet high standards. Also with franchising model, there is high recovery rate and income generation by both parties, which help, improve the service (Kolesova, 2015).

Conversely, when the user fees are high it may defeat the principle of 'publicness' or it won't meet the needs of the low-income earners of the town (ILGS, 2011).

Knowing the type of PPP model selected to manage the waste problem of a community is important. As to knowing the nature, type and quantity of waste to be managed. As such the next section looks to provide some information on the waste problem in Ghana and specifically, Tema metropolis.

Waste, solid waste and solid waste management

Waste, as defined by Ita (2003), is any material lacking direct value to the producer and so must be disposed of. In simple terms, an item turns waste when the owner or producer stops taking responsibility for it (Palmer & Strickland, 1998). Examples of waste materials includes; municipal solid waste (household trash/ refuse), hazardous waste, wastewater (such as sewage – mostly containing faecal matter, urine and household dirty water) and radioactive waste. These types of waste can be grouped into three basic forms, usually according to their characteristics, namely solid, liquid and gaseous waste.

Solid waste according to UNEP (2009) is all non-liquid, non-gaseous, non-hazardous waste. These include all domestic, commercial and industrial wastes as well as human waste (Cointreau-Levine, 1994). Managing solid waste has become a challenging issue and has prompted many scholars to research about it. Solid waste management is usually concerned with the way and manner the actors get organized for the collection, transport, treatment/processing and the final disposal of solid waste material (Obirih-Opareh, 2003). Hence, solid waste management can be defined as the

collection, transfer, treatment, recycling, resource recovery and disposal of solid waste (Christen, Schubeler & Wehrle, 1996).

The generation of solid waste is affected by a country's stage in economic development and the level of industrialization, which influences the personal income, and the consumption pattern of individuals (World Bank, 2011). As such, an area's socioeconomic status may determine the quantity, variety and composition of solid waste produced. In Africa, the average solid waste generation rate is around 0.78kg/person/day as compared to 1.22kg/person/day for the developed world (Van Beukering, Sehker, Gerlagh, & Kumar, 1999). In Ghana, according to Meizah et al. (2015), the rate ranges between 0.2kg/capita/day to 0.8kg/capita/day. Thus, the rate of waste generation ranges between 0.2 to 0.8 kilograms per capital invested per day. The generated waste is mostly composed of high biodegradables (organics and papers) 67 per cent, and out of this percentage, food waste is made up of 78 per cent whereas the remaining 22 per cent is made up of recyclables such as plastics, textiles, metals, glass, rubber and leather wastes.

Storage of solid waste is usually fraught with problems (Oteng-Ababio et al., 2013). Known among these problems is the inadequate supply of the storage containers and the irregular collection of the containers which lead them overflowing their banks and degrading the environment (Yoada Chirawurah & Adongo, 2014). Storage containers used are mostly in the form of dustbins for areas served by the House-to-House model and community container for areas served with Communal Container Collection (CCC).

The collection of solid waste in Ghana is in two forms, namely the House-to-House (H/H) and the Communal Container Collection services.

According to studies (Oteng-Ababio, 2010; Yeboah-Assiamah et al., 2017), solid waste collection in Ghana is mostly concentrated in the high-income areas as compared to the low-income densely populated areas which make up over 60 per cent of the landmass in urban cities.

Disposal of waste in Ghana is mostly done through landfills because of its economical and convenient advantage as compared to other waste disposal methods such as the recycling of the waste (Hoornweg & Bhada-Tata, 2012). According to Agyepong (2018), Ghana practices the form of landfill method which is often un-engineered, open-pit waste dumping with no leachate control, less application of cover material, open access to scavenging animals and humans. These landfills produce dangerous gases like methane, carbon dioxide, ammonia and hydrogen from their biodegradation into the atmosphere (Mata-Alverez, 2002).

Solid waste management as an "impure public good"

Although recently solid waste management is seen as a market good, factors such as its non-exclusive and non-rivalled nature still render it a public good (Baud & Post, 2003). This confusion has caused some scholars such as Lucy, Gilbert and Birkhead (1977) to term the good as an impure public good because in its provision some households are excluded from its benefit through the fees or charges placed on the service. However, because of the negative externality associated with waste, its management is always expected to benefit all equally (Cointreau-Levine, 1994; Centemeri, 2009).

A pure public good is a hypothetical good that is non-rival in consumption and exhibits a zero degree of exclusion; for instance goods such as public defence and administration of justice. On the other hand, a purely

private good is a good which its consumption is completely rival and has a relatively perfect degree of exclusion (Cointreau-Levine, 1994). However, between these two extreme cases is an intermediate area with goods finding themselves in this area being called “impure or merit goods” (Pessoa, 2006) this is shown in figure 1.

These goods are classified in the social sector zone in figure 1 and include goods such as free education, free health services, solid waste management and subsidised low-cost housing (Musgrave, 1959). These goods and services are termed impure because of the degree of exclusiveness its exhibits. Goods and services that are non-exclusive – meaning no one is excluded from its enjoyment but rivalled – meaning its consumption can be delivered by competing sources are termed impure public goods (Pessoa, 2006). However, the non-exclusive nature of the good or service means that there is a need for equitable distribution of it as such making it a public good.

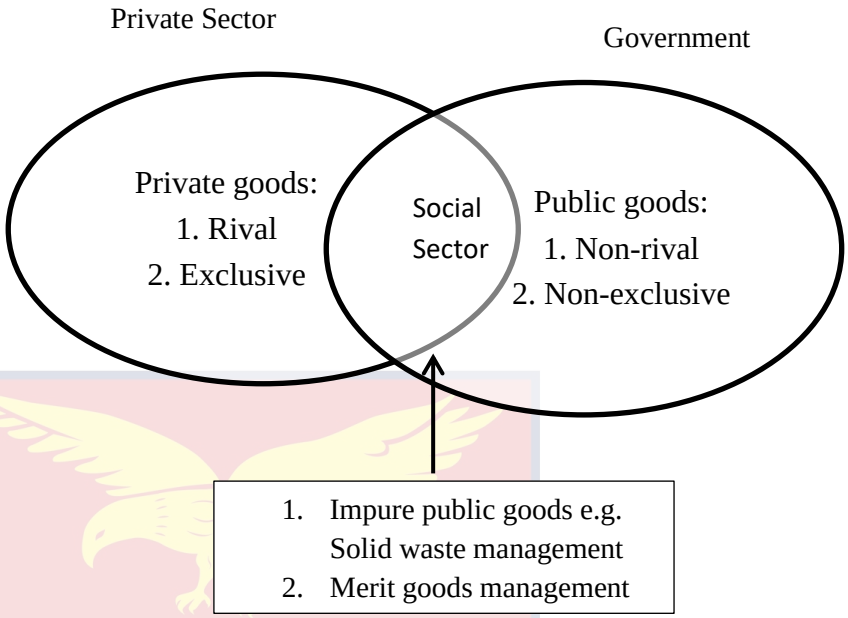

Figure 1: Solid Waste Management as an Impure Public Good

Source: Pessoa, 2006

Significance of PPP in solid waste management

With regards to the benefit of PPP on solid waste management, many views have been given. The first is that private sector involvement in waste management can help correct some management service problems (Van de Klundert & Lardinois, 1995). These management problems, according to the neoliberal theory, are the factors that brought about government failure in the delivery of public services (Awotwi, 2004). The introduction of PPP into public service delivery helps solve these problems through the introduction of new ideas, technologies, qualified staff and adequate production resources (Osborne, 2000).

Secondly, the introduction of PPP helps in the sharing of risk among actors or stakeholders of the services (Wang et al., 2018). This helps to

address the deficiency in quality service delivery, which the state-based management appeared to have failed. These risks include cost overruns, inability to meet schedules for service delivery, difficulty in complying with environmental rules and regulations or risks that revenue collected cannot cover the operation and capital cost (Kwan, 1999).

Thirdly, PPP help increase revenue generation through the setting user fees, which may reflect the true cost of the service (Lohri, Camenzind & Zurbrugg, 2014). This occurs because with PPP there is usually the introduction of innovative revenue techniques such as it allowing the introduction of many private firms into the service to allow for competition in price setting, which would not be possible under the state-managed service delivery (Kwan, 1999).

Lastly, the adoption of PPP may help improve the level of service delivery or help maintain the existing levels. This can be done through the introduction of new techniques, which often help reduce cost whiles improving the quality and level of services (Kwan, 1999). This form of efficiency is usually realised through various activities including the designing and construction of the project, flexible contracting and procurement of resources for the service delivery and quicker approval of financial decision-making (Kwan; Yeboah, 2017).

From the review it was realized that there exist some importance associated with the introduction of PPP in Solid Waste Management. However, how the service will be distributed across space needs to be explained. This is done in the next section.

Spatial distribution of private solid waste collection

Equal distribution of waste services with an urban spatial reach, according to studies (Baabereyir et al., 2012; Savas, 1978) poses a challenge because of factors such as the operational capacity of waste management companies, government policies, infrastructural availability and the type of distribution utilised. This renders universal coverage of the service only as an eventual objective. In an urban area, which comprises different classes of neighbourhoods according to socio-economic characteristics, the allocation of public service such as solid waste management usually varies between jurisdictions (Akafia, 2014). Given the limited reach, the distribution of solid waste service between neighbourhoods becomes an important issue.

One way of ensuring an equal distribution of the service is through the introduction of PPP. Through PPP, the government can resort to placing on private providers a mandatory obligation to provide universal or broader access to the service. This occurs when the private provider is occupying a monopoly position (Pessoa, 2006). This can result in the achievement of equal outcome in the distribution of the service. To ascertain whether the said service produces an equal outcome, one way is to measure the quality of service delivered to the beneficiaries of the service (Savas, 1978).

Service quality

The concept of service quality has been explained by different viewpoints. Common issues that were raised from all these views centred on meeting customers' needs or expectations (Bateson & Hoffman, 2011; Gabbott, Helsdingen, & Kasper, 2006; Park & Yoo, 2007). Expectations of a customer are the beliefs about the said service and this serves as a standard on

which the quality of the service is measured (Almsalam, 2014). Accordingly, expectations between two or three people are not always equal even if the service delivered to them is identical. This variation may be caused by some changing personal situations such as income levels, educational achievement or residential status (Shriwas, Rao & Sharma, 2018).

There are many models of service quality measurement (Ladhari, 2008). These models were designed for some industry-specific scales to show the relationship between the variables of interest and it is seen as a simplified description of the reality (Seth, Deshmukh & Vrat 2005). Some of the models are the Grönroos service quality model, the SERVQUAL model, and the SERVPERF model.

The Gronroos model believe that the conceptualization of service quality should be customer-based. The model stresses that the interaction between the buyer and the seller in a service setting is relevant as the evetual outcome. Basically, the priniciple of the model is that service quality rest on the comparison of two variables, that is the expected service from the customers and the actual service as perceived by the customers. This gives an outcome as the perceived service quality of the service. It has been criticised that the model is based on services that are sorely provided by humans as such lacking measuring performance of services that physical and technological elements play important role (Grönroos, 1984).

The SERVQUAL model on the other hand is seen as a gap between customers' expectations and perceptions (Parasuraman, Zeithaml & Berry, 1985). The model sees service quality as a multi-dimensional construct with about 5 dimensions. Thus, to the SERVQUAL model regardless of the type of

service, criteria for measuring service quality is to find the difference between expectations and perceptions of the customers through the dimensions. The dimensions are; reliability – thus, the ability to perform the promised service dependably and accurately, responsiveness- thus, the willingness to help customers and provide prompt service, assuarance- knowledge and courtesy of employees and their ability to convey trust and confidence, tangibility- appearance of physical facilities, equipment, written materials and personnel and empathy- caring, individualised attention the firm provides its customers. This model has been criticised for its not been appropriate for all services offerings (Babakus & Boller, 1992).

Lastly the Service Performance or SERVPERF model is seen as an alternative to the SERVQUAL model. This model believes in measuring only the experiences of the respondents without looking at the expectations of the customer (Cronin & Taylor, 1992). The model maintains that performance instead of performance-expectation determines service quality, meaning the model believes that customer expectation are built into the performance and hence no need to measure them separately (Kelkar, 2010). The SERVPERF model allows all services to be measured unlike the SERVQUAL model that was made for some specific services.

From these models, the study will use the SERVPERF model (Cronin & Taylor, 1992), although the instrument under the model will be remodelled to incorporate in it the specific interest of the solid waste collection service. The model will be used to measure the level of quality of the received solid waste collection service (perception) and compare with the ideal form of the service.

The SERVPERF model as an alternative to the SERVQUAL model measures experiences only and do not probe the customer's expectation. Thus, the instrument is devoid of the expectation part of the SERVQUAL model, as the model is of the view that measuring service quality is better off been predicted by just the perceptions of the service received and not the difference between the perception and expectation of the customer as suggested by Parasuraman et al., (1985).

Hence, the study will measure service quality by measuring how customers or beneficiaries of the solid waste collection are satisfied to the service been provided by the private waste companies (Savas, 1978; Angelova & Zekiri, 2011). The remodelled version will prioritise issues or variables such as reliability of collection service, condition of equipment and the satisfaction on complaints, charges and sanitary conditions. Under these dimensions of solid waste collection service quality, will be various parameters or questions on which the customers will be allowed to choose their satisfaction level. Information on this is shown in Table 1.

Table 1: Dimensions of Service Quality

Quality Dimensions	Definition	Parameters
Reliability of collection service	How timely and regular the service is been delivered to the customers by the private solid waste collection companies.	1. Timely collection 2. Regular or consistent collection
The condition of the equipment	How adequate, appropriate and obtainable is the collection containers for solid waste collection in the selected communities.	1. Adequate SWC containers provided 2. Appropriate equipment used for SWC 3. Proper handling of the SWC containers 4. Safe transportation of SWC containers
Satisfaction on complaints, charges and sanitary conditions	How the solid waste collection service satisfies the beneficiaries expectations on charges, cleanliness, and complaints after its delivery.	1. The behaviour of the collection crew 2. Cleanliness after SWC 3. Charges on SWC 4. Public monitoring and sanction by MA 5. Prompt response to user complaints

Sources: Oduro-Kwarteng, 2011; Shriwas, Rao & Sharma, 2018.

To measure the service quality, the study will employ the use of a four-point Likert scale which will range from Very Dissatisfied to Very Satisfied. Outcomes from this form of measurement will help determine whether the objective of equal distribution of the service has been achieved. Achievement of the objective will be shown by the equal satisfaction level attained by all the selected communities under each service quality dimension. This outcome can be spatially represented by the use of Global Information System thematic maps. The use of thematic maps is to show the differences or similarities in the distribution of solid waste collection services in Tema metropolis.

According to Shoba and Rasappan (2013), thematic maps are used to depict the spatial distributional pattern of a particular theme objective. Thus, they present information about a specific area in a manner that the spatial

patterns emerge. This type of map is composed of two important elements, namely; a base map and statistical data (Voženílek, & Kaňok, 2011). The base map shows the detailed background necessary to orient the location of the map, while the statistical data provides the parameters of the theme to be shown (Kovarik & Talhofer, 2013). In this study, the thematic map will be of importance, as it will be used to show patterns and relationships of the service quality delivered to specific communities within the study area. Thematic maps can be grouped according to the graphical variables been used and also the relationship they depict (Hinterberger, 2009). Popular among them are the dot density map, proportional symbol maps, isoline maps and choropleth maps.

The dot density maps use equal size dots to depict the presence of a feature at a specific location in geographic space. The dots represent the same amount or number of the phenomena to be presented. The dot pattern shown represents accurately the actual geographical distribution of the mapped phenomenon (Hey & Bill, 2014).

Secondly,the proportional symbol map is used to present absolute quantitative data. With this, a symbol such as a circle or a triangle is used to represent a spot on the map to which the data apply. The symbol usually varies in size from place to place in proportion to the value of the variable (Kunigami, de Rezende, Souza & Yunes, 2011). Thirdly,the isoline maps are elaborately drawn by linking constructed class boundary points to form a pattern by the use of contour lines. It is mostly used in weather forecast maps (Retchless, 2014).

Lastly, the choropleth maps are usually used to graphically present socio-economic phenomena, such as the unemployment rate, population density and literacy rate (Andrienko, Andrienko & Savinov, 2001). With this map, each area is shaded with a colour to show the density or number of people per square mile. These maps are a form of graduated colour maps that are used to show variation in the themed objective.

The study will adopt the choropleth map type of thematic mapping, as it will help show the difference or similarities of the quality of solid waste collection service distributed between the selected communities with ease. On this, the shaded colours used will show whether a community is averagely satisfied or not with the quality of solid waste collection service they receive from the private waste companies. However, whether the phenomena under investigation produce an equal or varied distribution depends on some influencing reasons or factors. On this, the next sub-section will be dedicated to the discussion of the factors that influence the spatial distribution of public service (solid waste management).

Factors influencing the spatial distribution of public service

The introduction of the private sector into the solid waste collection is to improve the effectiveness and efficiency of the service, which result in the equal distribution of the service. However, if the arrangement between the actors of service delivery and conditions are not perfectly structured, service providers (private solid waste companies) may not achieve the set objective (Cointreau-Levine & Coad, 2000). Thus, for private solid waste companies to achieve equal distribution of the service, there is the need to improve their equipment holdings (capital resource), skills and knowledge (human resource),

as well as the government or authority in-charge, has to ensure the implementation of good regulations to guide the service and better infrastructural facilities (Oduro-Kwarteng, 2011). These factors affect the distribution of the service across space. According to Oduro-Kwarteng the factors can be grouped into internal and external factors.

The internal factors according to Oduro-Kwarteng (2011) has to do with factors that arise from the dealings of the firm. The first had to do ewith the capital resource capacity of the firm. This looks at the availability of the required amount of both physical and liquid investment (Mishra, 2014). Physical investment of the firm looks at the equipment used in the collection of waste. For instance, the compactors, side loader, skip trucks and roll-on-trucks owed by the firm. Meanwhile, the liquid investment looks at the firm's financial capacity and their ability to retrieve monies owed the company in the form of charges on the service rendered (Bartone, Bernstein, & Wright, 1990).

The human resource capacity, on the other hand, deals with the human resource that makes effective management of capital resource possible (Nachum, 1999). Thus, they are the managers of the service delivery. They include all the employees of the firm, starting with the directors, managers, supervisors/mechanics, collection crew, drivers, and cleaners.

According to the public choice theorists, an increase in budget (internal resource) will have a positive effect on the efficiency of the firm. This is to say that an increase in budget will lead to an increase in the quality of service delivered by the private solid waste companies. As such, Boyne (2003) proposed that the relationship between the resource of a firm (financial and real resources) and improvement in service delivery is positive.

The external factors according to Oduro-Kwarteng (2011) are the factors that influence the service delivery from the outside sources. Thus, it influences service delivery from outside the dealings of the firm. These factors include the role of government as a regulatory body and the availability of infrastructural facilities.

On how the role of government as a regulatory body affects the delivery of public service, it is known that policies enacted by the government have always been geared towards the efficient management of the service (Abdel-Shafy & Mansour, 2018). In Ghana, efficiency in the management of solid waste has seen the government passing many policies including the Environmental Protection Agency Act (1994), the Environmental Assessment Regulations (1999) and the Environmental Sanitation Policy (2010). However, this regulatory control of the government through policies can also lead to inefficiencies, especially when its implementation leads to distributional inequality (Akafia, 2014).

Similarly, the availability of infrastructural facilities such as good road networks, and better disposal sites can help improve the efficiency of solid waste collection (Amoah & Kose, 2014). On the road networks, an urban area with poor urban planning will have its roads not leading to vantage points where the solid waste could be collected. This will lead the people to dump rubbish in unauthorised places indiscriminately. Again, without a better disposal site, the reliability of the collection service will be thwarted.

The discussion done on both the internal and external factors goes to show that the spatial distribution of the quality of solid waste collection service can be positively or negatively influenced by some factors. Again, the

distribution of the solid waste collection service by the private waste companies may affect the sustainable environment. Hence, the next sub-section will discuss these effects.

Effects of the Spatial Distribution of Solid Waste Collection Services on the Sustainable Delevopment

The concept of sustainability gained momentum towards the end of the twentieth century because of the growing awareness of environmental problems globally. This saw a surge in literature about the concept, with most trying to define, determine the various dimensions and find ways of measuring these various dimensions. One report that gave much popularity to the concept is the Bruntland Commission Report of 1987, which highlighted and stressed the need for sustainable development while harmonising economic growth with environmental soundness (Du Pisani, 2006; Gibson, 2006).

From the report, sustainable development was defined as development that meets the needs of the present era without compromising the ability of future generation to meet their needs (Harris, 2003). The report further provided three fundamental components of sustainability of which there is the need to maintain balance for the achievement of sustainable development (Du Pisani, 2006). The components are the environment, economy and society, together they form the framework of the "Triple Bottom line" as developed by Sibley, Hes and Martin (2003).

Environmental sustainability as one of the fundamental blocks of sustainable development has been defined by Morelli (2011) as the responsible interaction with the environment to avoid exhaustion or ruin of natural resources and allow for long-term environmental viability. Under the

environmental sustainability agenda, which is spearheaded by development partners World Bank and United Nations, solid waste management is seen as an important component (Tilaye & Van Dijk, 2014). This is because problems associated with solid waste such as inadequate service coverage, irregular waste collection, indiscriminate disposal in unauthorized places, waste spill-over from bins and storage containers, and waste littering may lead to environmental degradation and aesthetic nuisance (Onibokun & Kumuyi, 1999; Zurbrugg, 2002; Oduro-Kwarteng, 2011).

Social sustainability, on the other hand, looks at the social impacts of mismanaging solid waste to the beneficiary households and communities (Reddy & Thomson, 2015). The social impact associated with mismanagement of solid waste is the health consequences of the people. Thus as the environment becomes more favourable for the breeding of disease-carrying organisms such as mosquitoes and rodents because of some uncollected waste, there will be a rise of infectious diseases such as cholera (Haines, Kovats, Campbell-Lendrum & Corvalan, 2006).

Lastly, economic sustainability is generally defined as the ability of an economy to support a defined level of economic sustenance for the present and future generations. Thus, to be economically sustainable under solid waste management, there is a need for both the environment and society to be sustainable (Reddy & Thomson, 2015). This means that both the environment and public health should be manageable to allow the economy to sustain both the present and the future generations.

This calls for the implementation of sustainable solid waste management systems. One of such systems is the introduction of the Public-

Private Partnership to achieve an equitable distribution of solid waste collection service (Bayliss & Kessler, 2006). To measure the system to ascertain the achievement of the objective, there is the need to measure the effectiveness of the operation from its collection, transportation and disposal of the waste (Batley, 1996; Dorvil, 2007).

The need for setting up a workable solid waste management system has been for various purposes. According to Van der Klundert and Lardinois (1995) concern for a working solid waste management system, aroused because of public health and sanitation reasons. They further argue that motivation for a sustainable solid waste system can be related to factors such as quality of life, cleanliness of streets and community appearance. This shows that the use of a sustainable solid waste system is to achieve a sustainable development, where the latter encompasses a clean environment and good public health (Corvalan, Kjellstrom & Smith, 1999).

Empirical Review

The empirical review part of the study presents research works that focus on the variation in the spatial distribution of privatized Municipal Solid Waste Services. Studies reviewed add up to five and include Chen (2010), Adama (2012), Baabereyir et al., (2012), Oduro-Kwarteng and Van-Dijk (2013), and Amoah and Kosoe (2014).

Chen (2010) examined the spatial inequality in municipal solid waste disposal across regions in developing countries, focusing on Taiwan. Specifically, the study examined how some socio-economic characteristics such as income, population density, age composition, unemployment rate and the education level may bring about variation in waste management. In

examining this relationship, Chen employed the use of the Environmental Kuznets Curve and the life cycle assessment theory. Mixed method study design which was geared towards a more quantitative field and multiple regressions were used to examine the relationship between the variables.

Chen (2010) revealed that there were differences with the municipal solid waste collection and disposal service between the urban and rural regions in Taiwan. The variation could be explained to a degree by the variables studied. It was further revealed that other variables influenced the variation in the management of solid waste; they included the economic and demographic developments, technological change, resources endowment, institutional framework and lifestyles.

Adama (2012) examined how governance practices related to privatisation and the regulatory role of the state reinforces spatial inequalities in the delivery of solid waste services. This study was grounded in public choice theory. The study employed a qualitative research approach and a case study design with solid waste management in Abuja-Nigeria as the case. The sample used for the study consisted of 10 officials purposively selected from the Abuja Environmental Protection Board (AEPB) - the agency responsible for solid waste management - and a selection of private contractors. Variables measured in this study took the form of knowing the billing methods adopted and how user charges were fixed. The use of content analysis were useful in analysing the data collected.

It was discovered from the study that government role in the PPP policy – being the regulatory role – was a major mechanism through which spatial inequality was (re)produced. Specifically, their role in fixing user

charges and in the choice of billing method brought about the spatial variations in the delivery of the service as it fails to take into account the income differentials of the people before such decisions were made.

Adama further confirmed that the cause of the inequality was because of the failure of the government recognising the people as key partners in urban public service management. This resulted in their neglect as they are not consulted on such issues and thus their interest not taken into consideration when decisions are taken. This arose because of the government's ignorance of the importance of accurate information in decision-making. The effect was that it brought about spatial inequality, which was attributed to the introduction of PPP in solid waste management.

In similar studies in Ghana, Baabereyir et al., (2012) examined the delivery of solid waste collection service across different socioeconomic groups of the urban population and the siting of waste disposal facilities in relation to the concepts of social justice and environmental justice. The theoretical basis for the study was the public choice theory, the social justice theory and the environmental justice theory.

The mixed-method research approach was used, which laid the foundation for the use of both questionnaire and interview schedule in collecting primary data for finding answers to the aims of the study. Data analysis was done using the Statistical Package for the Social Sciences (SPSS) for the quantitative data collected while thematic analysis was used to interpret the qualitative data collected.

It was revealed from the study that the solid waste situation was improving but at a lower rate. The study attributes this situation to the amount

of waste generated as against the collection rate, on which the study reported that 70 per cent of the waste generated is properly collected and disposed of. The waste collected is mostly concentrated within the wealthy neighbourhoods and also areas with government buildings whiles poor neighbourhoods and commercial areas receive little or no service.

According to Baabereyir et al., (2012), the situation of differences in solid waste management services between different socio-economic neighbourhoods can be related to factors such as the lack of political commitment to address the waste collection and disposal problem. Furthermore, the difference was linked to the scarcity of resources including finances, equipment, personnel, land space for waste disposal and the lack of enforcement of existing regulations on solid waste management.

Oduro-Kwarteng and Van Dijk (2013) conducted a study in five cities in Ghana (Accra, Kumasi, Tema, Takoradi, and Tamale). The study focused on the private sector involvement in solid waste collection and the influence private sector capacity and local government's regulations had on the variation in private sector performance. This study's main objective was to examine the evolving involvement of private sector in urban solid waste collection and the factors that explain the difference in the performance of private sector companies.

Results for the study were attained by sampling 17 out of 25 private companies and examining their internal capacities. Data on their internal capacities constituted knowing the number and types of vehicles available for the service provision, quantities of waste collected and the number of trips

made by each company in their collection and transportation of solid waste materials.

Oduro-Kwarteng and Van Dijk (2013) reported that on the performance of the private firms, there was a significant difference in service quality across cities and that the service quality of the house-to-house collection was higher than that of service contract for communal container collection. The study further suggested that the high productivity of the private sector does not necessarily lead to better service quality due to the profit motive, capacity, and regulatory factors influencing performance.

As such, the study's finding was contrary to its hypothesis that high productivity of a company leads to better service quality, and that high performance is achieved when both productivity and service quality are high. Again, the study revealed that with the involvement of the private sector in waste services about 60 percent of the waste generated is collected. Further, it was reported that the municipal assemblies and companies have not ensured customer-oriented-services due to the slow pace of households' involvement.

The study further revealed that the shift towards cost recovery through charging all households on a pay-as-you-throw (PAYT) basis for communal services and monthly fixed charges for curbside collection (house-to-house) of waste has been successful. However, some companies involve themselves with a fee-based collection which is usually faced with problems such as the unwillingness of households to register for collection, low payment rate at low-income communities, illegal dumping by some households who refused to register, high disposal fee, and weak enforcement of registration by the municipal assembly.

Lastly, Amoah and Kosoe (2014) investigated spatially the distribution of solid waste collection facilities in the Wa municipality. The study which centred on finding out whether or not there are variations in the distribution of solid waste management service delivery was underpinned by the public choice theory. In finding solutions to its objectives, the study adopted the mixed-method research approach with both the questionnaire and the interview guide used in collecting the needed information.

The study's sample size was 160, comprising 150 respondents (beneficiaries) and 10 officials of the waste management authorities (both the local government authorities and the formal private waste management companies). Systematic simple random sampling technique was used for the beneficiaries' whiles the officials were purposively selected. To complement the secondary data, some field surveys were conducted to help generate empirical data through interviews and questionnaire administration. Again, to pick geographic positioning of the Communal Container Collection (CCC) points the Global Positioning System (GPS) was employed. Descriptive statistical analysis and some content analysis were used in the study.

The findings of this study showed that there are two forms of waste collection service in the municipality -- house-to-house collection for the high- and middle-income communities, which are characterised by low density in population, well-planned settlements and better infrastructure availability. While the low-income communities which have high population densities, haphazard suburbs and bad infrastructural facilities are served through CCC. It was also discovered that the inefficiencies in dealing with the waste problem can be attributed to factors such as government's inability to mobilize the

needed funds to finance solid waste management, institutional weakness, poor urban planning that militate against the waste collection and the lack of policies and regulations. The summary of this review can be found in Table 2.

Lessons Learnt

Review of the various empirical literature revealed that the exploratory and survey study designs were mostly used. The exploratory design was used because studies on how solid waste management (mostly the collection and disposal) under the PPP policy is delivered across space is not enough and as such lacks clearly defined concepts, theories etc. Survey designs were also used to assess the impact of the performance of the PPP policy on solid waste management. The design allowed for an in-depth examination of the impact of the policy. In summary, while the exploratory design was used to determine or locate all the solid waste collection sites or how the collection sites have been distributed across the study area, the survey research design was applied to determine the policy's impact on the distribution.

It also emerged from the review that studies employed quantitative, qualitative and mixed-method research approaches in studying the issues on the effect of the PPP policy on solid waste management. However, most of the studies under review used the mixed method approach because it allowed some flexibility and permits the use of both quantitative and qualitative measures in its data collection and analysis.

It was also revealed that the simple and stratified random sampling and purposive sampling techniques were the most used by the studies reviewed. The simple, systematic and stratified random sampling was used in studies that relied on quantitative and mixed-method approach. On the other hand,

purposive sampling was used mainly in studies based on qualitative and mixed-method research approaches. Specifically, the purposive sampling technique was used to select officials or key informants of the solid waste management while the simple, systematic and stratified random sampling was used in selecting the beneficiaries of the service.

With data collection instruments, it was discovered that most of the reviewed papers employed either the questionnaire, interview guide or the field observation guide. In the case of the methods used in data collection, it was the questionnaire administration, key informants' interviews and field observations. The methods helped gain much information from the beneficiaries and officials who were the key informants. The use of varied data collection methods was beneficial as it helps overcome some deficiencies of using one method and ensures the validity of the data collected.

The scale of measurement of the key issues was mostly in nominal and ratio scales. The measurement of issues such as the number of collection sites, the type of collection, income differentials, amount generation of waste and the frequency of waste collection were mostly on ratio scale whiles the causes of the distribution, its effects and challenges were measured on a nominal scale level.

With statistical analysis, some of the studies employed the descriptive statistics, analysis of variance and multiple regressions. These analytical tools were used to analyze variables measured on nominal or ratio scale. The use of analysis of variance to confirm the relationship and the existence of spatial variation in solid waste was consistent as such tool is used in measuring differences and relationships between variables. In addition, the multiple

regression was used to measure the relationship between the independent factors – economic (income), social (educational level, age composition, unemployment rate and geographical (population density and urbanisation of regions). For the qualitative data that were mostly measured in nominal scale, content and thematic analyses were mostly employed.

From the studies reviewed, it could be inferred that there is spatial variation when it comes to the distribution of solid waste management services. However, this study's investigation about the variations deviates from the most used model (which measures variation in terms of the firm's internal capacity) to a more limitedly used approach (measuring the service quality from the end user's perspectives). Again, reasons given as the cause of the variation seems inconclusive, so the study will look for reasons which will help explain the variation. Lastly, the study will examine how the variation affects the sustainability of the environment in terms of its collection effectiveness, storage effectiveness and community cleanliness.

Conceptual Framework

The conceptual framework presents the synthesis of the concepts in the literature reviewed and it helps explain the spatial distribution of private solid waste collection service. As explained by McGaghie Bordage, & Shea, (2001) conceptual framework provides a stage for the presentation of a particular research question that forms the foundation of the whole study. In other words, it provides an understanding of how the variables of the study connect.

Interaction between the variables is presented in Figure 2. From Figure 2, the distribution of private solid waste collection service is seen to have a key nexus with the achievement of the aims of PPP. According to the public

choice theory, the introduction of PPP is to promote efficient and effective delivery of public service which will ensure the equal distribution of the service (Nordtveit, 2004). On this Savas (1978) posits that the equity in the distribution of the service will be experienced in terms of the quality of service enjoyed by the service beneficiaries.

Solid waste collection service is seen as an impure public good because of its non-exclusiveness and rivalled nature (Pessoa, 2006). Thus, although its delivery can be done by competing sources, no beneficiary is supposed to be excluded from enjoying the service including the equal distribution of the quality of service (Baabereyir, 2009; Pessoa, 2006). However, achieving the aim is fraught with some hindrances towards the service providers.

According to Oduro-Kwarteng (2011), the achievement of equal distribution of public service is influenced by some factors. Internally, the distribution of goods and service is influenced by the operational capacity of the service provider (Cointreau-Levine & Coad, 2000). Thus, service provision is interfered internally by the firm's capital and human resource capacity. On the other hand, the service providers are externally influenced by the policies governing the service delivery, which are usually enacted by the government (an actor in PPP) and the availability of infrastructural facilities (Bartley & Larbi, 2004). The influence of these factors leads to either the provision of the service been equal or varied.

Equal distribution of the solid waste collection service will have each member of the society irrespective of the status or class receiving an equal portion of the benefits, in this case, a clean and healthy environment

(Baabereyir, 2009**)**. This will lead to the achievement of the achievement of the aims of PPP in solid waste management.

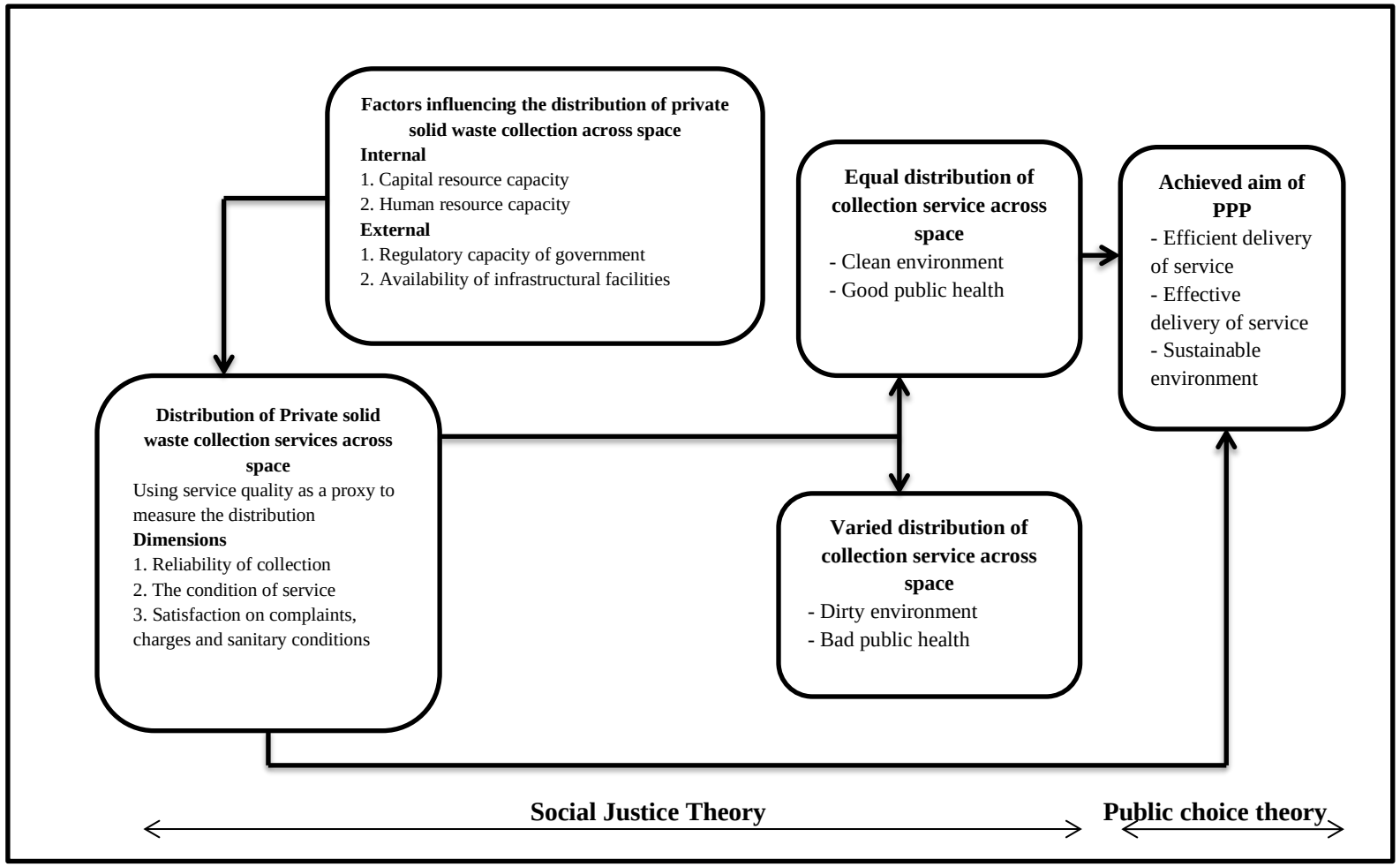

Figure 2: Spatial Distribution of Private Solid Waste Collection Service

Source: Author's construct, 2019; Adapted from Savas (1978), Oduro-Kwarteng (2011) and Baabereyir (2009)

Chapter Summary

The chapter first looked at the neloiberal, public choice and the social justice theories as they helped explain the spatial distribution of solid waste collection service under the public-private partnership. From the theories it was realised that PPP may lead to the equal distribution of the solid waste collection service with its effect been the good public health and sustainable development. The study, then, dealt with explaining some of the conceptual issues raised in the theories reviewed. These were; the public-private partnership, solid waste management and the spatial distribution of solid waste collection. Reviewing these issues revealed that to measure the spatial distribution of the solid waste collection, quality of service can be used. Hence, the SERVPERF model was employed and reviewed. Furthermore, it was realised that the distribution of the service could be graphically depicted using the Global Information System choropleth map.

Subsequently, the chapter touched on the factors that influences the distribution of the service. On the factors, it was gathered that both internal, and external affects the distribution leading it to be either varied or equal. The chapter further looked at the effects of the distribution on sustainable environment. Afterwards, similar works around the topic were reviewed and this helped fish-out the gaps within literature. The gaps recognised were; no use of service quality as a measure of the distribution, factors affecting the distribution and effects of the distribution. Lastly, a conceptual framework was adapted to help show how the issues within the study was linked.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter looked at how the study was conducted. The chapter was sub-divided into research design, study area, target population, sample and sampling procedure and source of data. It further looked at the data collection techniques, data collection instrument, data analysis and management, mapping techniques and the limitations to the study.

Research Design

To conduct successful research in social science there is the need to specify which philosophical paradigm forms the basis of the study. For this, three philosophical paradigms are known. They are; positivism, interpretivism and pragmatism (Sarantakos, 2005). The positivist thought contains an objective ontology (Sarantakos). To the positivists' epistemology, knowledge is gained through sensory experiences, meaning knowledge is attained through quantitative observation (Uddin & Hamiduzzaman, 2009). Positivist research uses quantitative research approaches and study designs such as survey, experimental and quasi-experimental designs (Krauss, 2005; Creswell & Creswell, 2017).

The interpretivist paradigm, on the other hand, believes that reality is individually constructed and as such there are multiple realities (De Villiers, 2005; Leitch, Hill & Harrison, 2010). This means that to the interpretivist, knowledge emerges through social constructions such as language, consciousness and shared meanings (Rowlands, 2005). The interpretivists'

apply the qualitative research approach with study designs such as case studies, phenomenology, hermeneutics and ethnography (Leitch et al., 2010).

Lastly, the pragmatist paradigm claims that knowledge is acquired through actions, situations and consequences rather than antecedent conditions (Creswell & Creswell, 2017). This paradigm is not bound to any one philosophy and reality. To a pragmatist, truth is what works at the time. Researchers applying this paradigm have the freedom to choose the method, technique and procedures that suit or address the issue under investigation. As such it employs the mixed-method research design with study designs from both the positivism and interpretivism allowed to be used.

This study adopted pragmatism as an appropriate paradigm. This is because the study concentrated on assessing the service quality of solid waste collection service, examining reasons for the distribution of solid waste collection service and ascertaining the effect of the collection of solid waste on the sustainability of the environment and this required both quantitative and qualitative data to be collected. Again, some related studies reviewed employed pragmatism as its research design, setting a precedent for its use.

The study employed the sequential explanatory mixed-method design which permits the use of both quantitative and qualitative data as it helped provide a comprehensive analysis for the research problem (Creswell & Creswell, 2017). With this approach, the researcher first conducted his interview schedules to collect quantitative primary data. The researcher, then, used the interview guide to collect qualitative data to assist in explaining the findings of the quantitative data. The approach was adopted because there was the need to first measure the service quality rendered to the beneficiaries

before getting to know the reasons and effects of the quality of service delivered. The study also employed the descriptive survey study design since the study was to investigate the spatial distribution of solid waste collection service in the Tema metropolis.

Study Area

The study was conducted in the Tema Metropolis - one of the districts in the Greater Accra Metropolitan Area. The metropolis is both an industrial hub and a residential area, hence, its waste generation is high around 0.72 kg/person/day (Miezah et al., 2015). With such waste generation, there is a need for a sustainable solid waste management system that will serve the whole metropolis. The Tema area shares boundaries in the northeast with the Dangme West District, southwest by Ledzokuku Krowor Municipal, north-west by Adentan Municipal and Ga East Municipal, north by the Akuapim South District and south by the Gulf of Guinea (Tema Metropolis Assembly, 2010). The area has a land size of 396 km² with Tema (Community No. 1) as capital.

According to the 2010 Population and Housing Census (Ghana Statistical Service, 2012), the Tema metropolis account for about 292,773 people which contributes to the 16.3 per cent population share of the Greater Accra Region. The population density is 784 people/sq.km which is considerably higher than the national average of 124 people/sq.km (GSS). The increase in population maybe as a result of the diverse economic activities in the metropolis. These diverse economic activities includes over 500 industries which comprises of the manufacturing, agricultural and service sector industries. According to the TMA (2010), 72 per cent of the population within

the metropolis fall between the economically active group (15-64 years), with 90.4 per cent of them fully employed whiles the rest 9.6 per cent are unemployed. The high population density has led to an increase in the generation of waste in the metropolis around 175,663.8kg in the year 2019.

Ensuring proper sanitation in the Tema metropolis has been the sole responsibility of the WMD of the TMA. This the WMD do through the regular collection, transportation and disposal of both liquid and solid waste. With solid waste management, the metropolis have adopted an organized system which involves themselves and the private sector. The partnership provides waste management service for most part of the metropolis, except few areas where the MA serve alone. Hence, there are four solid waste collection zones in the metropolis with the partnership servicing three (TMA, 2010).

The three zones are; Zone 1 which is served by the Meridian Waste Management Limited and it covers communities such as Community No. 10, 11, 12 and part of Community 1 (the market area and site 1), Zone 2 also covers communities No. 2, 7, 8, 9 and part of 1 (the residential area) and it is served by J. Stanley Owusu Waste Company limited, and lastly Zone 3 covers communities No. 4, 5, 15, Baatsona and Lashibi and this is served by Asadu Royal and Waste Seed Company.

Moreover, the communities within the metropolis fall under different socio-economic classes. According to GSS (2012), the classification is done looking at paramters such as wealth, population density and housing quality. As such, the classes within the metropolis according to the Physical Planning Department are; the High-Class Zone – thus, communities with privately owned estate houses, government built high-income houses and are served by

house-to-house waste collection, Middle-Class Zone – thus, communities with multi-storey compound houses, private middle-income houses and served by either house-to-house or community collection containers, and Low-Class Zone – thus, communities with compound houses, single storey houses and are usually served by the community collection containers (TMA, 2010). From this, communities selected were, HCZ Community No. 11, 9, 5 and LCZ Community No. 1(site1), 2 and 3, as shown in Figure 3.

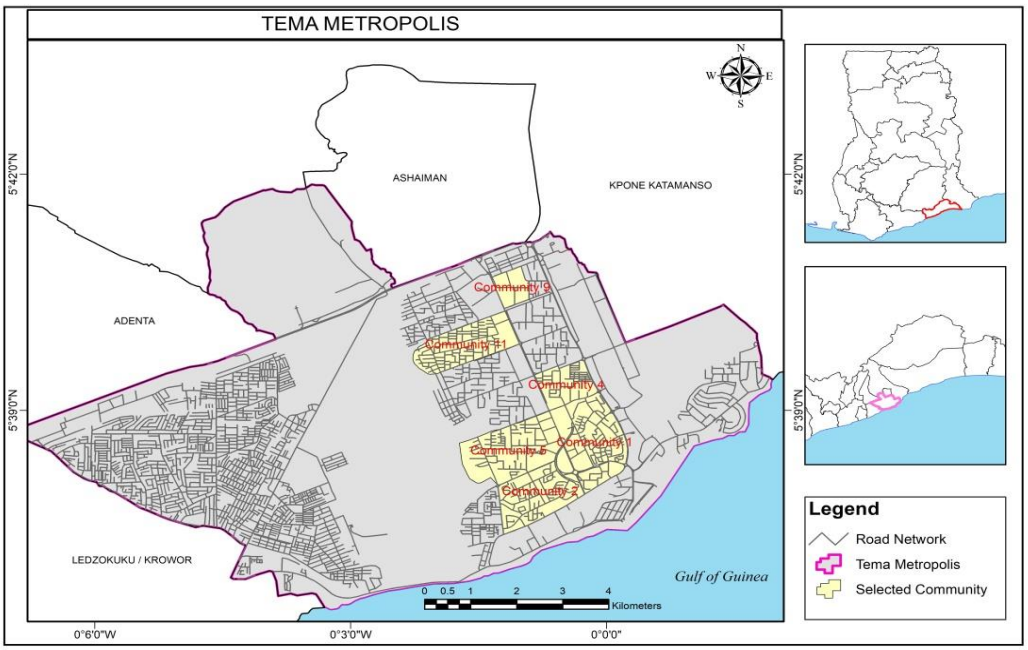

Figure 3: The Area Map of the Tema Metropolis Showing the Selected Communities

Source: Ghana Statistical Service (2012)

Target Population

According to Sarantakos (2005), the population from which the researcher is interested in gaining information from becomes the target population. In this regard, key stakeholders in public-private partnership in solid waste management formed the study's population. They include the Metropolitan Assembly's Waste Management Department, the Private waste

companies involved in solid waste collection and the beneficiaries of the service. Private waste companies in the Tema metropolis according to the WMD of the TMA are the Meridian Waste Management Limited, which is a subsidiary of Zoomlion Ghana Limited, John Stanley Company Limited and the Asadu Royal and Waste Seed Company.

Sampling Procedure

The study adopted a multi-stage sampling technique for arriving at the households to be sampled for the quantitative data while for the qualitative data purposive sampling technique was used. The multi-stage sampling technique started with the three waste collection zones under the PPP system purposefully been sampled. After communities within these zones which have already been classified according to the socio-economic classes were also purposefully sampled. The sampled communities fell under only the HCZ and LCZ with no communities picked from the MCZ. Communities (8, 15, Baastona and Lashibi) in the MCZs were left out because they were all served by only two of the service providers (J. Stanley Owusu Waste Compaby Limited and Asadu Royal and Waste Seed Company) and hence could not promote the comparison between all three service providers.

Consequently, the chosen communities included Community 11, 9 and 5 for the HCZ, and Community 1(site1), 2 and 4 for the LCZ. Then, the households within these chosen communities were randomly sampled. The number of households in the chosen communities summed up to 3905 (according to the Physical Planning Department of TMA) making it the sampling frame. Out of this total number, 363 households were sampled using the Yamane's 1967 formula. The formula was given by the relation:

$$n = \frac{N}{1+Ne^2}$$

Where, n = the sample size, N = the size of the population, and e = the margin of error of 5 per cent.

Given that N = 3,905

e = 0.05

the computed sample size for the research was = 363 households.

These households were proportionally sampled through the application of a simple random sampling technique and this is shown in Table 3. However, housing structures that contain more than two households had only one household interviewed. In cases where the household refuses to respond to the questions, researchers politely excused themselves and sought another household to fill the gap.

Table 2: Proportional Sampling of Zones, Communities and Households

Zone and Private Waste Company	Community	Number of households	Percentage Share	Sample size
Zone 1 (Meridian Waste Management Ltd)	Com. 11 **HCZ**	270	7 (270/3905*100)	25
	Com. 1-Site 1 **LCZ**	165	4 (165/3905*100)	15
Zone 2 (J. Stainey Waste Company Limited)	Com. 9 **HCZ**	721	19 (721/3905*100)	69
	Com. 2 **LCZ**	987	25 (987/3905*100)	91
Zone 3 (Asadu Royal and Waste Seed Company)	Com. 5 **HCZ**	780	20 (780/3905*100)	72
	Com. 4 **LCZ**	982	25 (982/3905*100)	91
Total		**3,905**	100	**363**

Source: TMA, 2010

NOTE: HCZ – High-Class Zone and LCZ – Low-Class Zone

Lastly, officials of the Waste Management Department of the Tema Metropolitan Assembly (thus, the Director of the WMD) and the private waste companies (thus, the operation managers) were purposefully sampled. These

officials totalled 4. Thus, official(s) who were known to manage these institutions were sought to be interviewed to find answers to the questions in the interview guide.

Sources of Data

The study adopted both primary and secondary sources of data. Primary data was collected using instruments such as interview schedule, interview guide. The study obtained some data or information from secondary sources. This form of data set was gained from journals, books, newsletters, magazines, published and unpublished materials. In addition, the researcher used existing documents in Tema metropolis's Waste Management Department, the Private Solid Waste Management Companies and other related institutions and departments. Lastly, for the thematic mapping both primary and secondary data including quantitative data from the interview schedule and photos and ward boundaries (from the Global Information System) were gathered respectively.

Data Collection Instruments

The instruments used for collecting the data were the interview schedule, interview guide. The interview schedule was divided into appropriate sections to allow for systematic collection of the data from households in varying socio-economic areas in Tema Metropolis. Issues included in the schedule were the type of collection service delivered to the household, the level of satisfaction derived from the service delivered (this covers the efficiency and affordability issues), its effect on the health of the household and the challenges the household face in the collection or disposal of solid waste. The interview schedule was appropriate for the study because it

was presumed that not all respondents will be able to read and answer the questions on their own and therefore some assistance was needed. The interview schedule was used to collect quantitative data from residents in households.

The interview guide was also used to gather information from some officials of the Waste Management Department of the Tema Metropolitan Assembly and the private waste companies. It was expected of these key informants to give their perspectives, understanding and knowledge about the current solid waste management situation in the metropolis. The questions in the guide covered areas such as the types of solid waste collection service in the metropolis, how it has been distributed across the township, its coverage and challenges faced in delivering the service. This is important because it helped the researcher gather valid and reliable data which was relevant in finding solutions to the research questions.

Validity and reliability of instrument

The validity of the instrument explains how the instrument measure what the study intended to measure (Field, 2005). Zelt, Recker, Schmiedel, and Brocke (2018),argues that for validity of the instruments experts review of it can suffice. Thus, the instruments can be given to experts in the field of the study so they can help validate the instrument. Hence the instrument of this study was sent to experts within the field to peruse its validity. On the other hand, the reliability of the instrument measures the extent to which the instrument provides stable and consistent results (Carmines & Zeller, 1979). Instruments that employ the Likert scales relies on the Cronbach Alpha Coefficient to test for the reliability of the instrument. After the test of the

instrument used in this study, it produced an internal consistency coefficient of 0.843, which according to Robinson (2010) is acceptable (minimum acceptable internal consistency is 0.70).

Data Collection Procedures

Primary data was collected via face-to-face interaction with the research participants. At the community level, the research sought consent from the community assembly and committee members before the survey was conducted. After, Households that were sampled to participate in the study were informed about the objectives of the study and assured that it was an academic exercise in partial fulfilment for the award of an MPhil degree. Before the start of the interview, the participants' were made aware of the issues to be discussed and any grievances around it were fixed. Participants who desired to withdraw were allowed. The interviewers' ensured a favourable environment for the conversation so that much of the participant's time was not wasted. For respondents who were literate the instrument were left with them so after completion the team goes back for it. However, for the illiterate the team makes sure they finish collecting their data before leaving.

At the institutional level, an introductory letter and an informed consent form were given to the institutional head and an appointment time was subsequently booked for the interview sessions. With the observation, the researcher asked permission from the Metropolitan Assembly. Moreover, during the observation pictures and notes were taken as data content to be analysed. In cases of discomfort during data collection because of long hours of interviewing, the principal investigator or research assistant called for a 15

minutes recess so that both participants in the interview could rest and recover their composure after which the interview continue.

Data Management

The quantitative data were collected using the interview schedule and later imputed into SPSS version 21 for analysis. The data was edited and cleaned for outliers (out of range values that may affect the result) and inconsistencies in responses to arrive at a valid and reliable data, which helped answer the research questions. The quantitative data was stored in the researcher's own Dropbox and as a draft in his email to ensure safety and security of the data in case of an eventuality. The qualitative data were transcribed and read through to determine inconsistencies and clarification was sought. The recorded data was stored in the researchers own Dropbox and as a draft in his email. Thematic maps obtained in shape files were stored in the researcher's own Dropbox.

Data process and analysis

Collected data contained both quantitative and qualitative data. Hence, required both quantitaive and qualitative analyses. Statistical tool used for quantitative analysis was the Satistical Product and Service Solutions version 21. Analyses were done using statistical techniques such as descriptive statistics, frequencies statistics, GIS thematic mapping chi-square test of independence and linear regressional model. Results from these analyses were presented in tables. Again, the qualitative data analysis was manually done using thematic analysis. The presentation of the qualitative results took the form of texts, tables and figures. There was an integration of both quantitative

and qualitative analyses under objectives 1 and 3 while only qualitative analysis was used for objective 2.

Objective one was analysed using descriptive statistics, frequencies statistics, GIS themathic mapping, chi-square test of uniformity and thematic analysis. Data on service quality dimensions – reliability of collection service, condition of equipment and satisfaction on complaints, charges and sanitary conditions were on nominal scale where the variables were categorical. Hence, analyses involved frequencies, percentages, cross tabulations, maps and chi-square test of uniformity. The chi-square test of uniformity was at 0.05 alpha level. Choropleth maps under the GIS thematic mapping were used to graphically show the distribution of the solid waste collection service. Conversely, the qualitative data on the reasons for satisfaction level of the service quality dimensions within the selected communities were analysed using thematic analysis.

The objective two entailed the use of thematic analysis to explain the factors that influenced the spatial distribution of the solid waste management. Factors that were exmined comprised the operational capacity of the firm (making up the internal factors – capital and human resources capacities) and the regulatory role of the government as well as the infrastructure availability (both making the external factors) as determined in the work of Oduro-kwarteng (2011). Qualitative data for the objective was collected from the key informants (operational managers) of all the three service providers as well as that of the director of the WMD in the TMA.

Finally, the analysis for objective three entailed the application of some descriptive statistics, Chi-Square and thematic analysis. Descriptive

statistics used comprised frequencies, percentages and cross tabulations. These helped in analysing issues such as the environmental sanity and health effectiveness as they were measured on nominal scales. After the linear regression was used to find the effect between the spatial distribution of quality solid waste collection and the sustainable development. Qualitative data on environmental sanity and health effectiveness were analysed using thematic anaysis.

Ethical consideration

The basic ethical requirement of the research was adhered to in the planning, execution and reporting of the study. In line with this, the study obtained ethical clearance from the Institutional Review Board of the University of Cape Coast before actual data collection. Beyond this primary issue, the central intent and purpose of the study was communicated to all the participants before securing their consent to participate in both the interview schedule and guide during data collection. Respondents were guaranteed their confidentiality and anonymity before data collection.

Chapter Summary

Chapter starts with addressing the design of the research which was the pragmatic design. This enabled the sequential mixing of both quantitaive and qualitative research designs. Afterwards, the study dealt with the study area. On this, the profile of Tema metropolis in the Greater Accra Region was discussed. The metropolis was selected because its an area with huge population density and diverse economic activities and as such generate a lot

of waste. Hence, with the metropolis under the PPP model its expected that wste collection will be equally collected.

Next, it was stated that the chapter's study population covered the beneficiaries, private waste collection companies and the WMD of the TMA. A sample size of 369 for the beneficiaries, officials of the private waste collection companies and the official of the WMD of TMA. The multi-staged sampling and the purposive sampling helped in the selction of the study respondents. Both primary and secondary data sources were employed. With the primary data, instruments used were the interview schedule and interview guide. The validity of the instruments used stem from the fact that the questions adopted were from other accepted studies (Oduro-Kwarteng & Van-Dijk,2013; Amoah & Kosoe, 2014). After these questions were given to expects in the field for approval. The instruments were reliable as it received 100 percent response rate from respondents.

The chapter next tackled the data processing and analyses. The quantitaive data analysis consisted of descriptive statistics, frequencies statistics, GIS thematic mapping and chi-square test of uniformity while the qualitative analysis involved thematic analysis. The last issue under the chapter was the ethical issues considered. The next chapter looked at discussing the results of the study.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Introduction

This chapter presents the results and discussions on how solid waste collection services are spatially distributed under the PPP system in the Tema Metropolitan Area. Firstly, the background characteristics of 363 respondents are discussed. This is followed by an examination and a graphical representation of the quality of solid waste collection service delivered by the private waste companies across the selected communities in the Tema metropolis as well as a discussion of the reasons for such distribution. It concludes by ascertaining the effects such distribution has on the sustainable environment (thus, how the collection of solid waste ensures a clean and healthy environment) in the Tema metropolis. The study established that the spatial distribution of the quality of solid waste collection service among the selected communities varied because of external reasons which militated against the work of the private waste companies.

The first and third objectives had their theoretical underpinning dependent on the tenets of the neo-liberal and public choice theories. The theories were used to explain the view that the introduction of PPP in the management of solid waste ensures that the distribution of the service is efficient and effective which in turn promotes the equal distribution of the service delivered (Asare & Frimpong, 2013). This assumption, according to Savas (1978) can be experienced in the form of an equal distribution of the quality of service delivered to the beneficiaries. And it becomes possible because with the collaboration of the two sectors (Public and Private) the

causes of failure of the previous management system (thus, the low capacity and the rent-seeking attitude of the government) will be overcome (Roskin et al. 2014).

The second and fourth objectives, were theoretically based on the social justice theory. The theory maintains that the concept of social justice which can be likened to distributive justice explains the situation where equal distribution of solid waste collection service leads to a fair distribution of benefits (clean and healthy environment) and burdens (dirty and unhealthy environment) of the service among members of the society (Miller, 1999; Young, 2011).

According to Isreal and Frenkel (2018), the distribution of the solid waste equally can be represented spatially. Furthermore, the effects of the equal distribution of the solid waste collection service on the sustainable environment may lead to a clean and healthy environment or vice versa (Finnvold, 2009). In discussing the findings, references will be made to the relevant literature reviewed and the conceptual framework that guided the study.

Background of Respondents

The background characteristics discussed include the respondents' sex, educational level, household income level and resident status. The background characteristics were needed because according to Chen (2010), factors such as; economically – income level, and socially –sex composition of the society and educational level; affect the spatial distribution of municipal solid waste management. The author further states that these factors help explain the

variation in the spatial distribution of solid waste management and thus cannot be ignored in the process of decision making.

Sex composition of the respondents was examined as the first background characteristic of the study. The need to consider the sex composition lies in the fact that males and females play different roles in the management of waste in households and as such have a different expectation regarding the quality of service they receive (Bernstein, 2004). From the interview, it was realised that in regard to the sex composition out of 363 respondents sampled the females were the majority with 218 (60.1%) while the males were 145 (39.9%). According to TMA (2010), the sex distribution of the metropolis was 152,827.506 (52.2%) for females and 139,945.494 (47.8%) for males; hence the distribution of the sample is in line with the metropolis's sex distribution. This because just like the population distribution of the the study's sample has females been more than the males. Furthermore, empirical findings of Yin and Mariwah (2013) and Shriwas et al., (2018) found women to be the majority in household waste management because it is perceived that it falls under their care-giving responsibilities.

The educational level of respondents was another demographic characteristic that was examined (Figure 4). The level of education of a person is a means of measuring his or her thinking ability for assessing issues (Purvis, 2009). As shown in Figure 4, the minimum qualification of respondents was no formal education (none) and the maximum, tertiary education. The findings of the study indicated that overall 357 (98.3%) of the respondents had some form of formal education whiles 6 (1.7%) had no formal education.

It can be inferred that the majority of respondents had attained some form of formal education and thus have the capacity to be more appreciative of issues concerning the quality of solid waste service and responsive to environmental issues. This is because the higher the level of education of a person, the higher their appreciation on the consequence of mishandling solid waste and the higher their valuation on avoiding living in an unclean environment (Afroz, Hanaki, & Hasegawa-Kurisu, 2009).

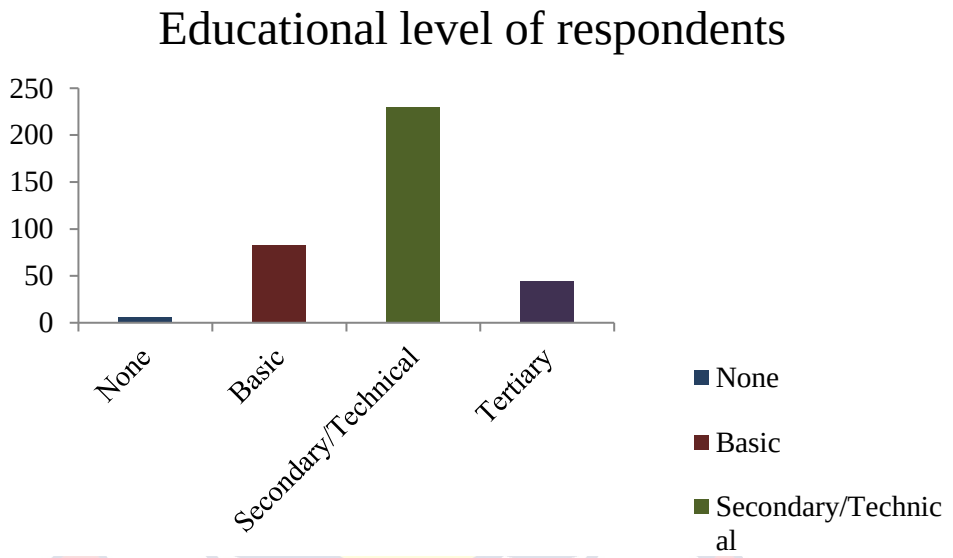

Figure 4: Educational Level of Respondents
Source: Field survey (2019)

Moreover, the figure portrayed that the higher percentage 230 (63.4%) of the respondents had secondary (Senior High or Technical) education.

Monthly income level is considered a very important variable that could influence the person's access to the quality of service they receive (Boateng et al., 2016). Thus, households with high-income will opt for a better quality of service as compared to low-income households. The results from Table 5 showed that the minimum income range of the respondents was GHC 50 to GHC100 while the maximum income range was GHC 1000 and above with a mean income of 2.80 (Standard Deviation = 0.734; Skewness = -0.13).

The results from the data gathered suggest that the respondents solid waste were collected based on their financial status. This is informed by the neo-liberalists claim in which an economy run by the free market or the forces of demand and supply allow rational actors to advance their ideal interest (Jessop, 2002). Further confirming the assertion, results from the study show that the family income levels of the respondents differed spatially with those in communities 11, 1(site 1) and 4 having majority gaining below the median income range whiles those in communities 9, 5 and 2 getting incomes between the median income range and above. The finding was in line with Katusiimeh, Mol, & Burger (2012) which insinuated that the financial status of households determines their ability to demand quality solid waste management service.

Table 3: Household Income Level for Selected Communities

	High-Class Zone								Low-Class Zone							
	Com. 11		Com. 9		Com. 5		Total		Com. 1(site1)		Com. 2		Com. 4		Total	
Income level (GHC)	Freq.	%	Freq.	%	Freq.	%	F req	%	Freq	%	Freq.	%	Freq.	%	Freq	%
50 – 100	0	0	0	0	0	0	0	0	3	20	0	0	0	0	3	1.52
101 – 500	17	68	29	42.0	40	55.6	86	51.81	11	73.3	10	11.0	9	9.9	30	15.22
501 – 1000	8	32	32	46.4	25	34.7	65	39.16	1	6.7	51	56.0	61	67.0	113	57.36
1001 <	0	0	8	11.6	7	9.7	15	9.04	0	0	30	33.0	21	23.1	51	25.89
Total	25	100	69	100	72	100	166	100	15	100	91	100	91	100	197	100

Source: Field survey (2019) Note: Com. – Community, Freq. –Frequency, % - Percentage

There was, also, an analysis of the tenure status of the respondents in the study. As claimed by the Organisation for Economic Co-Operation and Development (2008), people that are owners of buildings are mostly concerned about issues of cleanliness than those who rent these buildings. Thus, the urgency attached to environmental issues is dependent on the tenure status of the person. It was revealed that most respondents interviewed 272 (74.9%) rented their abode while 91 (26.1%) owned it. This affected the result under the service quality dimensions as the number of renters were more than the owners. The findings contradict with that of Katusiimeh et al., (2012) which revealed that majority of clients of the private waste companies are from rich neighbourhoods in Kampala – Uganda and they are mostly owners of their houses rather than been tenants.

Spatial Distribution of the Quality of Solid Waste Service Delivered by Service Providers

The first objective of the study was to describe the spatial distribution of the quality of service delivered by the private service providers in the selected communities. From the conceptual framework, the distribution of solid waste collection service is experienced through the quality of service delivered to the beneficiaries. Thus, one way of ascertaining whether the aim of PPP (thus efficient and effective delivery of the service which leads to the equal distribution of the service) has been achieved is to measure the service quality delivered to the beneficiaries (Savas, 1978). As such, service quality was used as a proxy to measure whether the distribution of collection service in the metropolis is equal or varied. Issues covered under the service quality measurement include the reliability of collection service, condition of

equipment used in the waste collection and satisfaction on complaints, charges and sanitary conditions.

Reliability of service can be explained as the ability to deliver the said service dependably and accurately (Benezech & Coulombel, 2013). In broader sense, reliability refers to a firm's ability to provide timely and consistent service delivery (Oduro-Kwarteng, 2011). In the case of solid waste collection service, the reliability dimension includes the timely collection of solid waste and the regular or consistent collection of solid waste. Hence, to describe the spread of the quality of solid waste collection service, the respondents degree of satisfaction on the reliability of the collection service was examined using beneficiaries category (Table 4).

The results demonstrates that in terms of the beneficiaries in the HCZ, all communities (that is Community No 11, 9 and 5) had majority of their beneficiaries (25 (100%), 40 (58%) and 50 (54.9), respectively) satisfied with how relaible their waste is been collected. On the other hand, one community in the LCZ (thus, Community 1(site1)) had majority of their respondents (15 (100%)) dissatisfied with the reliability of the collection service, with the rest of the communities (thus, Community 2 and 4) having majority of their respondents (64 (70.3) and 68 (94.4%), respectively) satisfied. A chi-square test of independence was performed to determine whether the beneficiaries' satisfaction on reliability of collection service was different in terms of their different communities. The result was significant at the five percent level (x^2 = 155.722; df = 15; p-value = 0.000). This showed that the perceptions of the beneficiaries ragarding their satisfaction with the relaibility of collection service was different among the communities.

Table 4: Selected community for the study * reliability of waste collection crosstabulation

Zones	Service Provider	Community	Dissatisfied	Satisfied	Total
High-Class Zone	Meridian Waste Co. Ltd	N	0	25	25
		% within Com 11	0.0	100	100%
	J.Stanley Owusu Co. Ltd	N	26	40	69
		% within Com 9	37.7	58.0	100%
	Asadu Royal and Waste Seed Co Ltd	N	41	50	91
		% within Com 5	45.1	54.9	100%
Low-Class Zone	Meridian Waste Co. Ltd	N	15	0	15
		% within Com 1(site1)	100	0.0	100%
	J.Stanley Owusu Co. Ltd	N	27	64	91
		% within Com 2	29.7	70.3	100%
	Asadu Royal and Waste Seed Co Ltd	N	4	68	72
		% within Com 4	5.6	94.4	100%
	Total	N	113	250	363
		% within Coms.	31.2	68.9	100%

Source: Field survey (2019)

$x^2 = 155.722$; df = 15; p-value = 0.000

Note: Com(s) = Community/Communites, N = Number, % = Percentage

The 250 respondents as shown in the Table 4 who were satisfied with the reliability of collection service gave reasons to support their standpoint. From the many (300) responses received, service providers' consistent on the designated days (Mondays and Wednesdays), and appropraite timing in the collection of waste were the reasons provided as accounting to their satisfaction with the service quality dimension. This was similar to Amoah and Kosoe's (2014) finding which saw beneficiaries in Wa municipality who were satisfied stating same reasons.

On the other hand, the 113 respondents, as shown in Table 7, who were dissatisfied with the reliability of the collection service gave some reasons for their choice. Of the many (165) reasons advanced, poor road network, traffic congestion and refusal to pay for the service were the main reasons explaining their choice. The finding was in line with that of Addai and Danso-Abbeam

(2014) which found the dissatisfied beneficiaries stating similar reasons, noting that private waste companies do not supply waste management service to households that refuse to pay for the service.

The finding was lastly depicted on a GIS thematic choropleth map to help analyse spatially the service quality dimension, reliability of collection service. This was to show the differences within the data set which the chi-square test of independence stated. With the use of the Natural Breaks (Jenks) data classification method which uses the optimal classification scheme that finds class breaks that will minimize within-class variance and maximize between-class differences (Chen, Yang, Li, Zhang, & Lv, 2013), data from the perceptions of the respondents were classified in Table 8. The Table 8 shows that the metropolis felt either satisfied (i.e. a value of 2.10 and above) or dissatisfied (i.e. a value of 2.0 and less).

Table 5: Description of the Median (Likert Scale) Scores

Range	Description
0.0 - 1.0	Very Dissatisfied
1.10 – 2.0	Dissatisfied
2.10 – 3.0	Satisfied
3.10 – 4.0	Very Satisfied

Source: Field survey (2019)

From the median (likert scale) values and the quartile deviation (Qtl. Dev) calculated in Table 5, the choropleth map in Figure 5 shows the distribution of the reliability of solid wste collection service in the selected communities. Figure 5, it could be inferred that respondents in Community 11 were “Very Satisfied” with how reliable the collection of waste was in their community. This was followed by Community Nos. 9, 5, 2 and 4, which had

its beneficiaries being "Satisfied" with the service. However, beneficiaries from Community 1(site1) felt "Dissatisfied" with the service. The result showed that there exist variation in the reliability of collection service delivered by private waste companies in the Tema Metropolis. Hence, contradicting the thought propagated by the neoliberal theory, which indicated that PPP promotes equality in the provision of public service (Roskin et al, 2014).

Table 6: Descriptive Statistics for "Reliability of Collection Service"

Community	Median (Likert)	Min	Max	Qtl. Dev.
High-Class Zone				
Community 11	3.05	3	4	0.75
Community 9	2.50	2	4	0.5
Community 5	2.50	1	4	0.5
Low-Class Zone				
Community 1 (site 1)	2.0	1	2	0.5
Community 2	2.50	1	4	0.5
Community 4	2.50	2	4	0.5

Source: Field survey (2019)

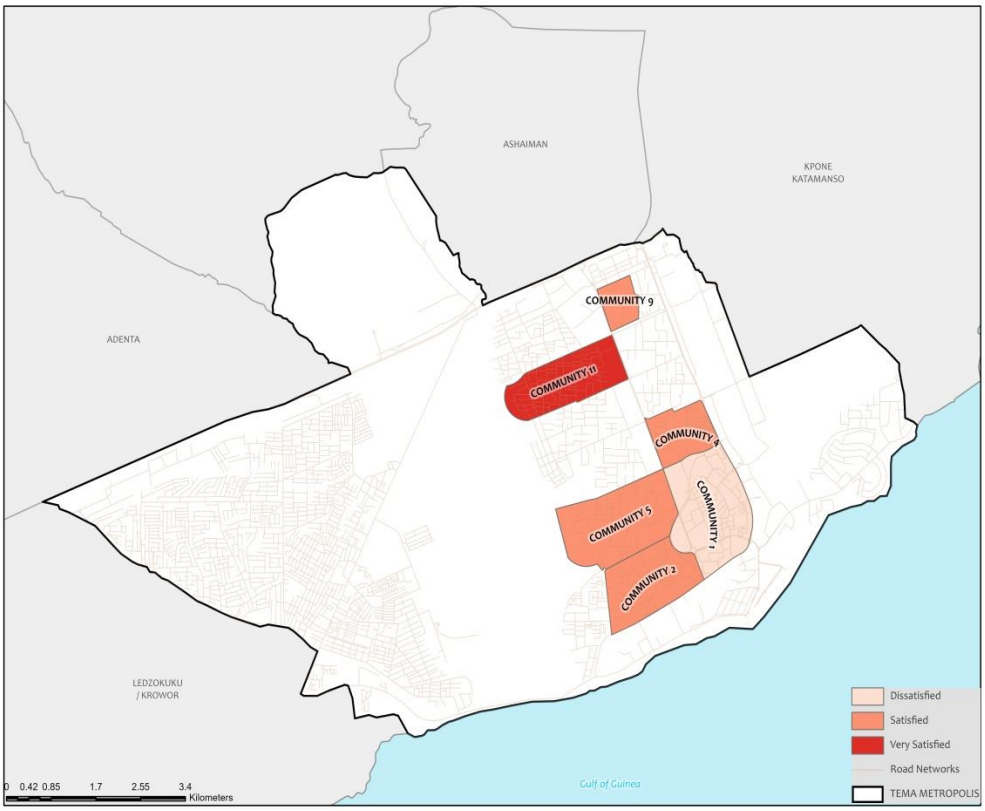

Figure 5: Spatial Distribution of the Service Quality Dimension "Reliability of Collection Service"

Source: Field Survey (2019)

The second issue under the service quality dimension is the condition of equipment. According to Baabereyir et al. (2012), the quality of service delivered to beneficiaries does not rest solely on the reliability of service but also on the issue of resource availability. Resource availability covers issues including appropriate and adequate logistic availability and the proper handling of these logistic resources (Ayantoyinbo & Adepoju, 2018). Hence, parameters under this dimension included; adequate solid waste collection equipment provided, appropriate equipment used for solid waste collection, proper handling of solid waste collection containers and the safe transportation of solid waste collection containers.

The results showed that in terms of the beneficiaries in the HCZ, all communities (that is Community No 11, 9 and 5) had majority of their beneficiaries (25 (100%), 52 (75.4%) and 65 (71.4), respectively) satisfied with the condition of equipment used for collection of solid waste. On the other hand, two communities (thus, Community 2 and 4) had majority of their beneficiaries been satisfied with the service quality dimension. However, one community in the LCZ (thus, Community 1(site1)) had majority of their respondents (15 (100%)) dissatisfied. To know whether there exist differences with the opinions of the beneficiaries in respect to the condition of equipment, a chi-square test of independent was performed. The result was significant at the five percent level ($x^2 = 268.606$; df = 15; p-value = 0.000). From the result it was inferred that the opinions of beneficiaries on their satisfaction with the condition of equipment was different among the communities.

Table 7: Selected community for the study * Condition of equipment Crosstabulation

Zones	Service Provider	Community	Dissatisfied	Satisfied	Total
High-Class Zone	Meridian Waste Co. Ltd	N	0	25	25
		% within Com 11	0.0	100.0	100%
	J.Stanley Owusu Co. Ltd	N	17	52	69
		% within Com 9	24.6	75.4	100%
	Asadu Royal and Waste Seed Co Ltd	N	26	65	91
		% within Com 5	28.6	71.4	100%
Low-Class Zone	Meridian Waste Co. Ltd	N	15	0	15
		% within Com 1(site1)	100.0	0.0	100%
	J.Stanley Owusu Co. Ltd	N	27	64	91
		% within Com 2	29.7	70.3	100%
	Asadu Royal and Waste Seed Co Ltd	N	1	71	72
		% within Com 4	1.4	98.6	100%
Total		N	86	277	363
		% within LCZ	20.9	76.3	100%

Source: Field survey (2019)

$x^2 = 268.606$; df = 15; p-value = 0.000

Note: Com(s) = Community/Communites, N = Number, % = Percentage

From Table 7, 277 beneficiaries were satisfed with the service quality dimension condition of equipment. These respondents while giving their choices provided about 320 reasons to support their claim. Most of these reasons revolved around; skilled employees used for waste collection, coverable containers used in the collection and disposal of waste, proper dustbins deployed by the service providers for the disposal of solid waste and proper vehicles used in waste collection. The finding was similar to Akaateba and Yakubu's (2013) work which found that beneficiaries were satisfied with the equipment used for collecting their waste for similar reasons.

Similarly, the 86 beneficiaries who were dissatisfied with the service quality dimension provided around 123 responses, asserting reasons for their choice. Of these reasons advanced sufficiency in the equipment deployed for the collection of solid waste, inappropriate collection containers used, irregular collection of waste, unprofessional attitude by the collection crew and the lack of cover for collection containers, stood out. On the unprofessional attitude displayed by the collection crew, an interviewee in Community 9 intimated that,

> *"The workers of the company are simply unskilled. I have changed my dustbin twice this very month (September 2019). They keep on destroying the cover of the dustbins and you know without the cover waste thrown in it becomes susceptible to all sorts of animals"*(24th September 2019).

These findings were corroborated by the work of Shriwas et at., (2018) which made similar findings in two cities in India (Bilaspur and Raipur), arguing that the dissatisfaction of the beneficiaries stem from the fact that the equipment used for the collection of waste seemed old and un-coverable.

To spatially represent the difference established by the chi-square independent test, GIS choropleth maps were employed. Using the median (likert scale) values and the quartile deviation (Qtl Dev.) in Table 11 and the descrption of the meadian scale values in Table 8, from Figure 6, it could be inferred that beneficiaries in Community 11 and Community 4 were "Very Satisfied" on the availability and condition of equipment used in the collection of waste. The beneficiaries of Community 9, 5 and 2 who felt "Satisfied" with the service quality dimension, follow this. However, beneficiaries from Communities 1(site 1), felt "Dissatisfied" with the service quality dimension. The findings generally show that there was some variation with the service quality dimension.

Table 8: Descriptive Statistic for the Condition of the Equipment

Community	Median (likert)	Min	Max	Qtl. Dev.
High-Class Zone				
Community 11	3.50	3	4	0.25
Community 9	2.75	2	3	0.31
Community 5	2.75	1	4	0.5
Low-Class Zone				
Community 1 (site 1)	1.25	1	2	0.375
Community 2	2.75	2	4	0.875
Community 4	3.07	2	4	0.375

Source: Field survey (2019)

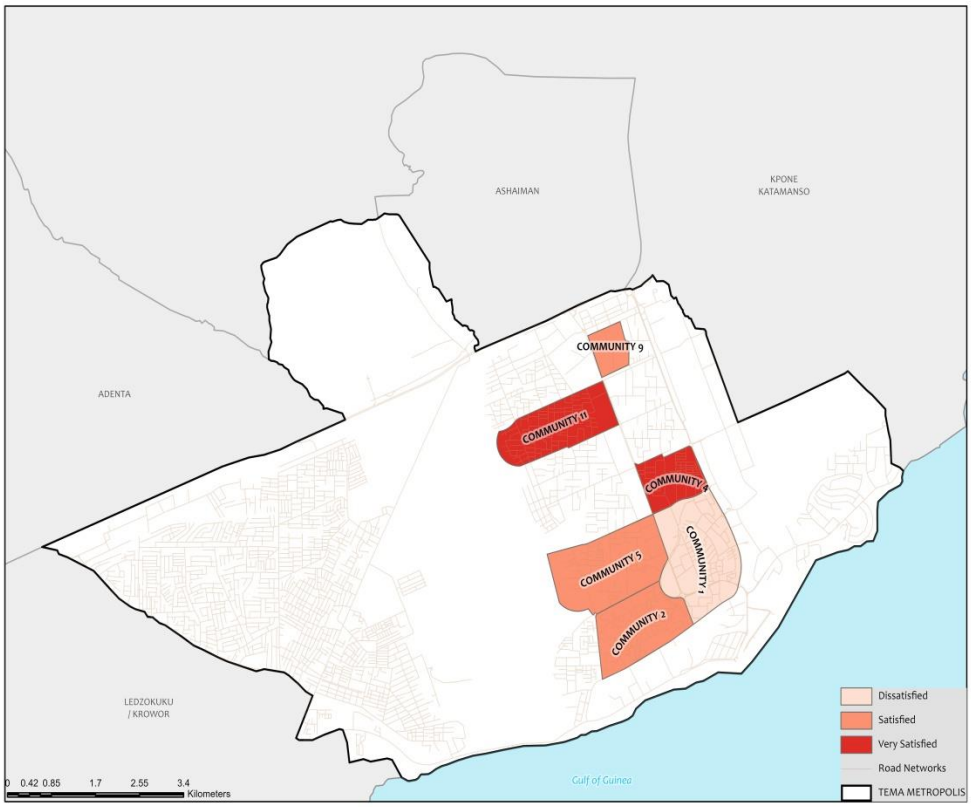

Figure 6: Spatial Distribution of the Service Quality Dimension "Condition of Equipment"

Source: Field survey (2019)

Based on the results, five communities selected (Community Nos. 11, 9, 5, 2 and 4) were generally satisfied with their respondents citing reasons such as adequate and appropriate equipment used for the collection of waste to support their claim. However, respondents from Community 1(site 1) who are serviced by the Meridian Waste Management Limited felt dissatisfied because of reasons such as the provision of few and small-sized collection containers, lack of professional collection crew and unsafe methods used in transporting the collection containers. The finding contradicts with that of Shriwas et al. (2018) that found that communities with different socio-economic backgrounds (i.e. Raipur and Bilaspur in India) felt equally satisfied with their condition of equipement.

The last issue employed to describe the spatial distribution of the quality of solid waste collection service was finding out the satisfaction level on the charges, cost and sanitary conditions. Under this dimension beneficiaries were asked to choose their satisfaction level on issues such as; the behaviour of the collection crew, cleanliness after solid waste collection, charges on the solid waste collection, prompt response to complaints and public monitoring and sanctioning by the metropolitan assembly.

The result in Table 12 indicated that for the beneficiaries in the HCZ, only one community (thus, Community 11) had most of its beneficiaries (23 (92%)) satisfied with the service quality dimension. However, two of the Communities in the zone (thus, Community 9 and 5) had most of their respondents (65 (94.2) and 67 (73.6) respectively) dissatisfied. With the LCZ, two communities (thus, Community 1(site1) and 2) had most of their respondents (15 (100%) and 73 (80.2%) respectively) dissatisfied, while only one community (thus, Community 4) had most of its respondents (58 (80.5%)) satisfied with the service quality dimension. Again, a test to know whether the opinons of the respondents were different was done using the chi-square test of independence. The result was significant at five percent level ($x^2 = 165.478$; df = 15; p-value = 0.000). From the result, it was inferred that the opinions of the beneficiaries on their satisfaction on complaints, charges and sanitary conditions were different among the communities.

Table 9: Selected community for the study * satisfaction on complaint, charges and sanitary conditions crosstabulation

Zone	Service Provider	Community	Dissatisfied	Satisfied	Total
High-Class Zone	Meridian Waste Co. Ltd	Count	2	23	25
		% within Com 11	8.0	92	100%
	J.Stanley Owusu Co. Ltd	Count	65	4	69
		% within Com 9	94.2	5.8	100%
	Asadu Royal and Waste Seed Co Ltd	Count	67	24	91
		% within Com 5	73.6	26.4	100%
Low-Class Zone	Meridian Waste Co. Ltd	Count	15	0	15
		% within Com 1(site1)	100	0.0	100%
	J.Stanley Owusu Co. Ltd	Count	73	18	91
		% within Com 2	80.2	19.8	100%
	Asadu Royal and Waste Seed Co Ltd	Count	14	58	72
		% within Com 4	19.5	80.5	100%
Total		Count	236	127	363
		% within LCZ	65	35	100%

Source: Field survey (2019)
$x^2 = 165.478$; df = 15; p-value = 0.000
Note: Com(s) = Community/Communites, N = Number, % = Percentage

With the results, it was seen that 127 beneficiaries were satisfied with the service quality dimension. In doing so, some reasons (150 responses) were put forth to back their claim. These responses hovered around these main ones; timely collection of waste by the service provider's collection crew, street sweeping habits of the service providers, skilled or professional collection crews of the service providers and appropriate collection equipment used by the service providers. The findings and reasons given was similar to that of Shriwas et al., (2018).

In contrary, the 236 respondents who opted for dissatisfaction as their choice gave around 250 reasons to back their perspective. Of the reasons advanced, uncleanliness after waste collection by the service providers, lack of adequate and appropriate collection containers, irregular collection of waste, high cost on collection of solid waste because of low-income level, and the lack of monitoring and sanctioning by the MA. On high cost of sollection of waste an interviewee in Community 4 corroborated this by saying;

> *"I am a fishmonger and the revenue I get after-sales is low but the charge I pay takes about a quarter of this revenue. This is too high for me to pay and so I don't patronize the service of the private waste collection people always."* (25th September 2019).

This confirmed Chen (2010) hypothesis that income is linked to the ability of people to financially access quality public services. The author further indicates that the budget for solid waste management in the low-income household is relatively small and constitutes the last item on the household's budget. Hence, some households due to their income level may find user charges for waste management services expensive.

The spatial representation of the difference established by the chi-square test of independence was shown using the GIS choropleth map. With the use of the median (likert scale) values and the quartile deviation (Qtl Dev) in Table 13 and the descrption of the median scale values in Table 8. The map in Figure 7 showed that respondents in Community 11 were "Very Satisfied" with the dimension while beneficiaries from Community 5, 2 and 4 felt "Satisfied" with the same service quality dimension. In contrast, Communities' 1 (site 1) and 9 had their beneficiaries "Dissatisfied" with the service quality dimension.

Table 10: Descriptive Statistic for the Satisfaction on Complaints, Charges and Sanitary Conditions

Community	Median (likert)	Min	Max	Qtl. Dev.
High-Class Zone				
Community 11	3.06	2	4	0.25
Community 9	2.00	1	3	0.2
Community 5	2.20	1	3	0.4
Low-Class Zone				
Community 1 (site 1)	2.00	1	2	0.2
Community 2	2.20	1	3	0.4
Community 4	2.90	2	4	0.4

Source: Field survey (2019)

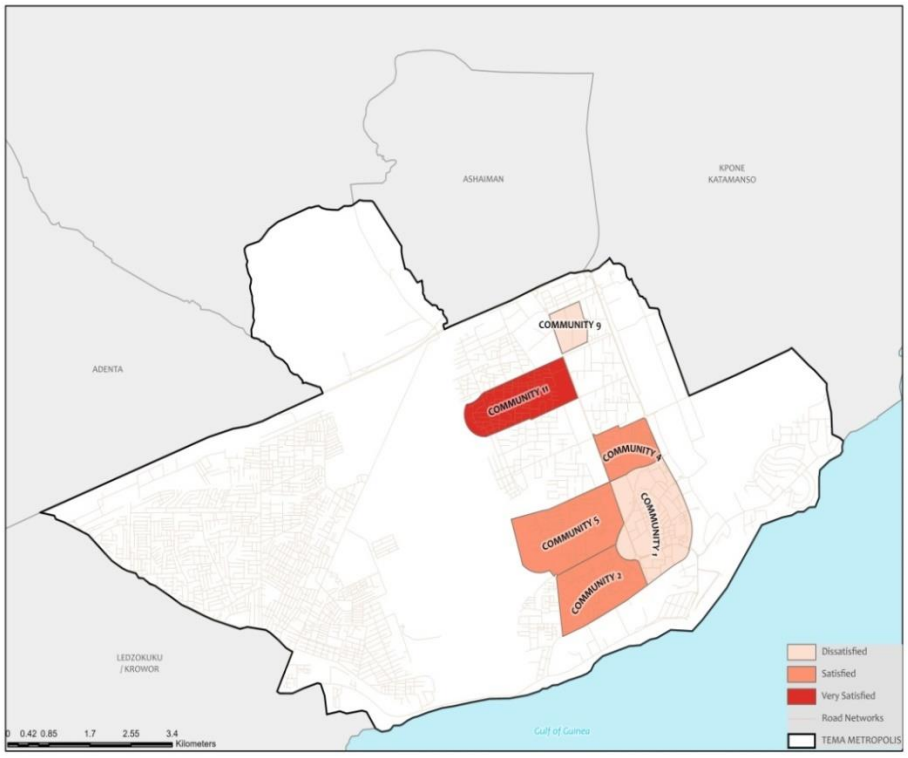

Figure 7: Spatial Distribution of the Service Quality Dimension "Satisfaction on Complaints, Charges and Sanitary Conditions"
Source: Field survey, (2019)

The variation experienced from the findings stemmed from some reasons. According to respondents from Community Nos. 1(site 1) and 9, their dissatisfaction was as a result of the high cost charged by the Metropolitan Assembly for the collection of waste, and the lack of vehicles to facilitate the public monitoring of the service delivered. However, the rest of the

communities selected for the study (Community Nos. 11, 5, 2 and 4) had respondents generally satisfied with the service citing reasons such as the professional behaviour of the collection crew and the cleanliness of the communities after the collection of waste reinforce their claim.

Reasons underlying the Spatial Distribution of the Private Solid Waste Collection Service

This section focuses on the third objective, which is about the reasons underlying the spatial distribution of solid waste collection. Specifically, the issues of concern were on whether the private waste companies achieved the universal coverage objective, and if so or not what reasons have propelled such distribution. Thematic analysis is employed in analysing this objective. The issues discussed are propelled by the varying findings from works of literature reviewed. For instance, according to Baabereyir et al. (2012), variation in the collection of waste is becuase of the unequal infrastructural investment and non-participatory decision making by the Metropolitan Assembly in Sekondi-Takoradi. Again, a study by Amoah and Kosoe (2014) argued that the disparity with the service in Wa-Ghana was due to inadequate funds, institutional weakness, poor urban planning and lack of good policies.

Coverage of Solid Waste Collection by Private Waste Companies

According to the environmental sanitation policy (Environmental Sanitation Agency, 2010), the promotion of a clean, safe and pleasant physical environment in all human settlement is the main objective of all the principal and allied institutions of environmental sanitation. Despite the many actors involved in the collection of solid waste in the Tema metropolis, there exists

variation in the quality of collection service delivered to the different socio-economic communities. This was revealed in the previous discussion (Objective 2), where the dimensions under the service quality model showed different satisfaction levels between the selected communities. As such, it could be inferred that the objective of universal coverage has not been met.

Although the data collected from the perspective of service users revealed such disparity, the study further confirmed with the private waste companies through their officials (key informants) perspective of whether the objective of universal coverage was achieved. In answering this question, key informants from the three contracted companies interviewed (i.e. Meridian Waste Management Ltd, J. Stanley Owusu Waste Company and Asadu Royal and Waste Seed Company) confirmed earlier findings that their outfits were not able to fully service their contracted areas. Though they believe, they were able to cover around 85 to 95 per cent of their contracted areas. On this, the key informant from J. Stanley Owusu Waste Company intimated that:

> *No I won't say that we can cover the area, I would say we cover about 95% of the area. The reason been that some areas are not easily accessible and in as much as we have made effort to reach the client living in these areas we also have a situation where vehicles park on roadsides do obstruct us and this happens a lot in Com No. 1 because of the commercial activities in the area. Again areas where tricycles are dominant the people usually patronize them so by the time we get there their wastes have already been taken. This happens a lot and I think the reason is that the owners of the tricycles live with the beneficiaries (*28th November 2019*).*

The quotation and information gathered confirmed that there exist differences in the spatial distribution of the quality of solid waste collection

service delivered to the communities, though this disparity occurred in just a few areas in the communities, however, it's environmental and health impacts may affect the whole metropolis (Hardoy, Mitlin & Satterthwaite, 2013).

Reasons for the Disparity in the Spatial Distribution of Solid Waste Collection Service

From the conceptual framework, the factors were grouped into the internal and external factors. Hence, the current study investigated by probing the officials (key informants) of the private waste companies on whether these factors helped explain the disparity in the collection service delivered.

Internal Factors (Operational Capacity of the Firm)

According to Oduro-Kwarteng (2011), before private sector companies in service delivery improve their efficiency, there is the need to improve their equipment holdings and upgrade their knowledge and skills to rationalize operations and maintenance. Thus, for efficiency improvement, both the capital and human resource capacities of the firm need to be adequate. This to Baabereyir (2009) is a major requirement for the achievement of equal service delivery and ultimately universal coverage.

Enquiry into the human resource capacity of all three firms under investigation revealed that all of them had adequate and appropriate personnel to tackle the service. During the interview, the key informant (operations manager) at the Meridian Waste Management Ltd stated that workers at his company are mostly skilled labour with just a few unskilled labours (about 5%) and they were usually street sweepers (2nd December, 2019).

Similarly, the officials from both Asadu Royal and Waste Seed Company and J. Stanley Owusu Waste Company confirmed to the fact that

their companies employed only skilled labour. From the finding it was inferred that the private waste companies had the required human resource capacity to help make effective management of the capital resource available so to achieve an equal spatial distribution of the solid waste collection service. Thus, the available human resource, which are seen as the managers of the service delivery will include all the employees of the company starting with the directors, managers, supervisors/mechanics, collection crew, drivers and cleaners (Bowan, 2013).

On the capital resource capacity of the companies, officials from all the 3 firms under investigation again believed they are resourced enough to be able to service their contracted areas. To elaborate further, the key informant from J. Stanley Owusu Waste Company indicated that his outfit has over 13 trucks which they use for the service. To him this was more than enough for serving the company's contracted area and on liquid capital (money), he affirmed that his company was deemed fit on that ground and it was on this reason that the Metropolitan Assembly gave them the contract (28th November 2019). As such all the companies had the required amount of both physical (i.e. the compactors, side loaders, skip trucks and Roll-on- trucks) and liquid capital (i.e. the financial ability) resource investment for the achievement of the equal spatial distribution of the service (Bowan, 2013).

With the required human and capital resource capacity available to the private waste companies, it was expected to have a positive effect on the spatial distribution of the collection service as backed by the public choice theory (Asare & Frimpong, 2013). This is because the public choice theory assumes that an increase in budget (internal resource) has a positive effect on

the efficiency of the service (Oduro-Kwarteng, 2011). However, the study suggests a variation in the spatial distribution of the solid waste collection service. Hence, it can be confirmed that the variation was not internally caused. As such, the study further probed about the other external factors to ascertain whether they will account as the cause of the disparity.

External Factors

The first external factor enquired about by the researcher was on whether the government policies governing solid waste accounted for the disparity that occurred with the collection service delivered by the private waste companies. This is of importance because as argued by Bartley and Larbi (2004) cited in the work of Oduro-Kwarteng (2011), weak regulatory capacity of governments' can lead to differences in the distribution of solid waste collection service delivered between the high- and low-class zones. This is because private waste service providers will prefer serving rich communities over the poor ones (Shriwas et al., 2018).

On this, all three private waste collection companies under investigation revealed that one policy or role by the Metropolitan Assembly that gives them absolute right in regulating the landfill site impede on their work. Thus, because the Assembly is allowed to regulate the landfill site sometimes trucks they use for the collection of the solid waste are stuck at the site for days which disrupt the schedule for the collection of waste from the communities. Alluding to this problem the key informant from the J. Stanley Owusu Waste Company, had this to say:

> *I know that the responsibility lies with the Assembly to ensure that there is a final disposal site, they have that at Kpone Katamanso. However, there is a challenge. Let say after*

> *collecting the waste within the communities according to the company's schedule, the trucks arrive at the disposal site but are unable discharge their wares. The outcome will be a delay in the collection of the waste the next day because of absent trucks* (28th November 2019).

Another key informant from the Meridian Waste Management Ltd confirmed the above statement by saying that:

> *To know the reliability of the collection of waste depends on the final disposal. After all our hard work of collecting the waste if the waste is not dumped, schedules or targets cannot be met, promises made for refuse collection will be broken and the clients will be disappointed. As we talk now the landfill site is a no go area, the place is full and a decommissioned site has been opened which is also not adequate* (2nd December 2019).

The role of government in the PPP structure is to regulate the service delivered by the private waste companies towards the efficient management of the service (Abdel-Shafy et al., 2018). The resultant outcome is to ensure an equal spatial distribution of the solid waste collection service. However, the finding indicates that the role played by the government (Metropolitan Assembly) on the final disposal site at Kpone-Katamanso influenced negatively the reliability of the collection services provided by the private waste companies and eventually the spatial distribution of the service.

In effect, the role of the government at the landfill site caused a delay in the schedule for the trucks used in collecting waste in the metropolis. Thus, this led to some communities receiving the collection service whiles others do not. This was confirmed in objective 2 where the service quality dimension "reliability of service" revealed variation in the spatial distribution of the quality of solid waste collection service, although most of the communities

selected had higher satisfaction level. This goes to confirm the argument by Akafia (2014) that the regulatory role by the government can also lead to inefficiencies such distributional inequalities.

Another role by the government that tend to cause disparity with the spatial distribution of solid waste collection had to do with the user-fee charges set by the Assembly in consultation with the private waste companies and a section of the beneficiaries. On this, the key informants from Asadu Royal and Waste Seed Company said that the fees set are usually unrealistic as it sometimes put their outfit in a loss from unpaid services by the beneficiaries (11th December 2019). The key informant from the Meridian Waste Management Company Ltd re-echoed their plight by saying that:

> *We cannot fix fees on our own unilaterally that is why the fees are fixed through the Assembly, consultation is been done by meeting contractors and a section of the public so that everybody's input is taken before they fix the fees. Sometimes the fee is highly disjointed, it does not sync with reality imagine going to charge GHS 87 in a place like Community 1(site1) – the people will not pay – so it has to be realistic. Sometimes the fee that is been charged for a current or a particular year cannot be implemented because the actual fee been collected and what is been proposed to be charged or gazetted is about 2 or 3 times higher* (2nd December 2019).

According to McAllister (2015), financial constraints on the part of the beneficiaries can result in the unfair distribution of the solid waste collection service. This is because the monthly incomes of some households usually in the LCZ are low as such they are not able to foot the bill set by the Metropolitan Assembly for their waste to be collected. This leads to the low-cost recovery of private waste companies as there will be households that will

not be willing and able to pay for the service (Oduro-Kwarteng & Van Dijk, 2013). Further confirming the neoliberal theory's assertion that with the forces of demand and supply managing the affairs of the market, most financial constraint areas will have their service supply being low (Roskin et al., 2014).

The argument so far showed that the disparity in the spatial distribution of solid waste collection services delivered in the Tema metropolis can be partly explained by the regulatory capacity played by the government or the Metropolitan Assembly. The finding is in line with that of Amoah and Kosoe (2014) which linked the difference in waste collected in the Wa municipality to the lack of good policies from the authorities in-charge.

The last external factor discussed to ascertain whether it could help explain the disparity between the spatial distributions of solid waste collection service delivered to beneficiaries in the selected communities was about the infrastructure facilities in the metropolis. On this, all three key informants from the private waste companies agreed that they do not have any problem with the road networks within most of the communities. Although there are few communities, which have its houses built in an unplanned manner with bad road networks such as Community 1(site1) and Community 2 and this derailed the work of the waste collection contractors. This is consistent with the situation in Community 1(site 1) with the people experiencing low quality waste collection services in all of the service quality dimensions. This to the accredited private waste companies increases the patronage of the informal solid waste collectors who normally use tricycles in these areas. To confirm this fact, the key informant of Asadu Royal and Waste Seed Company asserted that:

> *The roads at Tema is mostly good, I think because the city was specifically built as an industrial area by the government and as such help smoothen our work. However, there are few residential areas within the metropolis with bad roads (in terms of it been un-tarred and small spaces) so they destroy our trucks which affect the reliability of our collection (*11th December 2019).

According to Amoah and Kosoe (2014), the efficiency of solid waste collection service improves whenever a community has better infrastructural facilities such as good road networks and better disposal sites. These facilities not only propel the efficacy of the collection work but also help in providing broader access to the service to the people. However, the absence of these facilities in parts of the community affects the access cover of the service leading to variation in the distribution of the service. Eventually, the variation leads to some social and environmental injustice as the rich live and work in clean places while the poor will be exposed to a high level of pollution (Baabereyir et al., 2012).

In summary, it could be inferred that the variation in the spatial distribution of solid waste collection in the Tema metropolis was because of external factors. These factors (i.e. regulatory role of the government and the lack of good infrastructural facilities) militated against the work of the private waste companies leading to some areas receiving quality solid waste collection service as compared to others, indicating the existence of distributive injustice as ascribed by the social justice theory (Johnston et al., 2000; Young 2011).

Effects of the Spatial Distribution of Private Solid Waste Collection on Sustainable Environment

This section of the chapter centres on the third objective of the study, which looks at the effects of the spatial distribution of private solid waste collection service on the sustainable development. The aim of a sustainable solid waste system (such as solid waste management under the PPP model) is to achieve a sustainable development: a clean environment and good public health (Corvalan, et al., 1999). Hence, the objective looks at the outcome of the PPP solid waste collection service towards a clean and healthy environment. Specifically, the discussion of this objective covers issues on the effect of the spatial distribution of solid waste collection on the cleanliness of the environment and the health of the people. The theoretical outlook of this objective is embedded in the social justice theory. The analysis of the objective conducted was done through the use of logistic regression, chi-square statistics and thematic analysis.

Community cleanliness

Collection of solid waste from communities within the metropolis is aimed at making them clean as it helps promote public health, improve economic activities, and make them habitual (Yoada et al., 2014). As such the study wanted to find out whether the spatial distribution of the quality solid waste collection may lead to a clean or dirty environment. Hence, the study using a binary logistic regression tested the hypothesis regarding the relationship between the spatial distribution of solid waste collection and the cleanliness of the community (which has a dichotomous outcome: clean or dirty).

The logistic regression was performed to ascertain the effects of sex, educational level, family income, house ownership, and distribution of the solid waste collection on the likelihood that it leads to community cleanliness. The model was statistically significant (X^2 = 27.580; df = 7; p-value = 0.000). The model explained 20.5% (Nagelkerke R^2) of the variance in cleanliness of the community and correctly satisfied 94.8% of the cases. From Table 11, sex, educational level, and the distribution of solid waste collection had a positive Beta coefficient indicating an increased likelihood of exhibiting a clean environment when increased. However, increasing family income and house owenership was associated with a reduction in the likelihood of exhibiting a clean environment.

Table 11 goes further to show which of the predictor variables made significant contribution in the prediction of community cleanliness after the collection of solid waste. On this only the family income variable made a significant contribution at p < 0.028, while the rest of the variables were not significant predictors. Since the observations are of individual householders and not grouped, the regression model was estimated using the Maximum Likelihood estimation procedure with the final regression model as follows:

$$L_N \frac{P_i}{1-P_i} = -\frac{990}{1.990} + \frac{0.163}{0.837}X_1 - \frac{1.943}{0.943}X_2 - \frac{1.335}{0.335}X_3 + \frac{0.191}{0.809}X_4 - \frac{0.928}{1.928}X_5 - \frac{1.117}{2.117}X_6 - \frac{1530}{0.530}X_7.$$

Table 11: Marginal effects of binary logistic regression

Variable	Estimated coefficient (β)	Wald statistics	Sig.	Exp(β)
Constant (α)	-0.990	0.400	0.527	0.371
Sex	0.163	0.103	0.749	1.177
Educational level		5.618	0.132	
Educational level (1)	1.943	1.670	0.196	6.980
Educational level (2)	1.335	1.459	0.227	3.799
Educational level (3)	0.191	0.030	0.861	1.210
Family income	-0.928	4.848	0.028*	0.396
House ownership	-1.117	2.902	0.088	0.327
Spatial distribution	1.530	2.678	0.102	4.618

Chi-Square Statistics = 27.580 *Significant at 5%
df = 7
-2 Log Likelihood = 132.876
Cox & Snell R^2 = 0.073.
Nagelkerke R^2 = 0.205.
Source: Field Survey (2019)

Although in the previous sections it was discovered that there exists variation in the spatial distribution of the quality of solid waste collection service across the Tema metropolis, the state of cleanliness after the collection according to data gathered is relatively significant. Reasons given by the respondents to back their claim is that there were few uncollected waste left in the communities after the work of the private waste companies every morning. According to data from the Tema Metropolitan Assembly (2016), 155.1kg (88.3%) of the waste generated (thus, out of 175.66 kg) in the metropolis daily is successfully collected.

To confirm the assertion that the metropolis looks clean after the collection of waste by the private waste companies, the study observed the situation on the ground (road networks and drainage system). From the observation, it was concluded that indeed the metropolis looked relatively clean after the collection of waste. The streets within the selected communities

investigated looked relatively clean after sweeping and collection of the waste except for Community 1(site1) which being a Zongo community had some dotted uncollected waste. The drainage system (gutters) on the other hand remained clean (check Plate 1). Especially, the covered gutters prevents most refuse from entering, with small silt debris found in them. This helped prevent the flooding of the area as compared to the situation in Accra metropolis (Owusu, 2010).

Plate 1: Some street sweepers at work in Community 1(site 1) and a relatively clean gutter in Community 9
Photo credit: Author (2019)

Public health

There is an increasing risk to the general health of beneficiaries from the improper handling of solid wastes. This usually happens when a large proportion of the solid waste generated is never collected for disposal and end up dispersed on streets, in drains and around uncompleted buildings (Pacione, 2005; Hardoy et al., 2013). These areas help create breeding grounds for disease-causing insects and rodents to spread diseases such as cholera and fever. For these reasons, the researcher wanted to find out from the beneficiaries of the collection service whether the service delivered to them

has led to any adverse health problems. Moreover, if "yes" which adverse health problem did they suffer?

To know whether there exist a relationship between the spatial distribution of solid waste collection and the health of the beneficiaries, chi-square statistics was introduced. The result showed that at five per cent significant level, chi-square value of 8.619 was not significant (X^2 = 8.619; df= 10; p-value = 0.569). However, according to Hardoy et al. (2013), the difference in quality of collection of solid waste between communities within different socio-economic classes' leads to the low income areas suffering illnesses related to waste mismanagement as compared those in the high income areas. As such the study using some descriptive statistics (frequencies and percentages) in Table 12, revealed that almost all respondents 339 (93.7%) responded having no health implication regarding the solid waste collection service delivered to them. However, some respondents (23) confessed to having some health implication and cited contracting diseases such as cholera, fever and diarrhoea.

Table 12: Health implication out of the service provided in the Communities

Zone	Service Provider	Community	Yes	No	Total
High-Class Zone	Meridian Waste Co. Ltd	Count	2	23	25
		% within Com 11	8	92	100%
	J.Stanley Owusu Co. Ltd	Count	1	68	69
		% within Com 9	1.0	99.0	100%
	Asadu Royal and Waste Seed Co Ltd	Count	7	84	91
		% within Com 5	7.7	92.3	100%
Low-Class Zone	Meridian Waste Co. Ltd	Count	0	15	15
		% within Com 1(site1)	0	100.0	100%
	J.Stanley Owusu Co. Ltd	Count	6	85	91
		% within Com 2	6.6	93.4	100%
	Asadu Royal and Waste Seed Co Ltd	Count	7	65	72
		% within Com 4	9.7	90.3	100%
Total		Count	23	21	363
		% within Coms	6.3	5.8	100%

Source: Field survey (2019)

$x^2 = 8.619$; df = 10; p-value = 0.569

Note: Com(s) = Community/Communites, N = Number, % = Percentage

This confirmed that although there were differences with the spatial distribution of the quality of solid waste collection services within the selected communities, the collection of waste by the private solid waste companies in the metropolis seemed effective and efficient generally; as it helped promote the sustainability of the society through the improvement of the health of the people. The result is in line with data of the health directorate that reported that the prevalence rate of diseases caused by mishandling of solid waste in the Tema metropolis is low about 17 (1.5%) out of 1126 cases analysed in the Greater Accra Region, Ghana (Gershon, Yirenchi, Nuoh, & Atelu, 2014).

Chapter Summary

The chapter begins with the linkage between the theories discussed in the chapter two and the objectives of the study. On this, it was revealed that the objectives one and two were guided by both the neoliberal and public

choice theories while the third objective was guided by the social justice theory. Afterwards, the chapter dealt with discussing the bakground characteristics of the beneficiaries of the study. The age, sex, household income and the tenure system within the metropolis was looked at as according to Chen (2010), these variables affect the collection of solid waste.

Subsequently, the objective one of the study was analysed. The objective was to describe the spatial distribution of the quality of solid waste collection in the Tema metropolis. Employing the descriptive statistics, chi-square test of independence, GIS choropleth map and thematic analysis, it was revealed that the spatial distribution of the quality of solid waste collection service varied across the selected communities. In the objective two, through the use of thematic analyses, it was revealed that the distribution of the quality of solid waste collection service found in objective one was as a result of some external factors. These factors were the regulatory role played by the MA under the PPP system and the unavailability of infrastructure facilities (specifically, the road network). Lastly, objective three revealed that even though there was variation in the spatial distribution of the quality of solid waste collection there was significant effect on the sustainable development, leading to a clean environment and good public health. The objective employed the linear regression and the thematic analyses.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The study investigated the spatial distribution of solid waste collection service within the context of PPP in the Tema metropolis. The study was guided by the neoliberal theory, public choice theory and the social justice theory as a theoretical basis for the discussions of the research questions. With regard to findings on service quality of solid waste management, the study revealed from the opinions of the beneficiaries that the distribution of the service varied for the selected communities in the Tema metropolis.

The study adopted a mixed-method research approach, which was more qualitatively inclined, and the descriptive survey design to guide the study. The sample size comprised 363 respondents via a multi-stage sampling technique and 4 key informants comprising of officers from the Waste Management Department and the private waste collection companies who were purposefully sampled. The data was collected by the use of an interview schedule, observation guide and interview guide. Data was analysed through the application of descriptive statistics, chi-square test of independence, GIS thematic mapping and thematic analysis.

Key findings of the study

As per the analysis, results and discussions made in the previous chapter, the key findings based on the aims of the study are presented as follows. The first objective described the spatial distribution of the quality of solid waste collection service delivered by the private service providers in the selected communities within the Tema metropolis. The service quality

SERVPERF model was used as a proxy to meausre the distribution and it was done under three dimensions; reliability of the collection, conditions of the equipement and satisfaction on complaints, charges and sanitary conditions. Findings established under this objective after employing the descriptive, chi-square test of independence, GIS choropleth map and thematic analysis were:

- Under reliability of collection, all communities in the HCZ and 2 from the LCZ had most of their respondents satisfied with the service quality dimension. The satisfaction was linked to reasons such as consistency in the collection of waste by service providers, and appropriate timing in the collection of waste. However, community 1(site 1) had its beneficiaries dissatisfied with the sevrice quality dimension citing reasons such as poorroad network, traffic congestion and refusal to pay for the service to back their claim. The result showed significant difference in the distribution of the service across the selected communities and this difference was depicted with the GIS choropleth map (Figure 5).
- On the condition of equipment, communities under the HCZ had most of their respondents satisfied. On the other hand, only two communities within the LCZ had most of their respondents satisfied with the last one (Community 1(site1)) having most of its respondents dissatisfied. Respondents, who chose been satisfied revealed that because skilled employees were used for collection, coverable contaniers were employed, proper dustbins were deployed and enough vehicles were used for collecting their waste, they did not have any problems with the service quality dimension. However,

those dissatisfied cited reasons such as inappropriate collection containers used, irregular collection of waste, unprofessional attitude by the collection crew and the lack of cover for collection containers to back their claim. The finding indicated a significant difference in the distribution of the service across the selected communities and this difference was depicted with the GIS choropleth map (Figure 6).

- On the last issue "satisfaction on complaints, charges and sanitary conditions", it was revealed that within the HCZ only Community 11 had its beneficiries satisfied while the rest of the communities (thus, Community 9 and 5) had their beneficiaries dissatisfied. With the LCZ, two communities (thus, Community 1(site1) and 2) had most of their respondents dissatisfied, while only one community (thus, Community 4) had most of its respondents satisfied with the service quality dimension. Beneficiaries who were satisfied gave reasons such as; timely collection of waste, street sweeping habits of the service providers and professional collection crews of the service providers to substantiate their claim. Beneficiaries who were dissatisfied gave reasons such as lack of adequate and appropriate collection containers, uncleanliness after waste collection and high cost on collection of solid waste to support their choice. Furthermore the result showed a significant difference in the distribution of the service across the selected communities and this difference was depicted with the GIS choropleth map (Figure 7).

The second objective was to examine the factors underlying the spatial distribution of the quality of solid waste collection services. Using thematic analysis, findings from this objective were as follows:

- Firstly, on the internal factors, the human resource capacities of the private companies were examined. On this, all the companies agreed to have adequate human resource capacity to service effectively their contracted area fully and equally. In addition, the capital resource capacity of the company was also examined. On this, it was revealed that all the companies had the required capital capacity to be able to provide full and equal collection service to the beneficiaries. From the findings it was established that the internal factors could not be used to explain why there exist variations in the spatial distribution of the quality of the solid waste collection.
- On the external factors, the first to be examined was the regulatory capacity of the MA and how it influences the distribution of the collection service. It was discovered that the regulation of the landfill site and the the setting of collection charges by the MA had a negative effect on the distribution of the service. Again, the unavailability of good infrastructure facilities, hinders the distribution of the service in Tema metropolis. From these findings it was established that the external factors were the cause of the variation in the spatial distribution of the quality of solid waste collection service.

The third objective of the study was to ascertain the effects of the spatial distribution of the private solid waste collection service on the sustainable

environment. Findings from this objective were analysed using a logistic regression, chi-square statistics and thematic analysis and were revealed as follows:

- On community cleanliness after the collection of solid waste, data gathered revealed that the spatial distribution of the quality of solid waste collection service significantly affected the cleanliness of the environment. In line with this the residents revealed that their communities became clean after the collection of solid waste. Although, a few of them believes the communities remain dirty even after the collection of waste as such they advocated for an increase in the number of private waste collection companies to help in the collection of waste.
- On public health, the analyses established that the spatial distribution of the quality of solid waste collection sevrice did not significantly affect the health of the people in the metropolis. although, most of the respondents responded that they do not suffer any health implication with the kind collection service they receive. However, few of the beneficiaries confirmed getting some health implications from the kind collection service received citing contracting diseases such as cholera, fever and diarrhoea.

Conclusion

Conclusions drawn from the findings of the study was as follows.

The first objective was to describe the spatial distribution of the quality of solid waste collection service under the PPP system. It was established that distribution of the service varied across the selected communities with those in

the LCZ been the least satisfied. This phenomenon was realised in all three dimensions used to explain the service quality of the solid waste collection service. On two of these dimensions, that is relaibility of collection service and conditions of equipment, most beneficiaries revealed been satisfied citing reasons such as consistency in the collection of waste by service providers and skilled employees used for collection of the solid waste to sustain their claim. However, on the last dimension, that satisfaction on complaints, charges and sanitary conditions most of the beneficiaries were dissatisfied providing reasons such as uncleanliness after waste collection and high cost on collection of solid waste to back their claim.

The study revealed that the variation within the spatial distribution of the quality of solid waste collection service was as a result external factors. These factors that mitigate against the work of the service providers affect the reliability of the collection service. Firstly with the regulatory role of the MA, roles such as the regulation of the landfill site which affect the free flow of the collection trucks to and fro the disposal site at kpone katamanso and the setting of collection charges which prevent some beneficiaries from having their solid waste collected are but a few. Another external factor had to do with the unavailability of infrastructure facilities, specifically the road network in the metropolis. The roads been in a deplorable state prevent the collection trucks to do their work and this given rise to the use of tricycles (Aboboya) for solid waste collection.

Finding out the effect of the spatial distribution of quality solid waste collection service on sustainable development (thus, clean environment and public health) was the third objective. It was established that there was

significant effect between the variables understudy. On clean environment, the study revealed that the distribution of the collection service led to a clean evironment with pockets of uncollected waste left in few places. This was evident as most beneficiaries felt the metropolis become clean after the colletcion of waste by the service providers. On public health, the study revealed that the distribution of the collection service have led to few beneficiaries experiencing ill health associated with solid waste.

Recommendations

Based on the key findings and conclusions drawn from the study, the following recommendations were made by the reseacher:

The Government or Metropolitan Assembly (MA);

- The MA should incorporate the informal waste collectors (*aboboyas*') into the solid waste collection system. This is to help cover the metropolis, as the accredited formal waste collectors are not able to cover fully the collection of waste in the metropolis (particularly in the Low Class Zone of Community 1(site 1).
- Service beneficiaries should be educated on reasons why they are supposed to pay for the service delivered by the private waste companies. The Waste Management Department (WMD), Ministry of Sanitation and Water Resource (MSWR) and the Environmental Protection Agency (EPA) could embark on intensive education of the citizenry on the importance of maintaining environmental sanity. This is important as it will help the beneficiaries of the service recognize the need in making sure their solid waste is collected regularly through the payment of the service.

- The Metropolitan Assembly should ensure the proper management of the Kpone Katamanso landfill site, so to allow trucks (owned by the private waste collection companies) that send collected solid waste to the disposal site work efficiently (do not get stuck at the site). If the problem is caused by the lack of space as stated by the key informants of the private waste companies then a new method could be employed, for example the incineration or combustion method.
- Under the PPP arrangement, government and the Metropolitan Assembly's role of monitoring and supervision of contracts and enforcement of by-laws should be taken seriously as it could help keep the private waste companies in line to achieve success in the distribution of the solid waste collection service.

Avenues for Further Study

From the study done so far, gaps realised for further research are recommended as follows;

- A comprehensive study should be done on the proper management of solid waste landfill site in the Tema metropolis. As to enable the Assembly efficiently manage the site, which in turn will help in the collection of waste because there will not be a regular and equal collection of waste when there is inefficient management of the final disposal site.
- There is a need for detailed research on the people's willingness to pay for solid waste management service since the concept of PPP has firmly been incorporated into the solid waste management sector in the metropolis.

REFERENCES

Abalo, E. M., Peprah, P., Nyonyo, J., Ampomah-Sarpong, R., & Agyemang-Duah, W. (2018). A review of the triple gains of waste and the way forward for Ghana. *Hindawi- Journal of Renewable Energy*, 1-12.

Abdel-Shafy, H. I., & Mansour, M. S. (2018). Solid waste issue: Sources, composition, disposal, recycling, and valorization. *Egyptian Journal of petroleum*, *27*(4), 1275-1290.

Abenza, O. A. (2015). The public choice theory and it's capacity to explain unpopular nationalist policy decisions. *Global Diplomacy*, 1-6.

Accra Metropolitan Assembly [AMA]. (2016). *The composite budget for Accra Metropolitan Assembly for the 2016 fiscal year*. Accra: Government of Ghana.

Adama, O. (2012). Urban governance and spatial inequality in service delivery: A case study of solid waste management in Abuja, Nigeria. *Waste Management & Research*, *30*(9), 991-998.

Addai, K. N., & Danso-Abbeam, G. (2014). Determinants of willingness to pay for improved solid waste management in Dunkwa-on-Offin, Ghana. *Journal of Agriculture and Environmental Sciences*, *3*(1), 01-09.

Adu-Boahen, K., Atampugre, G., Antwi, K. B., Osman, A., Osei, K. N., Mensah, E. A., & Adu-Boahen, A. O. (2014). Waste management practices in Ghana: Challenges and prospect, Jukwa Central Region. *International Journal of Development and Sustainability*, *3*(3), 530-546.

Afroz, R., Hanaki, K., & Hasegawa-Kurisu, K. (2009). Willingness to pay for waste management improvement in Dhaka city, Bangladesh. *Journal of Environmental Management*, *90*(1), 492-503.

Agyepong, K. A., (2018). Waste management options in Ghana, future strategy. *IMANI* Africa.

Akaateba, M. A., & Yakubu, I. (2013). Householders'satisfaction towards solid waste collection services of Zoomlion Ghana Ltd in Wa, Ghana. *European Scientific Journal*, *9*(32).

Akafia, D. A. (2014). *Solid waste collection and willingness to pay for better service in Tema, Ghana* (Doctoral dissertation, Kwame Nkrumah University of Science and Technology). Retrieved from http://ir.knust.edu.gh/handle/123456789/6494.

Alhassan, H., Donkoh, S. A., & Boateng, F. V. (2017). Households'willingness to pay for improved solid waste management in the Tamale Metropolitan Area, Northern Ghana. *UDS International Journal for Development*, *3(2)*, 70-84.

Almsalam, S. (2014). The effects of customer expectation and perceived service quality on customer satisfaction. *International Journal of Business and Management Invention*, *3(8)*, 79-84.

Amoah, S. T., & Kosoe, E. A. (2014). Solid waste management in urban areas of Ghana: Issues and experiences from Wa. *Journal of Environment Pollution and Human Health*, *2(5)*, 110-117.

Anazodo, R., Okoye, J. C., & Ezenwile, U. (2012). Leadership-corruption: The bane of Nigeria development. *African Journal of Social Sciences*, *2*(3), 124-134.

Andre, C., & Velasquez, M. (1990). Justice and fairness. *Issues in Ethics*, *3*(2), 1-3.

Andrienko, G., Andrienko, N., & Savinov, A. (2001). Choropleth maps: Classification revisited. *Proceedings ica* (pp. 1109-1219).

Angelova, B., & Zekiri, J. (2011). Measuring customer satisfaction with service quality using the American Customer Satisfaction Model (ACSI Model). *International Journal of Academic Research in Business and Social Sciences*, *1*(3), 232.

Asare, B. E., & Frimpong, M. K. (2013). Public-private partnerships and urban sanitation: Do expectations meet realities in Madina-Ghana?. *Journal of African Studies and Development*, *5*(5), 113-124.

Awortwi, N. (2004). Getting the fundamentals wrong: Woes of public-private partnerships in solid waste collection in three Ghanaian cities. *Public Administration and Development*, *2(4)*, 213–224.

Ayantoyinbo, B. B., & Adepoju, O. O. (2018). Analysis of solid waste management logistics and its attendant challenges in Lagos Metropolis. *Logistics*, *2*(2), 11.

Ayee, J. R. (1996). The measurement of decentralization: The Ghanaian experience, 1988-92. *Journal of African Studies and Development*, 95(378), 31-50.

Ayee, J. R. (2013). The developmental state experiment in Africa: The experiences of Ghana and South Africa. *The Round Table*, *102*(3), 259-280.

Aziale, L. K., & Asafo-Adjei, E. (2013). Logistic challenges in urban waste management in Ghana: A case of Tema metropolitan assembly. *Eur J Bus Manage*, *5*, 116-28.

Baabereyir, A. (2009). *Urban environmental problems in Ghana: A case study of social and environmental injustice in solid waste management in Accra and Sekondi-Takoradi* (Doctoral dissertation, University of Nottingham). Retrieved from http://eprints.nottingham.ac.uk/10847/ .

Baabereyir, A., Jewitt, S., & O'Hara, S. (2012). Dumping on the poor: The ecological distribution of Accra's solid waste burden. *Environment and Planning A*, *44*(2), 297-314.

Babakus, E., & Boller, G. W. (1992). An empirical assessment of the SERVQUAL scale. *Journal of Business Research*, *24*(3), 253-268.

Babayemi, J., & Dauda, K. (2009). Evaluation of solid waste generation, categories and disposal options in developing countries. A case study of Nigeria. *Journal of Applied Science and Environmental Management*, 13(3), 83-88.

Bartone, C., Bernstein, J. D., & Wright, F. W. (1990). *Investments in solid waste management: Opportunities for environmental improvement* (Vol. 405). Washington, DC: World Bank Publications.

Bateson, J. E., & Hoffman, K. D. (2011). *Services marketing*. (4th eds.). Mason, Ohio : South-Western Publication.

Batley R. and Larbi G., (2004) *The changing role of government. The reform of public services in developing countries.* New York, NY: Palgrave Macmillan.

Batley, R. (1996). Public-private relationships and performance in service provision. *Urban Studies*, *33*(45), 723-751.

Baud, I. & Post, J. (2003). Between market and partnerships: Urban solid waste management and contributions to sustainable development?. *Global Business and Economics Review*, 3(1), 46-65.

Bayliss, K., & Kessler, T. (2006). *Can privatisation and commercialisation of public services help achieve the MDGs? An assessment* (No. 22). Brasilia, Brazil: United Nations Development Programme (UNDP).

Behr, T. (2005). Luigi Taparelli and social justice: Rediscovering the origins of a" hollowed" concept. *Social Justice in Context*, *1*(*1)*, 3-16.

Benezech, V., & Coulombel, N. (2013). The value of service reliability. *Transportation Research Part B: Methodological*, *58*, 1-15.

Bernstein, J. (2004). Social assessment and public participation in municipal solid waste management. *World Bank Working Paper*, 463617-1202332338898.

Boampong, O., & Tachie, B. Y. (2017). The implications of private participation in solid waste management for collective organisation in Accra, Ghana. *E. Webster, S., Bhowmik, & AO Britwum,(Eds.). Crossing the divide: Precarious work and the future of labour*, 228-249.

Boateng, S., Amoako, P., Appiah, D. O., Poku, A. A., & Garsonu, E. K. (2016). Comparative analysis of households solid waste management in rural and urban Ghana. *Journal of Environmental and Public Health, pp. 1-10.*

Bowan, P. A. (2013). Private sector capacity in the management of urban solid waste in Ghana: A study of Zoomlion in the Wa municipality. *Journal of Studies in Social Sciences*, *5*(2), 352-364.

Boyne, G. A. (2003). Sources of public service improvement: A critical review and research agenda. *Journal of Public Administration Research and Theory*, *13*(3), 367-394.

Buchanan, J. M., & Tullock, G. (1962). *The calculus of consent* (Vol. 3). Ann Arbor: University of Michigan Press.

Byiers, B., & Rosengren, A. (2012). *Common or conflicting interests? Reflections on the private sector (for) development agenda.* Discussion Paper No. 131. Brussels, Belgium: European Centre for Development Policy Management (ECDPM).

Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment* (Vol. 17). Thousand Oaks: CA, Sage Publications.

Centemeri, L. (2009). Environmental damage as a negative externality: Uncertainty, moral complexity and the limits of the Market. *e-cadernos CES*, (05).

Chen, C. C. (2010). Spatial inequality in municipal solid waste disposal across regions in developing countries. *International Journal of Environmental Science & Technology*, *7*(3), 447-456.

Chen, J., Yang, S., Li, H., Zhang, B., & Lv, J. (2013). Research on geographical environment unit division based on the method of natural breaks (Jenks). *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci*, *3*, 47-50.

Clarke, S. (2005). The neoliberal theory of society. Neoliberalism: A critical reader. *Warwick*, 59-67.

Cointreau-Levine, S. (1994). *Private sector participation in municipal solid waste services in developing countries*: (1st ed). The formal sector. Washington, DC: The World Bank.

Cointreau-Levine, S., & Coad, A. (2000). Private sector participation in municipal solid waste management. *SKAT, Guidance Pack. St. Gallen*.

Corrales, J. (2012). Neoliberalism and its alternatives. *Routledge Handbook of Latin American politics,* pp. 133-157.

Corvalán, C. F., Kjellström, T., & Smith, K. R. (1999). Health, environment and sustainable development: Identifying links and indicators to promote action. *Epidemiology*, 656-660.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Cronin Jr, J. J., & Taylor, S. A. (1992). Measuring service quality: A re-examination and extension. *Journal of Marketing*, *56*(3), 55-68.

Dorvil, L. (2007). *Private sector participation in integrated sustainable solid waste management in low and middle-income countries* (Doctoral dissertation, University of St. Gallen). Retrieved from https://www1.unisg.ch/www/edis.nsf/SysLkpByIdentifier/3381/$FILE/dis3381.pdf

Douti, N. B., Abanyie, S. K., & Ampofo, S. (2017). Solid waste management challenges in urban areas of Ghana: A case study of Bawku Municipality. *Scientific Research Publishing*, 494-513.

Du Pisani, J. A. (2006). Sustainable development historical roots of the concept. *Environmental Sciences*, *3*(2), 83-96.

Dube, C., & Chigumira, G. (2011). *The scope for public-private partnerships for infrastructure development in Zimbabwe*. Zimbabwe Economic Policy Analysis and Research Unit.

Environmental Protection Agency [EPA] - Ghana. (2014). *The challenges of waste management in Ghana: EPA's perspective*. In Government of Ghana

Environmental Sanitation Agency (2010). *Ghana environmental and sanitation policy.* Accra: Ministry of Local Government and Rural Development.

Esty, D. C. (1999). Toward optimal environmental governance. *NYUL Rev., 74*, 1495.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*, Vol 4. Los Angelis, LA: Sage Publication.

Finnvold, J. E. (2009). Socio-spatial inequalities and the distribution of cash benefits to asthmatic children in Norway. *International Journal of Health Geographics*, *8*(1), 22.

Fiszbein, A., & Lowden, P. (1999). *Working together for a change: Government, business, and civic partnerships for poverty reduction in latin America and the Caribbean*. The World Bank.

Flew, A. (1999). *Equality and liberty in justice.* New Jersey, Transaction Publishers

Friedman, M. (1962). *Capitalism and freedom: With the assistance of Rose D. Friedman*. In University of Chicago Press.

Gershon, A., Yirenchi, M. E., Nuoh, M. R., & Atelu, M. G. (2014). Report of cholera outbreak investigation, Greater Accra Region, June-August

2014. Retrieved from https://ghana.um.dk/~/m edia/Ghana/Documents /Cholera%20Outbreak%20Investigation%20Report%20GAR%20Fina l_12082014.pdf

Ghana Statistical Service (2012). 2010 *Population and housing census: Summary report of final results.* Government of Ghana.

Ghana Statistical Service [GSS] (2015). *Annual gross domestic product: Statistics for development and progress*. In Accra, Government of Ghana.

Gibson, R. B. (2006). Sustainability assessment: Basic components of a practical approach. *Impact Assessment and Project Appraisal*, *24*(3), 170-182.

Gilpin, R. (1987). *The political economy of international relations*. Princeton University Press.

Green, D. P. & Shapiro I. (1994). *Pathologies of rational choice theory.* New Haven: Yale University Press.

Griffee, D. T. (2012). *An introduction to second language research methods: Design and data (1st ed.).* United States of America: TESL-EJ Publications.

Grönroos, C. (1984). A service quality model and its marketing implications. *European Journal of Marketing*, Vol. 18, No. 4, pp. 36-44

Guevara, A. (2015). Public-private partnerships: An innovative solution for a declining infrastructure. *The Urban Lawyer*, *47*(2), 309-338.

Haines, A., Kovats, R.S., Campbell-Lendrum, D. & Corvalan, C. (2006). Climate change and human health: impacts, vulnerability and public health. *Public Health,* 120, 585–596

Hardoy, J. E., Mitlin, D., & Satterthwaite, D. (2013). *Environmental problems in an urbanizing world: Finding solutions in cities in Africa, Asia and Latin America* Vol. 2. London: In Routledge.

Harris, J. M. (2003). Sustainability and sustainable development. *International Society for Ecological Economics*, *1*(1), 1-12.

Harvey, D. (2005). *Spaces of neoliberalization: towards a theory of uneven geographical development* (Vol. 8). Franz Steiner Verlag.

Hay, C. (2004). Theory, stylized heuristic or self-fulfilling prophecy? The status of rational choice theory in public administration. *Public Administration*, 39-62.

Hepple, L. W. (1989). Destroying local leviathans and designing landscapes of liberty? Public choice theory and the poll tax. *Transactions of the Institute of British Geographers*, 387-399.

Hey, A., & Bill, R. (2014). Placing dots in dot maps. *International Journal of Geographical Information Science*, *28*(12), 2417-2434.

Hinterberger, H. (2009). Thematic map. *Encyclopedia of Database Systems* (pp. 3086-3087). Springer.

Hoornweg, D., & Bhada-Tata, P. (2012). *WHAT A WASTE: A global review of solid waste management.* Washington DC: The World Bank.

Institute of Local Government Studies [ILGS] (2011). *Districts Public-Private Partnership (PPP) project program brief 2010*. Accra, Ghana: Government of Ghana.

Israel, E., & Frenkel, A. (2018). Social justice and spatial inequality: Toward a conceptual framework. *Progress in Human Geography*, *42*(5), 647-665.

Ita M. (2003). Waste- is the developing world ready? Science in Africa. Africa's First On-line Science Magazine. Science Magazine for Africa. MERCK.

Jessop, B. (2002). Liberalism, neoliberalism, and urban governance: A state–theoretical perspective. *Antipode*, *34*(3), 452-472.

Johnston, R. J., Gregory, D., Pratt, G., & Watts, M. (2000). *The dictionary of human geography. ed*. Oxford, UK: Blackwell Publishers.

Jomo, K. S., Chowdhury, A., Sharma, K., & Platz, D. (2016). *Public-Private Partnerships and the 2030 agenda for sustainable development: fit for purpose?. UN Department of Economic and Social Affairs (DESA) Working Papers*, No. 148, UN, New York. Retrieved from https://doi.org/10.18356/f42bd4bb-en.

Jones, H. (2009). *Equity in development: Why it is important and how to achieve it* (Working Paper 311). London: Overseas Development Institute.

Kalimullah, N. A., Ashraf, K. M., & Ashaduzzaman, M. N. (2012). New public management: Emergence and principles. *Bup Journal*, *1*(1), 1-22.

Kapepula, K. M., Colson, G., Sabri, K., & Thonart, P. (2007). A multiple criteria analysis for household solid waste management in the urban community of Dakar. *Waste Management*, *27*(11), 1690-1705.

Karak, T., Bhagat, R., & Bhattacharyya, P. (2012). Municipal solid waste generation, composition, and management: The world scenario. *Critical Reviews in Environmental Science and Technology*, 1509-1630.

Kasper, H., Helsdingen, van P., & Gabbott, M. (2006). *Service marketing management, A strategic perspective*. West Sussex: John Wiley & Sons.

Katusiimeh, M. W., Mol, A. P., & Burger, K. (2012). The operations and effectiveness of the public and private provision of solid waste collection services in Kampala. *Habitat International*, *36*(2), 247-252.

Kaza, Yao, Bhada-Tata & Van Woerden. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050.* Washington, DC: World Bank Publications.

Kelkar, M. (2010). SERVDIV: A vedic approach to measurement of service quality. *Services Marketing Quarterly*, *31*(4), 420-433.

Kolesova, A. (2015). *Advantages and disadvantages of franchising as a form of business.* Tomsk, Russia: Tomsk Polytechnic University.

Kotz, D. (2015). *A great fall: The origins and crisis of neoliberalism. Dollars and sense: Real world economics*. Boston Massachusetts: Harvard University Press.

Kovarik, V., & Talhofer, V. (2013). General procedure of thematic map production using GIS technology. *International Conference on Military Technologies Proceeding*. 13, 1401-1408).

Krauss, S. E. (2005). Research paradigms and meaning making: A primer. *The Qualitative Report*, *10*(4), 758-770.

Kubanza, N. S., Das, D. K., & Simatele, D. (2017). Some happy, others sad: Exploring environmental justice in solid waste management in Kinshasa, The Democratic Republic of Congo. *Local Environment*, 595-620.

Kunigami, G., De Rezende, P. J., De Souza, C. C., & Yunes, T. (2011). Optimizing the layout of proportional symbol maps. *International Conference on Computational Science and Its Applications* (pp. 1-16). Springer, Berlin, Heidelberg.

Kwan, J. (1999). *Public-Private Partnership, A guide for local government*. British Columbia, Canada: Crown Publication.

Ladhari, R. (2008). Alternative measures of service quality: A review. *managing service quality. An International Journal*. 18(1), 65-86.

Leddy, T. (1995). Everyday surface aesthetic qualities: "Neat", "Messy", "Clean", "Dirty". *The Journal of Aesthetics and Art Criticism*, *53*(3), 259-268.

Leitch, C. M., Hill, F. M., & Harrison, R. T. (2010). The philosophy and practise of interpretivist research in entrepreneurship: Quality, validation, and trust. *Organizational Research Methods*, *13*(1), 67-84.

Lemieux, P. (2015). The state and public choice. *The Independent Review*, *20*(1), 23-31.

Lewis-Beck, M. S. (1990). *Economics and elections: The major Western democracies*. In University of Michigan Press.

Lister, A. (2013). The "mirage" of social justice: Hayek against (and for) Rawls. *Critical Review*, *25*(3-4), 409-444.

Lohri, C. R., Camenzind, E. J., & Zurbrügg, C. (2014). Financial sustainability in municipal solid waste management–Costs and revenues in Bahir Dar, Ethiopia. *Waste Management*, *34*(2), 542-552.

Lucy, W., Gilbert, D., & Birkhead, G. (1977). Equity in local service distribution. *Wiley*, 687-697.

Massoud, M., & El-Fadel. (2002). Public-Private Partnerships for solid waste management services. *Environmental Management*, 621-630.

Mata-Alvarez, J. (Ed.). (2002). *Biomethanization of the organic fraction of municipal solid wastes,* Vol. 1. London, UK: In International Water Association Publishing.

Mathiesen, K. (2015). Informational justice: A conceptual framework for social justice in library and information services. *Library Trends*, 198-225.

McAllister, J. (2015). Factors influencing solid-waste management in the developing world. (Masters' thesis, Utah State University). Retrieved from https://digitalcommons.usu.edu/gradreports/528/.

McGaghie, W. C., Bordage, G., & Shea, J. A. (2001). Problem statement, conceptual framework, and research question. *Academic Medicine*, *76* (9), 923-924.

Miezah, K., Obiri-Danso, K., Kádár, Z., Fei-Baffoe, B., & Mensah, M. Y. (2015). Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. *Waste Management*, 15-27.

Miller, D. (1999). *Principles of social justice.* Cambridge, Massachusetts: Harvard University Press.

Ministry of Local Government and Rural Development [MLGRD]. (2010). *Environmental Sanitation Policy of Ghana*. Government of Ghana.

Mishra, R. (2014). *Welfare state capitalist society* (Vol. 5). London: UK, In Routledge.

Mohamed, Y. (2013). *Utilization of municipal solid waste rejects in producing wave dispersion and shoreline erosion protection structures (breakwaters).* (Master's Thesis, American University, Cairo). Retrieved from http://dar.aucegypt.edu/handle/10526/3392.

Morelli, J. (2011). Environmental sustainability: A definition for environmental professionals. *Journal of Environmental Sustainability*, *1*, 2.

Mouraviev, N., Kakabadse, N., & Robinson, I. (2012). Concessionary nature of public-private partnerships in Russia and Kazakhstan: A critical review. *International Journal of Public Administration*, *35*(6), 410-420.

Musgrave, R. (1959). *The theory of public finance.* New York: McGraw-Hill.

Mutandwa H. (2015). *An Analysis of the potential use of public-private partnerships in water infrastructural development in Zimbabwe: The case of Harare City Council*. (Master's thesis, University of Zimbabwe). Retrieved from https://www.semanticscholar.org /paper/ An-analysis-of-the-potential-use-of-public-private-Mutandwa /3cbfc665fd870f9832cf83ec7c56f85e185c13c1.

Nachum, L., (1999). *The origin of the international competitiveness of firms. Impact of location and ownership in professional service industries.* Cheltenham: Edward Elgar.

Neilson, J. (2014). Value chains, neoliberalism and development practice: The Indonesian experience. *Review of International Political Economy*, *21*(1), 38-69.

Neuman, W. L. (2014). *Social research methods: Qualitative and quantitative approaches (Seventh edition).* London: Pearson Education Limited.

Nordtveit, B. H. (2004). *Managing public-private partnership: Lessons from literacy education in Senegal.* Africa Region Human Development working paper series, World Bank Group. Retrieved from http://documents.worldbank.org/curated/en/937571468104943834/Managing-public-private-partnership-lessons-from-literacy-education-in-Senegal.

Novak, M. (2000). Defining social justice. *First Things*, 11-12.

Obirih-Opareh, N. (2003). *Solid waste collection in Accra: The impact of decentralisation and privatisation on the practice and performance of service delivery*. (Doctoral thesis, Amsterdam: University of Amsterdam/AGIDS). Retrieved from https://pure.uva.nl/ws/files/3624230/29472_UBA002001156_14.pdf

Oduro-Appiah, K., Scheinberg, A., Mensah, A., Afful, A., Boadu, H. K., & de Vries, N. (2017). Assessment of the municipal solid waste management system in Accra, Ghana: A 'Wasteaware' benchmark indicator approach. *Waste Management & Research*, *35*(11), 1149-1158.

Oduro-Kwarteng, S. & Van Dijk, M. P. (2013). The effect of increased private sector involvement in solid waste collection in five cities in Ghana. *Waste Management & Research* 31(10), 81–92.

Oduro-Kwarteng, S. (2011). *Private sector involvement in urban solid waste collection* (UNESCO-IHE PhD Thesis). CRC Press. Retrieved from https://www.routledge.com/Private-Sector-Involvement-in-Urban-

Solid-Waste-Collection-UNESCO-IHE/Oduro-Kwarteng/p/book/9780415692779.

Okot-Okumu, J., & Nyenje, R. (2011). Municipal solid waste management under decentralisation in Uganda. *Habitat International*, *35*(4), 537-543.

Olukanni, D. O., Akinyinka, O. O., Ede, A. N., & Akinwumi, I. I. (2014). Appraisal of municipal solid waste management, its effect and resource potential in a semi-urban city: A case study. *Journal of South African Business Research*, 1-13.

Onibokun, A. G., & Kumuyi, A. J. (1999). Governance and waste management in Africa. In *Managing the monster: Urban waste and governance in Africa*. IDRC, Ottawa, ON, CA.

Onu, B., Price, T., Surendran, S. S., & Ebie, S. (2012). Solid waste management: A critique of Nigeria's waste management policy. *International Journal of Knowledge, Culture and Change Management*, 11-16.

Organisation for Economic Co-Operation and Development [OECD]. (2008). *Household behaviour and the environment: Reviewing the evidence* Vol. 1. Paris, France: OECD Publications.

Osborne, S. (2000). *Public-private partnerships: Theory and practice in an international perspective*, Vol. 1. London, United Kingdom: In Routledge.

Oteng-Ababio, M. (2010). Private sector involvement in solid waste management in the Greater Accra Metropolitan Area in Ghana. *Waste Management & Research*, *28*(4), 322-329.

Oteng-Ababio, M. (2011). Missing links in solid waste management in the Greater Accra Metropolitan Area in Ghana. *GeoJournal*, *76*(5), 551-560.

Oteng-Ababio, M., Arguello, J. E. M., & Gabbay, O. (2013). Solid waste management in African cities: Sorting the facts from the fads in Accra, Ghana. *Habitat International*, *39*, 96-104.

Pacione, M. (2005). *Urban geography. A global perspective. (2nd eds.). London and New York*. Routledge, Taylor & Francis Group.

Pai, R., Rodrigues, L. L., Mathew, A. O., & Hebbar, S. (2014). Impact of urbanization on municipal solid waste management: A system dynamic approach. *International Journal of Renewable Energy and Environmental Engineering*, 31-37.

Palmer, J., & Strickland, M. (1998). War and domesday waste. In *armies, chivalry and warfare in medieval Britain and France: Proceedings of the 1995 Harlaxton Symposium* (pp. 256-75).

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *The Journal of Marketing*, 41-50.

Pessoa, A. (2006). *Public-Private sector partnerships in developing countries: Prospects and drawbacks (No. 228).* Universidade do Porto, Faculdade de Economia do Porto: Fep Working Papers.

Purvis, C. A. (2009). *Factors that influence the development of critical thinking skills in associate degree nursing students* (Doctoral dissertation, University of Georgia). Retrieved from https://getd.libs.uga.edu/pdfs/purvis_carol_a_200912_edd.pdf.

Rawls, J. (1971). *A theory of justice*. Cambridge: Harvard Press.

Reddy, T. L., & Thomson, R. J. (2014). Environmental, social and economic sustainability: Implications for actuarial science. The *University of the Witwatersrand, School of Statistics and Actuarial Science*. Retrieved from https://www.actuaries.asn.au/Library/Events/ASTINAFIRERMColloquium/2015/ReddyThompsonActuarialSciencePaper.pdf.

Retchless, D. P. (2014). Communicating climate change: Spatial analogue versus colour-banded isoline maps with and without accompanying text. *Cartography and Geographic Information Science*, *41*(1), 55-74.

Robinson, J. (2010). *Triandis' theory of interpersonal behaviour in understanding software piracy behaviour in the South African context* (Doctoral dissertation, University of the Witwatersrand).

Roehrich, J. K., Lewis, M. A., & George, G. (2014). Are public-private partnerships a healthy option? A systematic literature review. *Social Science & Medicine*, *113*, 110-119.

Roskin, M. G., Cord, R., Medeiros, J.A., Jones, W., & College, L. (2014). *Political science*: *An introduction. (13th Eds.)*. New Jersey: Prentice-Hall.

Rowlands, B. H. (2005). Grounded in practice: Using interpretive research to build theory. *The Electronic Journal of Business Research Methodology*, *3*(1), 81-92.

Sarantakos, S. (2005). *Social research.* 3rd. Hampshire: Palgrave Macmillan.

Savas, E. S. (1978). On equity in providing public services. *Institute for operations research and management sciences*, Vol. 24, 800-808.

Savas, E. S. (2005). *Privatization in the city: Successes, failures, lessons*. In CQ Press.

Schübeler, P., Christen, J., & Wehrle, K. (1996). *The conceptual framework for municipal solid waste management in low-income countries* (Vol. 9). St. Gallen: SKAT (Swiss Center for Development Cooperation).

Seth, N., Deshmukh, S. G., & Vrat, P. (2005). Service quality models: A review. *International Journal of Quality & Reliability Management*. 22(9), 913-949.

Shoba, B., & Rasappan, K. (2013). Application of GIS in solid waste management for Coimbatore city. *International Journal of Scientific and Research Publications*, *3*(10), 1-4.

Shriwas, M. S., Rao, S. S., & Sharma, R. (2018). Public satisfaction towards solid waste management services in chhattisgarh: A comparative study. *International Journal of Research in Advent Technology*, 6(12), 3567-3571.

Sibley, J., Hes, D., & Martin, F. (2003). *A triple helix approach: An inter-disciplinary approach to research into sustainability in outer-suburban housing estates.* Proceedings of Methodologies in Housing Research Conference. Centre for Design, RMIT University. Retrieved from https://www.researchgate.net/publication/268009714_A_Triple_Helix_Approach_An_inter-disciplinary_approach_to_research_into_sustainability_in_outer-_suburban_housing_estates

Stottman, W. (2000). *The role of the private sector in the provision of water and waste services in urban areas in Uitto, Juha and AsitBiswas Water for Urban Areas.* Tokyo: The United Nations Press.

Sue, D. W. (2001). Multidimensional facets of cultural competence. *The Counselling Psychologist*, *29*(6), 790-821.

Tema Metropolitan Assembly (2010). *Shared growth and development agenda* 1 (2010-2013). Tema, Ghana: Government of Ghana.

Tema Metropolitan Assembly [TMA], (2016). *The composite budget for Tema Metropolitan Assembly for the 2016 fiscal year.* Accra: Government of Ghana.

Thorsen, D. E. (2010). The neoliberal challenge. What is neoliberalism?. *Contemporary Readings in Law and Social Justice*, *2*(2), 188-214.

Tilaye, M., & Van Dijk, M. P. (2014). Private sector participation in solid waste collection in Addis Ababa (Ethiopia) by involving micro-enterprises. *Waste Management & Research*, *32*(1), 79-87.

Uddin, M. N., & Hamiduzzaman, M. (2009). The philosophy of science in social research. *The Journal of International Social Research*, *2*(6).

UN-Habitat. (2010). *State of the world's cities 2010/2011: Bridging the urban divide.* Washington-DC: Earthscan

United Nations Conference of Trade and Development (UNCTAD). (2017). *Handbook of statistics.* Geneva: United Nations.

United Nations Environment Programme (UNEP). (2009). *Developing an integrated solid waste management plan training manual. V(4): ISWM plan.* Osaka/Shiga, Japan: United Nations.

United Nations Environment Programme (UNEP). (2014). *Policy coherence of the sustainable development goals: A natural resource perspective*. An International Resource Panel Report, New York: United Nations

Van Beukering, P., Sehker, M., Gerlagh, R., & Kumar, V. (1999). *Analysing urban solid waste in developing countries: A perspective on Bangalore, India*. Collaborative Research in the Economics of Environment and Development. Amsterdam, Netherlands: Institute of Environmental Studies (IVM).

Van de Klundert, A., & Lardinois, I. (1995). Community and private (formal and informal) sector involvement in municipal solid waste management in developing countries. *WASTE Consultants, Advisers on Urban Environment and Development*, Nieuwehaven, Netherlands.

Van den Bos, K. (2003). On the subjective quality of social justice: The role of effect as information in the psychology of justice judgments. *Journal of Personality and Social Psychology*, *85*(3), 482.

Voženílek, V., & Kaňok, J. (2011). Methods of thematic cartography-visualization of spatial phenomena. *Palacký University Olomouc*, 216.

Walker, R. G., & Walker, B. C. (2000). *Privatisation: sell off or sell out?. The Australian experience*. Sydney: ABC Books.

Wang, H., Xiong, W., Wu, G., & Zhu, D. (2018). Public-private partnership in public administration discipline: A literature review. *Public Management Review*, *20*(2), 293-316.

Wettenhall, R. (2007). ActewAGL: A genuine public-private partnership?. *International Journal of Public Sector Management*, *20*(5), 392-414.

World Bank. (2011). *World development report 2011: Conflict, security, and development*. The World Bank.

World Health Organisation (WHO). (2017). *Public health, environmental and social determinants of health (PHE).* Geneva: World Health Organisation.

Yamane, T. (1967). *Elementary sampling theory*. Englewood Cliffs, New Jersey: Prentice-Hall.

Yeatman, A. (2017). Is neoliberalism destroying social democracy?. *Victorian Fabians Autumn Series* (pp. 1-7). Sydney: Whitlam Institute.

Yeboah, R. (2017). *Public-private partnership in solid waste management in Sunyani Municipality, Ghana* (MPhil thesis, University of Cape Coast). Retrieved from https://erl.ucc.edu.gh/jspui/bitstream/123456789/3242/1/RICHMOND%20YEBOAH.pdf

Yeboah-Assiamah, E., Asamoah, K., & Kyeremeh, T. A. (2017). Decades of public-private partnership in solid waste management: A literature analysis of key lessons drawn from Ghana and India. *Management of Environmental Quality*, 78-93.

Yin, E.T. & Mariwah, S. (2013). A socio-legal approach: Gender and domestic solid waste management in Ashaiman, Ghana. *International Journal of Humanities & Social Studies*. 1(6), 6-13.

Yin, R. K. (2003). *Case study research: Design and methods (3rd ed.): Applied Social Research Series (Volume 5).* Thousand Oaks CA.: Sage Publication Inc.

Yoada, R. M., Chirawurah, D., & Adongo, P. B. (2014). Domestic waste disposal practises and perceptions of private sector waste management in urban Accra. *BMC Public Health*, 1-10.

Yoo, D. K., & Park, J. A. (2007). Perceived service quality. *International Journal of Quality & Reliability Management*. 24(9), 908-926.

Young, M. (2011). Curriculum policies for a knowledge society?.In L. Yates, & M. Grumet (1st Ed.), *World Yearbook of Education* 2011 (pp. 100-114). Milton Park, Oxfordshire: Taylor & Francis.

Zelt, S., Recker, J., Schmiedel, T., & Vom Brocke, J. (2018). Development and validation of an instrument to measure and manage organizational process variety. *PloS one*, *13*(10), e0206198.

Zerbock, O. (2003). Urban solid waste management, waste reduction in developing countries. *Masters International Program Series*, 11-43.

Zohoor, M., & Ghani, A. (2017). Municipal solid waste management challenges and problems for cities in low-income and developing countries. *International Journal of Science and Engineering Applications*, 39-48.

Zurbrugg, C. (2002). *Urban solid waste management in low-income countries of Asia how to cope with the garbage crisis.* Presented for: Scientific Committee on Problems of the Environment (SCOPE). Urban Solid Waste Management Review Session, Durban, South Africa.

APPENDICES
APPENDIX A

RESEARCH INSTRUMENTS

INTERVIEW GUIDE FOR WASTE MANAGEMENT DEPARTMENT

RESEARCH TOPIC: **PUBLIC-PRIVATE PARTNERSHIP (PPP) AND THE SPATIAL DISTRIBUTION OF SOLID WASTE COLLECTION SERVICES IN THE TEMA METROPOLIS.**

As part of your contribution to helping the waste management sector better and improve on service delivery, contribute your thoughts, experiences and opinions on the issues raised in this interview guide as sincerely as possible. Be assured that this data/ information would only be used statistically for academic purposes. Do not indicate your name on this questionnaire. All further questions/ enquiries can be addressed to the Researcher- Bernard Adjei-Asomani on 0240156160 or badjeiasomani@gmail.com. Thank you in advance for taking out time to be part of this survey.

Interview guide for Waste management Officials at Tema Metropolitan Assembly

Background Data of Respondent

Part A: Questions on the background data of the respondent

1. What is your role in the waste management department of the assembly?
2. What is the work of this department regarding solid waste management?
3. What areas fall under the jurisdiction of the department in terms of solid waste collection?

On Stakeholders and their roles in waste management

4. What institutions participate in administering solid waste in this city? What are their roles?
5. If the private sector is involved, when did they start work in the city?
6. What prompted the involvement of the private sector in waste management?
7. How many private waste companies participate in the collection of waste?
8. Which parts of the city are covered by their services?
9. Do you find this practice effective?
10. If yes, what improvement have they brought to the sector in this city?
11. If No, what are they doing wrong and how do you think they can rectify the problem?

12. Under this practice what are your department roles in waste management?
13. Are you facing any problems with your work in regards to your association with the private waste companies?

Zoning of the study area and private firms that work at the zones

14. Is zoning of the area according to solid waste collection parts your department's role?
15. If Yes, how is it done?
16. How many zones does the metropolis have?
17. Which communities fall under these zones?
18. Please indicate which private solid waste collection firms work under which zones?

Solid waste collection situation in the city

19. Please help determine the following?
    - Total solid waste produced daily in the city ……..tons (kg)
    - Amount of waste collected daily…….tons (kg)
    - Component of solid waste collected……and they percentages……..
20. What are the types of solid waste collection services practised in this city?

Reasons for the spatial distribution of solid waste collection service

21. Is the collection service able to provide universal coverage?
22. If No, what do you think is the reasons for this situation?
23. What are the factors that influence the decision to serve or not serve an area?
24. If served, what factors influence the quality of service provided in an area?
25. What can be done to reduce the situation of unequal coverage of the service?
26. What are the main solid waste management problems in the city?
27. What do you think are the causes of these problems?
28. Would you like to make any comments or ask questions concerning this discussion?

Thank you for your time and assistance.

APPENDIX B
INTERVIEW GUIDE FOR THE PRIVATE WASTE COMPANIES

RESEARCH TOPIC: **PUBLIC-PRIVATE PARTNERSHIP (PPP) AND THE SPATIAL DISTRIBUTION OF SOLID WASTE COLLECTION SERVICES IN THE TEMA METROPOLIS.**

Questions for Data Collection

As part of your contribution to helping the waste management sector better and improve on service delivery, contribute your thoughts, experiences and opinions on the issues raised in this interview guide as sincerely as possible. Be assured that this data/ information would only be used statistically for academic purposes. Do not indicate your name on this questionnaire. All further questions/ enquiries can be addressed to the Researcher- Bernard Adjei-Asomani on 0240156160 or badjeiasomani@gmail.com. Thank you in advance for taking out time to be part of this survey.

Interview questions for Private waste companies

Background Data of Respondent

Part A: Questions on the background data of the respondent

1. What is the name of your company?
2. What activities does the company engage in regarding solid waste management?
3. What position do you fill in this company?

Information on Private Solid Waste Company

4. What type of collection service does the company render?
5. What is the total number of registered house-to-house users served?
6. What is the total number of people that the communal container provided serve?
7. How is user fee charged for house-to-house and or communal container service?
8. Does the company have a standing contract with the city waste department?
9. If Yes, what is the type and duration of this contract?
10. Which solid waste collection zone does the company fall under?
11. Does the company work in this zone alone?
12. Which communities does the company serve under this zone?
13. Which solid waste collection service does the company deliver to the communities?

Reasons for the spatial distribution of the solid waste collection

14. Are you able to fully cover the area under your contract specification?
15. If No, what are the internal reasons behind this situation?
16. If No, what are the external reasons behind this situation?

17. In your opinion, what can be done to reduce the situation so to achieve the objective of universal coverage?
18. If Yes for No. 14, what have been the reasons for this situation?
19. Would you like to make any further comment or ask any question(s) concerning this discussion?

Thank you for your time and assistance.

APPENDIX C
INTERVIEW SCHEDULE FOR THE BENEFICIARIES OF THE SERVICE DELIVERED

RESEARCH TOPIC: **PUBLIC-PRIVATE PARTNERSHIP (PPP) AND THE SPATIAL DISTRIBUTION OF SOLID WASTE COLLECTION SERVICES IN THE TEMA METROPOLIS.**

Questions for Data Collection

As part of your contribution to helping the waste management sector better and improve on service delivery, contribute your thoughts, experiences and opinions on the issues raised in this interview schedule as sincerely as possible. Be assured that this data/ information would only be used statistically for academic purposes. Do not indicate your name on this questionnaire. All further questions/ enquiries can be addressed to the Researcher- Bernard Adjei-Asomani on 0240156160 or badjeiasomani@gmail.com. Thank you in advance for taking out time to be part of this survey.

Questions for beneficiaries of the service

Household Characteristics

1. Name of city…….. Zone …… Locality/Community……
2. Respondent Age: 18-28 [ ] 29-39 [ ] 40-50 [ ] 51 and above [ ]
3. Sex: Male [ ] Female [ ]
4. Is respondent household head? Yes [ ] No [ ]
5. Educational level of Respondent a. None [ ] b. Basic [ ] c. Secondary/tech [ ] d. Tertiary [ ]
6. Family income? a. GHC 50-100 [ ] b. GHC 100-500 [ ] c. GHC 500-1000 [ ] d. GHC 1000 –above [ ]
7. How many are you in the house? ……
8. Do you rent the house? Yes [ ] No [ ]

Perception of Quality of Service

9. How will you rate the quality of solid waste collection service in the metropolis*; using the scales (1) very dissatisfied (2) dissatisfied (3) satisfied (4) very satisfied*

The reliability of solid waste collection	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
a. Timely collection of solid waste				
b. Regular				

collection of solid waste				

10.

The condition of solid waste collection equipment	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
a. Adequate solid waste collection equipment provided				
b. Appropriate equipment used to collect solid waste				
c. Proper handling of solid waste collection containers				
d. Safe transportation of solid waste collection containers				

11.

Customer Satisfaction	Very dissatisfied	Dissatisfied	Satisfied	Very Satisfied
a. The behaviour of collection crew towards residents				
b. Cleanliness of service area after collection				
c. Charges on the collection of solid waste				
d. Public monitoring and sanctioning by the metropolitan assembly.				
e. Prompt response to user compliant				

12. If you were to compare with other communities in this city, would you say your community receives a fair or sufficient share of resources for waste collection?

Yes [ ] No [ ]

13. How would you rank environmental sanitation in your community concerning others in the city?

One of the cleanest community's [ ] Dirty [ ]
Averagely Clean [ ] One of the dirtiest community's [ ]

14. Do you suffer any health implications out of the service provided to you?

Yes ( ) No ( )

15. If "Yes", can you mention some of these implications?

……

16. What challenges prevent you from enjoying the service?

……

17. In your view, how can the waste collection be improved in your community?

……

Thank you for your time and assistance.