

UNIVERSITY OF GHANA



COLLEGE OF HUMANITIES

**LANDFILL MANAGEMENT IN KPONE KATAMANSO, GREATER
ACCRA: DECOMMISSIONING CONTEXTS, EFFECTS AND
CHALLENGES**

BY

MAAME OFEWAH SARPONG

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RESEARCH (ISSER)**



DECLARATION

I, Maame Ofewah Sarpong hereby declare that this thesis is as a result of my own research under supervision, except for reference to other people's work which has been duly acknowledged. This thesis has neither in whole nor in part been presented for the award of another degree elsewhere.



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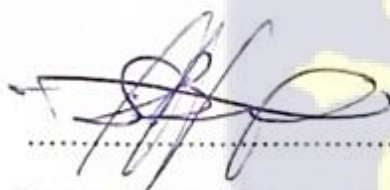
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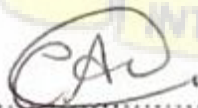
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DEDICATION

To God Almighty who has brought me this far, my lovely husband, Justice and our children, Daniel and Eden as well as my Dad, Mr. George Agyemang Sarpong.



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LIST OF ABBREVIATIONS AND ACRONYMS

ACHPRs	African Charter on Human and Peoples' Rights
AMA	Accra Metropolitan Assembly
ANOVA	Analysis of Variance
ASWs	Agricultural Solid Wastes
BSW	Bio-medical Solid Waste
EA	Environmental Assessment
EHS	General Environmental Health and Safety
EPA	Environmental Protection Agency
EU	European Union
GAMA	Greater Accra Metropolitan Area
GLSS	Ghana Living Standards Survey
GoG	Government of Ghana
GPRS	Ghana Poverty Reduction Strategy
HCS	Hauled Container System
HAD	High Density Aerobic
HDPE	High Density Polyethylene
ICCPRs	International Covenant on Civil and Political rights
ICESCRs	International Covenant on Economic, Social and Cultural Rights
IPCC	Intergovernmental Panel on Climate Change
ISW	Industrial Solid Waste
ISWA	International Solid Waste Association
ISWM	Integrated Sustainable Waste Management
ISWM	Integrated Sustainable Waste Management framework
KWPA	Kpone Waste Pickers Association
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MSW	Municipal Solid Waste
MSWR	Ministry of Sanitation and Water Resources
MWH	Ministry of Works and Housing
NGOs	Non-Governmental Organisations
PPE's	Personal, Protective Equipment
RCRA	Resource Conservation and Recovery Act
RII	Relative Importance Index
SA-NIDS	South African National Income Dynamics Study
SCS	Stationary Container System
SWM	Solid Waste Management
TOR	Tema Oil Refinery
UNEP	United Nations Environment Programme
WBG	World Bank Group
WIEGO	Women In Informal Employment: Globalising and Organising

ABSTRACT

Landfill decommissioning is a complex process with significant environmental, economic and social implications. The study examines the contexts associated with the Kpone Kokompe landfill decommissioning in Ghana and the environmental and socio-economic effects on residents both before and after the decommissioning.

The study was anchored on the Integrated Sustainable Landfill Management Framework and followed a sequential exploratory mixed-methods approach. Probit regression analysis was employed to examine the effect of the environmental, economic and social factors on the quality of life of residents.

The quantitative findings indicated notable environmental improvements, including reduced odour and traffic congestion as well as economic shifts, though social dynamics remained relatively stable with minor fluctuations post decommissioning. The qualitative analysis revealed concerns regarding inadequate community engagement, the absence of a decommissioning plan and weak institutional enforcement mechanisms. A notable finding was the gap in Ghana's environmental legislation, particularly the lack of policies on alternative livelihoods, resettlement and adaptation for affected individuals.

The study highlights the critical role of governmental agencies in enforcing regulatory standards. Key recommendations include setting clear operator obligations and strengthening regulatory compliance. These measures aim to improve the overall effectiveness of landfill decommissioning in a bid to minimise the negative environmental and socio-economic effects on residents.

CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

Solid Waste Management (SWM) has emerged as a critical developmental concern for local governments globally, particularly in urban areas across Africa. Rapid urbanisation has led to increased volumes of waste generation in cities, towns, and communities, challenging the ability of local authorities to manage waste effectively (Appiah Boamah, 2011; Mani & Singh, 2016; Debrah et al., 2021). In countries such as Nigeria, Kenya, and Ethiopia, urban centres are grappling with rising waste volumes, inadequate collection systems, and widespread reliance on open dumping (Wilson et al., 2013).

SWM involves the systematic processes of waste generation, storage, collection, transportation, processing, disposal, recycling, and transformation (Tchobanoglous & Kreith, 2002; Mishra et al., 2014). As Tchobanoglous and Kreith (2002) argue, effective SWM must be guided by both legal and social regulations to safeguard public health and the environment. Consequently, countries develop context-specific regulatory frameworks to govern solid waste practices.

In Ghana, several laws and guidelines provide the legal basis for SWM. These include the 1992 Constitution, the Environmental Protection Agency Act 1994, the Environmental Protection Assessment Regulations 1999 (LI 1652), the Ghana Landfill Guidelines 2002, the Local Governance Act 2016 (Act 936), and the Hazardous and Electronic Waste Control and Management Act 2016 (Act 917). These instruments collectively establish the framework for managing waste and sanitation in the country.

Globally, the scale of solid waste generation is escalating. In 2020, about 2.2 billion metric tonnes of solid waste were produced worldwide, averaging 0.79 kilograms per person daily, and this figure is projected to rise to 3.88 billion metric tonnes by 2050, primarily due to rapid urbanisation and population growth (World Bank, 2020).

In Africa, solid waste generation is expected to increase by 55.9% by 2025, driven by similar demographic trends (UNEP, 2015). Sub-Saharan Africa alone generates approximately 62 million metric tonnes of waste annually, yet only 50-80% of it is collected due to financial, institutional, and regulatory challenges (Lissah et al., 2021).

Ghana reflects these broader trends. An estimated 12,710 metric tonnes of solid waste are generated daily, amounting to over 4.6 million metric tonnes annually (Obuobi-Donkor et al., 2021). Alarming, only about 10% of this waste is collected and disposed of, primarily at improvised landfill sites located on the outskirts of urban areas (Opoku et al., 2022).

Weak institutional arrangements and poor financial management continue to undermine effective SWM in the country (Oteng-Ababio et al., 2013). These systemic inefficiencies have serious implications for the budgetary allocations of Metropolitan, Municipal, and District Assemblies (MMDAs), which are reported to dedicate significant portions of their funds to SWM (Ozbay et al., 2022; Adu-Gyamfi et al., 2023; Shaibu et al., 2023).

For instance, city authorities in Ghana reportedly spend close to GH¢6.7 million (US\$870,000) annually on waste collection and landfill transportation, with an additional GH¢550,000 (US\$71,000) spent on contractors and landfill site maintenance

(Williams et al., 2023).¹ These figures underscore the high cost of SWM and its competition with other national priorities such as healthcare, water provision, drainage, and education. Overall, Ghana expends about US\$290 million annually, equivalent to 1.6% of its GDP, addressing indiscriminate waste disposal (Shaibu et al., 2023).

In the Greater Accra Region, Accra alone generates about 3,000 metric tonnes of waste daily (Mudu et al., 2021). A study conducted by the Accra Metropolitan Assembly (AMA, 2020) revealed that household per capita waste generation stands at 0.70 kg, while markets and offices generate 1.32 kg and 0.70 kg, respectively. The same study highlighted socio-economic disparities in waste generation, with high-income areas producing 0.91 kg per capita daily compared to 0.51 kg in low-income areas (AMA, 2020; Immurana et al., 2022). The composition of domestic waste was found to be 53.1% organic, 16.15% plastic, and 12.6% inert material, while institutional and commercial waste comprised 56.2% organic, 13.59% plastic, 13.17% textiles, and 8.75% paper.

Much of Ghana's municipal solid waste is disposed of at unengineered landfill sites- essentially controlled open dumps, which lack the environmental safeguards typically associated with engineered landfills in developed countries (Baah & Kharlamova, 2018). Within the Greater Accra Metropolitan Area (GAMA)², two engineered landfills - Kpone Kokompe in the Kpone Katamanso Municipality and Nsumia in the Nsawam Adoagyiri Municipality, have historically served as primary disposal sites (AMA, 2020).

¹ Exchange rates as of February 2022 were used for currency conversion: 1 Ghanaian Cedi (GHC) = 7.7 United States Dollars.

² The Greater Area Metropolitan Area (GAMA) is located within the Greater Accra Region of Ghana. GAMA consists of 25 MMDs including the Accra Metropolitan Assembly (AMA) and the Tema Metropolitan Assembly (TMA).

In 2019 alone, these two facilities received a combined total of 688,482.65 metric tonnes of waste, with Kpone Kokompe handling 345,633.17 tonnes and Nsumia 341,849.48 tonnes. These sites were also responsible for emitting an estimated 395,434 and 385,977 tonnes of CO₂-equivalent emissions, respectively, underscoring concerns about the effectiveness of existing landfill management practices (AMA,2020).

Despite the increasing focus on landfill issues in the academic and policy literature, landfill management remains an underdeveloped and inconsistently defined concept (Annorbah, 2014; Wang et al., 2020; Owusu Amo-Asamoah et al., 2020). While some studies consider it a subset of broader solid waste management (SWM) systems, others describe it loosely in terms of operational routines, without clear reference to long-term planning, post-closure care, or sustainable end-of-life strategies. This conceptual ambiguity impedes the development of coherent policies and the implementation of best practices in landfill governance, particularly in rapidly urbanising contexts like Accra.

While significant attention has been given to the costs and operational challenges of solid waste management in Ghana, less emphasis has been placed on the end-of-life phase of landfills. Yet, effective landfill decommissioning is critical in addressing long-term environmental and public health risks, particularly as many of Ghana's landfills have reached or are nearing capacity without clear landfill management and specifically decommissioning strategies.

This study thus adopts a clear definition of landfill management as comprising the processes, policies, and activities surrounding the design, construction, operation, closure, and decommissioning of landfills aimed at protecting public health. Within this

framework, the study focuses on landfill decommissioning, the final phase of the landfill lifecycle. Special attention is given to the decision-making processes, stakeholder interactions, applicable waste disposal guidelines, socio-economic impacts of landfill closure, and the concerns of residents in affected communities.

1.1 Statement of the Problem

The challenges of waste management have led to the adoption of practices, such as incineration and composting, that aim to reduce waste generation at the source and minimise the amount of waste disposed of in landfills and other waste disposal sites (Badi et al., 2021). Under the three (3) R policy of reduce, reuse, and recycle, Japanese citizens collect empty bottles and cans and, after recycling, turn them into entirely new products, thereby reducing the cost of SWM (Japan Environmental Solution Centre, 2012; Hotta & Aoki-Suzuki, 2014). In Germany, up to 62% of generated solid waste is reused and recycled, and landfilling was banned in 2010 due to a ban on solid waste landfilling (Srivasta, 2016). In emerging economies such as India, composting of solid waste using aerobic and anaerobic techniques as well as refuse-derived fuel (waste-to-energy) are some common techniques adopted to manage solid waste. This has helped to reduce solid waste by 90% and increase the lifespan of landfills from 20 to 200 years on average (Srivasta, 2016). In the aforementioned countries, these solid waste and landfill management practices are mandated by law (Japan Environmental Solution Centre, 2012; Srivasta, 2016). Again, the reuse and recycling practice in Japan, for instance, is pursuant to an Act of Parliament on the Promotion of Sorted, Collection, Recycling, and Recycling Containers and Packaging promulgated in 2013 (Japan for Sustainability, 2016). In Germany, reuse, recycling, and land use practices are backed by laws promulgated initially in 1993, revised in 2001 and 2002, and fully implemented in 2005

(Srivasta, 2016). The 2015- established Solid Waste Management Rules in India support solid waste management. However, the rules do not contain a strategy for waste use and recycling (Mani & Singh, 2016).

The situation in Ghana is not different. Although Ghana appears to have a robust waste management regulatory regime, the country has, however, become slow in fully enforcing the solid waste management and landfill management practices enforcement laws such as the Environmental Protection Agency Act, 1994 (Act 460), and the Ghana Landfill Guidelines, 2002. Some challenges with SWM include the obsolescence of SWM laws (Owusu-Sekyere et al., 2015). Additionally, the lack of political will to enforce these laws emerges as another significant challenge (Tabiri, 2015). This was the bane of the insanitary state of the Kpone Kokompe and Nsumia landfills and the deplorable sanitary conditions of the towns and communities in GAMA. As a result, an accumulation of waste obstructs the gutters and major drains, including the Odaw River, thereby causing recurring floods during the rainy season (Amoako & Boamah, 2014; Tabiri, 2015). The inability of both central and local government authorities to enforce the Ghana Landfill Guidelines of 2002 is one of the reasons for the high level of gas emissions from landfill sites and groundwater leakages, which pose environmental health and ecological sustenance threats (Sarfo-Mensah et al., 2019). The health and ecological threats posed by high emissions from landfills have compelled the Government of Ghana (GoG) through the Ministry of Sanitation and Water Resources (MSWR) to decommission the Kpone Kokompe landfill in the Greater Accra Region (Ministry of Sanitation and Water Resources Report, 2020). This reinforces the need for the decommissioning of some landfill sites in Ghana. Landfill decommissioning aids in the elimination of gas emissions from landfills, thereby reducing the incidence of

respiratory diseases as well as helping to reduce low birth weights and birth defects among pregnant women (Staines et al., 2004; Baah & Kharlamova, 2018).

Further, landfill decommissioning can lead to an increase in the value of properties located in close proximity to landfills. In addition, landfill decommissioning may help improve the livelihoods of households (Mutz & Muller, 2016). Recreational use of re-engineered land can improve the emotional and psychological well-being of individuals.

Landfill decommissioning is the process of ending the lifespan of a solid waste landfill by restoring the land to its original condition and using it for other purposes (Bull & Love, 2019). It entails the removal of solid waste to a national repository and the decontamination of land from groundwater contamination, which is harmful to plants, water bodies, and the natural ecosystem (Orlova et al., 2017). Solid waste, during the decommissioning process, is categorised into three (3) categories: non-hazardous, restricted releasable, and radioactive waste (Park & Hong, 2005). Non-hazardous waste is packaged for recycling and reuse. The releasable and radioactive wastes are transported to national repository sites. Decommissioning cannot control the spread of groundwater leachate; therefore, periodic monitoring and assessment are required to prevent adverse environmental effects and subsequent adverse effects on residents and surrounding communities (Chen et al., 2016). The decommissioning of solid waste landfills, particularly in urban areas, has become essential due to the severe environmental damage caused by landfills in communities (Mcwatters et al., 2020). Apart from groundwater leakages, landfills produce offensive smells that threaten human livelihoods (Nain & Kumar, 2020).

As is the case in many developing nations, gas emissions from landfills are left unchecked in Ghana, posing threats to environmental health (Danthurebandura et al., 2012). Existing literature has emphasised the environmental and social effects of landfills on neighbouring communities. Danthurebandura et al. (2012) investigated the socio-economic and environmental impacts of landfill sites in Belgium. They identified three areas where landfills have environmental impacts: landfill construction, landfill gas, and leachate. They also pointed out that landfills have health and socio-economic impacts ranging from the health risk of gases and contamination by leachates from the sites to negative impacts on housing values (Danthurebandura et al., 2012). Due to its proximity to a residential community, a water body (the Densu River), a school, and cattle farms, the Oblogo landfill site in Accra has negative environmental and ecological effects, as determined by Osei et al. (2011). In addition, Baah & Kharlamova (2018) examined the environmental and health effects of two (2) landfill sites in Accra, namely the Kpone and Oblogo landfill sites, and found that the sites produce high levels of odour, attract a large number of pests, generate large volumes of dust and smoke, and pose an environmental risk. Nyame et al. (2012) used hydro chemical analysis to examine the ecological and environmental effects of landfill leachate from the Oblogo landfill site on the Densu River and its surrounding communities. The study revealed that leachate, a contaminated liquid that filters through landfill waste, is continuously discharged from the landfill into the nearby Densu River and surrounding Ramsar wetland. Denutsui et al. (2012) examined the effect of leachate pollution from the Oblogo landfill site on water quality and underlined the importance of addressing leachate management practices at the Oblogo landfill site to prevent further contamination of the surrounding groundwater resources. Annorbah (2014) examined the environmental impact of decommissioned landfills on the communities of Mallam

and Pantang. The studies discovered that those abandoned landfill sites, both in the Greater Accra Region, produce leachate pollutants that are harmful to the surrounding water bodies and the soil, thus posing ecological and environmental health threats.

Clearly, the preceding studies investigated the socio-economic and environmental effects of landfills on local residents. The literature, however, appears not to have focused on the factors that lead to decommissioning as part of landfill management processes in Ghana, the effect of decommissioning on residents, or whether the legal and regulatory regime for dealing with the phenomenon is robust and fit for purpose. Further, the 2002 Environmental Protection Agency's policy on 'Guidelines for Construction of Landfills' (EPA Landfill Guidelines 2002) that provides the prerequisites for the construction of a landfill, enjoins the proper designing of a landfill to minimise the risk of environmental pollution through leachate control and encourages proper handling of waste pickers resident in and around landfills. However, there appears to be little compliance with such rules by the authorities (Kyere et al., 2019).

A study by Oteng-Ababio (2014) revealed that the improper management of landfill decommissioning in Ghana has resulted in several devastating effects, notably bad odour in the landfill area and surrounding areas, health hazards, and general dissatisfaction among residents in the affected areas. A recent study conducted by Sackey et al. (2020) also revealed that landfill management is an activity that is not always handled competently by authorities and contractors, resulting in negative environmental and livelihood consequences for households. There however, appears to be a paucity of studies on the aftermath of landfill decommissioning. Moreover, the environmental,

economic, and social factors that affect the quality of life of residents before and after decommissioning have received less attention in literature.

Further, regarding decommissioning in Ghana, there appears to be a gap in the policy and legislative instruments directing landfill closure and decommissioning. Indeed, neither the 2013 National Environmental Policy of Ghana nor the 2016 amendment of the same discusses landfill closure or decommissioning. Thus, it is difficult to state with certainty the policies and legislation governing landfill decommissioning in Ghana. Although landfill decommissioning and re-engineering are generally seen as the solution to the negative effects of landfills on surrounding communities, how they are carried out may have adverse implications for residents, both in the short and long term. Thus, such an activity necessitates an effective institutional and legislative framework to ensure that it is implemented carefully to mitigate any potential negative effects on the local population. For example, the period of decommissioning may present new challenges that necessitate adaptation on the part of residents. Regarding the effects of decommissioning in Ghana, there is limited information available in the literature. This lack of information makes it difficult to anticipate the short- and long-term challenges that residents may face, as well as the necessary adaptation strategies they may adopt or be directed to adopt for survival.

Moreover, little is known about the difficulties and adaptation strategies of residents at various decommissioned sites. Effective adaptation depends on adaptive capacity, skills, and knowledge, robustness of livelihoods and alternatives, resources, and access to appropriate institutions (Ashley and Mangi, 2014). Thus, an appropriate institutional and legal framework as well as a tailored adaptation strategy for residents, are necessary

conditions precedents for the effectiveness of landfill decommissioning efforts (Abubakar et al., 2021).

The Kpone Kokompe landfill, once the largest engineered landfill in GAMA, spanned over 40 acres and played a central role in Accra's waste disposal system. It holds particular significance as the first landfill in Ghana to undergo a structured and environmentally compliant decommissioning process, featuring re-engineering, site remediation, and green repurposing initiatives (InfraGlobal, 2022). This distinguishes it from other landfill sites in the country, many of which have simply been closed without undergoing proper environmental restoration. This unique feature makes the Kpone Kokompe landfill an ideal case study for examining the effects of landfill decommissioning on urban environmental quality and resident well-being in Ghana.

Studying the Kpone Kokompe landfill offers important insights into Ghana's solid waste management (SWM) challenges. As one of the few landfills to undergo environmentally responsible decommissioning, it serves as a unique case for evaluating decommissioning practices. The site allows for analysis of impacts on nearby communities, particularly concerning environmental health, land use and social acceptance. It also reveals gaps in existing policies and opportunities for improvement. These insights can inform future urban landfill management and guide the development of more sustainable waste disposal strategies nationwide.

Given the lack of clarity on the institutional and legal frameworks and the obvious lacuna in the current literature on managing landfill decommissioning in Ghana, this study aims to unpack the institutional, legislative and policy frameworks governing

landfill decommissioning in Ghana, the extent of their effectiveness and the socio-economic factors that the activity entails.

1.2 Research Questions

This study seeks to answer the following research questions:

1. What were the environmental, economic and social factors that pertained in Kpone Kokompe prior to the decommissioning of landfill and how these factors affect the quality of life of residents?
2. What are the challenges, benefits, and adaptation strategies emerging from the decommissioning of the Kpone Kokompe landfill and how the adaptation strategies affect the quality of life of residents?
3. How effective are the institutional and legislative frameworks that governed the decommissioning of the Kpone Kokompe landfill in Kpone Katamanso?

1.3 Research Aims and Objectives

The overall purpose of this study is to assess the social, economic, institutional, and legislative context of the Kpone Kokompe landfill decommissioning in Kpone Katamanso, Ghana, as a case study. The specific objectives are as follows:

1. To examine the environmental, economic and social factors that pertained in Kpone Kokompe prior to the decommissioning of the landfill and how these factors affect the quality of life of residents.
2. To assess the benefits, challenges and adaptation strategies emerging from the decommissioning of the Kpone Kokompe landfill and the effect of the adaptation strategies on the quality of life of residents.

3. To analyse the effectiveness of the institutional and legislative frameworks that governed the decommissioning of the Kpone Kokompe landfill in Kpone Katamanso.

1.4 Relevance of the Study

This study provides valuable information to assist the central government, local government authorities, and other stakeholders in making policy on landfill decommissioning in Ghana. This will ensure that the policy regarding the scope and planning of landfill decommissioning is carefully formulated to reduce the risk of exposure to the Ghanaian population. Furthermore, insights into the institutional and legal frameworks will enable governments to evaluate existing structures and rectify deficiencies within the current regime. This will improve Ghana's institutional and legal frameworks for managing landfill decommissioning.

Residents in the vicinity of decommissioned landfills will find the study's findings useful in comprehending the effects of landfill decommissioning, as well as the environmental, economic and social factors that affect the quality of life of residents in Kpone Kokompe. This will facilitate the adoption of suitable measures to mitigate any potential negative effects of landfill decommissioning on them. Companies involved in the decommissioning of landfills will also benefit from the findings as it will assist them in understanding the challenges their work may present to locals. As a result, these businesses may adopt appropriate mitigation strategies to reduce any negative effects their activities may have on residents living near landfills. The study concentrated on those who were directly involved in the decommissioning process as well as those who

have already experienced or are currently experiencing its effects within the catchment area of the Kpone Kokompe landfill site.

Additionally, the study provides information to civil society and other non-state actors interested in solid waste management in Ghana. This study will strengthen advocacy for reforms to the current legal framework for decommissioning landfills and encourage the adoption of effective and efficient decommissioning practices in Ghana.

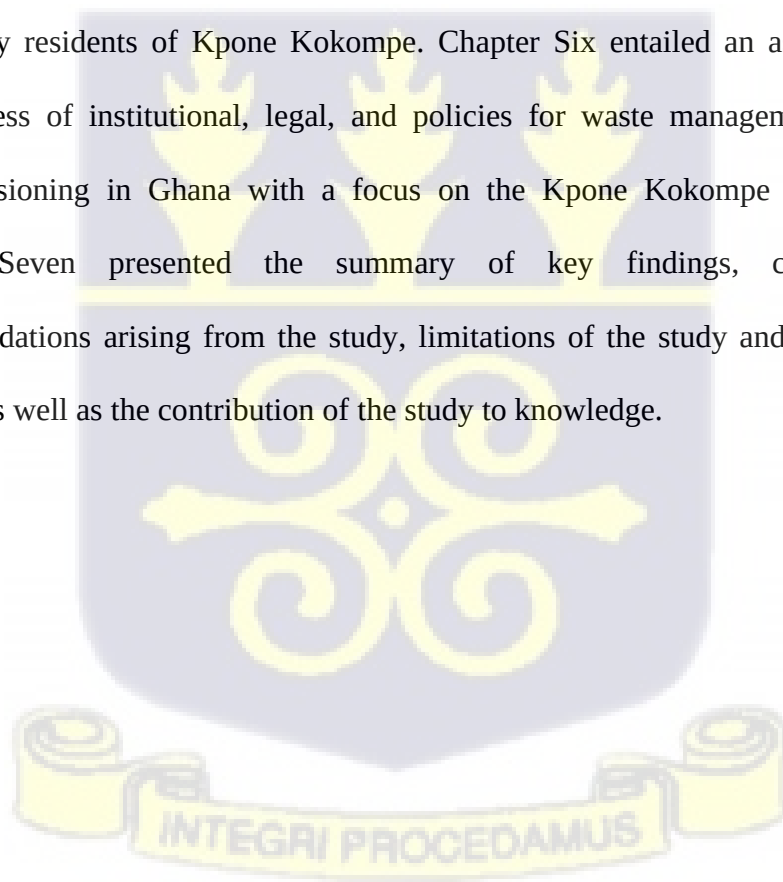
The study will contribute significantly to the existing literature on landfill management in Ghana especially Ghana's legal and institutional frameworks for landfill decommissioning. This research contributes to a greater understanding of Ghana's landfill management. This is a substantial addition to the literature on solid waste management in Ghana and a valuable resource for future scholars.

1.5 Scope of the Study

The objective of the study was to examine the landfill management practices in Ghana and assess the various factors contributing to the decommissioning of landfills in the country in light of the applicable legislative and regulatory frameworks. The study sought to unpack the legal and institutional frameworks for landfill decommissioning practices in Ghana, excluding its technical and engineering aspects. In addition, data collection was restricted to the Kpone Kokompe community, where the landfill is located. Within the Kpone Kokompe landfill site's catchment area, the study focused on those who were both directly involved in the decommissioning process and those who were or are currently experiencing its effects.

1.6 Organisation of the Study

The thesis was organised into seven (7) chapters. The context of the study, the problem statement, the research objectives, and the significance of the study were in the first chapter. The second chapter presents the literature review pertaining to landfill management and decommissioning, as well as the theoretical and conceptual framework of the thesis. The third chapter discussed the research methodology that was utilised for the study. Chapter Four entailed a discussion on the various environmental, social and economic factors that were prevalent prior to the decommissioning of the Kpone Kokompe landfill in the Kpone Katamanso municipality. Chapter Five explored the challenges, benefits, and adaptation strategies emerging from the decommissioning adopted by residents of Kpone Kokompe. Chapter Six entailed an assessment of the effectiveness of institutional, legal, and policies for waste management and landfill decommissioning in Ghana with a focus on the Kpone Kokompe landfill. Finally, Chapter Seven presented the summary of key findings, conclusions and recommendations arising from the study, limitations of the study and further areas of research as well as the contribution of the study to knowledge.



CHAPTER TWO

LITERATURE REVIEW, THEORETICAL AND CONCEPTUAL FRAMEWORK

2.0 Introduction

This chapter addressed the literature review on landfill management and decommissioning and the philosophical considerations for the study. The chapter delves into the multifaceted realm of landfills and the strategies adopted in the management of same. It begins by exploring the various types of landfills, categorising them based on the nature and composition of the waste they receive. The chapter further explored landfill decommissioning, legal frameworks, and adaptive strategies, supported by theoretical frameworks and empirical literature. Throughout the discourse, emphasis was placed on advocating for extensive management approaches. By synthesising theoretical insights with empirical findings, this chapter emerged as an indispensable resource for stakeholders engaged in the broader spectrum of waste management endeavours.

2.1 Review of Related Concepts

Management of solid waste consists of waste generation, waste collection, waste transportation, waste treatment and waste disposal. The section then focuses on landfills, types of landfills, landfill management, landfill classification in Ghana, decommissioning and landfill decommissioning, which are components of waste disposal.

2.1.1 Waste

Waste, as articulated by various scholars, encompasses any byproduct of human activity composed of physical substances from the original product (White et al.,1995).

According to Hoornweg & Perinaz (2012, p. 3), “waste is primarily a byproduct of consumer-based lifestyles that drive the majority of the global economy.” Since prehistoric times, waste generation has been a fundamental aspect of human society (Amasuomo & Baird, 2016; Chandler et al., 1997). All human activities, particularly those related to the production of goods and services, produce waste in some form (Brunner & Rechberger, 2014).

Robinson (1987) defined waste as organic and inorganic materials produced from household or commercial activities that do not have any value in the eyes of the original owner but may be of significant value for someone else. According to Mubaslat (2021), waste is a byproduct of a manufacturing process or an obsolete commercial product that cannot be used for its intended purpose and must be discarded. In other words, waste refers to any product or item that has lost its utility for the producer or user, but still has value for someone else. Waste is produced when a substance or item is no longer useful or wanted for the purpose for which it was acquired and must be discarded. This conception of waste depends on how consumers perceive a particular product. So long as users perceive a product or item to be of value to them, it cannot be considered waste in this context. This implies that one person's waste may be another's raw material. When a user no longer requires a product, it can be transformed into waste. While this has the benefit of minimising what can be classified as waste, there is the possibility that some hazardous items, which should ordinarily be discarded as waste, remain in use and can endanger human life and society.

2.1.2 Waste Management

Waste management, a pivotal aspect of addressing waste, encompasses a series of activities from collection to disposal. According to Demirbas (2011), waste management refers to the process of gathering waste and the transporting and processing of the same before disposing of the residue. Waste management is defined by Bacinschi et al. (2010, p. 381) as “the collection, transportation, processing, recycling or disposal, and monitoring of waste materials.” It entails “the collection of all discarded materials in order to recycle them and reduce their negative effects on human health, our surroundings, and the environment in order to improve our quality of life” (Bacinschi et al., 2010, p. 382). The cycle of waste management includes monitoring, collection, transportation, processing, disposal, and recycling (Bacinschi et al., p. 382).

The concept of waste management can be understood as a collective term used to describe activities, processes, and mechanisms developed to control waste generation, transportation, reuse, recycling, and disposal in a manner aimed at ameliorating the adverse health and environmental impacts of waste. Waste management is an umbrella concept as it involves sub-concepts such as solid waste and liquid waste management derived from the type of waste under consideration.

The primary goal of waste management is not just disposal but also waste reduction, acknowledging the impracticality of achieving zero waste (Bartl, 2014). Waste management aims to mitigate environmental and health risks associated with waste, making any effort towards this end an integral part of waste management (Bacinschi et al., 2010; Demirbas, 2011).

2.1.3 Solid Waste Management

Solid waste may be derived from various sources, including household or domestic waste, industrial or commercial waste, and agricultural waste (Beranek, 1992; Shekar, 2009). According to Xu et al. (2017), solid waste may be divided into various categories based on its source. It may be classified into Municipal Solid Waste (MSW), Biomedical Solid Waste (BSW), Industrial Solid Waste (ISW), and Agricultural Solid Waste (ASW). The authors also noted that “the major constituents of MSW are “paper and prescribed organic matter; metal, glass, ceramics, plastics, textiles, dirt, and wood are generally present, although not always so, in their relative proportions depending on local factors” (Xu et al., 2017, p. 114).

2.1.4 Elements of Solid Waste Management

A waste management system involves numerous processes, from waste generation to waste disposal. It includes waste generation, waste collection, waste processing, waste transportation, recycling, and composting (landfilling) (Wassermann et al., 2005). There are six widely acknowledged functional components of solid waste management. These are waste generation, on-site waste storage or handling, waste collection, waste transportation, waste treatment, and waste disposal (Abduli, 1995; Yadav & Samadder, 2014; Xu et al., 2017; Prajati et al., 2019).

2.1.5 Waste Generation

The first element of a waste management system is waste generation. Hoornweg & Bhada-Tata (2012) estimate that global solid waste generation will rise to more than 6 million tonnes per day in 2025 from 3.5 million in 2010. Due to the nature of human activities, waste is unavoidable (Shekdar, 2009). Adeleke et al. (2020) observed that an

efficient waste management strategy hinges on detailed waste characterisation, quantification, and prediction of the rate of generation and physical components of waste. An extensive understanding of waste generation and composition gives policymakers and organisations responsible for waste management the starting point for adopting a waste management strategy (Adeleke et al., 2020).

2.1.6 On-site Waste Storage or Handling

On-site storage or handling of waste refers to the various activities including storage, sorting, processing, and handling of waste at the source of generation (Tchobanoglous et al., 2013). Waste sorting at source involves segregating waste to facilitate recycling and reuse. Handling involves moving waste to the point of collection. For residential waste, families and communities are mainly responsible for on-site storage and handling. In developing countries, on-site storage and handling are normally carried out by mothers and children (Kebede et al., 2017). On-site storage has important health implications and needs to be well managed. Typically, waste is stored in containers such as plastic bins, metal drums, sacks, or open heaps, depending on availability and household practices. The choice of storage system often varies based on socioeconomic status, local regulations, and access to waste management services (Oteng-Ababio, 2011).

2.1.7 Waste Collection

This describes the activities and processes of gathering and transporting waste to the place where it is collected. According to Pires et al. (2019), waste collection is a combination of technology and human activities and includes the containers used for collection, the methods used in sorting and picking up, and the vehicles used for collection. According to Xu et al. (2017), communities need to define and prioritise

their waste collection system, as waste collection is integral to overall waste management. As part of their waste collection strategy, communities should consider the level or quality of services required, the community's long-term waste management and source reduction objectives, funding mechanism constraints, and labour or service contracts (Xu et al., 2017). Waste collection typically accounts for 50% to 80% of waste management budgets (Tchobanoglous et al., 1993; Pires et al., 2019). Thus, emphasising waste collection is crucial in waste management endeavours. Waste collection is also associated with pollution and environmental impacts that need to be minimised (Pires et al., 2019).

2.1.8 Waste Transportation

This is the procedure that follows waste collection. Smaller waste collection vehicles act as feeders, transporting waste to larger ones bound for treatment facilities. Waste collection and transportation are so inextricably linked that they are frequently discussed concurrently (Pires et al., 2019; Yadav & Karmakar, 2020). According to Pires et al., (2019, p. 27), “the functional aspect, referred to as “collection”, includes not only the removal of waste but also the transportation of the same to the location where the collection vehicle is emptied.” Tchobanoglous et al. (1993) recognised the importance of waste collection and transportation in safeguarding public health, preserving the environment, promoting resource conservation, enhancing community aesthetics, and ensuring compliance with regulatory requirements.

Many factors influence solid waste transportation. These include the type of vehicles used, the amount of waste produced, and the expenses entailed in its transportation (Haerani et al., 2019). There are two main waste transportation methods: Hauled

Container System (HCS) and Stationary Container System (SCS) (Haerani et al., 2015; Xu et al., 2017). The waste container is transported to the disposal facilities for HCS. The container is then restored to its original location. The waste container remains at the point of generation in SCS and is not carried with the transport vehicle. (Haerani et al., 2019).

2.1.9 Waste Treatment

Solid waste treatment aims to reduce waste through recycling or reuse. Solid waste treatment generally begins with waste generation and runs through the waste management process. Solid waste treatment may include mechanical treatment, thermal treatment, and biological treatment (Xu et al., 2017). Mechanical treatment normally aims at material recovery, while thermal treatment includes incineration, pyrolysis, and gasification. Biological treatment may take the form of composting (Xu et al., 2017). Hamer (2003) noted that the major objective of waste treatment is waste stabilisation. This makes the final residue “either noxious and incapable of further change, i.e., completely mineralised, or able to find ready entry into the various natural biogeochemical (elemental) cycles that govern material cycling in the environment without causing distortion in any cycle relative to another” (Hamer 2003, p. 73).

2.1.10 Waste Disposal

The last element of solid waste management is waste disposal. Waste disposal is the final stage of all waste management practices. According to Weiner & Matthews, “disposal of solid waste is defined as placement of waste so that it no longer impacts society or the environment” (2003, p. 263). Thus, waste disposal is more than merely discarding waste at a dumpsite. Waste disposal includes ensuring that the health and

environmental impacts of discarding waste are minimised. To Weiner & Mathews, “wastes are either assimilated so that they can no longer be identified in the environment, as by incineration to ash, or they are hidden well enough so that they cannot be readily found” (2003, p. 263). The authors noted that there are two realistic places where solid waste can be disposed of. These are on land and in the sea. With respect to land disposal, they noted that the same was easy in the past, as dumping of solid waste was carried out over city walls without much difficulty. Population growth renders traditional dumping unsustainable, exacerbating solid waste disposal challenges. Historical waste disposal practices often included dumping waste directly into the ocean. While seemingly convenient, this method is no longer acceptable due to its severe environmental consequences. International regulations like the London Convention have emerged to restrict such practices (Harding, 2016). Ocean dumping can harm marine life through entanglement, ingestion of debris, and pollution from toxic substances (Wright, et al., 2015).

2.2 Landfills and Landfill Management

Landfills remain the most preferred method of solid waste disposal across the world (Nanda & Berruti, 2021). Kim & Owens (2010) argue that notwithstanding the negative effects of unsanitary landfills and open dumping, these acts remain the practice in many nations. Utilisation of landfills for solid waste disposal is common both in developing and developed nations. Landfills are an integral part of any solid waste management system the world over. Chu (2008) defines landfills as “semi-natural terrestrial ecosystems reconstructed on lands with a history of waste disposal” (Chu 2008, p. 2099). According to Chu (2008), landfills are “ubiquitous and unique in terms of age, waste composition, engineering design, and ecological practice” (Chu 2008, p. 2099).

Thus, landfills are different from the surrounding land and any other land as they are purposely constructed or reserved to handle waste. Owusu-Sekyere (2018) defines a landfill as land that has been reserved for dumping waste. The Environmental Protection Authority (EPA) also defines a landfill as an in-ground engineered land that is designated for the safe and secure disposal of solid waste in particular (U.S Environmental Protection Agency (EPA), 2016).

2.2.1 Types of Landfills

The design of modern landfills aims to ensure that landfills are able to address threats posed to human health and the environment by disposed waste. In line with this, Chandrappa & Das (2012) noted that landfills can be classified into general (conventional landfills) and hazardous (milled waste and monofils) waste disposal sites based on the waste disposed of.

2.2.2 Categorising Landfills by the Nature of Waste

Tchobanoglous et al. (1993) identified three main types of landfills based on the type of waste. These are conventional landfills for mixed waste, landfills for milled waste, and monofils for specialised waste (Tchobanoglous et al., 1993; Nain & Kumar, 2020; Wong et al., 2020). Conventional mixed- waste landfills receive mixed waste. There is no segregation of the waste that is deposited in this type of landfill. On the other hand, milled landfills receive waste that is normally milled to reduce its size before reaching the site. Monofil landfills are purposely designed for specific waste materials ().

2.2.3 Segmenting Landfills by Waste Composition

Chandrappa & Das (2012) also classified landfills by their nature. They contend that landfills can be categorised into open dumps, controlled dumps, or sanitary landfills (secured landfills or engineered landfills). Open dumps are more traditional and common in most developing regions, with waste deposited on an area reserved without improved designs to minimise the health and environmental impacts. Sanitary or engineered landfills are more sophisticated, with technical mechanisms to reduce the size of waste and also minimise its health and environmental impacts (Chandrappa & Das, 2012).

2.2.4 Categorising Landfills by Evolution and Development

Townsend et al. (2015) reviewed the history of the evolution of modern landfills. Their work reveals that landfill types follow the innovations and adaptations in landfill management. The earliest form of landfill is uncontrolled dumps, which posed significant health and environmental problems for society. This led to the evolution of sanitary landfills, which reduce the health and environmental impact but cannot control leachate and landfill gas. In order to address controlled landfills, mechanisms for controlling leachate and gas emissions were developed.

2.2.5 Segmenting Landfills by Waste Characteristics

The European Union (EU) Landfill Directive of 1999 identified three types of landfills (Höxter, 2001; Butti & Lops, 2019). These are landfills for hazardous waste, landfills for non-hazardous waste, and landfills for inert waste. Butti & Lops (2019, p. 44) noted that “the admission criteria are rather strict. It means that landfills for inert waste can only accept inert waste, and landfills for hazardous waste shall only be used for hazardous

waste”. Only for landfills containing non-hazardous waste is some flexibility permitted. In this case, non-hazardous waste landfills may be used “for municipal waste and certain kinds of hazardous wastes, in particular those that are stable and nonreactive, with leaching behaviour equivalent to that of non-hazardous wastes” (Butti & Lops, 2019, p. 44).

Butti and Lops (2019) also pointed out that in the United States, there are two main types of landfills within the country's legislation. These are landfills for hazardous waste and landfills for non-hazardous municipal and commercial or industrial solid waste. While landfills for hazardous waste are addressed and regulated at Federal level by the Environmental Protection Agency, regulation of landfills for non-hazardous waste is delegated to the States. They further observed that in Japan, two types of landfills are identified by law. These are landfills for municipal solid waste and landfills for industrial waste.

2.2.6 Categorising Landfills in Ghana

Kusi et al. (2016) noted that landfills are grouped into four categories in Ghana. These are “open dumps”, “improved dumps”, “High Density Aerobic (HDA)” and “sanitary landfills”. Open dumps are unimproved, unsuitable disposal sites that are commonly found in valleys, whereas improved dumps are typically fenced, have site drainage, and separate special or hazardous wastes. For HDA landfills, waste is dispersed broadly across the site with additional compaction and leachate recirculation, whereas sanitary landfills feature daily cover, an impermeable liner, leachate treatment and gas management. The authors noted that this classification differs from that given

by the International Solid Waste Association (ISWA) for developing countries, which includes open dumps, controlled or engineered landfills, and sanitary landfills.

The classification of landfills is mostly a matter of law and the nature of waste being addressed. Various countries adopt various methods of classifying landfills. Against this background, this study adopts the classification offered by Kusi et al. (2016): open dumps, improved dumps, High Density Aerobic (HDA) landfills, and sanitary landfills. This choice is justified by the broad nature of the classification, which not only considers the legal framework but also takes into account the specific characteristics and management practices associated with each type of landfill. By adopting this classification, the study aims to provide a robust analytical framework that facilitates a nuanced understanding of landfill management practices and their implications for waste management strategies and environmental sustainability as a whole.

Landfills have five main phases in their life cycle. These are planning, construction, operation, completion, and final storage phases (Christensen, 1989; Townsend et al., 2015). The planning stage involves preliminary investigations about the site in terms of geological, hydrological, and environmental considerations, among others. The construction phase involves the actual earthwork, road networks, drains, and liners. It involves preparation of the landfill and other supporting infrastructure. The operation stage commences from the first deposition of waste to the last deposition. The completion stage involves the termination of deposition of waste at the site to the point where there is stabilisation so that emissions are minimal, although they could still pose some dangers to surrounding areas. The storage phase is where the emissions from the

site do not pose any significant harm to the surrounding environment (Christensen, 1989).

2.2.7 Landfill Decommissioning

Landfill decommissioning refers to the processes leading to the cessation of the use of a waste disposal facility for waste disposal (Lemasson et al., 2021). It involves strategies to remove waste from the site and the redesign and use of the land for alternative purposes such as a green area or a property development (SDN, 2015; Lemasson et al., 2021). Waste Management landfills are officially commissioned by the government to ensure the safety of human lives and the ecology of the proposed area (SDN, 2015). Decommissioning is usually done when the landfill has neared its useful life and its mere abandonment poses a threat to both human lives and the ecology and environment (Lemasson et al., 2021). Another reason that prompts governments to decommission solid waste landfills is maintenance costs. In the year 2018, the estimated cost for maintaining the Kpone landfill was US\$ 95,000, and this involved the cost of leachate management and monitoring, using Environmental Protection Agency Safety Guidelines estimated at US\$ 65,000 and US\$ 30,000 per year, respectively (Salifu, 2019). These costs are high compared to the charges for waste disposal received at the site. This suggests that landfills are decommissioned when the cost of remedial actions far outweighs the revenue collected from local waste disposal facilities.

Landfill management must take into account the need for proper post-closure management as landfills may continue to produce harmful pollutants several years after closure. It is the management of the closure of landfills so as to protect both the environment and human health that is at the heart of landfill decommissioning.

According to William (2005), “after the site is closed, the obligations of the landfill site operator do not end. The monitoring of the site is carried out after closure, for example, at six-monthly intervals, until the regulating authority agrees that stabilisation of the site has occurred, and the landfill poses no hazard to the environment” (William, 2005, p. 178). The risk of leachate pollution may persist long after the closure of a landfill (Christensen, 1989). Landfill decommissioning must be properly carried out to ensure that the adverse impact of post-closure activities does not harm residents near closed landfills.

According to Chu (2008), adverse pedoclimatic conditions in the landfill also impact the soil, resulting in problems such as gas leakage, shallow soil, nutrient deficiency, elevated temperature, and leachate contamination, all of which impede vegetation establishment in decommissioned sites. Further, he observed that natural processes and human intervention typically coexist in the ecosystem development of closed landfills, which can result in a number of difficulties (Chu, 2008). Activities of residents or people around landfill sites influence post-closure activities, while post-closure activities also have implications for residents. Thus, landfill decommissioning must achieve a dynamic balance between the activities of residents and the impacts of closed landfills on residents. However, the extent to which residents in areas of closed or decommissioned landfills are taken into consideration in policies and processes on the decommissioning of landfills currently appears not to be accounted for in the literature. This study aims at addressing this gap by understanding the adaptation strategies of residents around the Kpone Kokompe landfill.

As noted by Chu (2008), closed landfills may be inhabited by reptiles and amphibians within a few years of revegetation, and the diversity of species improves with time after closure. Some grasslands developed on decommissioned landfills may serve as habitats for butterflies and other rare species. Additionally, abandoned landfills may present opportunities for wildlife conservation. With proper gas control, soil management, and succession management, closed landfills can be transformed into habitats with significant conservation purposes (Chu, 2008; Christensen, 1989).

Landfill decommissioning and post closure care are complex activities that offer the opportunity to put a hitherto ‘dump site’ to use. In view of the many issues involved in landfill management and the dangers the same can pose to health and the environment, this study aims at understanding landfill decommissioning in Ghana, focusing on the legal and institutional frameworks as well as the adaptation behaviour of residents around such areas when decommissioning occurs.

2.3 Legal Framework for Landfill Decommissioning in Ghana

Ghana, as a sovereign state, has various legislation and regulations relevant to landfill decommissioning. This section discusses these legislative and institutional regulatory frameworks and their effectiveness in the decommissioning of the Kpone Kokompe landfill.

2.3.1 The 1992 Constitution of Ghana

The 1992 Constitution of Ghana establishes a three-branch government with separate but complementary branches for executive, legislative, and judicial power. All citizens, Parliament, the President, the Judiciary, the Council of State, the Cabinet, political

parties, and other bodies must adhere to Chapter Six, '*The Directive Principles of State Policy*,' which provides a broad framework and guidance for all decisions regarding the application of the Constitution itself and actions.

The Constitution vests the judicial power in the Judiciary; consequently, neither the President nor Parliament, nor any or agency of the President or Parliament, are granted final judicial power. The Judiciary has jurisdiction over all civil and criminal matters, including those pertaining to the Constitution, as well as any other jurisdiction that the legislature may confer by statute (Sarpong, 2018).

The Constitution of Ghana, under Article 11, outlines the origins of the country's legal system. The 1992 Constitution includes a section on fundamental human rights that mirrors language from the International Covenant on Civil and Political Rights, the International Covenant on Economic, Social, and Cultural Rights, and the African Charter on Human and Peoples' Rights. Unlike in previous constitutions, the Constitution of 1992 does not provide residents a right to a healthy environment; instead, it places a duty on the state and on every person to preserve and defend the natural world.

The Constitution's list of protections should not be seen as eliminating the broader range of rights that are inherent in a democratic society and designed to uphold each person's intrinsic worth and dignity. There have been some judicial pronouncements on how the courts deal with the right to a healthy environment. In the *Centre for Public Interest Litigation v Tema Oil Refinery (TOR)* the Plaintiffs, a public interest litigation firm, and a resident of the community brought an action in the high court against TOR for:

- “(a) A declaration that the defendant was negligent in spilling oil into the Chemu lagoon.*
- (b) A declaration that the oil spillage into the Chemu lagoon is a violation*
- of the rights of the inhabitants of Chemu, particularly the rights of those*
- who are settled along the banks of the lagoon to a clean and healthy environment under the Constitution and under international law;*
- (c) An order enjoining the defendant to clean up the Chemu lagoon under*
- the supervision of the EPA;*
- (d) An order of perpetual injunction to restrain the defendant from further*
- pollution of the aforesaid lagoon through oil spillage or other means.”*

The action was resisted by the Defendant, who questioned the locus standi of the Plaintiffs. The court held, inter alia:

“The plaintiffs’ contention that they are citizens of Ghana and even more so are residents of Ghana have not been challenged. Their argument is that the Constitution of Ghana guarantees Ghanaians the right to life and by implication, the right to a clean and healthy environment; such that the defendant’s act of spilling oil into the Chemu lagoon will deprive Ghanaians of the Constitutional right to a clean and healthy environment.

They also argue that the same Constitution stipulates in article 33(1) that where a person alleges that any provision relating to his right or freedom has been contravened or is likely to be contravened, he may seek redress in the High Court. This is the reason why they are in court.” (Page 5 of the Judgment of the High Court dated 20th September 2007 delivered by Justice Korbieh)’’

The court held as follows:

“The Constitution guarantees citizens certain “procedural rights” within the Constitution that allow people “to freely associate with others to protect the environment; to protect the rights of others affected by environmental harm; to take collective action in support of environmental cases... Thus, from a purely Constitutional perspective and in the light of the relevant rules of public international law, the Constitution, 1992 provides some substantive and procedural basis for dealing with environmental problems. The recognition of the right to a wholesome environment as a fundamental right offers the plaintiff the advantage of a remedy which is cheap and expeditious for the redress of environmental grievances (Page 6 of the Judgment of the High Court dated 20th September 2007 delivered by Justice Korbieh).”

The Ghanaian courts have thus validated ‘the right to a healthy environment’ and granted individuals and groups the legal standing to sue government agencies responsible for environmental protection in order to compel them to uphold the law. (Sarpong, 2018). The redress of environmental complaints is made possible for every

person when ‘the right to a healthy environment’ is recognised as a basic right. A person who believes his rights have been violated may seek remedies from the High Court in accordance with Article 33 of the 1992 Constitution. If their environmental rights have been violated, there are other sources of law to which they might turn for relief besides the Constitution.

2.3.2 The Common Law Rules

The English common law has some torts that aim to protect interests in property and the environment, including land. Common Law torts may be resorted to in environmental actions, as Article 11 of Ghana's 1992 Constitution recognises them as part of Ghana's laws (Constitution of Ghana, 1992). Common law torts such as nuisance, negligence, and trespass are most relevant to landfills.

2.3.2.1 Nuisance

The tort of nuisance is the interference with one's enjoyment of property, including land, in such a manner as to affect one's reasonable comfort and convenience (Witting, 2015). Nuisances may be private, public, or statutory. A private nuisance tort claim may be brought by a person. However, in circumstances of public nuisance, the plaintiff must show that he or she suffered harm in addition to the nuisance that has been caused to the public at large (Witting, 2015). Various statutes, including the Criminal Offences Act of 1960, the Environmental Protection Act of 1994, the Local Governance Act of 2016, and the Road Traffic Regulations of 1974, among others, create statutory nuisances.

When it is proven that one party caused or permitted a continuing condition that has or is interfering with another party's enjoyment and use of land owned by that party or in

which that party has a sufficient interest, the tort of private nuisance has been committed (McBride & Bragshaw, 2018). If a person can demonstrate that they have been the victim of a public nuisance, they may be able to sue for "special damages," or damages above and beyond those sustained by the general public. The Defendant's immediate neighbourhood and its residents must be affected by the purportedly illegal conduct (McBride & Bragshaw, 2018). The residents of Kpone Kokompe would have had legal recourse against the authorities had the landfill been neglected and left unattended, as Article 293(1) of the Constitution of 1992 gives a person the right to bring an action against the government for damages where a grievance is alleged against it.

2.3.2.2 Negligence

Negligence has limited application as a means of vindicating or ventilating environmental grievances. It accurately conveys the concepts of obligation, violation, and damage to the individual to whom the obligation is owed.

Unlike nuisance actions, a Plaintiff in a negligence suit need not prove or establish an interest in land or demonstrate a loss to members of the public. If a chemical release causes damage to people or property, such persons may file a claim for those losses plus the cost of clearing up the debris (Sarpong, 2018). However, such persons cannot sue for lost revenue during the time the site was closed (Sarpong, 2018). It will therefore be possible for the citizens around the Kpone Kokompe landfill to claim damages for negligence in the event that the garbage in the landfill is left unattended and causes them damage in any form.

2.3.2.3 Trespass

Trespass to land occurs when a person knowingly, recklessly, or carelessly enters private property without permission. Dumping waste or other debris on property is a typical type of trespass, even if no significant harm is done, as in the locus classicus case of *Gregory v. Piper*, where the defendant dumped garbage in a manner that blocked a right of way (1829) 2 B & C 591). The Defendant was found liable for trespass when the rubbish rolled up against Plaintiff's wall. Trespass also includes obstructing traffic on a public road. This seems to be the case in situations like chemical spills from landfills and fly-tipping of rubbish. Damages and an injunction are the common remedies for trespass.

2.3.3 Environmental Protection Agency Act 1994, Act 490

The Environmental Protection Agency (EPA) is the institution in Ghana responsible for controlling and preventing waste discharge, issuing environmental permits, and ensuring environmental quality improvement (Environmental Protection Agency Act, 1994). It also prescribes standards and guidelines for air, water, land, and other forms of pollution. The EPA works with government agencies, district assemblies, and other institutions to control pollution and protect the environment. Section 2 of the Act mandates the agency's involvement in coordinating environmental measures with other organisations and local authorities. Further, the EPA is responsible for ensuring ecological stability before, during, and after significant agricultural or industrial activities. The EPA also supervises the continuous monitoring and management of decommissioned landfills. While it provides a general framework for environmental management, it lacks specific provisions relating to Landfill decommissioning.

2.3.4 Environmental Assessment Regulations 1999, LI 1652

Guidelines for performing environmental impact assessments are provided in the Environmental Protection Assessment Regulations, 1999 (LI 1652) document. These regulations are vital in determining the possible effects that landfill management operations may have on the surrounding environment. Prior to initiating a project, LI 1652 requires the proponent to register the project with the Agency and then apply for an Environmental Permit. However, L1 1652 does not explicitly address landfill decommissioning requirements.

2.3.5 Ghana Landfill Guidelines, EPA 2002

The Ghana Landfill Guidelines, published by the EPA in 2002, provide detailed recommendations on decommissioning of landfills. However, they are not legally binding and do not provide exhaustive provisions for landfill decommissioning. The Landfill Guidelines were developed by the EPA in 2002 to provide operational guidelines to MMDAs in Ghana. The guidelines establish a methodical procedure for selecting a disposal location, as well as the size and type of operations that should be used for various types of communities and the quantities of waste to be disposed of (EPA, 2002: 23-26). According to the Ghana Landfill Guidelines, a report outlining the environmental impacts of the proposed landfill's location and any proposals for mitigation must be submitted prior to the grant of a licence.

The Guidelines mandate local residents, such as traditional leaders and youth organisations, to be involved in the administration and operation of landfills. The payment of compensation and the proper acquisition of land for use as a landfill are also fundamental requirements for the proponent of a landfill. The Guidelines are currently

outmoded and appear to have been developed without taking into account the peculiarities of a developing country like Ghana. The guidelines fail to sufficiently account for the unique waste composition typical of developing nations, such as Ghana, where a considerable portion of waste comprises organic matter. This necessitates distinct management approaches compared to countries with predominantly industrial waste (Debrah et al., 2021).

Moreover, the guidelines inadequately incorporate the socio-economic dynamics of waste pickers and informal waste management methods. This oversight can result in conflicts and undermine the overall efficiency of the waste management system (World Bank, 2020).

2.3.6 Local Governance Act, 2016 Act 936

The Metropolitan, Municipal, and District Assemblies (MMDAs) are vested with deliberative, legislative, and executive powers by the Constitution of 1992 and the Local Governance Act of 2016 (Act 936). The assemblies are corporate bodies that can sue and be sued. As legal entities, District assemblies are tasked with a variety of responsibilities, including the development, enhancement, and administration of human settlements and the environment.

The MMDAs are authorised by Act 936 to develop, enhance, and manage human settlements and the environment in the district. Section 91 (1) of Act 936 prohibits the physical development of a district without the prior written sanction of the District Planning Authority in the form of a written permit. The assemblies created by Act 936 are required to ensure adequate waste management, particularly waste disposal, within

their respective jurisdictions, either independently or through contractual agreements. Consequently, an assembly typically leases the land where landfills are sited or same is acquired for them under legislative instruments (L. I's). Hence, if a person's actions or inactions are likely to cause significant harm to the environment, amenities, public health, or economy, a district planning authority may serve him with a notice requiring him to abate the nuisance within a specified time period. While Act 936 deals with some aspects of waste management, it does not specifically address decommissioning.

2.3.7 Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)

Act 917 addresses the control, management, and disposal of hazardous, electrical, and electronic refuse, as well as other related matters. A person is prohibited from depositing hazardous refuse or other debris on any land in Ghana or in the country's territorial waters. A person involved in the management of hazardous wastes or other wastes must also take the steps necessary to prevent pollution from hazardous wastes and other wastes resulting from their management and minimise the effects of pollution on human health and the environment when pollution does occur.

The express objective of Act 917 of 2016, also referred to as the Hazardous and Electronic Waste Control and Management Act, is the management and regulation of hazardous and electronic waste. Although it contributes to a safer waste management system, it does not completely cover decommissioning practices.

2.3.8 Public Health Act, 2012 (Act 851)

Act 851 was passed to ‘prevent diseases, promote, safeguard, maintain, and protect the health of humans and animals, and provide for related matters.’ The Act has various provisions that deal with the many aspects of Public Health. The sections include those on food and drugs, environmental sanitation, clinical trials, and miscellaneous provisions.

2.3.9 Lands (Statutory Wayleaves) Act, 1963 (Act 186)

The Lands (Statutory Wayleaves) Act, 1963 (Act 186) outlines the procedures for the occupation of land for the construction, installation, and maintenance of public works, as well as the creation of rights of way for such works. The Statutory Wayleave Registration Regulations of 1964 (L.I.334) provide procedural information and grievance redress mechanisms for Act 186. This statute applies to matters involving Project Affected Persons (PAPs).

2.3.10 The Land Act, 2020 (Act 1036)

Act 1036 amends and consolidates prior land laws into a single statute. Act 1036's stated objectives include ensuring sustainable land administration and management, effective and efficient land tenure by, among other things, establishing a broad-based framework for registering land rights and interests, a framework for customary land rights, and enhancing transparency and accountability in land governance institutions.

Act 1036 vests the President with the authority to acquire property in the public interest. It also assigns responsibility for registering a claim on behalf of the affected individual or group and outlines the procedure for doing so. The Land Act specifies a number of

factors to be considered when calculating compensation, including (1) cost of disturbance, (2) market value, (3) replacement value, etc. This statute also applies to matters involving project-affected persons (PAPs).

2.4 Adaptation

The concept of adaptation is more difficult to define than its common usage would suggest. Despite its origins in the field of biology, specifically in the discourse on evolution, adaptation has become an interdisciplinary concept, attracting scholars from both the natural and social and behavioural sciences (Simone, 2010). The modern discourse on adaptation has been fuelled by climate change and is therefore heavily influenced by environmental science. Yet, even in the climate change debate, the concept remains imprecise and confusing, with new perspectives emerging as it continues to evolve (Burton et al., 2003). As a truly multidisciplinary concept, the challenges of precision in the definition of adaptation should not be surprising. It is in the nature of true multidisciplinary concepts to invite a multiplicity of meanings and conceptions. It is, therefore, necessary to engage some definitions of the concept to clarify its usage in this study.

In the words of Brandon (1978, p. 104): “In adaptation, according to evolutionary theory, there is a biological property called adaptability, which some organisms have more of than others. Those having more of it, or those better adapted, tend to have more offspring. And this is the mechanism of evolution”. According to Gregory (2009), adaptation refers to “the process by which populations of organisms evolve in such a way as to become better suited to their environment as advantageous traits become predominant” (Gregory 2009, p. 161). Gregory (2009) further added that adaptation

involves “how physical, physiological, and behavioural features that contribute to survival and reproduction (“adaptations”) arise over evolutionary time” (Gregory 2009, p. 161).

In psychology, adaptation is defined as an ongoing interaction between an organism (humankind) and its environment, in which both are entangled in a web of mutual influence (Simone, 2010; Bevan, 1965). Thus, adaptation entails human responses to environmental stresses at the same time as human activities modify the environment. Adaptation emphasises the dynamic interplay between human actions and environmental processes that conditions the emergence of diverse perspectives (Jakubowicz, 2002; Taché, 2003). Human adaptation is a product of processes, situations, and actors in the network of the environment, in which man is an important actor.

Through the lens of culture, anthropology, sociology, and archaeology have also embraced the concept of adaptation and contributed to its scholarly development. The concept of cultural adaptation has been central to social anthropology and its contributions to the adaptation theory. Cultural adaptation includes “all behaviours and acquired responses (socially or by learning) that affect human survival (reproduction, provisioning, and habitat), such as oral communication” (Simone, 2010, p. 4). Adaptation, according to O'Brien and Holland (1992, p. 37), is “the process by which groups of people add new and improved methods for coping with the environment to their cultural repertoire.” In this light, the development of human culture is an ongoing process of adaptation in which societies assimilate and adapt to new developments. According to Simone (2010, p. 4), human adaptation “co-evolved with the human brain, each strengthening the other.”

The contemporary discourse on adaptation is in the field of environmental science, more specifically, the climate change discourse. Within this field, adaptation is seen as an integral part of responses to global climate change since rising global temperatures mean that some effects of climate change are already underway and cannot be avoided (Adger et al., 2003; Berkhout, 2012). The Intergovernmental Panel on Climate Change (IPCC) offers the most trustworthy definition in the discussion of climate change adaptation, which frequently serves as the basis for studies on the subject. The IPCC noted that adaptation “in human systems is the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities” (2014, p. 5). In natural systems, adaptation to the actual climate and its effects, such as human intervention, can facilitate adaptation to the anticipated climate. Thus, adaptation to climate change involves human action aimed at mitigating the effects of climate change on humanity. It entails the evolution of responses that enable humankind to survive in a warmer climate with changing weather and climatic conditions and their associated consequences. Nelson et al. (2007, p. 395) define adaptation as “a deliberate process of change in anticipation of or in response to external stimuli and stress.” Adaptation necessitates an element of deliberate action, especially when the issue at hand is a result of policies and predetermined activities. In the case of landfills, adaptation is not anticipated to be sudden but rather planned, as the phenomenon is subject to policy formulation and implementation or deliberate human decisions, in contrast to environmental disasters, which may result in unplanned adaptation.

The idea of vulnerability underpins climate change adaptation. According to Shinn et al. (2015), vulnerability is related to the extent to which individuals, groups, and systems become prone to threats or danger due to exposure to a risk or hazard and the ability to

cope, recover, or fundamentally adapt. In this context, adaptation becomes a mechanism for addressing human vulnerability to threats posed by anthropogenic-induced climate change.

The link between climate change and solid waste management is complex and interwoven. While solid waste is said to contribute to greenhouse gas emissions, particularly methane, proper management of solid waste can contribute to climate change mitigation through a reduction in energy demands due to recycling, the protection of forests, and a reduction in gas emissions. On the other hand, extreme weather events may undermine waste management infrastructure and compromise the quality of waste management systems. (UNEP, 2010; Christian, 2010). Thus, adaptation to climate change involves restructuring or reengineering solid waste management systems to be more resilient to extreme weather events.

The differing perspectives on adaptation as surveyed above show that adaptation is a complex concept with no watertight meaning. Many studies on landfills and the effect of the same on residents hardly engage or employ the concept of adaptation. (Salah et al., 2020; Etea et al., 2021). This study, however, makes the concept of adaptation a central theme in understanding how residents in areas of landfill decommissioning are able to adjust to the changes to the environment due to the decommissioning of landfills. It proceeds on the understanding that landfill management, which includes decommissioning, engages residents and impacts their lives in various ways that demand orientation and residents' adaptation.

Adaptation involves changing human attitudes, behaviours, orientations, and activities aimed at addressing the perceived or real impacts of an adverse situation on individuals, groups, and communities. Landfill decommissioning alters the environment for residents close to these sites. The hitherto heavy trucks that frequented the area where the landfill is located may no longer be the case. Landfill managers may withdraw waste workers, which may impact the livelihood of hawkers who service these workers. At the same time, decommissioning may pose threats through the continuous production of emissions, which are hardly understood by residents and lead to maladaptation, in which case residents are unable to cope with new stresses from the environment (Ensor & Berger, 2009).

2.4.1 Types of Adaptation

In climate change studies, various types of adaptation can be identified based on common themes including time, intention, scale, duration, and agencies in the adaptation process (IPCC, 2014). Adaptation types also relate to issues of institutional and legal frameworks and the degree of adjustment as compared to the prior state of being (Burton et al., 2003; Risbey et al., 1999; Smit and Skinner, 2002). Institutions and legal regimes must allow people and communities to address environmental stresses and adjust to new demands for survival so as to be useful. Institutions and regulations condition the activities of people and prescribe what is permissible and what is not. Institutions can therefore become an impediment to adaptation. Agrawal (2008) acknowledges the part local institutions have played in adapting to climate change. He highlighted the three main roles of local institutions in aiding climate change adaptation. First, he acknowledged that local institutional structure impacts vulnerability. As noted by Chu (2008), closed landfills may be inhabited by amphibians and reptiles within a few years

of revegetation, and the diversity of species increases with time after closure. Second, the local institutional structure mediates between individual and collective responses to climate impacts, thereby shaping adaptation outcomes. Lastly, the local institutional structure serves as the conduit for the delivery of external resources to facilitate adaptation, thereby governing the access to such resources (Agrawal, 2008).

Both local and national institutional frameworks are necessary for understanding adaptation to changing environments at the community level. In solid waste management, the coping strategies of local residents around landfills are mediated by institutions both at the local and national levels (Kyerem et al., 2019).

Adaptation types may also be viewed from the perspective of soft and hard adaptation, which derives from the works of Amory Lovins in the 1970s in relation to adaptation to energy demands in the midst of the energy crisis at the time (Sovacool, 2011). Hard adaptation involves large-scale adaptation, usually at the national level, with complex and expensive technologies that are beyond the ability of any single person to undertake. Failures in hard adaptation therefore affect the whole system. On the contrary, soft adaptation involves diverse responses, normally at the community level, allowing different approaches from diverse actors at the lowest cost (Mechler et al., 2020).

Mechler et al. (2020), however, propose that a hybrid adaptation offers more resilience to future impacts at the least cost by combining the merits of both hard and soft adaptation. Large-scale efforts at the national level in adaptation must be complemented by localised measures of adaptation to reduce vulnerabilities and aid adjustment to the environment at the lowest cost. In adjusting to landfills, it may be useful to explore how

the national framework for managing landfills integrates and allows local institutions and residents the flexibility to alter attitudes, orientations, and behaviours to cope with the vulnerability to the impacts of landfill decommissioning. Synergy and interaction among the national, regional, district, and local levels are important in residents' adaptation behaviour. Yet the foregoing appears to have been largely ignored in landfill studies.

Nelson et al. (2007) distinguished between the actor-centred perspective on adaptation to environmental change and the system-oriented approach. They noted that the actor-centred approach has been the traditional and dominant research tradition. It focuses on “the agency of social actors to respond to specific environmental stimuli while emphasising the reduction of vulnerabilities” (Nelson et al., 2007, p. 395). The system-oriented approach, on the other hand, “takes a more dynamic view and sees adaptive capacity as a core feature of resilient social-ecological systems” (Nelson et al., 2007, p. 395). Systems may adjust to new demands or be transformed. System transformation may produce new social ecosystems, while system adjustment may result in new processes to reduce risk and vulnerability and promote an effective system response to change. In their words, “the outcome of the adaptation process is the system's adaptability and the level of effectiveness in the way a system relates to the environment and meets the normative goals of system managers and stakeholders” (Nelson et al., 2007, p. 400). In landfill management and decommissioning, the human ecosystem around the landfills may be transformed or adjusted as landfills are decommissioned. Interrogating how decommissioning results in transformation or adjustment provides a useful guide to policy, which may enhance human understanding about the relationship between the human ecosystems around landfills.

2.4.2 Adaptation Strategies of African Communities Situated Around Landfill Sites after Closures

African communities residing near closed landfills face substantial socio-economic and environmental obstacles that can be mitigated through the implementation of adaptation approaches. These strategies are essential for ensuring the well-being and livelihoods of residents affected by the closure and decommissioning of landfills. In the African context, where waste management systems are often inadequate and landfill operations are not always sustainable, residents face significant challenges in adapting to the closure of these sites. One common adaptation strategy is the development of alternative livelihood options for affected residents. As landfill closure can result in the loss of employment for waste pickers and other informal workers who rely on the site for their livelihoods, finding alternative income-generating activities is essential. For example, in a study conducted by Smith et al. (2019) in Nairobi, Kenya, waste pickers who were impacted by landfill closures were provided with training and support to transition into formal waste management roles or other income-generating activities. Engaging communities in the decision-making process is another important adaptation strategy.

The participation of residents in the planning and implementation of decommissioning projects ensures that their concerns and needs are taken into account. This participatory approach empowers communities to voice their opinions, contribute local knowledge, and propose solutions that are culturally appropriate and sustainable (Ntaji et al., 2020). Community engagement can be facilitated through public consultations, stakeholder meetings, and the involvement of local organisations and community leaders. Collaboration with non-governmental organisations (NGOs) and international agencies is also pivotal in supporting adaptation strategies. These organisations often provide

technical expertise, financial resources, and capacity-building initiatives to help affected communities cope with the changes brought about by landfill closures. For instance, organisations like Waste Aid have partnered with communities in several African countries to develop waste management solutions and create income-generating opportunities through recycling and composting initiatives (Waste Aid, 2024).

Furthermore, integration into formal waste management systems can enhance the resilience of communities affected by landfill closures. Waste pickers, who are often excluded from the formal sector, can be recognised as valuable contributors to waste management and provided with appropriate training, protective equipment, and fair remuneration (Wilson et al., 2020). By integrating waste pickers into formal systems, their contributions can be maximised, and their working conditions and livelihoods improved (Medina, 2020).

Adaptation strategies adopted by residents around decommissioned landfill sites in Africa are necessary in mitigating the socio-economic and environmental impacts of landfill closures. Among these methods are the introduction of official waste management systems, community involvement, partnerships with NGOs and international organisations, and the creation of new opportunities for garbage pickers to earn a living. By implementing these strategies, communities can navigate the challenges brought about by landfill closures and build more sustainable and resilient futures.

2.4.3 Influential Factors Shaping Quality of Life: The Nexus of Environment, Economy and Society

Quality of Life (QL) is a multidimensional social construct that reflects an individual's health, comfort, and ability to participate in and enjoy life's activities (Shah et al., 2023). The interplay of environmental, economic and social factors can exert substantial influence on the quality of life for individuals and society as a whole. The quality of life and overall satisfaction of individuals are collectively impacted by the amalgamation of these factors in their daily routines. In order to comprehend the broader context in which an individual's perception of their quality of life is situated, it is imperative to possess a grasp of the intricate influence exerted by various aspects. The influence exerted by an individual's environment on their overall quality of life is substantial and should not be undervalued. The impact of the environment on health and quality of life is significant, encompassing various aspects such as pollution levels in the air and water, accessibility to green spaces, and the potential exposure to environmental risks. Multiple studies have consistently demonstrated a strong association between adverse environmental conditions, such as pollution and limited availability of clean resources, and negative health outcomes as well as a diminished quality of life (Lelieveld et al., 2019).

Research has indicated that there exists a correlation between unfavourable environmental conditions and negative health consequences, as well as a decrease in overall quality of life. Conversely, it has been seen that settings that foster physical exertion, interpersonal bonding, and cognitive repose have a beneficial impact on overall quality of life (Shanahan et al., 2019; Van den Bosch & Sang, 2017). The significance of economic issues in relation to quality of life is commensurate with their influence. The quality of life experienced by individuals or communities is significantly influenced by

various factors, including income levels, employment opportunities, and access to resources. There is a positive association between higher salaries and increased levels of life satisfaction and overall happiness, as indicated by previous research conducted by Diener et al. (2019) and Oishi & Schimmack (2019). The correlation between economic prosperity and quality of life has been substantiated in several studies (Diener et al., 2019; Oishi & Schimmack, 2019). Hofmann et al. (2019) believe that economic disparity exerts a detrimental influence on individuals' quality of life, hence exacerbating social disparities and limiting opportunities for individuals with limited means.

The assessment of an individual's quality of life is heavily influenced by factors such as the availability of educational opportunities, access to medical care, presence of social support networks, and level of community engagement. Based on the findings of Siedlecki et al. (2019), it has been shown that persons who possess strong social connections and support networks tend to report higher levels of life satisfaction and overall quality of life. Conversely, several elements such as social exclusion, discriminatory practices, and limited availability of essential services can detrimentally affect an individual's overall quality of life (O'Neil et al., 2018; Pickett et al., 2019).

In summary, the interplay of environmental, economic, and social factors exerts a substantial influence on the overall well-being of individuals. Gaining an understanding of the intricate interconnections between these elements in the current study cannot be overemphasised as it will aid in providing resilient adaptation pathways for residents at decommissioned landfill sites.

The literature reviewed demonstrates significant attention to waste management practices, landfill typologies, and policy evolution in Ghana and the broader African context. However, few studies critically examine landfill decommissioning as a strategic component of solid waste management, particularly its long-term environmental and social impacts on adjacent communities. While some African studies mention the closure of landfills, there is limited exploration of how communities adapt post-closure, the strategies they employ to sustain livelihoods, and the factors shaping their overall quality of life—such as access to rehabilitated land, health outcomes, and economic opportunities. Additionally, existing research often overlooks the integration of legal and institutional frameworks in post-closure processes such as site remediation and green repurposing. This study addresses these gaps by focusing on the decommissioning of the Kpone Kokompe landfill, the first of its kind in Ghana, offering new insights into sustainable landfill decommissioning, community adaptation strategies, and policy reforms aimed at enhancing urban environmental management in Ghana and comparable African settings.

2.5 Theoretical and Conceptual Framework

2.5.1 Integrated Sustainable Solid Waste Management

The Integrated Sustainable Waste Management (ISWM) approach thrives on the understanding that most waste management problems are not necessarily financial or technical problems (Van de Klundert & Anschutz, 2001). On the contrary, most waste management challenges are the result of the attitudes of citizens, waste managers, and other actors involved in the waste management problem. (Van de Klundert & Anschutz, 2001). In the words of Van de Klundert & Anschutz, “other problems are caused or made more serious by factors that are not technical or financial but relate to managerial

(in)capabilities, the institutional framework, the environment, or the social and cultural context (2001, p. 10). In these cases, it is not money or equipment that provide solutions, but rather changing social, institutional, legal, or political conditions”. Thus, the challenges to waste management involve more than technical and financial challenges.

The ISWM framework originates from the frustration among NGOs and international organisations about the inability of the so-called technical fix, which is an exclusively technical approach to waste management, to address the waste management problem in developing countries (Wilson, 2007; Wilson et al., 2013). A seminar on municipal sustainable solid waste management organised in 1995 in Switzerland during a programme on solid waste management in low- income countries spearheaded by UNDP, UN-Habitat, and the World Bank birthed integrated municipal solid waste management. According to Wilson et al. (2013), the ISWM is founded on the principle of sustainability, encompassing holistic and thorough approaches across multiple levels. The initial framework was further developed by Arnold van de Klundert into the integrated sustainable waste management framework (ISWM) (Van de Klundert & Anschütz, 2001; Wilson et al., 2001). The ISWM is both an analytical tool and a development framework for waste management.

The framework as shown in Figure 2.1 is centred on four fundamental principles. These include fairness, efficacy, effectiveness, and sustainability (Van de Klundert & Anschütz, 2001). Due to health concerns, all individuals have the right to appropriate waste management systems, as implied by the concept of equity. Adopting a particular waste management model that is effective would ensure the safe removal of all waste. In waste management, efficiency entails a cost-benefit optimisation of resource utilisation.

According to the principle of sustainability, a waste management system must take into consideration local conditions and technical, environmental, social, economic, financial, institutional, and political viability. It also asserts that a waste management system can sustain itself without degrading or exhausting the resources that sustain it (Van de Klundert & Anschütz, 2001).

Furthermore, the framework from Figure 2.1 is based on three key dimensions. These include (i) the stakeholders associated with waste management, (ii) the practical and technical components of the waste system, and (iii) the local factors that should be considered when evaluating and planning a waste management system (Klundert & Anschütz, 2001, p. 12).

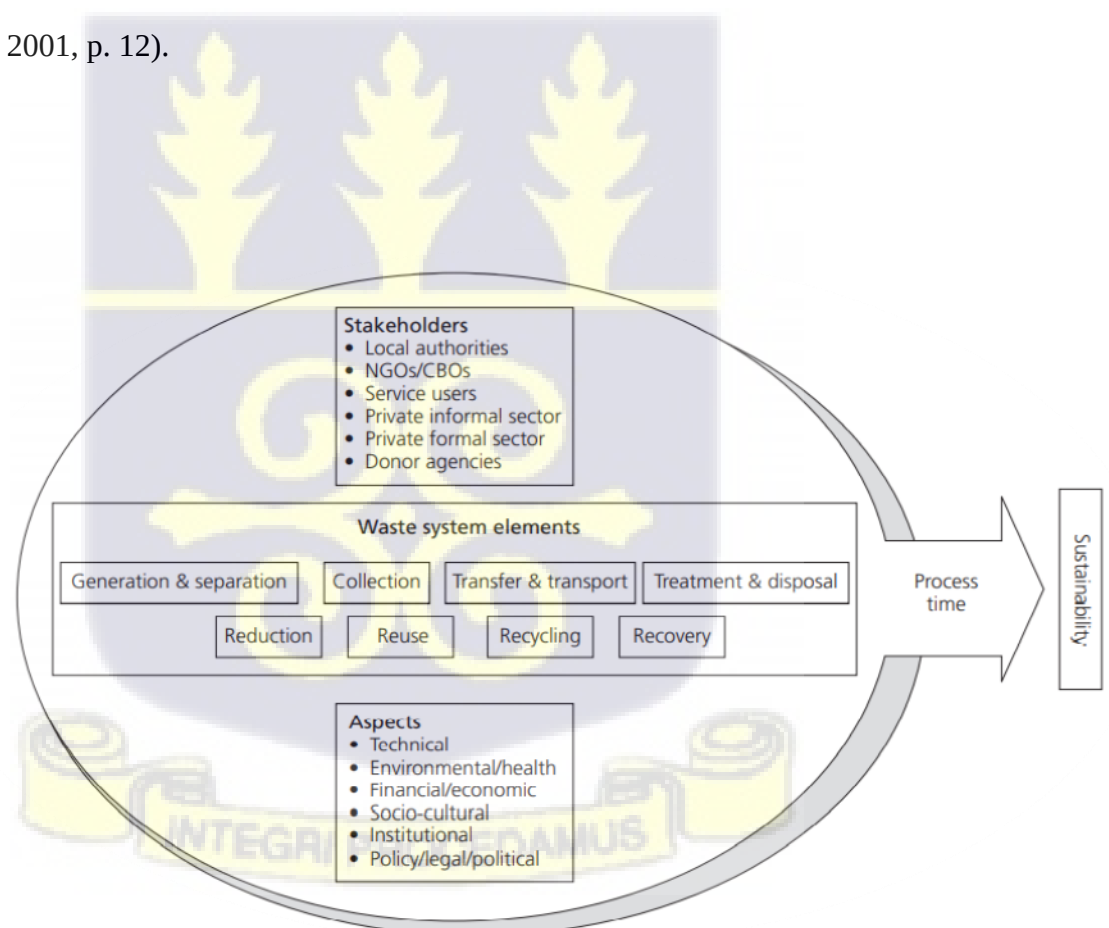


Figure 2. 1: Integrated Sustainable Solid Waste Management Framework
Source: Van de Klundert & Anschütz, 2001

There are six aspects that make up the ISWM framework. These are:

- i. *Environmental aspects*, which deal with the impact of waste management on the environment (including the land, water, air, and public health);
- ii. *Political and legal context* of waste management is discussed, in addition to the constraints that this framework places on activities like goal-setting and prioritisation;
- iii. *Institutional aspects* address the influence of social norms and customs on people's waste disposal habits;
- iv. *Socio-cultural aspects* relate to the roles of culture and the behaviours of communities on waste management.
- v. *Financial-economic aspects* pertain to budgeting and cost accounting within the waste management system. It also includes the impact of waste management on the economic activities, such as the impact on prices of housing and commodities in the market, and
- vi. *Technical and performance aspects* concern the observable practical implementation and maintenance of all of the waste elements: what equipment and facilities are in use or planned; how they are designed; what they are designed to do; whether they work in practice; and how clean the city is on a consistent basis.

This study employed the six components of the ISWM framework to evaluate Ghana's legal and institutional frameworks for landfill decommissioning. The components enabled an examination of the phenomenon in terms of its environmental impacts on local residents, the legal and regulatory frameworks for decommissioning, the institutional framework, the economic impacts of decommissioning, the socio-cultural

environment of decommissioning, and the various decommissioning practices. The frameworks therefore offer an extensive assessment tool for analysing landfill decommissioning in Ghana. All the various components of the frameworks provide categories for disaggregating the various elements of decommissioning for analytical purposes. Thus, the main advantage of the frameworks is that while they offer categories to analyse waste management by disaggregating the issues, they are equally far-reaching to permit detailed analysis of the interrelationships of the various aspects. The frameworks also go beyond the technicalities of waste management to incorporate community involvement within the appropriate legal, political, social, economic, and environmental frameworks.

2.5.2 Institutional Theory

The philosophical roots of institutionalism, or institutional theory, emerged in the field of political philosophy. The focus is on ancient political philosophy and how political institutions ought to be designed and function for the general good. While the behavioural revolution supplanted the study of institutions during the post-World War II period, it re-emerged in the 1980s as a major theory in almost all social science disciplines (March & Olsen, 1996; 2004; Steinmo et al., 1992). There was also the re-emergence of the study of institutions, or the focus on how institutions influence socio-economic development and how institutions are transformed over time. (North, 1990). The failure of market reforms in third-world economies brought back the need to understand how institutions shape political and economic life (Chang, 2011).

Institutions mean many things to many people, depending on the field of enquiry and the interest of the one employing the concept. However, many studies on institutions

proceed from or take as a point of departure the main definitions of institutions, which have remained important to institutional theory. Douglas North proposed the first of these definitions. North opines that “Institutions are the rules of the game in a society, or, more formally, are the humanly devised constraints that shape human interaction” (1990, p. 3). The second definition is associated with March & Olsen, (2006) who opine that “An institution is a relatively enduring collection of rules and organised practices, embedded in structures of meaning and resources that are relatively invariant in the face of turnover of individuals and relatively resilient to the idiosyncratic preferences and expectations of individuals and changing external circumstances” (March & Olsen 2006, p.125). Institutions can thus be seen as the formal and informal constraints that shape human choices and activities. They are rules of the game that ensure the orderly conduct of human interactions (Johansson, 2013; Gyampo, 2016). Institutions involve both formal and informal rules, structures, norms, and values that condition human behaviour and interactions. Human actions achieve legitimacy within the framework of institutions. Therefore, the institutions of a particular society determine what is legitimate or not.

Institutions provide the range of permissible actions or responses that people and communities may adopt in given situations. They also define the range of solutions or legitimate actions available to an actor in a given situation (March & Olsen, 1984). Institutions are normally the product of human historical experiences. They therefore embody the values and aspirations of society. They are durable yet dynamic, as they change over time to accommodate changing circumstances (North, 1990).

Institutional theory is an approach that attempts to understand how institutions (formal and informal rules and structures) influence human behaviour and outcomes. Within the field of social science, institutional theory generally attempts to uncover how institutions inform socio-economic, cultural, and political actions and their outcomes. It emphasises the connection within institution-specific features and political agency, performance, and change (March & Olsen, 2004).

At the heart of institutional theory is how institutions shape human choices and actions. The management of landfills occurs within institutional frameworks. The mediating roles of culture, economic, political, and legal structures influence how landfills operate and how people nearby adapt to the operations of the landfill. These structures, some of which are formal and others informal, are important to understanding human actions within the context of landfill management and decommissioning. In adopting the institutional theory, this study interrogated how formal and informal rules (norms, culture, socio-economics, and behaviour) interact to influence landfill management and decommissioning in Ghana. The study also allowed the researcher to appreciate the role of informal rules and norms in the process of adaptation to landfill decommissioning.

There are three main approaches to the study of institutions. The first is the Rational Choice or functionalist approach, which considers an institution as a system based on carrots and sticks, providing both the rules and the incentives that help influence human choices and behaviour in a given situation (Farrell, 2018; Peters, 1999). Institutions are the means by which individuals attempt to maximise their utility. An actor within this framework evaluates his goals and preferences within the context of available resources and options for achieving those goals under specific rules. Without the rules and

restrictions imposed by institutions, each actor would aim to maximise its utility at the expense of others, resulting in a conflictual situation. However, in the presence of institutions, each actor chooses from the range of options that are considered legitimate. In making choices, rationality demands that actors normally choose options that maximise their utility. Institutions therefore help to achieve equilibrium among self-seeking individuals by imposing restrictions on the range of legitimate actions, thereby reducing uncertainties.

The second approach to the study of institutions is sociological institutionalism. According to this approach, the interest of the individual is rooted in identities and cultures (Friel, 2017; Schmidt, 2010). The norms and values of an organisation influence, to a large extent, the behaviour of the actors. Institutions refer to the values and norms that shape human conduct in a given situation. Individuals are considered to be in a complex web of relationships with collectivist actions instead of egoistic individuals. The norms and values of an organisation influence what people consider possible and the actions they take in pursuit of them. Examining the values and norms connected to a specific culture or institution is necessary to comprehend the behaviour and actions of actors. However, actors choose among influences and interpret the meaning of their organisational commitments in decision-making, so actions and choices are based on the logic of appropriateness (Farrell, 2018).

Historical institutionalism is the third approach to the study of institutions. This approach considers institutions as a product of historical processes and practices. Proponents contend that institutions are a set of regularised practices. Historical institutionalism focuses on the understanding of the historical processes that give rise to

rules and structures that condition human behaviour. As institutions emerge, people meet new challenges and attempt to address them by agreeing to new rules, norms, and practices. Institutional development is characterised by path dependence. This implies that the policy choices or rules have a continuing and largely determinate influence beyond the time of institutional formation into the future (Yang, 2019). In other words, institutions persist beyond their formation and inherent practices. Sanders opines that a crisis, or a serendipitous confluence of events or social pressures, produces a new way of doing things. Historical processes can therefore explain the transition from an old rule structure to a new rule structure. Understanding the contemporary function and behaviour of institutions necessitates a historical examination of the events, processes, and practices that have shaped them over time (Carter & Fuller, 2015).

Landfill decommissioning is influenced by the rational application of the regulations governing landfills in Ghana as well as by the economics of landfill management, i.e., the cost of maintaining landfills versus the cost of its closure. Thus, a rational approach is important to this study as it seeks to understand the legal and institutional frameworks of landfill decommissioning and how residents adapt to their new environment. At the same time, the study is interested in how the adaptation process leads to the formation of new norms and rules among residents of landfill areas. This is in line with Schmidt (2010), who argues that the approaches to the study of institutions should be seen as complementary instead of as opposing or entirely different. In integrating the rational choice approach with the historical approach, the study aimed at probing how rational choices concerning decommissioning are made by actors within the constraints of the legal framework on decommissioning in Ghana while emphasising the changes in norms

and behaviours that allow residents to cope with the new challenges during landfill decommissioning.

2.5.3 Protection Motivation Theory

Ronald Rogers developed the protection motivation theory in 1983 to investigate people's reactions to potential health and safety threats. The theory proposes that both individual and environmental factors can provide either encouragement or discouragement for engaging in protective behaviours and that the effects of such factors are mediated by individual cognitive processes (Rogers, 1985; Clubb & Hinkle, 2015).

On the issue of adaptation, the theory is to the effect that the ability to adapt or not to any threat hinges on two main processes, namely: threat appraisals and coping appraisals (Prentice-Dun & Rodgers, 1986). Threat appraisal relates to judgements about the probability of an event or occurrence endangering or causing harm to an individual. Threat appraisal involves an understanding of harm in the absence of behavioural change or preventive action. It includes an evaluation of the factors that may help improve or undermine the probability of adaptation or maladaptation (Prentice-Dun & Rodgers, 1986).

On the other hand, coping appraisal deals with issues of response efficacy and self-efficacy. Individuals assess the efficacy of their preventive measures when they identify an event as likely to cause harm. The judgement of the efficacy of the preventive measures is what is referred to as response efficacy. Self-efficacy, which derives from social learning theory, involves the ability of the individual to control his or her behaviour (Prentice-Dun & Rodgers, 1986). Coping appraisals also involve judgements

about the cost of preventive measures (Prentice-Dun & Rodgers, 1986). When both response and self-efficacy are high, the adaptation rate may be high.

Protection motivation as a theory also rests on the information available to the individual. Information may be from the environment or intrapersonal (Clubb & Hinkle, 2015). Information is important for both threat and coping assessments. Poor information about the threat and the individuals' abilities may result in maladaptation.

When individuals perceive an event or development as likely to cause harm, they engage in adaptive behaviour in an effort to eliminate or mitigate the perceived or actual threat. The theory of motivational protection is an important tool for examining why and how individuals adapt or maladapt to the threat of landfills in the context of landfill management. People living in the vicinity of landfills are exposed to health risks. Consequently, the evaluation of the threat that landfills pose to an individual's health and economic well-being, as well as the evaluation of the efficacy of the available response options and self-efficacy, are vital components of adaptation at landfill sites. Evaluation of the risk landfills pose and the adaptation options available within their limited information and resources aid in explaining how people make decisions.

2.5.4 Actor Network Mapping

Actor network mapping makes it easier to understand how connected a network's participants are. Key players, including government agencies, commercial corporations, and non-governmental organisations, can be identified using this method in the context of landfill decommissioning in Ghana. It also illustrates the power dynamics inside a network and how various players are connected to each other in terms of finance,

decision-making, and regulatory enforcement (Serrat & Bosch, 2020). To better understand the facilitators and obstacles to information flow among players, network maps are useful for visualising and measuring both formal and informal links between them (Shanahan et al., 2019).

According to Serrat & Bosch (2020), network maps shed light on the informal and formal patterns of information flow among participants. The power and knowledge domains of actors are shaped through their interactions with one another over time and via shared experiences (Clubb & Hinkle, 2015). Network maps (Net-maps) provide a more holistic examination of institutions than conventional organograms by depicting both formal and informal relationships and the underlying power dynamics. An investigation of water management systems in Ghana's Volta Basin by Schiffer and Hauck (2010) highlights the significance of this visual depiction. Even still, complicated quantitative estimates, such as network density or centrality, are beyond the capabilities of network maps (Scott, 2017). Actor network mapping was selected in this study due to its ability to provide insights into the connectivity of network participants, including governmental agencies, commercial corporations, and non-governmental organisations, in the context of landfill decommissioning in Ghana. While other forms of network mapping exist, actor network mapping offered a holistic examination by visualising both formal and informal relationships and their underlying power dynamics, as highlighted by Serrat & Bosch (2020) and Schiffer and Hauck (2010). Its focus on understanding roles and interactions among all parties involved offered valuable insights for improving landfill management practices and addressing associated challenges. The institutional dynamics and power interactions affecting landfill decommissioning in Ghana were better understood by applying actor-based network mapping.

The interconnection of the key players, including governmental agencies, commercial corporations, and non-governmental organisations in the context of landfill decommissioning in Ghana are shown in Figure 2.2.



Figure 2. 2: Network Mapping
Source: Author's Construct, (2023)

2.6 Review of Empirical Literature

This section examines empirical literature on waste management in Ghana. It surveys various studies relating to waste management, particularly those concerned with landfill management, so as to identify relevant gaps in the literature and be able to properly situate the study within the proper empirical context.

2.6.1 Socio-economic Challenges of Waste Management in Ghana

Waste management begins with the process of waste generation. About 12,710 tonnes of waste are generated per day in Ghana, according to a study by Lissah et al. (2021). The authors also pointed out that biodegradable waste (organics and papers) remained the largest form of waste generated in Ghana, followed by non-biodegradable or recyclable waste (rubber, glasses, metals, leather and textiles), inert waste, and miscellaneous waste (Lissah et al., 2021). The result of their study also shows that waste generation varies according to population clusters and socio-economic status. Metropolitan areas with higher populations and economic activities generate the most waste, followed by municipal areas and districts, respectively. Studies have also discovered that in Ghana, socio-economic status is related to waste generation, with people of higher socio-economic standing generating more waste (Miezah et al., 2015; Lissah et al., 2021). The relationship between economic status and waste generation in Ghana is also evident in several other studies (Fobil, 2005; Mudu et al., 2021).

Further analysis of the relationship between socio-economic status and waste disposal reveals that socio-economic status affects the method employed to dispose of waste in Ghana. (Adzawla et al., 2019; Immurana et al., 2022). It is argued that people at the lower end of the socio-economic ladder usually resort to inappropriate methods to

dispose waste. Immurana et al. (2022), using statistics from the Ghana Living Standards Survey round 7 (GLSS7) and multinomial probit regression as an estimation model, found that financial inclusion reduces the likelihood of households adopting burning, open dumping, and indiscriminate waste disposal methods. On the contrary, a lack of financial inclusion may result in households opting for these methods of waste disposal. The authors concluded that financial inclusion is necessary for households to opt for healthy waste disposal methods such as collection.

Adzawla et al. 2019 used the multinomial logit approach to examine whether socio-economic factors influence households' decision to adopt a specific solid waste disposal system. The findings demonstrated that a number of the hypothesised socio-economic factors motivate households to use a specific solid waste disposal system. They found that socio-economic factors, including education, location, gender, and income levels, influence solid waste disposal methods. They, however, concluded "that solid waste disposal at unapproved places was largely influenced by socio-economic characteristics other than income or welfare of households" (Adzawla et al., 2019, p. 57). For them, while income levels are important, the level of education and awareness about the need for proper waste management are most important in addressing improper disposal of solid waste in Ghana.

Afriyie (2020), conducted an economic analysis of the factors that contribute to poor solid waste management practices and underpayment for such services in Ghana, drawing on information from the seventh round of the Ghana Living Standards Survey (GLSS7). The research used a utility theory framework and the logistic regression technique. The results showed that the location, wealth status, kind of dwelling, and

occupancy status of a household all play a role in whether or not solid waste is disposed of properly.

In terms of gender, it is important to understand that within the Ghanaian context, female headed households pose less of a challenge when it comes to proper solid waste management. On the contrary, male headed households appear to face challenges with waste management as they engage in more inappropriate waste disposal methods (Adzawla et al., 2019; Immurana et al., 2022). The improper handling of waste among male headed households appears to be related to the sociocultural context, where females are traditionally tasked with household duties including waste management.

2.6.2 The Role of Population Growth and Urbanisation in Waste Management

According to Lissah et al. 2021, one of the obstacles to waste management in Ghana is accelerated urbanisation and a growing population. The capacity of local authorities to manage and dispose of waste in a sanitary manner has been exceeded as a result of these two occurrences in Ghana's main urban areas. From the perspectives and experiences of municipal waste company managers and supervisors in the Ho municipality of Ghana, for example, they discovered that organisational capacity, resources, and expertise; community factors such as socio-cultural beliefs and a low sense of responsibility towards solid waste management among urban residents; and contextual factors such as regulations and lax enforcement of same influence an organisation's waste management practices. They noted that “policy frameworks and procedures implemented to curb poor urban waste management practices should be systematic and thorough in order to tackle the issue of solid waste in the study setting and Ghana in general” (Lissah et al., 2021, p. 1). The authors further observed that the “nature of the identified issues and challenges

requires multidimensional and multilevel interventions to provide sustainable solutions for managing urban waste in Ghana” (Lissah et al., 2021, p. 1).

The above findings highlight the role of an effective institutional and legal frameworks for waste management in Ghana. Lissah et al. (2021) discovered that the waste management challenge in Ghana is multifaceted involving the role played by the people and culture in waste management. Thus, any waste management system that ignores the human aspect of any element of waste management may be ineffective in addressing the waste management challenges of the society in which it is being implemented.

2.6.3 Financial and Technical Constraints

According to Addaney & Oppong (2015), the main challenges to solid waste management in Ghana are the low level of technical and financial capacity of various actors within the waste management system, particularly households. They also point to the absence of a coordinative framework for solid waste management as impeding waste management. In addition, institutions within MMDAs are ill-resourced to undertake the task of effective waste management. They pointed out that “achieving sustainable solid waste management largely depends on these critical factors: effective and relevant legal framework; institutional strengthening and capacity building for the private sector as well as the implementation of cost recovery regimes. Others include development of sound partnerships with the private sector, waste reduction and mainstreaming of recycling activities” (Addaney & Oppong, 2015, p.30). The findings of Addaney & Oppong (2015) highlight the institutional and legal challenges to waste management in Ghana. It reveals that the challenges to waste management are not only socio-economic in nature, but also a matter of inadequate or lack of a proper legislative and institutional

frameworks for effective management of solid waste. Although Addaney and Oppong (2015) studied the entire solid waste management system in Ghana, the findings are relevant to the instant study as it seeks to focus on landfill management and the legislative framework underpinning the same in Ghana.

2.6.4 Public Awareness and Involvement

According to Douthett et al. (2017), factors that negatively impact waste management in Ghana include an insufficient supply of waste collection bins, the presence of a feeble waste transportation system, and a low reliance on door-to-door collection. Lack of public awareness and the absence of an inclusive approach to waste management has led to the indiscriminate disposal of waste by individuals who believe that waste management is the sole responsibility of the local government (Douthett et al., 2017). The issue of lack of participation of residents in waste management is important to this study. Waste management, particularly landfill management affects people and is influenced by people. The focus of the current study is to understand the level of engagement of residents around landfill sites in the management of the landfill and how they adapt to decommissioning. In this regard, this research builds on participation, to understand how residents in landfill areas adapt to decommissioning (Douthett et al., 2017). The approach adopted here is more centred on landfill areas rather than the generic solid waste management system.

From the foregoing, it is evident that solid waste management in Ghana is confronted with many socio-economic challenges. One of the major challenges to solid waste management is low incomes or poverty (Twumasi & Akwasi, 2014; Douthett et al., 2017). Waste collection charges drive poor households into improper disposal of waste. At the

same time, limited resources have adversely affected the ability of waste management companies to effectively undertake their duties. (Twumasi & Akwasi, 2014; Douth et al., 2017). As aptly stated by Douth et al., 2017, p. 495 “waste management institutions were faced with financial difficulties, understaffing and poor logistics and nature of roads, and social constraints”. Without proper funding, waste management cannot be effective.

2.6.5 Importance of Landfills in Solid Waste Management

Landfills remain an unavoidable component of the solid waste management system. Various reasons account for the continuous relevance of landfills. Despite the European Union's (EU) emphasis on recycling and other methods within the waste framework directive, landfills will continue to play an essential role in modern waste management (Zuser et al., 2011). Two important issues support the relevance of landfills in contemporary waste management. Foremost, the use of landfills as a sink for hazardous substances whose use or recycling is currently not feasible; and secondly, the use of landfills as temporary storage for secondary raw materials that cannot be recycled due to economic or technological limitations (Zuser et al., 2011).

Vaverková (2019) also stated that regardless of efforts to promote waste prevention, reuse and recycling, “there will always be a role for landfills in a waste management system...” (Vaverková 2019, p. 8). He advanced three main reasons why landfills would remain relevant in waste management. First, he observed that landfills represent the sole option for disposing of waste that cannot be prevented, reused, or recycled for various reasons. Thus, if all options for waste management and disposal fail, landfills become the only available option. As he put it “there are some types of waste for which landfill

is the best waste management option” (Vaverková 2019, p. 8). Secondly, treatment of waste by other methods produces residues, which cannot be addressed through any other waste disposal method except landfills. This makes landfills the ultimate waste disposal method. Thirdly, landfills may “provide a safety net for other waste management operations, which may encounter a (temporary) lack of capacity” (Vaverková 2019, p. 8). He further stated that “landfill is a valuable and essential element of any integrated waste management system, and should be recognised as such. A society striving for sustainable development needs sustainable methods of landfilling” (Vaverková 2019, p. 8).

In developing nations, landfills are regarded as the ultimate waste disposal method (Agamuthu, 2013). The relevance of landfills in solid waste management does not disappear due to the availability of other waste disposal methods, such as recycling. According to Agamuthu (2013), one of the reasons landfilling remains important in the developing world is due to its relatively lower cost of management. Thus, in many developing countries where financial constraints have affected the ability to adopt other waste disposal methods, landfills remain the main waste disposal option. In Ghana, the situation is no different; landfills are the most common form of solid waste disposal due to their lower maintenance cost and convenience (Kusi et al., 2016; Environmental Protection Agency, 2002).

Regardless of the adoption of waste prevention and recycling methods, aimed at reducing the amount of waste generation and treatment, landfilling is an integral part of any effective waste management system. It is important to understand the negative effects of landfills and adopt measures to address them instead of hoping that other

methods will displace landfills. In Ghana and other developing nations, the cost of adopting alternative waste disposal methods and the technology requirements of such methods imply that landfilling, both open dumps and sanitary landfills, would continue to be the main waste disposal methods.

In addition, in many rural areas where organic waste is generated in very small quantities, waste disposal by landfill and other less sophisticated methods poses little threat to the environment and people (Miezah et al., 2015). Within this context, landfill management in urban areas must be of interest to stakeholders. Indeed, many of the studies on landfill management in developing nations are more concerned with adopting sustainable practices. Advocates of recycling and waste reduction recognise either explicitly or implicitly that landfilling is an unavoidable part of any modern solid waste management system. (Maheshwar & Deswal, 2017; Addaney & Oppong, 2015).

2.6.6 Overview of Landfill Management in Ghana

Landfills remain the most common method of solid waste disposal in Ghana (Kusi et al., 2016). However, majority of the landfills in Ghana are not sanitary or engineered landfills. Most landfills are excavated mining and abandoned quarry sites (Kusi et al., 2016). Thus, many of the landfills in Ghana are better described as open dumps.

Kusi et al. (2016) provide a detailed discussion on the landfill management practices in three of Ghana's landfills; Kpone, Abokobi, and Nkonfoa landfills. Their findings were discussed under five major sub-headings. Types of equipment; waste reception; waste disposal; general site management and control; and operational cost. They found that in terms of equipment, "landfill equipment and vehicles available for operations include

bulldozers, excavators, landfill compactors, pick-up trucks, and tipper trucks. Bulldozers were used for pushing and levelling waste. The excavating of cover materials and subsequent transporting to the working face were done by excavators and tipper trucks. The pickups serve as operational vehicles” (Kusi et al., 2016, p. 23). However, not all three landfills had enough equipment. The Nkanfoa landfill had no permanent operational vehicle, while the Kpone landfill had the highest number of pieces of equipment. The better equipment of the Kpone landfill was attributed to the large volumes of waste deposited at the site (Kusi et al., 2016).

Kusi et al. (2016) found that only the Kpone landfill site had a controlled fenced gate for refuse reception. Abokobi and Nkanfoa lacked appropriate gated entrances. In addition, three landfills were discovered to have signages at the entrance indicating the type of waste accepted, the tipping fees charged, name of the landfill and the operating hours. In addition, only the Kpone landfill had a scale house for recording details of each load. However, there was no practice of waste segregation before dumping in any of the three landfills. The primary and secondary access roads leading to the Kpone landfill were gravelled, providing good traction for the waste trucks. This provides better access to the Kpone landfills than the other two. Thus, the Kpone landfill had a better waste reception setup than the other two sites.

For waste disposal, Kusi et al. (2016) observed that after trucks deposit the loads, the waste is levelled and compacted using bulldozers and landfill compactors. At the Kpone landfill, the daily deposited waste is covered with sand. Under general site management, they found that the Kpone landfill had a better dust control and litter management system that reduced dust and litter as compared to the other two. At the Kpone landfill,

leachate was controlled by an underground pipe drainage system connected to drain compartments at the base of the cells and a pumping machine, whereas at the Abokobi landfill, there was a drainage system. The dumpsite in Nkanfoa lacked adequate drainage and effluent control. Again, it was discovered that only the Kpone landfill had a gas extraction facility, which consisted of High-Density Polyethylene (HDPE) pipelines inserted into Gibeon cages. While scavenging occurred in all landfills, it was better managed in the Kpone landfills, where scavengers were registered and monitored to a certain extent. The Kpone landfill's subterranean water was monitored annually, whereas the other two landfills were not monitored. In terms of operational cost, the study found that the cost of equipment is the highest among the operational costs of landfills (Kusi et al., 2016).

Owusu-Nimo et al. (2019) conducted another study on landfill management in Ghana at the Oti landfill in the Kumasi Metropolis. They noted that “landfill facility consists of a weighing bridge (not operational at the time of study) and guard house, an office building, waste cells, septage treatment pond system, and workshop/yard” (Owusu-Nimo et al., 2019, p.2). According to the Authors, prior to the arrival of trucks at the landfill in the morning, a number of tasks are performed, including maintenance of compactor, equipment, fuelling, preparation of working face of the unloading areas, and cleaning of roads. The equipment used at the site includes landfill compactors, dozers, tipper trucks, water carts, road graders, excavators, and a utility vehicle. Solid waste deposited is compacted using a dozer and a compactor. Scavenging is also permitted at the site and the deposited waste is spread and compacted using compactors.

The end products of degradation are leachate and gases (Danthurebandura et al., 2012). These leachates and gases are pollutants that negatively affect the land, soil, water bodies, and plants, as well as pose environmental health threats to human beings (Environmental Protection Authority, 2016). Apart from leachate and gas, a typical landfill produces wind-blown litter, noises, dust, vermin, and insects that threaten human well-being (Oteng-Ababio, 2011).

2.6.7 Health, Environmental and Socio- Economic Impacts of Landfills in Ghana

2.6.7.1 Health Impacts

Landfills have considerable health implications, primarily due to pollutants generated throughout their active life. Studies have consistently shown a negative correlation between proximity to landfills and human health. Njoku et al. (2019) found that residents living near landfills (100-500 m) reported higher instances of air quality-related ailments such as influenza, eye irritation, and general body weakness compared to those living farther away (1-2 km). Over 56% of nearby residents expressed concerns about long-term health effects, often driven by fear and psychological stress.

Similarly, Mataloni et al. (2016), through a large cohort study involving over 240,000 participants in proximity (within 5 km) to landfills, found a strong association between exposure to Hydrogen Sulphide and increased mortality due to lung cancer and respiratory diseases. Children aged 0-14 were particularly vulnerable, with increased hospitalisations for acute respiratory infections. Further evidence from South Africa by Tomita et al. (2020) linked landfill proximity with asthma, tuberculosis, diabetes, and depression. These effects were statistically significant even after controlling for socio-economic variables, highlighting landfill exposure as an independent risk factor.

In Dhaka, Urme et al. (2021) identified common health complaints such as diarrhoea, pneumonia, headaches, and loss of appetite among residents near landfills. Likewise, Dolk et al. (1998) associated proximity to hazardous landfills with increased birth defects, notably neural tube anomalies and vascular malformations, within a 7-km radius. In Ghana, Iddrisu & Debrah (2021) highlighted the health risks of poor landfill management in the Sagnarigu Municipality. Common conditions included cardiovascular issues, respiratory infections, and waterborne diseases such as typhoid.

Educational background played a mediating role; individuals with no formal education reported higher illness rates compared to those with some level of education, contrary to Tomita et al. (2020), who found socio-economic factors to be insignificant. Nuripuh et al. (2022) reported that landfill scavengers at Gbalahi perceived themselves immune to “dirt diseases,” prioritising economic survival over health concerns. This underscores the role of behavioural adaptation in mediating health outcomes. However, Vrijheid (2000) cautioned that many reported health effects may be influenced by perception, stress, or reporting bias. While acknowledging increased reports of symptoms like fatigue and headaches near landfills, he maintained that any causal connections remain speculative pending more detailed and carefully designed epidemiological and toxicological studies.

2.6.7.2 Environmental Impacts

Landfills are a significant source of environmental pollution, affecting air, water, and land. Leachate, rich in heavy metals, organic compounds, and other toxins can contaminate soil and water sources (Danthurebandara et al., 2013). Air pollution results

from methane and carbon dioxide emissions, which contribute to climate change and degrade air quality (Njoku et al., 2019; Iravanian & Ravari, 2020).

Studies in Ghana highlight localised impacts. Odonkor and Mahami (2020) found significantly higher airborne bacterial and fungal counts near Accra landfills, with pathogens such as *Staphylococcus aureus*, *E. coli*, and *Aspergillus niger* present. Similarly, Osei et al. (2011) noted nuisances like odour, vermin, and leachate runoff into the Densu wetland from the Oblogo landfill.

The cumulative environmental impact is long-lasting. Iravanian & Ravari (2020) observed that landfills continue to pollute ecosystems well after closure, requiring long-term remediation plans. Landfills account for 20% of global anthropogenic methane emissions (Danthurebandara et al., 2012), reinforcing their role in climate change.

2.6.7.3 Socio-economic Impacts

Landfills also produce significant socio-economic consequences. Communities near landfills often express dissatisfaction with their location due to noise, odour, vermin, and increased truck traffic (Taylor, 1999; Njoku et al., 2019). This can lead to reduced community satisfaction and increased resistance to landfill projects (Sasao, 2004; Lober & Green, 1994).

Property values near landfills tend to decline, although findings are mixed. Some studies report clear depreciation (Ready, 2005; Ofori, 2021), while others find no correlation or even positive impacts where landfills are used for energy generation (Mundy, 1992; Owusu-Sekyere, 2018). In energy-repurposed landfills, methane can be captured and

converted into renewable energy, generating employment and raising property values (Ofori, 2021). These effects may vary by location. In rural or low-value property markets, landfills may have negligible economic impact (Reichert et al., 1992; Owusu et al., 2014). Beyond property values, the impact on informal economic activities such as petty trading, hawking, and farming is an area requiring further research.

2.7 Adaptation by Residents in Landfill Areas

Residents near landfills are perhaps the major stakeholders in landfill management. The landfill's presence affects their daily lives, and their actions also have an impact on landfill management. However, generally, the adaptation behaviour of residents in landfill areas appears to be hardly studied.

A major review of literature on the attitudes of residents towards landfills by Zhang & Klenosky (2016), revealed changing attitudes throughout various stages of landfill management. In general, residents oppose the construction of landfills, whereas existing facilities may raise their concerns. Concerns typically revolve around the operational, traffic, environmental, economic, psychological, and physical impacts of landfills. Residents will continue to oppose the placement of landfills in their communities if the government does not address the perceived negative effects of landfills. Zhang and Klenosky, (2016) pointed out that residents' attitudes towards landfills could shift positively when they witness concerted efforts to address their concerns. This implies a potential change in residents' perceptions of landfills over time.

Elliot et al. (1997) found evidence of residents' cognitive reappraisal of landfills in a longitudinal study. The psychosocial effects on a population residing near the Halton

Regional Landfill in Milton, Ontario, were evaluated over a five-year period. A random stratified (by distance) sample of households was contacted via telephone immediately after the landfill site was approved (1990), shortly after the site was constructed and began operations (1992-93), and two years after the site began operations (1995). They discovered that while 50 percent of the 1995 respondent group remained concerned, another 40 percent had adapted to the facility or were at least resigned to it. They claim that the design and operation of the landfill, which were influenced by the concerns raised by locals during the environmental assessment process, may be responsible for this shift in attitude. This implies that incorporating residents' concerns into landfill design and management is important to residents' adaptation to the landfill. It is therefore useful to investigate how resident concerns are incorporated into landfill decommissioning and how citizens adapt to decommissioning.

Education was identified by Njoku et al. (2019) as a significant variable in residents' adaptation to the health effects of landfills. Educated individuals are able to adapt to the environment of a landfill by reducing their exposure (Njoku et al., 2019). Thus, various socio-economic and cultural variables may influence how residents adapt to landfills and the decommissioning of landfills. According to Nuripuh et al. (2022), economic factors have the greatest influence on scavenger behaviour in landfills. Thus, socio-economic and cultural factors cannot be discounted as influencing adaptation.

2.8 Conceptual Framework for Integrated Sustainable Landfill Management

This study introduces the Integrated Sustainable Landfill Management (ISLM) as an extension of the theory of Integrated Sustainable Waste Management (ISWM). The theory proceeds from the understanding that the challenges facing landfill management

are not purely technical and financial. On the contrary, landfill management, like waste management in general, takes place within a complex environment with various stakeholders, institutions, and interests that need to be integrated into any discourse on landfills. In extending ISWM to ISLM, there is the specific focus on the management of landfill sites within the broader context of sustainable waste management. Landfills are a critical component of waste management systems, and their effective management is essential for minimising environmental pollution, protecting public health, and ensuring long-term sustainability. Thus, the conceptual framework is the application of ISWM to landfill management. Consequently, the six main elements of ISWM are an integral part of the concept.

Environmental aspects, highlight the importance of mitigating the impact of landfills on land, water, air, and public health through measures such as proper site selection, waste compaction, and leachate treatment.

Political and legal aspects address the regulatory framework governing landfill management, ensuring compliance with environmental regulations and promoting transparency and accountability in decision-making processes.

Institutional aspects, focus on the organisational structures and governance mechanisms involved in landfill management, including stakeholder engagement and collaboration.

Socio-cultural aspects recognise the role of culture and community behaviour in shaping attitudes towards landfill management, emphasising the importance of community participation and awareness-raising initiatives.

Financial-economic aspects consider the financial implications of landfill management, including budgeting, cost accounting, and the economic impact of landfills on local economies. Finally, *technical and performance aspects* encompass the practical

implementation and maintenance of landfill infrastructure, ensuring effective waste containment and pollution control measures.

By integrating these elements into the concept of ISLM the study developed a holistic approach to landfill management that addresses the multifaceted challenges and opportunities associated with sustainable waste management practices.

As depicted in Figure 2.2, landfill management commences with the decision to locate a landfill. The design and construction of the landfill then follows. When the first solid waste is deposited, operations commence, and they conclude when the last is deposited. When the landfill reaches a point where it is no longer cost-effective or capable of absorbing additional waste, the decision will be made to close or decommission it. The landfill must be monitored and maintained after its closure because it poses numerous health and environmental risks. When the former landfill is no longer deemed hazardous to human health or the environment, the next step is to reintegrate it into the surrounding land.

Throughout all of these stages or processes, the decisions made by landfill managers are influenced by a variety of factors, such as availability of resources, economics, technology, legal and political frameworks, institutional factors, and the social factors and dynamics of the local population. These factors reflect the environmental, social, and economic dimensions that are directly related to the quality of life of residents of Kpone Kokompe, as examined in Objectives 1 and 2 of this study. Furthermore, the processes of closure and post-closure management often involve the implementation of adaptation strategies by both managers and residents in response to changing

environmental and socio-economic conditions, strategies whose impact on residents' welfare is central to Objective 2. Therefore, landfill management and decommissioning are affected by, inter alia, their natural, human, economic, and technological

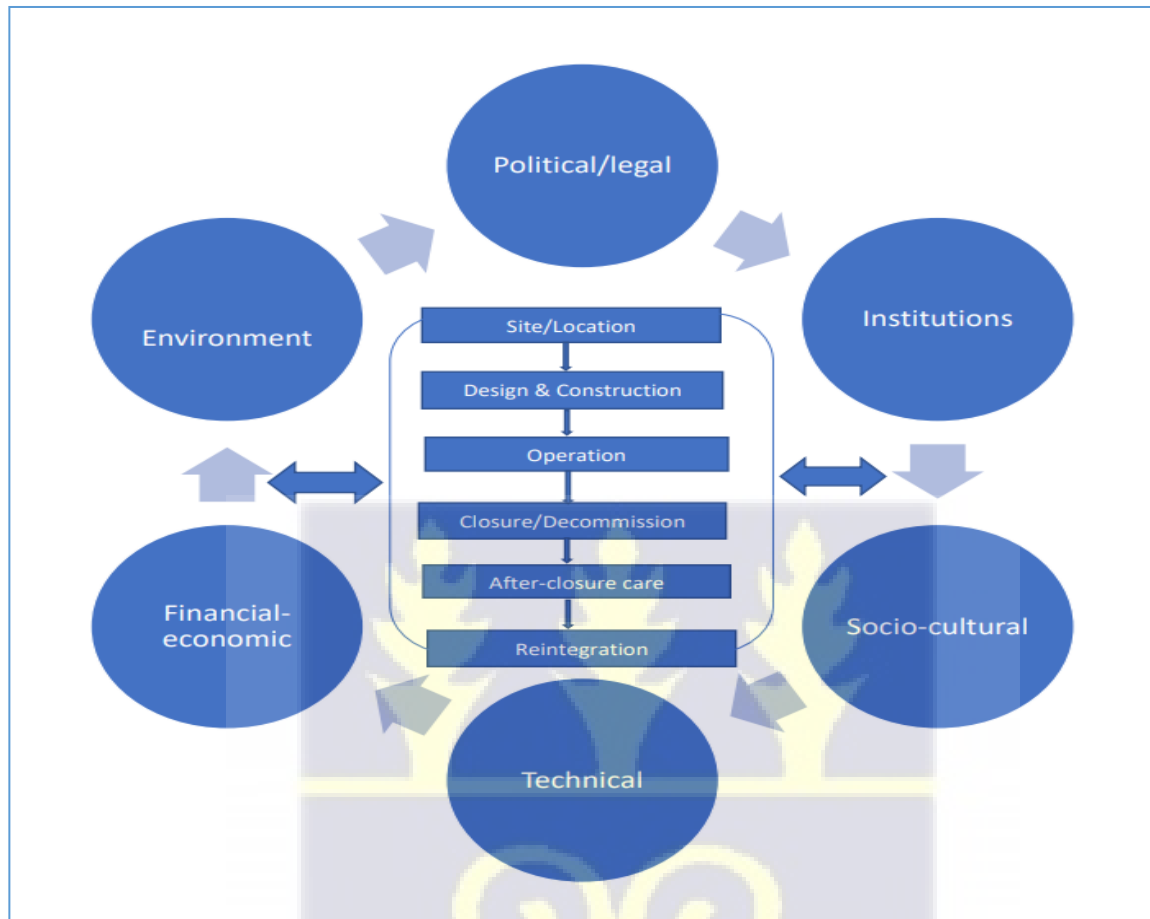


Figure 2. 3: Conceptual Framework: Integrated Sustainable Landfill Management
Source: Modified version of Integrated Sustainable Solid Waste Management, V&an Klundert and Ansch&utz (2001).

environments. To comprehend any of the stages or processes involved in landfill management, it is necessary to adopt an all-inclusive framework such as the ISLM that permits an examination of the various influences on landfill decisions and practices and how landfills interact with the socio-economic, sociocultural, and environmental variables in their environment. In addition, it is essential to comprehend how the various influences on landfill management decisions and processes interact with one another.

2.9 Chapter Summary

This chapter reviewed the existing literature on landfill management and the legal and institutional frameworks which appertain to landfill management in Ghana. Landfills are sites designated for the safe and effective disposal of solid waste. The key points highlighted in the chapter were a review of related concepts (waste management, solid waste management, landfills and landfill management, and adaptation), a theoretical and conceptual framework (Integrated Sustainable Solid Waste Management, institutional theory, and protection motivation theory), and a review of empirical literature.



CHAPTER THREE

METHODOLOGY

3.0 Introduction

The chapter commenced with an overview of the study area and research philosophy, followed by discussions on research design and methodology. Data sources, sampling procedures, and instruments utilised for data collection, along with details on sample size, sampling strategy, and data collection methods, are presented subsequently. Methods of analysis are then elaborated upon, detailing the techniques employed for analysing the gathered data. The chapter concludes with a discussion on the validity and reliability of the study.

3.1 Study Location: Kpone Kokompe

Kpone Kokompe as shown in Figure 3.1 is located within the Kpone Katamanso Municipal Assembly (KKMA) in the Greater Accra Region, extending from the coast to the southern lower slopes of the Akuapem mountains. It is located at latitude 50° 40' N and a longitude of 4° 0' E. The municipality shares borders with the Southern Belt's eastern, western, and southern belts, with the Ningo-Prampram District to the south-east, the Tema Metropolitan Assembly to the south-west, and the Gulf of Guinea to the south (GSS,2022). Along the highway, KKMA's southern border with Ningo-Prampram District, Ashaiman Municipal Assembly, and Adentan Municipal Assembly is located in the Middle Belt. On the Northern Belt, it shares its northern border with Shai-Osudoku District, La-Nkwantanang-Madina Municipal Assembly and Akwapim South District. KKMA is about 38 kilometres away from Accra, the capital city of Ghana, and falls on longitude of 4° 0' E and a latitude of 50° 40' 60" N. (KKMA Composite Budget, 2019). Figure 3.1 represents Kpone Kokompe in the municipal, regional and the national

context. Prior to its decommissioning in 2020, the Kpone Kokompe landfill was the largest engineered landfill in Ghana (AMA, 2020).

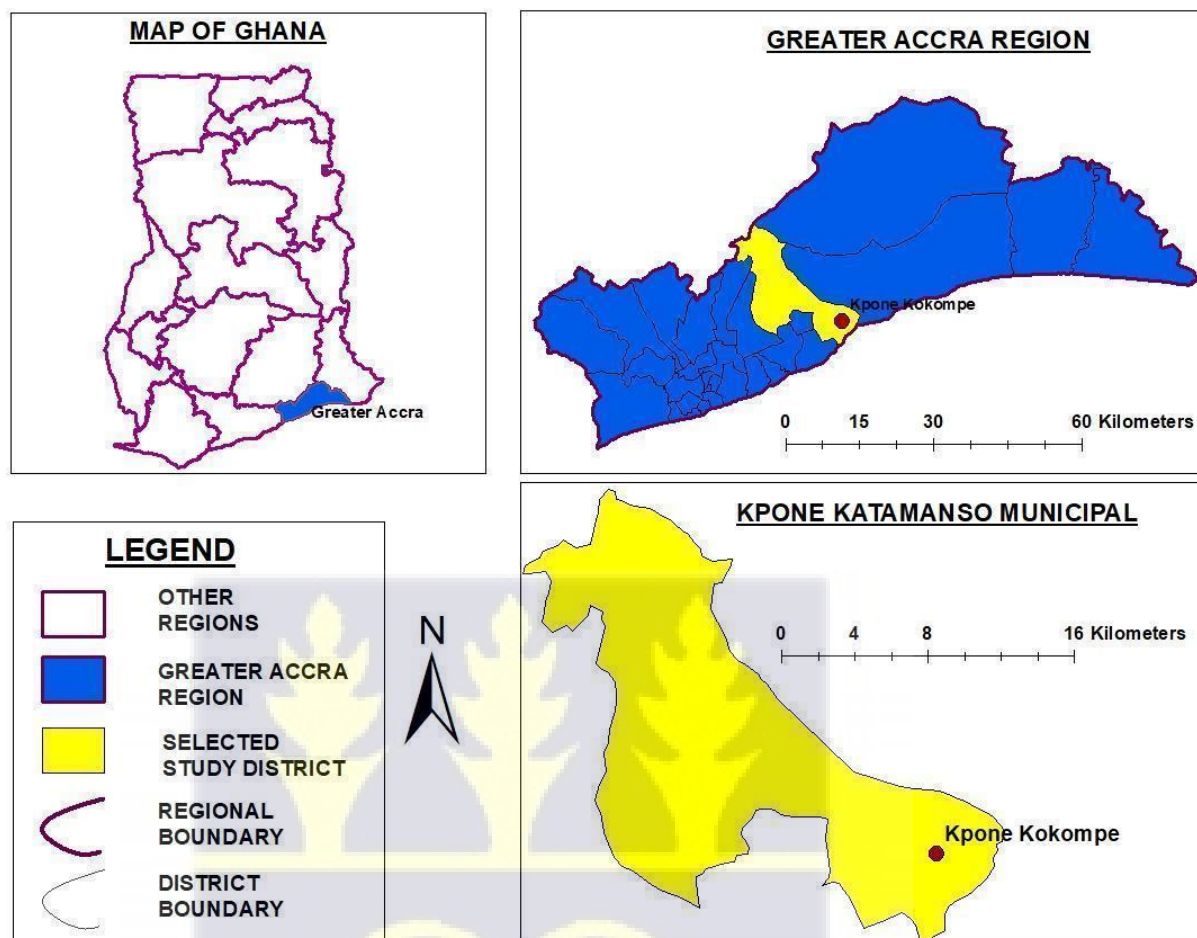


Figure 3. 1: Map of Kpone Kokompe

Source: Author's Construct (2023)

3.1.1 Population of Kpone Kokompe

From a population of 114,617 in 2010, the population of Kpone Katamanso had more than tripled to 417,334 in 2021 (GSS 2012, 2022). The population of Kpone Kokompe is 20,968 (KKMA Statistics Department, 2022). Kpone Kokompe shares a boundary with the town known as Kpone. Kpone Kokompe was specifically established to repair faulty cars from various industries in the Tema Industrial Area, which is how it got its name 'Kokompe'. The dominant economic activities are fitting of cars, factory or industrial workers and waste picking. Kpone Kokompe also has the biggest cemetery in

the municipality. Just like the other major municipalities in Ghana, Kpone Katamanso is a highly urbanised district with about 95% of the population living in urban localities (GSS, 2021).

3.1.2 Sanitation

3.1.2.1 Liquid Waste

The KKMA is responsible for ensuring the proper disposal of liquid waste within the municipality. It does so through its environmental health and sanitation unit and the refuse management division of the Tema Metropolitan Assembly (TMA), as the Kpone Katamanso Municipal Assembly has not yet established its own waste management division. Kpone Kokompe has two landfills and until the decommissioning, one of the landfills was the largest engineered landfill in Ghana. According to the Population and Housing Census of 2021, more than half (51%) of the municipality's households lack domestic sanitation facilities. About 24 percent of these households engage in open defecation, while 27.1 percent use public restrooms. There are currently 64 commercial toilet facilities in the municipality, 51 of which are privately owned and 13 of which were either erected by the Assembly or under the 1996 Heavily Indebted Poor Countries (HIPC) project. In order to resolve the issues, the Assembly is raising awareness and promoting household toilet ownership through the GAMA Project. As one of the prerequisites for approval, all proposed building plans must include provisions for sanitary facilities. Before being considered, all motor vehicle stations and markets project proposals must include provisions for lavatory facilities. One of the measures adopted to resolve sanitation in the district is the prevention of slum communities (KKMA Composite Budget, 2019).

3.1.2.2 Industrial and Liquid Wastes

Kpone Kokompe is home to a variety of heavy and light industries, it is necessary to dispose of the diverse types of waste these industries generate in a safe manner. The ‘Kokompe’ light industrial area of the municipality is home to car spraying, welding, fitting, and vulcanizing specialists. Although these industrial activities are modest in scale, they have provided training and employment opportunities for some of the region’s youth. There are also a large number of squatters and factory workers in the area. A significant number of these industries have acquired communal containers for the storage of their solid refuse prior to its transportation to a landfill by waste management specialists designated by the municipality. Typically, the Assembly’s unit for environmental health and sanitation conducts periodic inspections to ensure precise compliance with environmental sanitation regulations. Again, the EPA has been effective in ensuring that these industries treat the vast majority of their refuse before releasing it into the environment. To safeguard the health of its citizens, the Assembly has enacted measures to ensure that all industries operating within its jurisdiction dispose of their waste responsibly (KKMA Composite Budget, 2021).

3.2 Philosophical Considerations

The philosophical considerations in a research study refer to the assumptions, beliefs, and values that guide the research process and influence its outcomes (Holden & Lynch, 2004). This includes ontology, which refers to the perceived reality of the research, and axiology, which refers to the values underlying the study (Saunders, Lewis, et al., 2019). Positivism and interpretivism are two important philosophical considerations (Aliyu et al., 2015). Positivism assumes that reality can be observed objectively, and that the researcher’s role should be minimised to achieve impartial results. Interpretivism, on the

other hand, acknowledges that reality is socially constructed and subjective, emphasising the significance of the researcher's interpretation and the shared meanings within a social context (Saunders et al., 2019).

Other philosophical considerations include critical realism, postmodernism, and pragmatism (Creswell, 2019). Critical realism investigates the social, political, cultural, and economic structures that influence societal phenomena (Sovacool et al., 2018). Postmodernism highlights the role of language and power relations in shaping marginalised voices and addresses societal development issues.

Pragmatism combines positivism and interpretivism, allowing subjective and objective views of reality to complement each other (Saunders et al., 2019). This research adopted a pragmatic philosophical perspective. Pragmatism combines subjective and objective perspectives in an effort to provide an all-encompassing understanding of reality that takes into account various aspects of the research problem (Rahi, 2017). The pragmatic research approach was selected for this study due to its strengths in real-world applicability, flexibility, mixed methods integration, stakeholder engagement, and problem-solving orientation. The research intends to contribute to practical developments, make suggestions and affect policy or decision-making processes.

3.3 Research Design

Research design refers to the framework or blueprint of a study that outlines the structure for data collection and analysis (Nayak & Singh, 2015). It ensures that research questions are answered convincingly and aims to gather valid, accurate, reliable, and

objective evidence (Kothari, 2004). There are three broad types of research designs: exploratory, descriptive, and explanatory (Nain & Kumar, 2020).

Exploratory research is conducted when little is known about a subject, serving as a feasibility study (Nain & Kumar, 2020). It begins with a literature review and may involve qualitative research to gain in-depth understanding and justify further studies (Pandey & Pandey, 2015). It can also establish baseline conditions for behaviour change or advocacy programmes through case studies or cross-sectional studies (Pawar, 2020).

Descriptive research design focuses on analysing the existing conditions of a phenomenon, such as relationships between variables, attitudes or living conditions (Salaria, 2012). Descriptive research can be observational, experimental, or survey-based, depending on the approach used to gather data (Ramadass & Aruni, 2019).

Explanatory research design refers to a study that elucidates the relationship between variables related to a phenomenon using rich narratives that provide in-depth understanding (Nayak & Singh, 2015). It uses rich narratives to provide in-depth understanding and may contribute to the development of grounded theory (Creswell, 2019). Further, the narratives from explanatory research can provide an understanding of the personal or actual experiences of people related to a subject, thus depicting a phenomenological study. Other examples of explanatory research design are case studies, ethnography, and archival studies (Creswell, 2014; Pandey & Pandey, 2015; Rahi, 2017).

This study adopted a sequential exploratory mixed method design, integrating qualitative and quantitative methods, focusing on the decommissioned landfill in Kpone Kokompe (Creswell, 2018). Adopting a case study approach, it delved into the social context, legal frameworks, and adaptation behaviour of residents' before and after the landfill decommissioning, aligning with the ISWM framework. According to Denscombe (2003), a case study as a research design provides an in-depth understanding of a particular phenomenon by studying the relationships and processes that define the case. A case study provides answers to specific research questions by collecting a range of different pieces of evidence from the case setting (Gillham, 2000). Through in-depth analysis and multiple data sources, the case study facilitated a thorough understanding of landfill decommissioning dynamics in Kpone Kokompe, aiding exploration and descriptive purposes.

3.4 Research Approach

The term research approach refers to the systematic collection and analysis of data to suit the research purpose. Quantitative research refers to the use of numerical data analysed using statistical or mathematical techniques to explain a phenomenon (De Vaus, 2001; Sukamolson, 2007; Williams, 2007; Rahi, 2017). The strength of quantitative research is not related to the use of numbers per se but to its ability to present the facts without the active involvement of the researcher (Sukamolson, 2007). Creswell (2014) argued that quantitative research presents the findings or results without the bias of the researcher through emotions, feelings and the environmental context. Qualitative research, on the other hand, refers to the use of texts or narratives to provide an in-depth understanding of the situation under study (Creswell, 2014).

The strength of qualitative research is inherent in the role of the researcher as an instrument of research to ensure quality data is gathered so as to provide an in-depth understanding of the subject of research, taking into consideration the environmental settings (Pandey & Pandey, 2015). Mixed research refers to the combination of both quantitative and qualitative research approaches in order to trade off the weaknesses of these approaches. A mixed-methods approach offers a deeper understanding of research findings, surpassing the insights gained from using either a qualitative or quantitative approach alone (Creswell, 2014). The mixed method leverages the advantages or strengths of both qualitative and quantitative research approaches.

This study employed a mixed research method as it made use of both quantitative and qualitative data. Thereafter, the data collected from the different sources was verified and triangulated to ascertain whether or not it truly captured the relevant features of the decommissioned Kpone Kokompe landfill. The nature of the study on the decommissioned landfill at Kpone Kokompe required the collection and analysis of both qualitative and quantitative data from different sources since no single method could effectively capture all the requirements of the study and ensured that the research questions were explored from different perspectives, which could lead to a broader understanding of landfill decommissioning. Azorin and Cameron (2010) argue that the verification capacity of using mixed research enhances the validity, objectivity and reliability of a study. This aided in the identification and analysis of contradictions as well as ensuring complementary results.

3.4.1 Sources of Data

There are two (2) types of data sources, namely, primary and secondary sources. Primary data refers to the data collected for the first time and purposively for the research; thus, the researcher originates the data for the first time (Church, 2001; Boslaugh, 2007; Ajayi, 2017). Secondary data refers to the data that has already been collected and used for other purposes other than the current study; thus, in this case, the researcher is not the originator of the data (Church, 2001; Boslaugh, 2007; Ajayi, 2017). The researcher only uses the data if it suits the theme of his or her study. This makes secondary data collection economical compared to primary data collection since the collection of primary data is time-consuming and expensive (Boslaugh, 2007).

The study employed both primary and secondary data sources. Primary data was collected using survey-structured questionnaires and interview guides designed specifically to achieve the research objectives whereas secondary data was sourced from various articles, policy documents, reports among others.

3.5 Sampling Procedure

The sampling procedure involved three cohorts of participants, namely, households in Kpone Kokompe and respondents sourced from both governmental agencies and private companies who were directly involved in the Kpone Kokompe landfill decommissioning.

3.5.1 Sampling Procedure and Sample Size for Quantitative Survey

The population of a study is made up of the observable units with similar characteristics that are of interest to particular research (Salaria, 2012). It refers to the units or items

with some identified characteristics that are of interest to a study (Sekaran, 2003; Kothari, 2004). The population of a study may refer to the number of people in a particular geographical area or to some people with some identified characteristic. It may also be objects or non-human items like trees, animals, etc. The Kpone Katamanso Municipality has a population of 417,334 (Ghana Statistical Service (GSS 2021). However, the total number of households in the Kpone Kokompe community is 5242 (KKMA Statistics Department, 2022). This study was based on the household population of Kpone Kokompe.

The process of selecting the sample is therefore referred to as sampling (Salaria, 2012). The population of this study is composed of persons who had lived in and around the Kpone Kokompe landfill before or during the operation of the landfill (that is any time before the year 2018) and who still resided in the area after the decommissioning (that is in the year 2023 when data was collected). The five-year period (2018-2023) was selected because it captures the period immediately before and after the landfill decommissioning in Kpone Kokompe. It represents a meaningful span of time during which residents could reasonably observe and assess changes in their environmental, social, and economic circumstances resulting from the decommissioning. Similar timeframes have been used in prior empirical research assessing the medium-term impacts of environmental policy changes (e.g., Shanahan et al., 2019; Capobianco et al., 2022). Moreover, the selection of this period aligns with practical considerations in field research, allowing respondents to recall changes without excessive reliance on long-term memory.

To estimate the sample size for questionnaire administration, the study adopted Slovin's formula for estimating a representative sample when the population is finite or known (Slovin, 1960). The study computes the minimum sample size required for accuracy in estimating proportions by considering the margin of error set at 5%. The formula is as follows:

$$\text{Sample Size (n)} = N / (1 + N * e^2)$$

Where:

N is the population size

e is the desired margin of error (expressed as a proportion)

$$n = 5242 / (1 + 5242 * 0.05^2)$$

$$n = 372.04$$

This study assumed 10 percent non-sampling responses. This meant that there was the likelihood of about 37 participants not responding to the questionnaire (Dillman et al., 2014). Therefore, the sample size for administering the questionnaire was set at 410 households.

3.5.1.1 Sampling Frame

To establish a thorough sampling frame, an extensive listing exercise was conducted within the locality encompassing all households. This process involved selecting enumeration areas (EAs) from the list of EAs utilised by the Ghana Statistical Service (GSS) for Ghana's 2021 Population and Housing Census. Using the existing enumeration areas from the Census, ensured a wide coverage of households within the locality, establishing a thorough sampling frame for the study (GSS, 2021).

3.5.1.2 Sampling Criteria

The sampling inclusion criteria involved any adult (18 years and above) resident who lived in Kpone Kokompe during the active or operational years of the landfill and has continued to live there (before and after decommissioning i.e. before 2018 and continued to live there in the year 2023). This facilitated the analysis of the first research objective, which sought to identify the social, economic and environmental factors influencing the decommissioning of the Kpone Kokompe landfill.

3.5.1.2.1 Sampling Technique

This study adopted the multistage sampling technique. Multistage sampling techniques involve using more than one probability sampling technique. In contrast to simple random and systematic sampling methods, this approach aimed to achieve a sample composition that closely corresponds to the research objectives, reflecting a heightened emphasis on respondent representativeness and the broader applicability of research findings Vandenbroek, (2021). The first stage involved cluster sampling, whereas the second stage involved stratified sampling.

3.5.1.2.2 Cluster Sampling

To ensure the selection of a representative sample from the population, the cluster sampling technique was employed. Using settlements within a 3 km range from the decommissioned landfill, five distinct clusters were identified. This range ensured that the sample included households experiencing different levels of impact from the landfill, thus providing an effective assessment of the effects of the landfill on the community. As depicted in Figure 3.2 the first cluster comprised households around IBF Ghana Company limited (approximately 2.52km from the landfill). The second cluster

comprised households towards the Majorie Estates area (1.920 km from landfill). The third comprised all households towards Vihamma Energy Tank Farms (1.362 km). The fourth cluster was the area towards the Goil Zonal Depot (1.58 km from landfill). The fifth cluster was the area around Kpone Kokompe MTN junction (1.57km from the landfill).

Two out of the five clusters were randomly chosen i.e., the cluster towards Vihamma Energy Tank Farms and the cluster towards IBF Ghana. The selection of the Vihamma Energy cluster (1.362 km) and the IBF Ghana cluster (2.52 km) provided a balanced representation of the community. These clusters were chosen to cover different directions and distances (the closest) and the farthest from the landfill, ensuring that the study captured a wide range of experiences and impacts related to the decommissioning.

At the end of the listing exercise, 400 households were established in the cluster known as Vihamma Energy Tank Farms (Section A) and 150 households in the cluster known as IBF Ghana (Section B). Listing the households allowed for the systematic identification and enumeration of potential participants within each cluster. This step ensured that all households in the designated areas were accounted for and had an equal chance of being included in the sample.

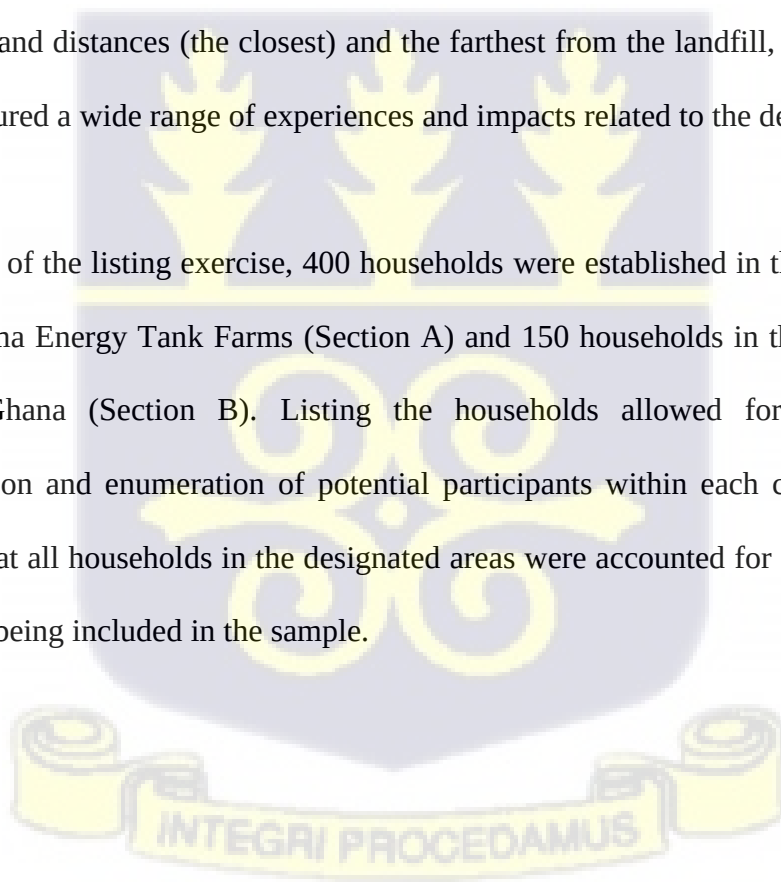




Figure 3. 2: Map of Clusters Around the Landfill Site
Source: Author's Construct (2023)

3.5.1.2.3 Stratified Sampling

Next, the proportional allocation technique in stratified sampling was applied based on the total number of households identified in the selected clusters. This technique ensured that each stratum within the clusters was proportionally represented in the sample. The formula for proportional allocation was used to determine the sample size for each stratum, considering the relative size of the stratum compared to the total number of households in the clusters.

The formula for proportional allocation is as follows:

Sample size for each stratum = (Number of households in the stratum / Total number of households in the clusters) * Total desired sample size.

Total desired sample size: 410

Number of households around Vihamma Energy Tank Farms, Section A: 400

Number of households in (IBF Ghana limited) Section B: 150

Sample size for Section A = $(400 / (400 + 150)) * 410$

Sample size for Section A = $(400 / 550) * 410$

Sample size for Vihamma Energy Tanks Farms, Section A ≈ 299

Sample size for Section B = $(150 / (400 + 150)) * 410$

Sample size for Section B = $(150 / 550) * 410$

Sample size for (IBF Ghana) Section B ≈ 111

Based on the proportional allocation formula, approximately 299 households were selected from Section A and approximately 111 households were selected from Section B, resulting in a total sample size of approximately 410 households for the study.

3.5.1.2.4 Selection of Respondents

Following the determination of sample sizes for each stratum, a simple random sampling approach was employed within each stratum. Each household within the stratum was assigned a unique identifier, and random selection methods, such as using a random number generator, were used to select the required number of households. Each household's identifier was systematically generated or assigned, and random numbers were used to select households from the list. The selected households were then verified to meet the inclusion criteria operation of the landfill (that is any time before the year 2018) and who still resided in the area after the decommissioning (that is in the year 2023 when data was collected) and documented for transparency. By employing simple random sampling, every household within the stratum had an equal chance of being

selected, minimising potential bias and ensuring a representative sample that accurately reflected the population's characteristics.

Table 3. 1: Determined Sample Sizes According to Selected Clusters

Cluster	Total No. of Households	Sample households
Vihamma Energy Tank Farms	400	299
IBF Ghana	150	111
Total		410

Source: Fieldwork (2023)

3.5.2 Sampling Techniques for Qualitative Study

The study employed the purposive sampling technique for the qualitative study because it required the use of expert knowledge in order to provide illuminating insights (Degu & Yigsaw, 2006). Qualitative data was obtained from the two (2) private companies involved in the decommissioning of the Kpone Kokompe landfill, namely: The managing director of Waste Landfills Ltd., formerly the landfill department of Zoom Lion Ghana Limited and the lead consultant of EAP Consult.

These key informants provided first-hand and expert insights into the practical aspects of the decommissioning and the regulatory regime that guided their work. One (1) person each from the Environmental Protection Agency (EPA), the Tema Metropolitan Assembly (TMA), and the Ministry of Sanitation and Water Resources (MSWR) were also interviewed. Respondents from the Kpone Katamanso Municipal Assembly (KKMA) were not included because the KKMA was yet to have a waste management department and had ceded those functions to the TMA as at the time of the research. As depicted in Appendix 1, the interviews focused on the role of central government institutions and local authorities in the decommissioning of the Kpone Kokompe landfill, as well as the effectiveness of the institutional and legislative frameworks and

policies governing the decommissioning practices used in the Kpone Kokompe landfill. Two other respondents, the president of the Kpone Waste Pickers Association and the Project Officer for Waste and Sanitation for Greater Accra Women in Informal Employment: Globalising and Organising (WIEGO), a non-governmental organisation that worked at the site during the decommissioning were also interviewed. The interviews with local residents concentrated on the challenges they encountered and the adaptation strategies they adopted, particularly those utilised by waste pickers.

Direct observation of the decommissioned landfill site at Kpone Kokompe and an active landfill site about 30 minutes' drive from the decommissioned landfill site were also employed. This provided an opportunity to observe at firsthand, the challenges faced by the residents and waste pickers in Kpone Kokompe. In addition, digital photographs were taken during the fieldwork.

3.5.3 Instruments for Data Collection

Data collection refers to the process of gathering evidence to help answer the research question (Kairuz et al., 2007). There are numerous data collection methods used in social science research. These include, the administration of questionnaires, interviews, observations and focus group discussions. The selection of data collection methods is contingent on the study's objective and methodology. In research, data collection is conducted on purpose using a tool or instrument that contains predetermined questions that guide and shape the response (Couper, 2011). Data collection is one of the most important aspects of any research project and must be planned at the outset (Couper, 2011). In other words, it is important to consider the type of data needed at the outset of a research project. Data collection instruments can be adopted, adapted or created.

When selecting an instrument, the researcher may rely on one that has been used by other researchers in the past, as appropriate for the objectives of the current study and accurately measures the relevant variables. Adapted research uses a questionnaire from a previous study but modifies the questions to meet the aims of the new study. However, Townsend et al. (2015) argued that it is necessary to design a new data collection instrument for every research project in order to ensure that specific responses are collected in order to answer the specific research questions. A household survey and key informant interviews were the two primary data collection methods utilised in this study.

3.5.3.1 Questionnaires

Questionnaires remain one of the main methods of data collection in social science research (Bowling, 2005). The use of questionnaires in research has the advantage of allowing large samples of quantitative data to be collected at a lower cost (Hartson & Pyla, 2012; Wagenaar, 2005). The study made use of household questionnaires in the collection of research data from the Kpone Kokompe community. The questionnaire as shown in Appendix 1 was administered to answer research objective one on the environmental, social and economic factors that existed prior to the decommissioning of the Kpone Kokompe landfill. Prior to the actual data collection, a pre-testing phase was conducted to ensure clarity of the questionnaire. Feedback from the pre-test participants was gathered and used to refine the questionnaire, ensuring that the wording, response options, and overall layout were appropriate and easily understandable (Smith, 2010). The questionnaires were administered by a team consisting of the researcher and five other research assistants (RAs) who were recruited and trained for the purpose. In order to ensure a maximum response rate and facilitate data entry, the questionnaires were uploaded on tablets. During the data collection process, the research team read out the

questions and recorded the derived responses from the respondents. This approach allowed for the immediate data collection on the spot and minimised errors or omissions in the responses (De Leeuw et al., 2018).

3.5.3.2 Interviews

Interviews are one of the main tools for data collection in qualitative research. Interviews are suitable when the goal of the research is to achieve a detailed understanding of issues within their natural socio-economic and cultural setting. It allows a researcher to assess the social world from the perspective of actors (Hannabuss, 1996). Interviews allow for deeper probes as compared to questionnaires since they permit open discussions between the interviewer and the interviewee (Creswell, 2019). The study employed key informant interviews. Thus, an interview guide with predetermined open-ended questions was developed to guide the interviews. Those selected for the interviews were initially contacted through phone calls, emails and visits to their locations. The researcher introduced the aim and importance of the research to the respondents and solicited their participation at the first contact. The date and time for the actual interviews were decided based on the availability of the interviewee. During the actual interview, permission was sought from the participants for them to be recorded. The researcher conducted all of the interviews face-to-face. Prior to the commencement of the actual interview, participants were assured of the confidentiality of the data collected and were made to understand that they could discontinue the process any time they felt uncomfortable with the line of questioning.

3.6 Data Analysis

3.6.1 Data Analysis for Quantitative Study

The study adopted a multifaceted approach to assess the environmental, economic and social determinants that impacted the decommissioning process of the Kpone Kokompe landfill. The Statistical Package for Social Sciences (SPSS) Version 26 and descriptive statistics such as frequencies and percentages were used to summarise the data and identify patterns to analyse the quantitative data. Descriptive statistics were employed to gain insights into the various environmental, economic and social factors influencing the decommissioning of the Kpone Kokompe landfill.

This study adopted a Probit regression model. This initial stage of the analysis allowed for a thorough understanding of the dataset. The determinants of the quality of life have been previously established in other studies (Roy et al., 2023; Shah et al., 2023). The analysis initially adjusts the individual factors, rendering them dimensionless and within the [0,1] range (Fu et al., 2019). The Principal Component Analysis (PCA) is among the most established and extensively used multivariate analysis methods for examining the relationship among factors (Nunnally & Bernstein, 1994). In this study, PCA was performed to generate normalised variable weights for preparing the synthetic index for analysing the factors that affect the quality of life of residents in the study area.

The dependent variable, quality of life of residents, is a discrete binary variable; therefore, the probit regression model was appropriate for its analysis (Polit & Beck, 2017). The equation adopted is shown thus:

$$Y_i = \beta X_i + \mu_i$$

(3)

Equation 1 is a model with a binary choice involving an estimation of the probability of a resident to exhibit a good quality of life, (Y_i), given a set of factors (X_i) which are exogenous to the resident.

The equations are specified as follows:

$$\begin{aligned} \text{Probability}(\text{QL} = 1) &= \Phi(X\beta) \\ \text{Probability}(\text{QL} = 0) &= 1 - \Phi(X\beta) \end{aligned} \quad (3.1)$$

β = set of estimated coefficients; X = vector of explanatory variables; $(X\beta)$ = probit score/index and quality of life dummy = 1 if an individual resident has a good quality of life, otherwise 0.

To examine the effect of environmental, economic and social factors on the quality of life of residents in Kpone Kokompe both before and after decommissioning, probit regression analysis was employed. This method harnesses the advantages of cross-sectional data, enabling the construction of a baseline equation as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_n X_{ni} \dots + U_i \dots \dots \dots (3.2)$$

“Where Y is the dependent variable; β_0 is the intercept; $\beta_1, \beta_2, \beta_3 \dots$ are the coefficients of the independent variables; i -index represents cross section of the respondents and X_{1i} to X_{ni} represent the independent variables for respondent”. The nature of the dependent variable allowed the use of the “binary probit regression model, as discussed above.

Thus, the study provides the reduced form of equation 2 as specified as follows:

$$\begin{aligned} \text{QL}_i &= \alpha_0 + \alpha_1 \text{Social factors}_i + \alpha_2 \text{Economic factors}_i + \\ &\alpha_3 \text{Environmental factors}_i + \alpha_4 X_i + \mu_i \\ &\dots \dots \dots (3.3) \end{aligned}$$

“Where, subscript i denotes the cross-sectional dimension (individual/household resident in the sample); α_{1-4} , represent the regression coefficients of a vector of explanatory variables (factors); and μ_i is the error term. QL is the quality of life of respondents.

3.6.1.1 Measurements and Data Descriptions

The study employed various variables to measure and describe the data for analysis. This analytical strategy aligns with best practices in social science and environmental perception literature, where individual constructs are commonly analysed to understand complex social-environmental dynamics (Bollen & Bauldry, 2011). Each variable is explained in terms of its measurement and the expected outcomes as detailed below and in Table 3.2:

3.6.1.2 Dependant Variable: Quality of Life of Residents (QL)

This variable was used to assess the quality of life of residents in Kpone Kokompe. It is represented as a dummy variable equal to 1 if a respondent's quality of life has improved over the last five years, and 0, if otherwise. This subjective measure is based on the household survey questions requiring respondents to reflect on whether their overall well-being has improved during the reference period. This approach reflects established practice in applied econometrics and public policy research, where self-reported life satisfaction or perceived quality of life is often operationalised as a binary or ordinal variable (Hanck et al., 2024).

3.6.1.3 Independent Variables: Social, Environmental and Economic Factors

a. Social Factors: These factors relate to the social environment in Kpone Kokompe, both before and after decommissioning. They were measured using a Likert scale ranging from 1 (least agreement) to 5 (strong agreement) and are expected to have either positive or negative effects. The study expects a negative relationship between the social factors and the quality of life of residents before and after the decommissioning. This is in line with the work of Loia et al. (2022) who show that social factors dampen the quality of life of household respondents. In this study, *social factors* were defined as residents' perceptions of key elements of their social environment, including safety, social inclusion, community conflict, and the quality of social relationships. Specific indicators included concerns about youth involvement in drug use, incidents of theft, expressions of social dissatisfaction linked to environmental degradation (such as community protests), and perceptions of underdevelopment or social neglect. These factors reflect both the supportive and disruptive aspects of the community's social fabric. Social factors were measured using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A higher score represents stronger agreement with *positive* social attributes-for example, a greater sense of safety, stronger social ties, and lower levels of conflict. Conversely, a lower score reflects disagreement with those positive attributes, indicating the presence of negative or deteriorating social conditions. These scores were used to evaluate the relationship between social dynamics and residents' overall quality of life before and after the landfill decommissioning.

b. Environmental Factors: In this study, *environmental factors* refer to residents' perceptions of the physical and ecological conditions in Kpone Kokompe, both before and after the decommissioning of the landfill site. These factors encompass factors such

as air quality, odour nuisance, visual pollution, noise levels, waste accumulation, and overall cleanliness of the environment. These indicators were selected to capture the extent to which environmental degradation, often associated with landfill operations, affected daily life and well-being in the community. Respondents assessed their agreement with statements relating to these environmental conditions using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores reflected more favourable environmental conditions (e.g., cleaner surroundings, improved air quality), while lower scores indicated poorer conditions (e.g., persistent odour, waste buildup, and unsanitary environments). The study hypothesised a **negative relationship** between environmental factors and quality of life *before* the landfill was decommissioned, based on the findings of Tafesse et al. (2022), who demonstrated that adverse environmental conditions significantly reduce quality of life in affected communities. However, a **positive relationship** was anticipated *after* the decommissioning, following the work of Capobianco et al. (2022), who argue that the removal of environmentally hazardous infrastructure often results in improved well-being and community satisfaction over time.

c. Economic Factors: In this study, *economic factors* refer to the availability and quality of economic opportunities in Kpone Kokompe, both before and after the landfill decommissioning. These factors were captured through indicators such as the emergence of new jobs, the extent to which businesses depended on the operations of the landfill site, economic activity density, proximity to landfill-related employment, affordability of land, and access to affordable waste disposal services. Additional observations included the absence or presence of new business developments, the nature of new shops that emerged post-decommissioning, and the availability of formal employment

opportunities in the area. Respondents rated these economic indicators using a Likert scale ranging from 1 (least agreement) to 5 (strong agreement). A higher score indicated stronger agreement with positive economic attributes (e.g., increased job availability, business growth, and affordable land), while a lower score reflected limited economic opportunities and stagnation. The study hypothesised a negative relationship between economic factors and quality of life *before* the landfill decommissioning, in line with Tafesse et al. (2022), who found that poor environmental-economic conditions tend to reduce quality of life in affected communities. However, a positive relationship was expected *after* decommissioning, as suggested by Capobianco et al. (2022), due to anticipated improvements in local economic activity and land use.

d. Adaptation strategies: Adaptation strategies in the context of this study, refer to the deliberate behavioural and livelihood adjustments adopted by residents to cope with the social, economic, and environmental disruptions resulting from the landfill decommissioning. These strategies include shifts to alternative sources of income, relocation decisions, and other coping mechanisms aimed at sustaining household well-being (IPCC, 2014).

3.6.1.4 Control Variables (X)

A set of control variables was employed in the analysis to account for potential confounding factors that could influence the relationship between the main explanatory variables (social, economic, and environmental factors) and the dependent variable (quality of life). Drawing on previous studies that have examined predictors of quality of life, such as Parmenter et al. (2021), Patil and Sharma (2022), Risal et al. (2020), and

Table 3. 2: Variable Measurement and Expectations

VARIABLE		MEASUREMENT	EXPECTATIONS
Dependant Variables	QL=Quality of life of residents	A dummy equal to 1 if respondent's quality of life has changed over the last five years, 0 otherwise	Expected to increase as quality-of-life increases
Independent Variables			
Social factors	Social factors before and after decommissioning	Likert scale (1(least agreement..., 5(strong agreement)	Positive/Negative
Environmental factors	Environmental factors before and after decommissioning	Likert scale (1(least agreement..., 5(strong agreement)	Positive/Negative
Economic factors	Economic factors before and after decommissioning	Likert scale (1(least agreement..., 5(strong agreement)	Positive/Negative
Adaptation Strategies	Measured as specific strategies adopted by residents post-decommissioning such as: - Started a new livelihood activity -Relocated temporarily - Received NGO/government support	Each coded as Yes = 1 / No = 0	Expected to positively influence QL
Control variables	X= Gender (defined as 1 if the respondent is male, 0 otherwise), Household size , (a continuous variable indicating the household size of the respondent) Employment status , (a dummy variable equal to 1 if respondent is employed, 0 otherwise); Average monthly income , (a continuous variable indicating the individual's income earned monthly); Education level , (a categorical variable indicating the individual's education level) Motivation for staying , (a categorical variable denoting the individual's motivation for staying in the residence), Type of Dwelling , (a categorical variable denoting the individual's type of accommodation) Tenure/holding Arrangement , (a categorical variable denoting the individual's province)length of stay and distance from the landfill site.	Rates, scores or scales	Positive/Negative

Source: Author's Construct, (2023)

Nanor et al. (2018), the study incorporated a range of demographic and socio-economic characteristics specific to the Kpone Kokompe context.

These control variables included gender, household size, employment status, average monthly income, education level, motivation for staying, type of dwelling, tenure or holding arrangement, length of stay, and distance from the landfill site. Each variable was measured using appropriate formats such as rates, scores, or categorical scales and was expected to have either positive or negative effects on quality of life, depending on the individual and contextual characteristics.

By including these variables, the study ensured that the effects of the core independent variables were not confounded, thereby enhancing the robustness and reliability of the Probit regression model. This approach provided a more accurate understanding of how landfill decommissioning influenced the well-being of residents both before and after the intervention.

3.7 Analytical Techniques for Qualitative Data

The analysis of the qualitative data was done using a combination of thematic analysis and interpretative phenomenological analysis (IPA). Thematic analysis is a technique for discovering, analysing and reporting patterns (themes) in qualitative data (Braun & Clarke, 2019). IPA is a method for comprehending individuals' lived experiences through their own accounts of those experiences (Terry et al., 2017). Together, thematic analysis and IPA were utilised in this study to provide a thorough and in-depth understanding of the experiences of the participants. The main themes in the data were identified through thematic analysis, and IPA was used to comprehend their meaning and significance. This further required the researcher or interviewer to take notes on the

naturalistic setting of the interview environment, such as the gestures and mannerisms of the interviewees, which can be directly related to the study (Sutton & Austin, 2015; Xu & Storr, 2012).

3.7.1 Thematic Analysis

Thematic analysis is the transformation and condensing of collected data to facilitate interpretation and comprehension of the environmental, economic and social factors that led to the closure of the Kpone Kokompe landfills for residents (Sutton & Austin, 2015). The interviews were transcribed and reduced into themes and codes that corresponded to the key concepts of the study (Xu & Storrer, 2012). Themes are broad terms associated with the phenomenon, whereas codes are repeated terms that describe particular events pertinent to the study. The repeated words from the themes helped to identify comparisons in the participants' responses within the context of their experiences (Hashimov, 2015). The codes helped to generate themes such as 'patterns in data that were interesting and important' to address the research questions. The themes and codes facilitated a coherent presentation of the participants' opinions, attitudes, and behaviours (Flick, 2014). Effective rapport was created by asking questions and probing into the responses of the respondents in order to influence the interpretation of the data (Sutton & Austin, 2015; Xu & Storr, 2012).

3.7.1.1 Study Participants

For the qualitative study, a total of seven (7) individuals were interviewed comprising of important stakeholders of the landfill decommissioning exercise. Table 3.3 provides an overview of the respondents who participated in the qualitative study. The table highlights their organisations/institutions and also offers some insight into their job

portfolio or role. Overall, these seven respondents were chosen to be part of the qualitative study due to their experience in landfill management and participation in the landfill decommissioning at Kpone Kokompe. These individuals consented to face-to-face interviews, which were recorded with their permission after which the interviews were transcribed.

Table 3. 3: Demographic Profile of Interviewees

No.	Institution	Role	No of years on Project or lived in Kpone Kokompe
1.	EAP Consult	Lead Consultant for the Kpone Kokompe landfill Decommissioning	For the 18-month duration of the decommissioning of the landfill
2.	Environmental Protection Agency (EPA)	Officer, Sustainability Department of EPA and with oversight over the landfills in Tema and its environs	2019 to date
3.	Kpone Waste Pickers Association (KWPA)	President of KWPA	President of KWPA between 2018-2023 and resident in Kpone Kokompe since 2013
4.	Ministry of Sanitation and Water Resources (MSWR)	Officer in Charge of Environmental Sustainability	Team lead from the MSWR in charge of the Decommissioning between October 2019 to May 2021
5.	Tema Metropolitan Assembly (TMA)	Head of Waste Management Department (WMD)	Head of WMD of TMA from 2018-2023 in charge of waste management in Kpone Kokompe
6.	Waste Landfills Limited (WLL)	Managing Director of Private Company that jointly worked on project with lead consultant	Between October 2019-May 2021 (18 months)
7.	Women in Informal Employment: Globalising & Organising (WIEGO)	Project Officer for Waste & Sanitation, Greater Accra 2019 till date.	Was deployed to the Kpone Kokompe landfill to aid in the establishment of the cooperative (Green waste pickers association) during the decommissioning
TOTAL			7

Source: Fieldwork, (2023)

3.7.1.2 Analytical Method and Data Coding

The qualitative data collected via interviews were analysed using Braun and Clarke's (2022) six-step approach to qualitative data analysis. According to Braun and Clarke (2022), six steps need to be followed in thematically analysing qualitative data, and these steps include: (1) Data familiarisation: this refers to the process where the researcher becomes acquainted with the data by scanning and reading through transcripts, (2) Code generation: this is the process where the researcher generates codes from the data, (3) Theme generation: this refers to the process of identifying and generating themes based on the codes identified within the data, (4) Theme review: this step involves reviewing themes to ensure relevance, (5) Theme description: this pertains to defining and naming themes, and finally (6) Locating exemplars. This analytical technique has been commended for its structure and robustness in analysing qualitative data (Terry et al., 2017; Braun & Clarke, 2019; Braun et al., 2022).

This study therefore adopted this technique and followed through the steps iterated by Braun and Clarke (2022). This resulted in the identification of nine (9) codes which were used in the analysis of data. The codes developed include adaptation strategies, assessment of decommissioning, benefits of decommissioning, challenges of decommissioning, institutional regime, legal regime, public participation, socio-economic factors for decommissioning and resident support in decommissioning. These codes and their descriptions are presented in Table 3.4.

Table 3. 4: Codes for Thematic Analysis of Qualitative Data

Code	Description
1. Adaptation strategies	These are strategies adopted by waste pickers in particular to mitigate the effects the decommissioning has had on them.
2. Assessment of the Decommissioning of the Kpone Kokompe Landfill	The assessment by stake holders in terms of whether the decommissioning has achieved its intended purpose and whether the procedure used was effective.
3.Benefits of the Kpone Kokompe Decommissioning	The advantages the decommissioning has brought to residents.
4.Challenges of Decommissioning	Disadvantages of the decommissioning.
5.Institutional Regime	The institutions involved in the decommissioning of the Kpone Kokompe landfill.
6.Legal Regime	The laws and policies that governed the decommissioning of the Kpone Kokompe landfill.
7.Public Participation	Whether or not residents were consulted in the decommissioning process and whether their views were considered during the process.
8.Socioeconomic factors prior to Decommissioning	The social and economic factors prevalent in Kpone Kokompe prior to decommissioning.
9.Support to Residents in the Decommissioned area	The support that residents, particularly those whose livelihoods depended on the landfill were given.

Source: Fieldwork, (2023).

Based on the codes presented in Table 3.4, Four themes were identified using the NVivo 14 software and confirmed through an analysis of the data, which involved categorising responses according to the assigned codes. These four themes were highlighted in Table 3.5 and are reflective of the key responses which also relate to the objectives of the study as presented in Chapter One.

Table 3. 5: Themes for Data Analysis

Themes	Target
Theme 1: Socio-Economic & Environmental Factors Influencing Decommissioning	Responses from Residents Responses from Waste Pickers Responses from NGO Responses from Waste Management Companies Responses from MSWR, EPA, TMA
Theme 2: Institutional and Legislative Frameworks and Policies Governing Decommissioning Practices	Responses from EPA, TMA, MWSR, & Waste Management Companies
Theme 3: Challenges/ benefits of Decommissioning	Residents Waste Pickers EPA, MSWR, TMA Waste Management Companies
Theme 4: Adaptation Strategies Adopted by Residents	Residents, Waste Pickers EPA, MSWR, TMA Waste Management Companies

Source: Fieldwork (2023)

These four (4) themes were identified as being essential to facilitate an analysis of the responses obtained from respondents in the qualitative study. The first theme pertains to responses covering the general factors which impacted the landfill decommissioning at Kpone Kokompe and is deconstructed into socio-economic and environmental factors. All relevant responses pertaining to this theme were duly analysed and together with the results of the quantitative study are discussed in Chapter 5. The second theme also pertained to the challenges that stakeholders faced in the process of executing the landfill decommissioning as well as the benefits of the phenomenon, whilst the third theme was dedicated to assessing the adaptation strategies by residents in relation to the landfill decommissioning. These themes are also analysed in Chapter 5. Further, a quantitative analysis, based on theme 4, was conducted to examine the effect of adaptation strategies of the three factors (environmental, economic, and social) on residents' quality of life. In analysing this, the study makes use of the probit regression model. The model is expressed as:

$$\begin{aligned}
 QW_i = & \beta_0 + \beta_1 \text{Social Adaptation Strategies}_i + \\
 & \beta_2 \text{Economic Adaptation Strategies}_i + \\
 & \beta_3 \text{Environmental Adaptation Strategies}_i + \beta_4 X_i + \varepsilon_i \\
 & \dots\dots\dots (5)
 \end{aligned}$$

“Where, subscript i denotes the cross-sectional dimension (individual/household resident in the sample); β_{1-4} , represent the regression coefficients of a vector of explanatory variables (factors); and ε_i is the error term.

Environmental Adaptation Strategies: These are sets of rules and coping strategies employed to mitigate environmental factors affecting the quality of life and well-being of residents. Items that define environmental strategies were identified in the questionnaire and were measured using a Likert scale, ranging from 1 (least agreement) to 5 (strong agreement). The principal component analysis (PCA) was used to generate an index for the environmental adaptation strategies, which are expected to have a positive effect on the quality of life and well-being of residents.

Economic Adaptation Strategies: These are regulations employed as a proxy to capture the coping strategies for curbing economic factors affecting the quality of life and well-being of residents. Some items were identified to define economic factors for the respondents to respond. These items were measured using a Likert scale, ranging from 1 (least agreement) to 5 (strong agreement). Economic adaptation strategies are measured with a composite index, using the PCA, and are expected to have a positive effect on the quality of life and well-being of residents.

Social Adaptation Strategies: These are standards of coping strategies that help to avoid and prevent social factors that affect the quality of life and well-being of residents.

Items that define the social strategies were identified in the questionnaire and were measured using a Likert scale, ranging from 1 (least agreement) to 5 (strong agreement). A construct was created to measure the social adaptation strategies, using the PCA. The social adaptation strategies are expected to have a positive effect on the quality of life and well-being of residents.

While the above estimations are discussed in Chapter 5, the final theme about the frameworks, laws, and government policies that influence and regulate the practice of landfill decommissioning is discussed in Chapter 6 of the study. The subsequent sections present results of the quantitative data.

3.7.1.3 Interpretative Phenomenological Analysis

Data was obtained through an interview with the President of the Kpone Waste Pickers Association and the representative of WIEGO, as well as by observing the Waste Pickers at the active dumpsite near the decommissioned site. An analysis of the data was done by distinguishing the participant's most significant experiences and their interpretation of those experiences (Smith et al., 2009). This enabled an understanding of the participants' worldview and how they made sense of their experiences. Grouping similar experiences allowed for the discovery of themes. The themes were further analysed by investigating their significance and meaning.

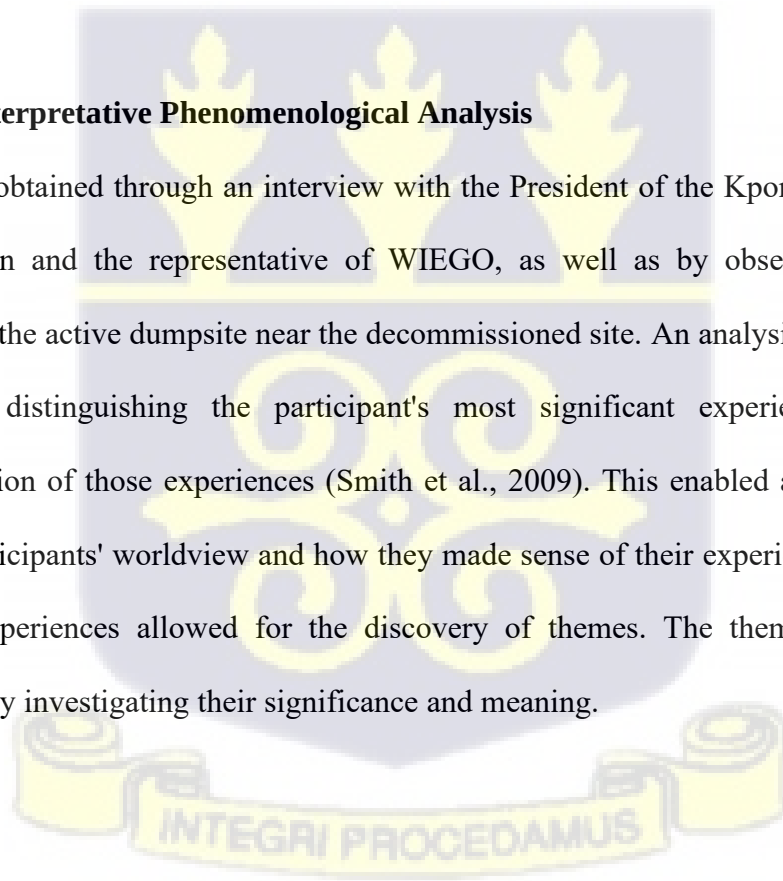


Table 3.6: Linkages Between Research Objectives, Methods of Data Collection and Analysis

Objectives	Types of Data	Approach	Method of Data Collection	Unit of Data Collection	Analytical Technique
1.To examine the environmental, economic, and social factors that influenced the Kpone Kokompe landfill decommissioning and how these factors affect the quality of life of residents.	Primary Data	Qualitative / Quantitative	Household Survey Questionnaires, Key Informant Interview Guides.	Households, Institutional Representatives	Descriptive Statistics, Probit Regression Analysis, Non-Parametric Testing (Wilcoxon Signed-Rank test).
2.To assess the benefits, challenges and adaptation strategies emerging from the decommissioning of the Kpone Kokompe landfill and the effect of the adaptation strategies on the quality of life of residents	Primary Data	Qualitative / Quantitative	Key Informant Interview Guides, Household Survey Questionnaires.	Households, Key Informants	Thematic analysis of interviews with key institutions, Descriptive Statistics, Probit Regression, Chi-Square Tests.
3. To analyse the effectiveness of the institutional and legislative frameworks that governed the decommissioning of the Kpone Kokompe landfill in Kpone Katamanso.	Primary Data	Qualitative / Quantitative	Key Informant Interview Guides, Household Survey Questionnaires.	Key Informants, Households	Thematic Analysis of Interviews with key institutions, Descriptive Statistics.

Source: Author's Construct, (2023)

3.8 Validity and Reliability of the Study

A validation process was undertaken to assess the reliability and validity of the questionnaire. The validation involved examining the questionnaire's ability to measure the validity of the socio-economic factors prior to the decommissioning of the Kpone

Kokompe landfill. Consulting experts in the field of landfill decommissioning and getting their input on the questionnaire's relevance and suitability for capturing the desired constructs helped establish its validity (Polit & Beck, 2017). Furthermore, construct validity was assessed by analysing the responses to the questionnaire items to determine whether they accurately reflected the theoretical constructs being investigated (Bryman & Cramer, 2011).

To pretest the instrument, a small-scale survey was conducted with a subset of the target population involving 30 participants around the closed landfill in Pantang in the Ga East Municipal Area in the Greater Accra Region. The pretest aimed to identify any potential issues or challenges with the questionnaire and also to assess the clarity, relevance, and length of the questions. During the pretest, participants were asked to provide feedback on the survey items, and some questions were flagged for review due to ambiguity or difficulty encountered.

The pretest helped in refining the research instruments. Participants' feedback highlighted ambiguities in certain questions and difficulties in comprehension, which led to targeted revisions. This process of identifying and addressing potential pitfalls prior to the main study significantly enhanced the efficacy of the questionnaire. Moreover, it allowed for the optimisation of data collection procedures, ensuring that the final instrument was well-calibrated to the specific context and characteristics of the target population.

This approach to pretesting aligns with best practices in social science research methodology (Denscombe, 2014). It not only improved the technical quality of the

questionnaire, but also increased the likelihood of gathering meaningful and accurate data in the main study. The pretest thus served as a vital step in strengthening the overall research design and bolstering the credibility of the subsequent findings.

The researcher calculated Cronbach's Alpha coefficient for the Likert-type scale questions to ascertain the reliability of the data. Cronbach's Alpha is a statistical measure that indicates the extent to which the items in a questionnaire are interrelated and measure the same underlying construct (Taber, 2018). The Cronbach's Alpha value for this study was 0.861. A Cronbach alpha value of 0.861 is regarded as satisfactory. It indicates that the scale items measure the same construct (or concept) in a reliable manner (Taber, 2018). In other words, the elements measure the same thing and are consistent with each other (Nunnally & Bernstein, 1994).

3.9 Ethical Considerations

Ethical considerations are fundamental in any research endeavour, ensuring the optimal protection of participants and upholding the confidentiality of the research process. Additionally, ethical guidelines serve to prevent any misconduct by the research team, particularly concerning the treatment of respondents.

Approval for this study was granted by the Ethical Clearance for the Humanities (ECH) committee at the University of Ghana under serial number ECH 161/22-23 as shown in Appendix 5. All secondary sources, including journals, books, and materials utilised in this research, were appropriately acknowledged and referenced following the American Psychological Association (APA) referencing style. The ethical considerations that guided the study are as follows:

3.9.1 Voluntary Participation

The researcher encouraged voluntary participation among the respondents; hence, their consent was sought before recruitment to the study (Saunders, Lewis, & Thornhill, 2009; Creswell, 2014; European Commission, 2013). Creswell (2014) and Saunders et al. (2009) assert that allowing respondents to provide their consent prior to recruitment for the study denotes the 'right to the integrity of the person'.

3.9.2 Privacy and Confidentiality

Safeguarding the 'right to the integrity of a person' requires that the information gathered be kept with the utmost secrecy and confidentiality (Saunders et al., 2009; Creswell, 2014). Hence, the data gathered was used for academic research purposes only.

3.9.3 Anonymity

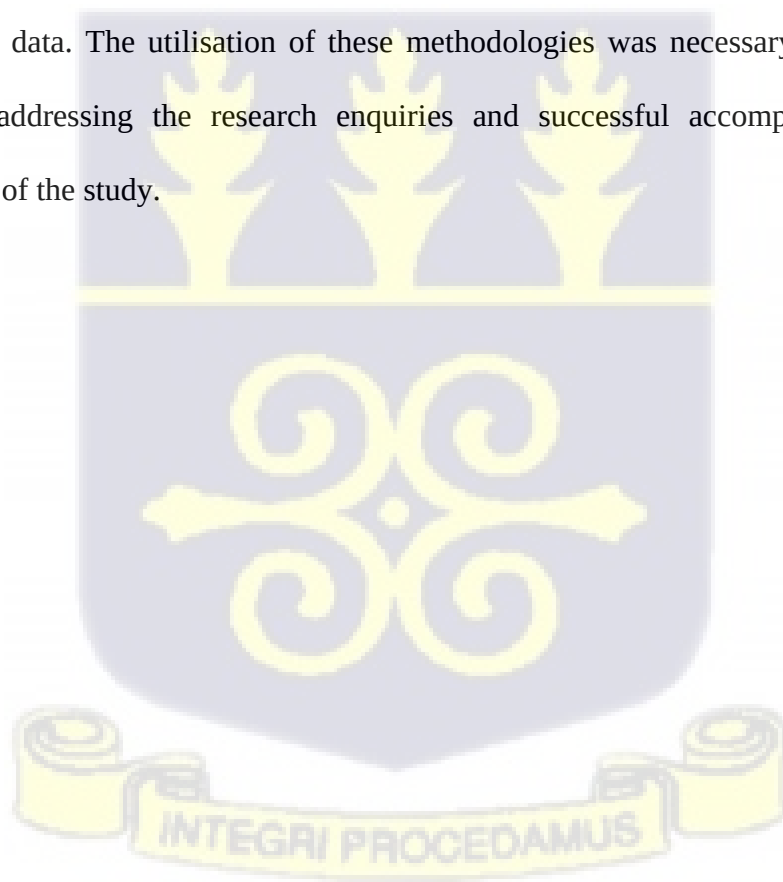
Further, safeguarding the 'right to the integrity of a person' requires that the personality of the respondents be hidden (Creswell, 2014). Even though the names of the respondents were provided on the consent form, their identities were kept anonymous in the data analysis process. The participants were given identity codes and were referred to as such. This enhanced the security and safety of the respondents (Saunders et al., 2009).

3.9.4 Informed Consent

In addition to safeguarding the 'right to the integrity of a person', the researcher sought the informed consent of the participants before conducting interviews (Creswell, 2014). Participants were made to sign a consent form before the interviews were conducted.

3.10 Chapter Summary

Chapter Three outlined the methodology employed to investigate the decommissioning of the Kpone Kokompe landfill and its impacts. The research adopted a sequential exploratory mixed-method approach, integrating both qualitative and quantitative data collection and analysis. Primary data was gathered through structured questionnaires and interviews, while secondary data came from literature, policy documents, and reports. A multistage sampling technique was used for the quantitative study, and purposive sampling was applied for the qualitative study. The instruments for data collection were refined through pre-testing to ensure clarity. Data analysis involved the use of SPSS for quantitative data and thematic and interpretative phenomenological analyses for qualitative data. The utilisation of these methodologies was necessary and effectively aided in addressing the research enquiries and successful accomplishment of the objectives of the study.



CHAPTER FOUR

CONTRASTED CONTOURS FOR THE KPONE KOKOMPE LANDFILL DECOMMISSIONING

4.0 Introduction

This chapter analysed the effect of the landfill decommissioning on various social, economic and environmental factors in Kpone Kokompe. The chapter explored how the decommissioning process influenced these factors and, consequently, the quality of life of the residents of Kpone Kokompe. Beginning with an overview of the respondents of Kpone Kokompe, the context was set for an understanding from the perspectives of the residents. The analysis also dissected the factors behind the decommissioning of the landfill, emphasising the intricate relationship between environmental, social, and economic factors.

4.1 Results and Discussion

4.1.1 Demographic and Socio-economic Characteristics of Respondents

This section presents the demographic characteristics of the respondents, including gender distribution, educational status, marital status, ethnicity, religion, and income status. A total of 396 respondents participated in the survey, providing a comprehensive overview of the population's socio-demographic profile. In this study, the respondents were categorised by sex, with a higher proportion of males (59.1%) compared to females (40.9%), as illustrated in Figure 4.1.

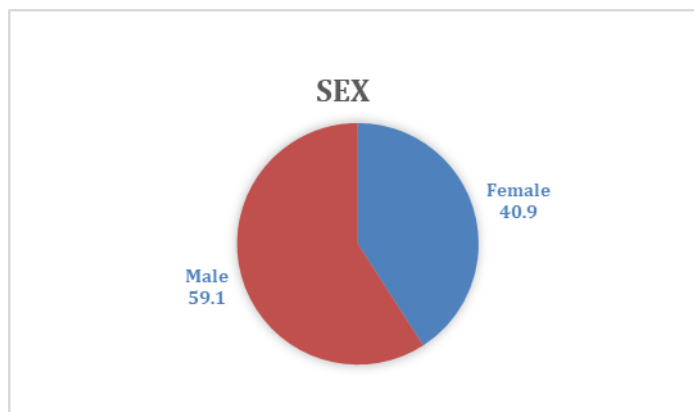


Figure 4. 1: Distribution of Respondents According to Sex
Source: Fieldwork, (2023)

4.1.1.1 Age Category

Table 4.1 outlines the distribution of individuals across different age groups within the Kpone Kokompe community. The majority of respondents (65.0%) fell within the adults' category (36-60 years), followed by the young adults (18-35) comprising 23.0% of the participants. Additionally, a noteworthy portion of respondents (12.0) fell within the elderly category (61 years and above). This demographic profile highlights a significant working-age population in Kpone Kokompe, with the dominance of both adults and young adults' categories. Such a distribution aligns with national observations across Ghana indicating a consistent trend in age demographics (GSS, 2021). However, for communities residing near dumpsites in sub-Saharan Africa, this age distribution holds specific significance. Residents, particularly those within the working-age demographic around dumpsites, often face environmental challenges such as exposure to pollutants, inadequate sanitation, and limited access to healthcare (Wilson et al., 2017; Nsiah-Asare et al., 2020). The presence of a large working-age population near the decommissioned

landfill in Kpone Kokompe suggests a potential reliance on informal employment opportunities for generating income. Waste picking and recycling activities emerge as common economic activities.

Table 4. 1: Demographic and Socio- economic Profile (Quantitative Survey)

Profile	Options	Frequency	Percentage (%)
Age	Young Adults (18-35)	92	23.0
	Adults (36-60)	256	65.0
	Elderly (61+ years)	48	12.0
	Total	396	100
Marital Status	Single	199	50.3
	Married	151	38.1
	Cohabiting	31	7.8
	Widow	6	1.5
	Divorced	7	1.8
	Separated	2	0.5
	Total	396	100
Religion	Christian	323	81.6
	Muslim	56	14.1
	African Traditional Religion	9	2.3
	Others	8	2.0
	Total	396	100
Ethnicity	Akan	136	34.3
	Ga-Adangbe	95	24.0
	Ewe	111	28.0
	Guan	15	3.8
	Mole-Dagbani	27	6.8
	Others	12	3.1
	Total	396	100

Source: Fieldwork, (2023)

4.1.1.2 Marital Status

As shown in Table 4.1, a greater proportion (50.3%) of the respondents were single. A little over one third (38%) were married. Further, about 7.8 percent of participants stated that they were cohabiting, while a few of the residents were widowed (1.5%), divorced (1.8%), or separated (0.5%). The dominance of ‘single’ individuals (50.3%) in Kokompe is revealing. Recent data from the Ghana Statistical Service shows a national increase in singlehood compared to previous decades (GSS, 2021). Research on waste

pickers by Lissah et al., (2021) revealed that the majority were single, potentially due to the demanding and often-stigmatised nature of the work as can be seen with the residents around the decommissioned landfill in Kokompe.

4.1.1.3 Ethnicity and Religion

With respect to the ethnicity of the participants, a higher proportion (34.4%) were Akan followed by Ewe (28%), and Ga-Adangbes (24%) as shown in Table 4.1. The rest were Mole-Dagbani (6.8%), Guan (3.8%), and others, including Gurma, Gonja, and Grusi, which made up about 3 percent of the population. The majority of the participants (81.6%) were Christians, whereas about 14 percent were Muslims, African traditional religion (2.3%), and others (2%) formed the minority.

4.1.1.4 Educational Status

From the household survey, the respondents were either literate or non-literate. In Table 4.2, the majority of the respondents (37.4%,) had completed Junior High School (JHS) and 32.8 percent had completed Senior High School (SHS). About 11 percent of respondents had attained tertiary education, 10.6 percent had attained primary education, and 8.6 percent had no formal education. Research suggests a positive correlation between educational attainment and income in Ghana (Stenzel et al., 2024, Addai, 2024). This implies that residents with lower educational qualifications might have fewer opportunities for higher-paying jobs within the formal sector. The combined percentage of residents in Kokompe with SHS (32.8%) and tertiary education (10.6%) suggests a growing segment of the population with higher income potential. These qualifications might open doors to a wider range of job opportunities within the formal sector, often associated with higher salaries compared to those requiring only basic

education. While education is an important factor, income variability exists within both formal and informal sectors. Grimaldi et al. (2019) highlight that the informal waste picking sector has its own income dynamics. The authors discovered that in Brazil, specific skills in waste scavenging and navigating market fluctuations for recyclable materials can influence earnings within this sector, creating income variability even without formal educational qualifications.

Table 4.2: Socio-economic Stability - Indicators-Income, Employment Status and Educational Level.

Profile	Options	Frequency	Percentage (%)
Level of Education	No education	34	8.6
	Primary	42	10.6
	JHS	148	37.4
	SHS	130	32.8
	Tertiary	42	10.6
	Total	396	100
Employment Status	Employed	230	58.1
	Factory Workers	220	55.1
	Bankers	4	1.0
	Teachers	6	1.5
	Self Employed	133	33.6
	Waste Pickers	96	24.2
	Traders	15	3.7
	Farmers	13	3.3
	Herdsmen	9	2.3
	Unemployed	29	7.3
	Retired	4	1.0
	Total	396	100
Income Status	Less than 450	85	21.5
	450-1000	191	48.2
	1001-2000	72	18.1
	2001-3000	15	3.8
	3001-4000	0	0.0
	4001-5000	0	0.0
	More than 5000	4	1.0
	Total	367	92.6

Source: Fieldwork, (2023)

This differs from what pertains in Kpone Kokompe as all of the waste pickers reported an average monthly income of between GH¢450 and GH¢1000. However, the findings of Grimaldi et al., (2019) on income variability appear to be the case with respect to factory workers in Kpone Kokompe. As can be seen from Table 4.2, the monthly incomes of factory workers in the area ranges from below GH¢400 to GH¢2000.

4.1.1.5 Employment Status

The employment status was categorised into Employed, Self-employed, Unemployed and Retired. More than half of the participants (58%) stated that they were employed. From Table 4.3, a higher proportion of the employed residents (55%) were factory workers, followed by teachers (1.5%) and a small percentage who stated that they were bankers (1%). The finding that majority of employed residents in Kokompe are factory workers aligns with observations by Boateng & Frimpong, (2020), who highlight the role manufacturing plays in the Tema industrial hub of Ghana, particularly for young adults. About one third (33.6%) of the population stated that they were self-employed. The greater number of the self-employed residents were waste pickers (24.2%). As noted by Asante et al. (2020), majority of inhabitants residing near landfill sites in Ghana relied on these sites for livelihoods, notably through participation in informal waste collection endeavours. Traders and farmers followed with 3.7 percent and 3.3 percent respectively. A small number of the residents are herdsmen (2.2%) and retired (1%).

The prevalence of self-employed waste pickers, traders, and farmers highlight the importance of the informal sector in Kokompe and by extension, in the Ghanaian economy. This observation resonates with the findings of Choi et al., (2020), who

identified the significant role played by informal work in contributing to the economies of sub-Saharan African nations. The significant number of self-employed individuals in Kokompe not only highlights the resilience and adaptability of informal economic activities, but also emphasises the contribution of self-employment to sustaining livelihoods and enhancing economic resilience at both local and national levels.

4.1.1.6 Income Status

The income status of participants in the study depicted a varied spectrum of monthly earnings, ranging from GHC 450 to GHC 5000. Analysis from Table 4.2 indicated that nearly half of the respondents (48.6%) reported an average monthly income falling between GHC450 and GHC 1000. A significant portion of the community, comprising 21.6 percent of respondents, reported earning GHC450 or less per month, indicating that many individuals in this group have relatively lower income levels. Moreover, approximately 18 percent of respondents reported earning between GHC1001 and GHC2000 monthly, signifying a significant portion of the population with moderate income levels. A small proportion of respondents (3.8%) reported monthly earnings of between GHC2001 and GHC3000. Notably, no participants reported earnings in the income ranges of GHC3001 to GHC5000 and only one percent of respondents reported earning over GHC5000 monthly.

Tables 4.2 and 4.3 illustrate the diverse employment landscape and economic contributions of residents in Kokompe. Bankers emerged as the highest earners, representing approximately one percent of the population, with monthly incomes exceeding GHC5000. Factory workers and waste pickers predominantly fell within the GHC450-1000 income bracket, reflecting the prevalent income distribution within these

occupations. Teachers, constituting about 1.5 percent of the population, earned between GHC1001-2000. Farmers and traders exhibited varied income brackets, with farmers typically earning between GHC1001-2000 and traders primarily earning between GHC2001-3000. Conversely, herdsmen and retired individuals demonstrated relatively low incomes, typically below GHC450.

The income landscape of Kokompe, revealed a significant presence of low-income households. Nearly half (48.6%) of respondents fell within the GHC450-1000 monthly income bracket. This finding mirrors the national challenge of income inequality highlighted by Afrobarometer (2022) in Ghana. However, the income distribution within Kokompe is not a homogenous picture. The presence of a few residents earning above GHC5000 shows some degree of income variability.

Table 4. 3: Employment Types and Income Levels

EMPLOYMENT STATUS (FREQUENCY)										
INCOME STATUS	Employed			Self Employed		Unemployed			Retired	
Monthly Income GHC	Banker	Factory worker	Teacher	Waste picker	Herdsmen	Trader	Farmer			
Less than 450		72			9			29	4	
450-1000		95		96						
1001-2000		53	6				13			
2001-3000						15				
3001-4000										
4001-5000										
More than 5000	4									
Grand Total	4	220	6	96	9	15	13	29	4	396

Source: Fieldwork, (2023)

4.2 Residential Characteristics

This section discusses the residential characteristics of the respondents. As can be gleaned from Table 4.4, 9.6 percent of respondents cited their native ties to the locality as a reason for staying. This suggests that social and cultural connections play a significant role in residential decisions, a finding consistent with research emphasising the influence of familial and community networks on housing choices (Wenger, 2021). A substantial majority of respondents (69.4%) identified employment opportunities as the primary factor influencing their decision to reside near the landfill. Previous studies have highlighted the importance of proximity to job centres in shaping residential choices, indicating a strong correlation between employment opportunities and residential location (Osei et al., 2011, Owusu et al., 2014, Opoku et al., 2022).

Table 4.4: Residential Characteristics

Residential Status	Frequency	Percent (%)
Motivation for staying		
Cost of Accommodation	36	9.1
Access to Market	24	6.1
Native	38	9.3
Employment	274	69.4
Others	24	6.1
Tenure/Holding Arrangement		
Rental	161	40.7
Family house	91	23.0
Owner-Occupied	54	13.6
Squatter	90	22.7
Type of Dwelling		
Separate House (Detached)	103	26.1
Semi-Detached house	264	67.0
Uncompleted house	18	4.6
Others	9	2.3

Source: Fieldwork (2023)

Regarding housing affordability, 9.1 percent of respondents mentioned the cost of accommodation as a determining factor. Literature suggests that lower-income households may be more likely to live near landfills due to the availability of cheaper housing options in such areas, underscoring the impact of socio-economic factors on residential patterns (Ofori, 2021). Moreover, about 6 percent of respondents indicated access to markets and other amenities as a motivation for residing in the locality. This highlights the importance of local infrastructure and services in shaping residential preferences, indicating that proximity to essential facilities influences housing decisions (Soroui, 2021).

In terms of tenure arrangement, 40.7 percent of respondents lived in rented accommodation, indicating a significant portion of the population facing housing insecurity. Renting, particularly in informal settlements near landfills, may contribute to housing instability and vulnerability, highlighting the challenges of tenure security in these areas (Achamwie & Danso-Wiredua et al., 2021). Furthermore, 23.0 percent of respondents identified as squatters, emphasising the prevalence of informal housing arrangements near landfills. Squatting in these areas may pose health and safety risks due to inadequate infrastructure, necessitating interventions to improve housing conditions and tenure security (Grant, 2020). Additionally, 13.6 percent of respondents reported residing in self-owned houses, indicating a degree of housing stability among a minority of the population. However, it is essential to assess whether these households are also exposed to environmental hazards associated with landfill proximity, highlighting the need for environmental justice approaches (Danthurebandura et al., 2012, Mudavanhu, 2020, Urme et al., 2021, Matheka, 2023).

In terms of types of dwelling, the majority of respondents (67%) reported living in semi-detached house accommodation, reflecting relatively dense living conditions. Research suggests that higher population density near landfills may exacerbate environmental health risks, underscoring the need for adequate infrastructure and sanitation in such areas (Qasim et al., 2020, Iddrisu & Debrah 2021).

These demographics offer some insight into the potential effects and consequences of the landfill decommissioning on livelihood, especially given that the prime reason why residents stayed in the area was due to employment. The prevalence of informal housing with inadequate sanitation infrastructure in peri-urban areas in sub-Saharan Africa appears to be similar to what pertains in Kokompe. This finding resonates with broader observations indicating that individuals residing in close proximity to landfills often gravitate towards informal settlements and semi-detached houses due to the affordability of such housing types (Omilusi, 2020). These dwellings, however, frequently lack proper waste management infrastructure, potentially exacerbating health risks associated with the proximity to landfills.

In addition, Agyekum et al. (2022), highlight the economic dependence of many residents on informal waste picking activities within and around dumpsites in Ghana. This economic reliance creates a complex dynamic in which residents find themselves balancing the pursuit of livelihood with the adverse health and environmental consequences posed by landfill proximity (Mudavanhu, 2020, Matheka, 2023).

In conclusion, the driving factors for individuals to reside near the decommissioned Kokompe landfill represented a nuanced balance between economic necessity and

environmental challenges. The multifaceted nature of the demographics in Kokompe played an integral role in unravelling the social, economic realities and the environmental realities faced by residents of Kokompe before and after decommissioning.

4.3 Underpinning Factors for the Decommissioning of the Kpone Kokompe

Landfill

The decision to decommission the Kpone Kokompe landfill was influenced by a myriad of environmental, social, and economic factors. Environmental concerns, as shown in Appendix 6 (a) including health risks posed by waste disposal practices, alongside social issues such as conflicts among waste pickers and limited community engagement, highlighted the need for the intervention. Moreover, economic considerations, including long-term sustainability and public safety, played a pivotal role in shaping the decision-making process. This section examined the multifaceted underpinning factors that contributed to the decommissioning of the Kokompe landfill based on the assessment of both quantitative and qualitative data.

4.3.1 Environmental Drivers of the Decommissioning

Environmental factors, including pollution and hazards caused by the landfill, were pivotal in the government's decision to decommission the Kokompe landfill. The primary environmental trigger for the decommissioning in the view of the regulators and consultants engaged in the decommissioning was a significant fire outbreak in 2019, compounded by issues such as leachate pollution, pervasive stench, and smoke emissions that adversely affected the nearby community and water resources.

As confirmed by the officer from the Tema Municipal Assembly, one of the fundamental motives underpinning the decommissioning at Kpone Kokompe was to “...save the residents from the leachate pollution running through nearby community...to control and prevent the stench emanating from the landfill environment...”. This response exemplified the environmental motive underpinning the decommissioning exercise and proved that from a stakeholder perspective, the main reason why the decommissioning had to be carried out was the need to protect residents from the adverse environmental effects posed by the landfill.

“There are a number of goals sought to be achieved by the decommissioning. They included: (1) To save the residents of the leachate pollution running through nearby community, (2) To control and prevent the stench emanating from the landfill environment, (3) To convert the contaminated site to a useful recreational facility for the residents and communities around and (4) To safeguard the environment of its emissions affecting the ozone layer and total depletion of environment at large.”

(Officer, TMA, 2023)

The officer from the EPA corroborated the rationale decommissioning from a regulatory perspective stating,

“..... leachate seeped into the community. The EPA thus received complaints from the community, and we moved there to ensure that the place was safe and for the project to continue.

I forgot to add that there were also fires at the landfill site when it was active. That is also another reason for the decommissioning.”

(Officer, EPA, 2023)

Similarly, an official from the MSWR reported,

“The decommissioning of the Kpone Kokompe Landfill site became necessary after the landfill caught fire in August 2019 and rendered the already full landfill unusable. At this point the decision to decommission was taken as the site had become a threat to the health and wellbeing of the residents.”

(Officer, MSWR, 2023)

The lead consultant for the project also corroborated the environmental reasoning, stating,

“Again, sometime in 2019, it rained the leachate which is black water overflowed to the communities. You see there's a stream down there in Kokompe where the indigenes fetch water from and where the kids play. The overflow from the leachate from Kokompe went into the community and there was a huge mess. The stench was horrible, there were so many flies, you couldn't even stand there without the flies beating you, it was a real battle”

4.3.1.1 Assessment of Environmental Factors Before Decommissioning

The study evaluated fourteen constructs (14) as shown in Table 4.5 prior to the decommissioning of the Kpone Kokompe landfill as environmental indicators from the respondents of the household survey. Using the mean ranking and the standard deviation, constructs with a higher mean ranking were classified as the most influential environmental factors prior to decommissioning. The study findings revealed that most of the participants stated that *there was a lot of dust in the environment* as the most

influential environmental factor that accounted for the decision to decommission the landfill based on the mean rank of 4.12. This implies that the majority of the participants alluded to the fact that dust in the environment was a major issue prior to the decommissioning of the Kpone Kokompe landfill site. Again, from Table 4.5, the *landfill site produced a lot of odours* obtained the second-highest mean of 3.77. Landfills are notorious for unpleasant odours due to decomposing waste. Landfill odours negatively affect surrounding communities, impacting their quality of life and potentially serving as a deterrent to investment (Hannun,2024).

Njoku et al., (2019) further emphasised the adverse effects of landfill odours on health and life satisfaction, particularly for those living in close proximity to the site. Public opposition to odour issues likely contributed to decommissioning calls. According to residents of Kokompe, *contamination of the surroundings by leachate* from the landfill site was a significant concern, with a mean rank score of 3.76 as depicted in Table 4.4. Appendix 6 (c) shows a picture of the leachate from the Kpone Kokompe landfill site prior to the decommissioning. Thus, in addition to dust and odours, residents considered leachate from the landfill and its connection to waterborne diseases like cholera as major factors in the decision to decommission the landfill. Alao, 2024, highlighted the risks associated with improper disposal of dumpsite waste, including the generation of hazardous leachate that contaminates the environment and poses health risks. Landfill emissions can exacerbate respiratory problems like asthma. Studies by Staines et al., 2004; Baah & Kharlamova, 2018 document the link between air pollution from landfills and *respiratory illnesses*. The mean of 3.76 and high standard deviation of 4.65 for this factor suggests that some residents might not have directly linked their respiratory problems to the landfill, prior to its decommissioning but possibly to other factors such

as concerns about air quality. Before decommissioning, there was also a *lot of littering in the environment* by residents, had the fourth highest mean of 3.38. Thus, littering in the environment was common and prevalent environmental factors prior to decommissioning. The *high volume of truck traffic* associated with landfill operations played a role in the decision to decommission the facility in Kpone Kokompe according to the residents as they ranked traffic concerns moderately high (mean rank: 3.35). Traffic congestion disrupts daily routines which results in economic costs, including lost productivity and increased fuel consumption (Afrin & Yodo, 2020).

Additionally, the *constant noise pollution from landfill activities*, with a mean rank of 3.35 and a standard deviation of 1.34, likely exacerbated residents' discomfort and further disrupted their quality of life. This finding corroborates Owusu-Sekyere (2020) observations, which highlighted that such environmental disturbances significantly contribute to the degradation of living conditions and heightened stress levels among nearby populations. Overall, these factors contributed to a general feeling of disturbance among residents, reinforcing the decision to decommission the landfill. With a mean of 3.34, it is obvious that the *unsanitary conditions* of Kpone Kokompe prior to the decommissioning was of concern to residents. The health risks associated with landfill management, including leachate contamination, windblown debris, and the spread of diseases are replete in literature and these concerns are usually the drivers of discussions towards decommissioning and or closure of landfills (Dolk et al., 1998; Oteng-Ababio, 2014; Sackey et al., 2020; Odonkor & Mahami, 2020). Urme et al., 2021, further emphasised the adverse environmental and health effects of improper solid waste management practices, such as leachate percolation and waste incineration, in Dhaka, Bangladesh which appear to be similar to the situation faced by residents of Kokompe

prior to the decommissioning. The potential for disease transmission due to *mosquitoes, flies and pests in general* was also a significant concern for residents before the decommissioning, scoring a mean of 3.34. Landfills pose multifaceted environmental and health concerns, including the risk of groundwater contamination and the proliferation of disease-carrying pests. Qasim et al. 2020 and Urme et al. 2019, have highlighted the potential for landfill leachate, laden with pollutants, to seep into groundwater, posing significant health hazards for nearby communities. This risk is particularly alarming in areas with open dumps, where the lack of containment systems exacerbates the threat (Aderemi & Falade 2012). Furthermore, landfills serve as ideal breeding grounds for mosquitoes and other pests, as noted by UNEP (2021). The associated public health risks explain the pressing concerns of residents in Kokompe, making the potential for disease transmission due to pests, including malaria, a significant factor which in their view influenced the decision to decommission.

Stagnant water near landfills can create breeding grounds for malaria transmitting mosquitoes. Residents' concerns about *malaria and cholera* as reflected in the mean ranks of 3.33 and 3.34 respectively, appear to have been environmental factors prevalent in the area prior to the decommissioning of the landfill (Agyemang- Badu et al., 2023). Another construct that obtained a relatively high mean rank of 3.29 in Table 4.5 was *babies being born with health defects* before the decommissioning of the landfill in Kokompe. This mean rank suggests that residents of Kokompe perceived the occurrence of health defects in newborns as a significant concern. Health defects in newborns are often linked to environmental factors such as exposure to pollutants and chemical as well as inadequate healthcare, which residents of Kokompe viewed as threats to the well- being of the community (Abdu & Seyoum, 2019).

Lastly, although the *incidence of cancer* (3.18) and *memory disturbances* (2.90) obtained slightly lower mean ranks, they were of concern to residents of Kokompe prior to decommissioning. Residents recognised the potential health risks associated with exposure to heavy metals from industrial activities and pollution. Chronic exposure to heavy metals has been linked to various health problems, including cancer, respiratory diseases, memory loss and neurological disorders (Vrijheid, 2000; Mataloni et al., 2016).

Table 4. 5: Environmental Factors (Before) Decommissioning

Environmental Factors	Mean Rank Score	Standard Deviation
There was a lot of dust in the environment and the quantity of air was poor	4.12	3.666
The landfill site produced a lot of odours	3.77	1.088
There was the contamination of the surroundings by leachate from the landfill	3.76	1.042
Respiratory and breathing disorders were common	3.76	4.650
There was a lot of littering of the environment by residents	3.38	1.200
There was a lot of vehicular traffic in the area	3.35	1.162
The area was generally unhygienic or had unsanitary conditions	3.34	1.276
There were a lot of mosquitoes, flies, and rodents in the area	3.34	1.244
Cholera	3.34	1.308
The area was very noisy from the landfill bulldozers among others	3.33	1.342
Malaria was prevalent	3.33	1.288
Babies were born with health defects	3.29	1.265
Cancers associated with heavy metal inhalation	3.18	1.200
Memory disturbances	2.90	1.111

Source: Fieldwork, (2023).

From the above discussion, the core environmental reasons underpinning the decommissioning of the landfill site at Kpone Katamanso from both the institutional respondents and the residents is environmental pollution, particularly from dust and smoke from the landfill site, leachate, stench and or odours, noise as well as respiratory disorders. The most significant environmental driver according to the residents however was the *dust in the environment* prior to the decommissioning. These reasons largely reflect environmental factors pertaining to the well-being of respondents. The potential health implications of exposure to leachate-contaminated environments are well-documented in literature. Studies have linked such exposure to a range of adverse health outcomes, including respiratory problems, skin infections, gastrointestinal illnesses, and even chronic diseases such as cancer as can be shown from Table 4.4 in Kokompe, prior to the decommissioning (Olanrewaju, 2021, Shilpa et al., 2023, Dagwar & Duta, 2024).

4.3.2 Social Drivers of the Decommissioning

Another category of factors which influenced the decommissioning of the Kpone Kokompe landfill site were social factors. These are factors regarding the quality of the social life of individuals in the community. It also reflected factors such as lifestyle of people living in the area.

An analysis of responses from key stakeholders in state and governmental institutions revealed that social concerns for the health and well-being of residents took precedence over economic factors in the decision to decommission the Kpone Kokompe landfill. An incident involving a factory, Sentuo Ceramics, which had a boiler or chimney behind the facility, underlined these social concerns. In 2019, a fire incident at the factory led to a massive fire outbreak at the landfill site due to the gas in the landfill. This fire produced

thick smoke that engulfed the entire Tema area, posing severe health hazards to the surrounding residents.

An officer from the Ministry of Sanitation and Water Resources (MSWR) detailed the incident:

“There is also this factory, known as Sentuo Ceramics, which had a boiler or chimney just behind the facility so somewhere in 2019 thereabout there was a fire incident..... The fire went on for days and the whole of the Tema area was covered in dark smoke. It became a threat to those living around. The Ministry of Sanitation and Water Resources had to shut it down. The police started complaining about the safety of the residents, industries and the residents around also started complaining to the government about the location and threats posed by the landfill.”

(Officer, MSWR, 2023).

From the perspective of the officer from the MSWR, the fire outbreak at the landfill site raised social concerns especially in relation to the safety of residents, industries and businesses in the area. The fire outbreak triggered an immediate stakeholder response and the safety and security of residents in the area was of priority. From a social perspective, it was perceived that the fumes emanating from the factory fire, which spread to the landfill site posed a threat to residents. Even though the smoke and fumes emanating from the factory fire outbreak which spilt onto the landfill site also constituted an environmental concern, the social implications for residents could not be

ignored, and was, therefore, another factor that triggered the need to decommission the landfill site.

This view was also echoed in another response obtained from an officer at the Tema Municipal Assembly:

“The decommissioning of the Kpone Kokompe Landfill site became necessary after the landfill caught fire in August 2019 and rendered the already full landfill unusable. At this point the decision to decommission was taken as the site had become a threat to the health and wellbeing of the residents. The youth in the area subsequently went on a demonstration complaining about the stench and essentially calling for the landfill to be closed as it was causing health challenges to residents.”

(Officer, TMA, 2023)

The response above indicates that one of the main reasons for decommissioning the landfill site was to protect the social well-being of residents in the community and surrounding areas, especially after the fire outbreak in 2019.

4.3.2.1 Setting the Stage: Pre-Decommissioning Social Factors

The study entailed an analysis of the prevailing social factors in Kokompe before the landfill decommissioning from the perspectives of survey respondents. Several areas of concern, including conflicts among waste pickers, limited environmental activism, lack of awareness about landfill operations, inadequate access to infrastructure, perceptions of underdevelopment, and perceived gaps in the effectiveness of environmental regulations and local governance were highlighted. As can be seen in Table 4.6, nine (9) social constructs were evaluated as social factors prevalent in Kokompe prior to the

decommissioning. Using the mean ranking and the standard deviation, constructs with a higher mean ranking were classified as the most influential social factors prior to decommissioning.

In Table 4.6, *there was less environmental activism among residents* (Very few or no environmental advocacy) was the construct with the highest mean rank score of 3.45. This suggests that, on average, residents of Kokompe were not highly engaged in environmental activism or advocacy efforts before decommissioning. This finding is consistent with prior research indicating that inadequate exposure to environmental education or information campaigns, particularly among those who rely on traditional media sources, may result in a lack of an understanding of the potential environmental impacts associated with decommissioning projects (Carvalho 2020; Jang & Lee, 2023). Kokompe, prior to the decommissioning was *generally underdeveloped with very few amenities* with a mean rank of 3.43. The observed mean rank of 3.40 for *youth involvement in drug use* suggests a significant concern within the community. This aligns with findings from Umukoro et al. (2021), who reported a 19.4% prevalence of substance abuse among secondary school students in Sapele, Nigeria, highlighting the widespread nature of this issue among adolescents. Such behaviours not only reflect underlying social challenges but also underscore the need for increased awareness and targeted interventions to address substance abuse and its impact on community well-being. *Incidents of robbery and theft* in Kpone Kokompe, as indicated by a mean rank of 3.32, reflect residents' concerns about safety in the vicinity of the landfill site. This aligns with findings from Owusu-Sekyere (2018) who discovered that waste scavengers in Kumasi, Ghana, often face health and safety risks, including exposure to crime, due to inadequate regulation and oversight of landfill operations. *Conflicts among waste*

pickers was a notable social issue in the area before landfill decommissioning with a mean rank of 3.31 as depicted in Table 4.6. These conflicts could have various implications for the community, including safety concerns and social tensions as noted by Wilson, (2020) who discovered that competition for scarce resources, like valuable recyclables, can breed tension and conflict among waste pickers in and around dumpsites. Further, the view that *residents did not have access to good roads and educational facilities* also obtained a mean rank of 3.21. This indicated that the availability of good roads and educational facilities were a concern for residents before decommissioning.

Recent studies have emphasised the role of social and economic factors in influencing the vulnerability of marginalised communities to environmental hazards and the importance of equitable access to resources and infrastructure in promoting community resilience (Polcarova & Pupikova, 2022). Mavhura's studies offer a detailed spatial analysis of social vulnerability to natural hazards in Zimbabwe, emphasising key factors such as poverty, informal employment, and household characteristics (Mavhura et al., 2017; Mavhura, 2019; Mavhura et al., 2021). On the average, respondents perceived that *Community Protests* prior to the decommissioning recorded a mean rank score of 3.19, reflecting a notable level of public concern regarding the environmental and health impacts of the landfill. This score suggests that residents were actively voicing dissatisfaction and calling for remedial action from authorities. The presence of such protests indicates a level of environmental awareness and civic engagement within the community. However, it also underscores the need for stronger institutional mechanisms for public participation and more effective enforcement of environmental regulations, to ensure that community concerns are addressed proactively through dialogue and

collaboration rather than reactive demonstrations. Application of the *Local Governance Act, 2016 (Act 936)*, in Kokompe obtained a mean rank of 3.07, indicating that, on average, respondents of Kokompe prior to the decommissioning believed that the Local Governance Act of 2016 (Act 936) was not effective or impactful in addressing social issues in the area prior to the decommissioning. The *effectiveness of the 2002 Ghana Landfill Guidelines of the EPA* obtained a mean rank of 3.05. The low mean rank suggests that there was perceived room for improvement in adhering to the Ghana Landfill Guidelines of 2002 before decommissioning in the opinion of residents.

There have been calls for a comprehensive approach to environmental governance, emphasising the importance of community engagement, innovation, and socio-political context (Ortmann & Ortmann, 2017; Unece, 2020). These studies highlight the need for stronger regulatory frameworks and governance mechanisms, particularly in landfill operations. Together, these findings emphasise the need for a holistic and effective approach to environmental regulations and governance.

The foregoing discussions highlight the importance of environmental and social considerations in the decision to decommission over and above economic factors. Moreover, economic considerations were perceived as long-term in nature, with benefits not immediately realisable in the short or medium term. Economic factors in Kokompe prior to decommissioning will be analysed in the next section.

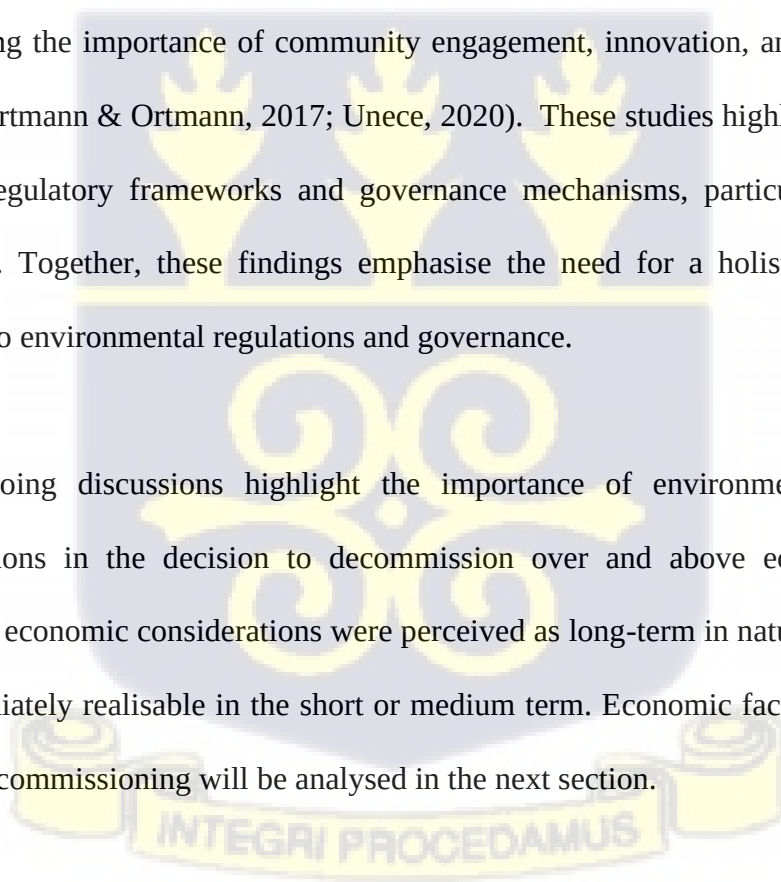


Table 4.6: Social Factors (Before) Decommissioning

Social Factors	Mean Rank Score	Standard Deviation
There was less environmental activism among residents (Very few or no environmental advocacy)	3.45	1.205
The place was generally underdeveloped with very few amenities	3.43	1.222
Youth Involvement in drug use	3.40	1.185
Incidents of robbery and theft	3.32	1.215
During the operations of the landfill, there were conflicts among the waste pickers	3.31	1.213
Residents did not have access to good roads and educational facilities	3.21	1.162
Community Protests	3.19	1.208
Local Governance Act, 2016 Act 936	3.07	1.262
Ghana Landfill Guidelines EPA 2002	3.05	1.225

Source: Fieldwork, (2023)

4.3.3 Economic Drivers for the Decommissioning

The decommissioning of the Kpone Kokompe landfill site was influenced by several factors, among which economic motives played a role, albeit a minor one. The analysis of responses from state institutions and key informants revealed that while there were economic considerations, these were not the primary drivers behind the decommissioning efforts. The economic benefits associated with the decommissioning were expected to materialise only in the long term, making them less significant in the decision-making process.

One potential economic motive identified was the future use of the decommissioned site for a recreational facility. However, this benefit is far from immediate. According to an officer from the TMA, the economic advantages of repurposing the landfill site would only be realised after extensive and prolonged treatment of the area:

“Ideally it should take about 30 years with constant treatment before the area can be reused. That is even in advanced countries where they

segregate their waste. In Ghana where we just dump everything and do not segregate our waste it will take even more time.”

(Officer, TMA, 2023)

The substantial timeframe required for the site to become suitable for recreational use was further corroborated by the lead consultant on the project:

“We cannot allow people to use the site until about 30 to 50 years. Why? Because this is a waste mass. There is still a lot of moisture in there that needs to be drained. The site still produces gases that need to escape or be trapped out.”

(Lead Consultant, EAP, 2023)

The officer from the EPA also emphasised the long-term nature of the potential economic benefits:

“There's still gas in there. We can't say go and play there while we still have gases there. Yes, eventually we can think of re using the site, but for now no. Maybe after some 50 years when we're very sure that it is not harmful.”

(Officer, EPA, 2023)

These statements collectively highlight the impracticality of developing the landfill site for recreational purposes in the short to medium term. The presence of toxic waste, harmful gases, and the need for thorough treatment means that any economic benefits from repurposing the site are only foreseeable after several decades.

Furthermore, while the idea of using the decommissioned site for alternative purposes exists from a regulatory perspective, it is clear that the immediate goal of

decommissioning was not economically driven. The primary focus was on mitigating the environmental and health hazards posed by the landfill. The economic advantages, though acknowledged, were secondary and expected to accrue only after a significant period of remediation and treatment.

4.3.3.1 Resident Perspectives on Economic Drivers of Decommissioning in Kpone Kokompe

Ten (10) constructs were evaluated in this study prior to the decommissioning of the Kpone Kokompe landfill as economic indicators from the respondents of the household survey. Using the mean ranking and the standard deviation, constructs with a higher mean ranking were classified as the most influential economic factors that led to the decommissioning. Understanding residents' prioritisation of these economic factors sheds light on the economic dynamics of the area before the decommissioning.

The study findings revealed that most of the participants generally agreed that *new jobs that have emerged in the area* were non-existent before the decommissioning. As can be gleaned from Table 4.7, the fact that new jobs had opened up in the area, which jobs were not in existence prior to the decommissioning was the most influential economic factor responsible for the decommissioning according to the residents based on the mean rank of 3.65. This finding is consistent with the concept of 'aspirational urbanism' where residents in developing countries seek access to amenities and opportunities associated with modern urban living Grimaldi, et al., (2019).

Residents in the Kpone Kokompe were of the view that *many businesses before decommissioning depended on the landfill* as this received the second highest mean of

3.60. Participants considered the presence of the landfill as an important economic channel in Kokompe before the decommissioning. This finding suggests that the local economy was heavily reliant on the operation of the landfill site as corroborated by Asante et al., 2020, who found that about 65 percent of residents living near dumpsites in Ghana depended on the dumpsites for income, particularly by engaging in informal waste picking activities. Table 4.7 further revealed that the availability of *more economic activities prior to decommissioning* in Kpone Kokompe was likely to have contributed to improved economic prospects, increased income, and enhanced quality of life for the community. This is because this variable of economic activity density obtained the third highest mean of 3.55. *The proximity to landfill indicator* describes residents who were working around the landfill site prior to decommissioning. This variable received the fourth-highest mean rank score of 3.53. Thus, the presence of more residents working around the landfill site was an important economic factor for residents of Kokompe. This suggests that residents perceived a vibrant local economy with various economic activities, potentially enhancing their quality of life and economic prospects prior to the decommissioning. However, such dependence could also lead to vulnerability and limited economic mobility, as highlighted by Chen et al. 2021.

Affordability of land in the area prior to the decommissioning received the fifth -highest mean rank score of 3.52. Thus, participants recognised the affordability of land in the area prior to decommissioning as an economic factor of importance. This is confirmed by Owusu Sekyere, 2018 and Ofori, 2021, who discovered that the economic value of properties located near landfills decreases and thus concluded that distance from a landfill is important to understand the effect of landfills on property values. Cheaper land could have facilitated the expansion of businesses and residential development,

positively impacting residents' economic prospects. The moderate ranking of “*affordability of waste disposal*” (3.43) as seen in Table 4.7 is intriguing. While residents valued this factor, it was not of top priority among the prevalent economic factors prior to the decommissioning. This could suggest that affordability was essential, but not the sole factor determining waste disposal practices. The existence of the landfill likely provided an accessible and possibly inexpensive waste disposal solution (Silva et al., 2020). With a mean rank score of 3.34, the *absence of new business developments* implies stagnation or limited growth in the local entrepreneurial ecosystem, potentially hindering innovation and diversification of economic activities.

The *new shops that have opened up were non-existent* received a moderate mean rank score of 3.30 and was ranked the eighth most important economic factor by way of relevance to residents prior to decommissioning. Participants mentioned that new shops that exist currently had not opened up in the Kokompe area before the decommissioning. Scoring 3.24, *limited employment opportunities* as an economic indicator suggested a perceived scarcity of job prospects within the area, potentially reflecting challenges in matching workforce skills with available employment opportunities or broader structural economic issues. The *existence of formal employment opportunities* in Kokompe prior to decommissioning received the lowest mean rank score of 2.55. Residents of Kokompe did not perceive the abundance of formal job opportunities and economic activities as a highly influential economic factor before landfill decommissioning. This means that, compared to other economic factors considered in the study, the availability of jobs and economic activities ranked relatively lower in terms of importance to residents. Residents of Kokompe may have had a diverse economic landscape with various economic opportunities before decommissioning. As a result, residents might not have

considered the abundance of formal jobs and economic activities as a standout factor since multiple other factors may have been equally or more significant in their daily lives.

The qualitative study revealed that economic motives were not the primary drivers for the decommissioning of the Kpone Landfill site, with stakeholders emphasising environmental and social concerns. Respondents from state institutions highlighted economic factors such as the potential for future economic benefits and the need for long-term treatment of the site before reuse. Residents on the other hand prioritised the emergence of new jobs, dependence on the landfill for businesses, and the availability of economic activities, reflecting a reliance on the landfill-driven local economy. These findings align with existing literature on the economic impact of landfills on local communities, emphasising the complex interplay between economic, environmental, and social factors (Asante et al., 2020; Grimaldi et al., 2019; Silva et al., 2020). The discrepancy between residents' perspectives and those of state institutions underscores the multifaceted nature of decision-making in landfill decommissioning processes, highlighting the importance of considering diverse stakeholder viewpoints in waste management policy and planning.

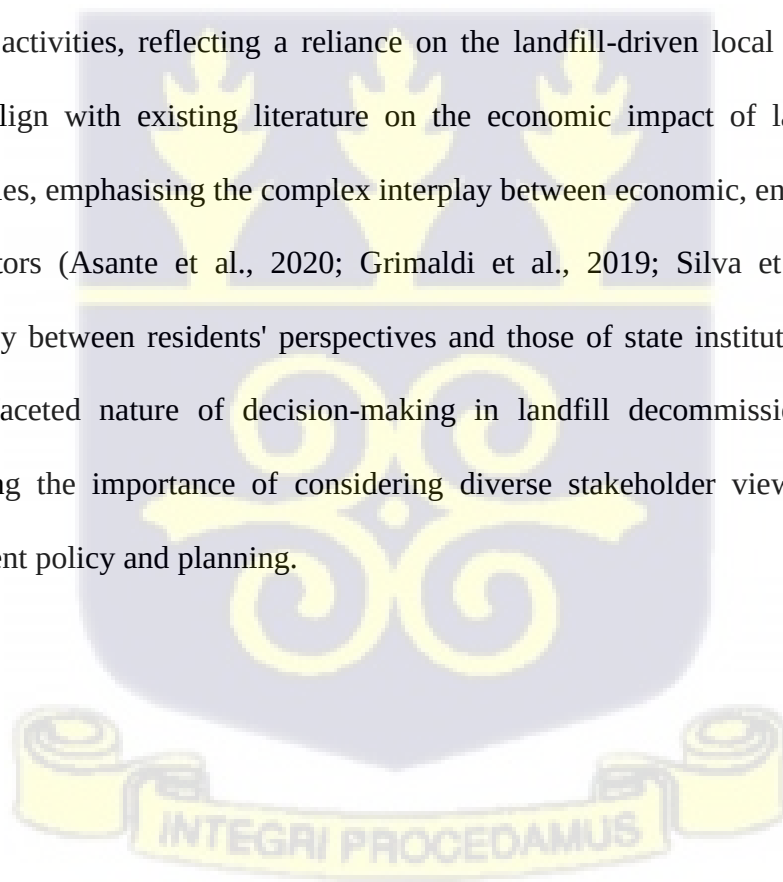


Table 4. 7: Economic Factors (Before) Decommissioning

Economic Factors	Mean Rank Score	Standard Deviation
Emergence of new jobs	3.65	1.071
Many businesses depended on the operations of the landfill site	3.60	1.146
Economic activity Density	3.55	1.154
Proximity to landfill employment	3.53	1.166
Affordability of Land	3.52	1.144
Affordable waste disposal	3.43	1.222
Absence of new business developments	3.34	1.220
The new shops that have opened up were non-existent	3.30	1.127
Limited employment opportunities in the area	3.24	1.173
There were a lot of formal employment opportunities in the area	2.55	1.408

Source: Fieldwork, (2023)

4.4 Evolving Dynamics: Post-Decommissioning of the Kpone Kokompe Landfill

In the aftermath of the decommissioning of the Kpone Kokompe landfill, a nuanced understanding of the evolving dynamics surrounding environmental, social, and economic factors is essential. This section delves into the post-decommissioning landscape, examining how environmental stewardship, social cohesion, and economic sustainability have been reshaped. Exploring the ongoing impacts and emerging challenges will aid in obtaining insights into the lasting effects of the landfill decommissioning on the surrounding community and ecosystem.

4.4.1 Environmental Factors After Decommissioning

The decommissioning of the Kokompe landfill had a significant impact on the environmental conditions of the area, as highlighted by various respondents. This section presents the responses from the respondents such as state institutions and private entities who were involved in the decommissioning process as well as the residents of Kokompe on the economic aftermaths of the phenomenon.

4.4.1.1 Improvement in General Environmental Conditions

In a response captured from an officer of the MSWR, it was evident that significant improvements in cleanliness and environmental quality have been observed in Kpone Kokompe since its decommissioning. Appendix 6 (f) shows the current state of the decommissioned landfill site. The absence of foul odours and the improved air quality suggest successful efforts to address pollution and waste management issues. Furthermore, infrastructure development, such as road construction, further indicates positive changes in the area's overall condition following the decommissioning process:

“Yes, absolutely, I mean if you go to Kpone Kokompe now and you are told the place was so filthy two years ago, you won’t believe it. There is no smell, the air quality has improved, the road has been constructed. It is nothing like it used to be trust me.”

(Officer, MSWR, 2023).

In addition to the response from the officer of the MSWR above, decommissioning efforts in Kokompe have significantly enhanced the quality of life for residents, as evidenced by a drastic reduction in foul odours and improved public hygiene after the decommissioning. Residents now enjoy the freedom to move about without the threat of encountering airborne waste, indicating a tangible improvement in environmental health.

Moreover, the formation of a waste collection cooperative by former landfill workers highlights the positive socio-economic impact of decommissioning, with residents now benefitting from organized waste management services. This is evident in the response from the views of the lead consultant for the decommissioning thus:

“Decommissioning has improved the quality of life of the people. I mean the stench in the area has drastically reduced; people can walk about freely without fear of being hit by flight litter. Generally, the wellbeing of residents has improved. As I stated earlier, the waste pickers who were working on the landfill when it was operative have even formed a cooperative after the decommissioning and are now doing house to house collection of waste in the nearby towns within the vicinity.”

(Lead Consultant, EAP, 2023)

The above views on environmental conditions in Kokompe after decommissioning was further reiterated by the managing director of waste landfills in the following words:

“Well, I wanted to say that the landfill is no longer an environmental hazard. For the purpose of this discussion, decommissioning has significantly reduced the poor sanitary conditions such as litter and leachate seepage into the community.

The residents would have benefitted more if the project had been completed fully and the site had been converted into a recreational area where they could have for example a football field, or where they can hold events. For now, however the main benefits of the decommissioning in my opinion remain environmental. The air quality has improved, the source of water is not contaminated, the flies in the area have drastically

reduced. To be honest the place was deplorable prior to the decommissioning but now unless you are told, you will not even know that there was stench or windblown litter.”

(MD, Waste Landfills Ltd, 2023)

4.4.1.2 Resident Views on Environmental Factors Post Decommissioning

The study examined fourteen constructs (14) post-decommissioning of the Kpone Kokompe landfill as environmental indicators from the respondents of the household survey as depicted in Table 4.8. Using the mean ranking and the standard deviation constructs with a higher mean ranking were classified as the most influential environmental factors post-decommissioning. The study findings revealed that most of the participants stated that *decommissioning had reduced leachate in the environment* as one of the major influential environmental factors post-decommissioning, based on the mean rank of 3.78. This implies that majority of the participants were of the view that the reduction of leachate in the environment is the most noticeable environmental factor post-decommissioning of the Kpone Kokompe landfill site.

The reduction in leachate has the effect of reducing the risk of disease transmission through contaminated water, potentially explaining the higher ranking for cholera reduction in Kokompe. Various research works have highlighted the severe economic consequences of leachate pollution, including increased costs for water treatment and remediation of contaminated land (Osei et al., 2011, Baah & Kharlamova ,2018, Xu et al., 2019). *Decommissioning has reduced the mosquitoes, flies, and rodents* in the area around the landfill site, obtained the second highest mean of 3.71. Landfill decommissioning and the subsequent reduction in pest and mosquito populations are

intrinsically linked. Proper management of landfill sites has been shown to effectively decrease the population dynamics of various insect pests, thus mitigating health risks (Qasim et al., 2020). This correlation is particularly evident in the case of Kpone Kokompe, where the substantial decrease in mosquitoes, flies, and rodents in the vicinity following decommissioning is supported by findings from previous research. Landfills serve as ideal breeding grounds for these pests due to the abundance of organic waste, which not only attracts them but also provides ample breeding and feeding opportunities (Owusu- Sekyere 2022). Studies by Nyame et al. (2012), Denutsui et al. (2012), Annorbah, 2014 and UNEP (2021) have extensively documented the public health risks associated with landfill-related pests, further highlighting the importance of effective landfill management. The observed decrease in pest populations in Kpone Kokompe post-decommissioning suggests potential health benefits and improved living conditions for residents. However, the presence of a standard deviation of 2.331 in the data indicates the need for continued vigilance and implementation of comprehensive pest control measures to sustain these improvements over time.

Furthermore, *reduction in littering of the environment* obtained the third highest mean of 3.65 as shown in Table 4.8. This means that apart from the reduction of leachate in the environment, the reduction in mosquitoes, flies, and rodents in Kpone Kokompe, after decommissioning, there has also been a reduction in the litter that used to be in the environment. Landfills can attract littering due to their association with waste disposal (Oteng Ababio, 2011; Kusi et al., 2016). A number of studies have discovered a link between improper waste management and increased littering (Ojedukun et al., 2022; Oduro-Appiah et al., 2024). The decrease littering in Kpone Kokompe indicates a potential improvement in waste management practices and overall community aesthetics.

Several studies, including those by Tenodi (2020), Akparorue (2020) and Iddrisu & Debrah (2021) highlight the health risks associated with poor landfill management, such as exposure to dust, smoke, and vermin, as well as groundwater and soil contamination. These findings stress the importance of *improved sanitary conditions* in mitigating these risks. Thus, the mean rank score of 3.51 in Kpone Kokompe post decommissioning reflects a positive impact on public health and well-being, stemming from improved sanitary conditions.

Landfill operations are notorious for generating significant noise pollution due to the use of machinery and increased traffic in the vicinity. Stankov et al. (2022) elucidate the adverse effects of noise pollution on human health and well-being, stressing the urgency of addressing noise pollution issues. A mean of 3.4 suggests a *reduction in noise* levels in Kpone Kokompe post-decommissioning, hinting of an improvement in the noise levels.

Maio et al. (2023) highlight the link between air pollution from landfills and respiratory illnesses, underscoring the potential health risks associated with poor air quality. From the data, post decommissioning, residents reported an *improvement in the odour and air quality* in Kpone Kokompe, as reflected by mean rank scores of 3.36 and 3.35 respectively (Mataloni et al., 2016, Njoku et al., 2019). Despite reduced landfill emissions contributing to the observed improvement, the variability in resident perceptions, as indicated by a standard deviation of 1.149, may suggest potential lingering concerns or a necessity for better communication regarding air quality data. Extensive air quality monitoring and longitudinal health studies are necessary to

understand the long-term impact on air quality and respiratory health in the area post decommissioning.

Memory loss, Cancers, malaria reduction, birth defects, reduction in respiratory diseases and health improvements had the following means: 3.42, 3.39, 3.32, 3.21, 3.21 and 3.21 respectively as shown in Table 4.8. Malaria reduction post decommissioning in Kokompe necessitates further exploration. While reduced leachate (indicating lower water contamination) might contribute to the reduction in Malaria cases in Kokompe, other factors may also have played a role as discovered by Anoopkumar et al. (2022) who highlight the importance of factors like mosquito breeding grounds and climate in malaria transmission.

The variability in perceived health improvements, including reductions in birth defects, cancers, and memory disturbances among residents in Kokompe present challenges in assessing their impact post decommissioning. This reflects research that support the fact that attributing these improvements solely to reduced landfill exposure may be challenging due to the long latency periods of diseases like cancers and memory disorders (Yeley, 2021). High standard deviations in resident perceptions (1.279, 1.229, 1.160) reveal the need for more robust epidemiological studies to track disease incidence over time and validate the health impacts of decommissioning. Nonetheless, the precautionary principle in environmental health supports the notion that reduced exposure to potential toxins from the landfill is a positive step towards improving overall community health (Siddiqua et al., 2022; Wijekoon et al., 2022). Continued monitoring and research are essential for understanding the full extent of the environmental

improvements and their implications for public health in Kpone Kokompe post decommissioning.

From Table 4.8, a *noticeable decrease in vehicular traffic* is observed in Kokompe after the decommissioning exercise (mean score of 3.28) with some variation in resident perceptions. Landfill operations often generate significant truck traffic and the economic costs of traffic congestion, including loss of productivity and increased fuel consumption (Mohsenizadeh, 2020). The reduced traffic in Kokompe post decommissioning can lead to economic benefits like improved travel times and potentially lower transportation costs.

In summary, the combination of qualitative insights from institutional stakeholders and quantitative data from residents reveal the multi-dimensional impact of landfill decommissioning in Kokompe. Residents reported notable improvements in living conditions, including reduced odours and better air quality, fostering a more welcoming environment. Closure of the landfill has addressed long-standing concerns such as litter accumulation and leachate seepage, enhancing sanitation standards. While aspirations for further development are voiced, the primary benefits remain environmental, with tangible improvements in air and water quality and overall improvement in the quality of life of residents of the community.

Prior to the decommissioning, residents endured adverse conditions marked by odour, air pollution, and inadequate sanitation, prompting calls for action. However, the post-decommissioning landscape signifies a significant step towards environmental rejuvenation and enhanced quality of life.

Table 4.8: Environmental Factors (After) Decommissioning

Environmental Factors	Mean Rank Score	Standard Deviation
Reduced leachate in the environment	3.78	2.796
Cholera	3.77	3.116
Reduction in the mosquitoes, flies and rodents in the area	3.71	2.331
Decommissioning has reduced littering of the environment	3.65	3.106
Improved sanitary conditions in the area	3.51	1.126
Memory disturbances	3.42	1.160
Reduced the noise in the area	3.41	1.204
Cancers associated with heavy metal inhalation	3.39	1.220
Decommissioning activities have led to less odour from the site	3.36	1.194
Reduced the dust in the environment and has led to improvement in the quality of the air	3.35	1.149
Decommissioning has reduced the incidence of malaria	3.32	1.208
Reduced vehicular traffic in the area	3.28	1.162
Babies born in the vicinity after decommissioning have less birth defects	3.21	1.279
Respiratory and breathing disorders in the vicinity have reduced after decommissioning	3.21	1.273

Source: Fieldwork, (2023)

4.4.2 Post-Decommissioning Social Dynamics

This section discussed the multifaceted social aftermath of landfill decommissioning in Kokompe, exploring both the positive impacts and challenges encountered by local residents and waste pickers.

4.4.2.1 Community Resilience and Economic Opportunities Post-Decommissioning

Respondents in the study highlighted significant enhancements in the quality of life of residents post-decommissioning. The reduction in waste-related hazards, such as leachate overflow and air pollution, has led to a safer and more sanitary environment. Residents now enjoy improved access to clean water for household chores, leading to a

healthier living environment. Respondents 1 and 6 expressed the above views in the following words:

“Yes, absolutely, I mean if you go to Kpone Kokompe now and you are told the place was so filthy two years ago, you won’t believe it. There is no smell, the air quality has improved, the road has been constructed. It is nothing like it used to be trust me.”

(Lead Consultant, EAP, 2023)

“In addition, during the decommissioning, the young men in the area, Kokompe were employed. We engaged some of them to help us with moving the waste around the cells among others. They were well paid. Further with respect to the quality of the water in the area, the aqua life, the streams, downstream have a lot of improved parameters so fish life has been improved post the decommissioning. The river or water bodies are now safer than before. The residents in the community can use it for washing and other chores. They have no pathogens to care about.”

(MD, Waste Landfills Ltd, 2023)

The decommissioning process provided employment opportunities for young men in the Kokompe area, contributing to local economic development according to participants of the interviews. Furthermore, the reduction in waste-related environmental hazards has likely positively impacted property values and reduced healthcare costs, resulting in potential economic benefits for residents.

The following excerpt from the interview captures these points:

“In addition, during the decommissioning, the young men in the area, Kokompe were employed. We engaged some of them to help us with moving the waste around the cells among others. They were well paid. Further with respect to the quality of the water in the area, the aqua life, the streams, downstream have a lot of improved parameters so fish life has been improved post the decommissioning. The river or water bodies are now safer than before. The residents in the community can use it for washing and other chores. They have no pathogens to care about.”

(MD, Waste Landfills Ltd, 2023)

Respondents emphasised the critical role of waste pickers in waste management and the need to integrate them into formal waste management systems post decommissioning. By providing waste pickers with personal protective equipment (PPE) and regulating their activities, stakeholders should aim to improve waste management practices and ensure the efficient extraction and recycling of valuable materials from the waste stream. This can be gleaned from the views of the officer from WIEGO reproduced below:

“Our focus is to get policy makers to integrate these waste pickers into the formal waste management cycle. At the height of COVID 19 for example, when the formal waste management service providers shut down, it was these informal waste pickers that filled the void.”

(Project Officer, WIEGO, 2023)

4.4.2.2 Residents Views on Post-Decommissioning Social Constructs

The study evaluated nine (9) social constructs post-decommissioning in Kokompe, as perceived by residents, revealing important shifts in the community’s social

environment. These are presented in Table 4.9, where the analysis of mean rank scores highlights areas of perceived progress and continuing social concern.

Table 4. 9: Social Factors (After) Decommissioning

Social Factors	Mean Rank Score	Standard Deviation
Roads being constructed	3.54	1.159
Youth Involvement in drug use	3.50	1.166
Has resulted in environmental activism	3.36	1.229
Local Governance Act, 2016 Act 936	3.36	1.156
Less conflicts among waste pickers	3.30	1.135
Opened the place for development	3.28	1.221
Ghana Landfill Guidelines EPA 2002	3.23	1.190
Incidents of Robbery and theft	3.22	1.205
Environmental Assessment Regulations LI, 1652	3.12	1.185

Source: Fieldwork, (2023)

Access to good road and educational facilities recorded the highest mean rank score of 3.54, reflecting improved access to services and physical connectivity within the community. This infrastructural enhancement represents a key social gain associated with the post-decommissioning phase. *Youth involvement in drug use*, with a mean rank score of 3.50, emerging as a critical concern and reflects greater community awareness and sensitivity to youth vulnerability and social challenges following decommissioning, as noted by Salah et al. (2020), who argue that increased awareness is essential for mitigating health and social risks.

Environmental activism, with a score of 3.36, points to rising civic engagement and the community's growing commitment to environmental sustainability. This trend suggests a more active citizenry participating in post-decommissioning dialogue and advocacy. Perceptions of *improved implementation of the Local Governance Act, 2016 (Act 936)*

and *the Ghana Landfill Guidelines* (EPA, 2002) also featured, with scores of 3.36 and 3.23 respectively. These scores signal improved institutional responsiveness and regulatory visibility following the closure of the landfill. *Conflicts among waste pickers were perceived to have reduced* (mean score 3.30), indicating enhanced social cohesion in the post-decommissioning setting.

The perception that the decommissioning *has opened up the area for development* received a mean score of 3.28, reinforcing findings from Venter (2020), Berman et al. (2022), and Becerra (2022), who assert that former landfill sites, when properly managed, can become catalysts for community regeneration.

Incidents of robbery and theft (mean score 3.22) remain an issue of concern, suggesting that while certain social improvements have occurred, safety challenges persist in the area. Likewise, the occurrence of *community protests* before decommissioning (mean score 3.12) signals previous dissatisfaction, underscoring the need for enhanced community engagement and more transparent environmental governance moving forward.

In summary, the post-decommissioning period in Kokompe has seen both improvements and ongoing challenges in the social sphere, with gains in infrastructure and civic awareness, alongside persistent issues such as youth vulnerability and security concerns. These findings underscore the complex social dynamics accompanying environmental interventions in urban communities.

4.4.3 Economic Factors After Decommissioning

The economic aftermath of the landfill decommissioning is a critical aspect influencing community livelihoods and prosperity. In the context of Kokompe, stakeholders provided insights into the diverse impacts of decommissioning, ranging from potential property value appreciation to challenges in sustaining local economies. This section discusses the economic dynamics post-decommissioning, exploring both opportunities and obstacles faced by residents and stakeholders.

4.4.3.1 Economic Insights into Post Decommissioning in Kpone Kokompe

In the view of the lead consultant decommissioning could potentially lead to appreciation in property values in Kokompe and its environs due to the improved habitability of the area post the exercise. This suggests a positive economic impact for homeowners as their properties become more desirable in the real estate market. The lead consultant for the decommissioning expressed these views in the following words:

“Generally, the properties of homeowners in Kpone Kokompe and its environs will appreciate in value as the area has become more habitable. Also, the house-to-house collection of waste by the waste pickers who have formed the association is also a source of income for the waste pickers”.

(Lead Consultant, EAP, 2023).

The officer from WIEGO emphasised the importance of waste pickers, food vendors, and middlemen in sustaining livelihoods and fostering a thriving local economy in Kokompe. The activities of WIEGO contribute to job creation and income generation,

providing essential support for residents' economic well-being post decommissioning.

These views were expressed in the following words:

“Majority of the people who live in the community are the waste pickers, food vendors, middlemen. Through the activities of WIEGO, livelihoods in the Kokompe area are sustained and as such there is a thriving local economy as people have work to do.”

(Project Officer, WIEGO, 2023)

The foregoing notwithstanding, there were contrasting perspectives on the economic benefits of the decommissioning. While the lead consultant for the project (EAP Consult) highlighted potential benefits such as property value appreciation, the president of the Kpone waste pickers association expressed concern about the negative impact of decommissioning on livelihoods in Kokompe. The president of the waste pickers association pointed out that decommissioning led to the loss of livelihoods for waste pickers, and the alternative livelihood plan initiated by WIEGO may not fully compensate for the loss. Despite the efforts of the waste pickers cooperative and the door-to-door waste picking initiative, many individuals remained unemployed, highlighting the economic challenges faced by the community post-decommissioning. Below is the excerpt from the views of the president of the Kpone waste pickers association:

“From my perspective there is no benefit. The decommissioning took away our livelihood. The only benefit maybe is the alternative livelihood plan we have implemented and that came about because of the decommissioning. Even done it was initiated by the NGO called WIEGO

and not the government who took away our source of food. Even now some people are unemployed. A lot of people actually.

For the cooperative idea and the door-to-door waste picking, it came about as a result of the decommissioning. That was the reason why we started. Majority of the waste pickers also have other small, small jobs they do in addition to support themselves and their families.’’

(President, KWPA,2023).

4.4.3.2 Economic Analysis Through Resident Perspectives Post-Decommissioning

The study evaluated ten (10) constructs after decommissioning of the Kpone Kokompe landfill as economic indicators as can be seen in Table 4.10.

Decommissioning has led to the closure of some businesses received the highest mean rank score of 3.64. This high mean rank score indicated that it was the most prominent economic effect observed after landfill decommissioning. The high score for business closures suggested significant economic disruption in Kokompe. Wilson, (2020) observed significant job losses and decreased tax revenue when businesses close due to environmental cleanup projects. The nature of businesses which closed as well as any support programmes offered to help residents relocate or transition is an important consideration in determining resident adaptation in Kokompe post decommissioning.

The second most influential economic factor after decommissioning was the *increase in the value (price) of the land* in Kokompe with a mean rank score of 3.57. Thus, the decommissioning process led to a notable appreciation in property values, which can benefit property owners and attract potential investors to the Kokompe area. This

finding corresponds to research by Becerra, (2022) on the Brownfield redevelopment in the United States of America, who found that there was property value appreciation in areas following environmental remediation. However, it is important to consider whether the increase benefitted all residents or widened existing inequalities. Gentrification can displace low-income residents who cannot afford the rising property taxes (Delmelle, 2021). In light of the foregoing, community engagement in land-use planning is important to ensure equitable development in Kpone Kokompe post decommissioning.

People have obtained new jobs in the area ranks third with a mean rank of 3.47, in Table 4.10 indicating that the creation of new job opportunities for residents was a significant economic outcome of decommissioning. According to Tekin (2021), environmental remediation projects create new jobs in areas such as construction, decontamination, and waste management. This is a positive sign for residents' economic well-being in Kpone Kokompe.

The opening of new shops is another positive economic development. It ranked closely behind the factor related to job creation with a mean rank of 3.46, suggesting that it has had a notable impact on the local economy. The opening of new shops can indeed indicate economic revitalisation, as seen in the positive impact of infrastructure development on local businesses (Grimaldi, 2019). However, the types of shops opening and their target clientele in Kpone Kokompe need further investigation.

Decommissioning has resulted in increased demand for accommodation in the area ranks fifth with a mean rank score of 3.45 indicating that decommissioning has led to

increased demand for accommodation. The rise in demand for housing signifies potential economic growth. This can be seen as a positive sign of potential economic growth and investment in the community (Alemzero et al., 2021).

The loss of jobs by some residents of Kpone Kokompe ranked sixth with a mean rank score of 3.38. While it was not the highest-ranked factor, it was significant, suggesting that some residents, such as waste pickers, suffered job losses as a consequence of the decommissioning. Morais, et al. (2022), highlight the potential for job losses in industries reliant on landfills, such as waste picking or waste transportation.

Decommissioning has negatively affected economic activities had a mean rank score of 3.31. This factor ranked seventh, indicating that certain economic activities were negatively impacted. It highlights potential challenges in the local economic landscape post-decommissioning. *Increased cost of waste disposal after decommissioning* ranked eighth with a mean rank score of 3.27. While this was not the most influential factor, it signified an economic challenge that residents of Kpone Kokompe are encountering after the landfill decommissioning. Ghimire et al. (2021) suggest that transitioning to alternative waste management systems can come with higher costs. Additionally, exploring alternative, potentially more affordable, waste management solutions could lessen the financial burden on residents.

Decommissioning has created new jobs for the residents with a mean rank of 3.07 in Table 4.10. This factor received the lowest mean rank score. According to Dell'Anna, (2021), there is the potential for a 'green jobs' sector to emerge from environmental cleanup projects as may likely be the case in Kpone Kokompe. Although this construct

is positive in the opinion of residents of Kpone Kokompe, it is not as prominent as the other economic effects post decommissioning as residents may not be qualified to occupy the new jobs created.

From the above, the economic aftermath of landfill decommissioning in Kpone Kokompe illustrates a dynamic landscape marked by both positive and negative factors. The closure of businesses and the surge in land values stand out as prominent economic shifts post-decommissioning, alongside the emergence of new job opportunities and commercial ventures. However, there were concerns regarding job losses, economic disruptions, and escalated waste disposal costs in Kpone Kokompe.

Table 4. 10: Economic Factors (After) Decommissioning

Economic Factors	Mean Rank Score	Standard Deviation
Has led to the closure of some businesses	3.64	1.127
Has increased the value (price) of the land in the area	3.57	1.164
People have obtained new jobs in the area	3.47	1.124
New shops have been opened	3.46	1.157
Has resulted in increased demand for accommodation in the area	3.45	1.141
Led to the development of new businesses	3.29	1.099
Some residents losing their jobs	3.38	1.225
Has negatively affected economic activities	3.31	1.147
Increased the cost of waste disposal	3.27	1.208
Has created new jobs for the residents	3.07	1.238

Source: Fieldwork, (2023)

4.5 Reliability Analysis of Environmental, Social, and Economic Factors Before and After Decommissioning of the Kpone Kokompe Landfill

The internal consistency of the environmental, social, and economic factors before and after the decommissioning of the Kpone Kokompe landfill was assessed using the Cronbach's Alpha analysis. This approach allowed for a thorough examination of reliability across different time frames, offering valuable insights into the enduring impacts of decommissioning on Kpone Kokompe.

4.5.1 Environmental Factors Before and After Decommissioning- Assessing

Internal Consistency

The Cronbach's Alpha coefficient for environmental factors before decommissioning is 0.778 as shown in Table 4.11. This indicates a relatively good level of internal consistency among the fourteen (14) items used to measure environmental factors in this context (odour, vehicular traffic, littering of the environment, unhygienic or unsanitary conditions, mosquitoes/flies and rodents, respiratory and breathing disorders, contamination from leachate, dust in the environment, noise, babies born with health defects, prevalence of malaria, cancers, memory disturbances and cholera). From Table 4.11, the Kappa coefficient of 0.642 suggests substantial agreement among the items, and the low standard error (SE) of 0.07 indicates a high level of precision. The p-value of 0 indicates that the reliability of the scale is statistically significant, meaning the internal consistency is not due to chance.

The Cronbach's Alpha coefficient for environmental factors after decommissioning from Table 4.11 is 0.832. This shows a higher level of internal consistency compared to the 'before' condition. The Kappa coefficient of 0.673 indicates substantial agreement among the items, and the lower standard error (SE) of 0.061 suggests higher precision.

Again, the p-value of 0 indicates statistically significant reliability, as shown in Table 4.10.

4.5.2 Social Factors Before and After Decommissioning- Assessing Internal Consistency

Table 4.11 shows the Cronbach's Alpha coefficient for social factors before decommissioning is 0.883. This represents a very high level of internal consistency among the nine (9) items used to measure social factors in this context (Conflicts among waste pickers, environmental activism among residents, youth involvement in drug use, access to good roads and educational facilities, the place was generally underdeveloped with very few amenities, community protests enforcement of Ghana Landfill Guidelines of the EPA 2002 in the decommissioning process and enforcement Local Governance Act, 2016 Act 936) in the decommissioning process. The Kappa coefficient of 0.712 indicates substantial agreement among the items, and the low standard error (SE) of 0.012 demonstrates a good level of precision. The p-value of 0 indicates statistically significant reliability.

The Cronbach's Alpha coefficient for social factors after decommissioning is 0.782. While this is slightly lower than the “before” condition, it still suggests a reasonable level of internal consistency among the nine (9) items used. The Kappa coefficient of 0.681 indicates substantial agreement among the items, and the low standard error (SE) of 0.013 indicates a good level of precision. The p-value of 0 indicates statistically significant reliability.

4.5.3 Economic Factors Before and After Decommissioning-Assessing Internal Consistency

The Cronbach's Alpha coefficient for economic factors before decommissioning as seen in Table 4.11 is 0.891. This is a very high level of internal consistency among the eleven (11) items used to measure economic factors in this context (Affordability of Land, formal employment opportunities in the area, dependency of business on the operations of the landfill, affordable waste disposal, limited employment opportunities in the area, absence of new business developments, new shops that have opened up were non-existent, emergence of new jobs, economic activity density, proximity to landfill employment).

Table 4. 11: Reliability Tests

Reliability Test	Cronbach Alpha	Number of Items	Kappa	SE	P-value
Environmental factor					
Before	0.778	14	0.642	0.07	0
After	0.832	14	0.673	0.061	0
Economic factors					
Before	0.891	11	0.665	0.004	0
After	0.701	10	0.683	0.008	0
Social factor					
Before	0.883	9	0.712	0.012	0
After	0.782	9	0.681	0.013	0

Source: Fieldwork, (2023)

The Kappa coefficient of 0.665 indicates substantial agreement, and the extremely low standard error (SE) of 0.004 demonstrates a very high level of precision. The p-value of 0 indicates statistically significant reliability.

The Cronbach's Alpha coefficient for economic factors after decommissioning is 0.701 as can be seen in Table 4.11. While this is lower than the “before” condition, it still

indicates a reasonable level of internal consistency among the 11 items used. The Kappa coefficient of 0.683 suggests substantial agreement among the items, and the low standard error (SE) of 0.008 indicates a good level of precision. Like the other measures, the p-value of 0 indicates statistically significant reliability.

4.5.4 Assessment of Environmental Conditions Before and After Decommissioning

The Wilcoxon signed rank test was conducted to evaluate the significance of differences in environmental factors before and after the decommissioning event in Kpone Kokompe. From Table 4.12, the following observations were noted:

4.5.4.1 Negative Ranks (a)

A total of 185 cases exhibited negative ranks, indicating instances where the second measurement after decommissioning yielded lower values compared to the initial measurement taken before decommissioning. These cases include:

1. Odour Reduction: Decrease in odour emanating from the landfill site post-decommissioning.
2. Vehicular Traffic: Reduction in vehicular traffic in the vicinity of the landfill site.
3. Littering: Decrease in littering of the environment surrounding the landfill area.
4. Sanitary Conditions: Improvement in sanitary conditions within the area after decommissioning.
5. Pest Reduction: Decrease in the presence of mosquitoes, flies, and rodents in the vicinity.

6. Respiratory Disorders: Reduction in respiratory and breathing disorders among residents.
7. Leachate Contamination: Decrease in leachate contamination observed in the environment.
8. Air Quality Improvement: Reduction in dust and enhancement of air quality post-decommissioning.
9. Noise Reduction: Decrease in noise levels in the area surrounding the landfill site.
10. Health Improvements: Reduction in birth defects, malaria incidence, and ailments associated with heavy metal inhalation such as cancers, memory disturbances, and cholera.

4.5.4.2 Positive Ranks (b)

Conversely, Table 4.12 shows that 205 cases had positive ranks, indicating situations where the second measurement post-decommissioning surpassed the initial measurement taken prior to decommissioning. These instances include the absence of adverse environmental conditions observed before decommissioning.

4.5.4.3 Ties (c)

There were 8 instances where both measurements yielded identical values, resulting in a rank of 0 for these cases as depicted in Table 4.12.

4.5.4.4 Interpretation of Results

4.5.4.4.1 Test Statistics

The test statistic was calculated as -0.962, representing the summation of ranks attributed to negative differences (negative ranks) subtracted from the summation of ranks assigned to positive differences (positive ranks).

4.5.4.4.2 P-Value

The associated p-value for this test was determined to be 0.336. With a p-value exceeding the conventional significance threshold of 0.05, there is insufficient evidence to reject the null hypothesis. Consequently, there was no statistically significant difference between the measurements obtained before and after the intervention or treatment.

Based on the results of the Wilcoxon signed rank test, there is no statistically significant divergence between pre- and post-decommissioning measurements of environmental factors in Kpone Kokompe. These findings suggest that the decommissioning activities may have positively impacted the environmental conditions in the area, as evidenced by the observed reductions in various environmental hazards and improvements in overall environmental quality. However, further research and monitoring may be necessary to assess long-term environmental trends and sustainability.

Table 4.12: Wilcoxon Signed Rank Test for Environmental Factors

Ranks	N	Mean Rank	Sum of Ranks	test statistics	p-value
Negative Ranks	185 ^a	198.98	36811.50	-0.962	0.336
Positive Ranks	205 ^b	192.36	39433.50		
Ties	8 ^c				
Total	398				

Source: Fieldwork, 2023

4.5.5 Evaluating Social Conditions Pre- and Post-Decommissioning

Table 4.13 provided an insightful comparison of social factors before and after the decommissioning of the Kpone Kokompe landfill site. This analysis aimed to shed light on the impact of this significant environmental intervention on the social dynamics within the community. The table presents data on negative ranks, positive ranks, and ties, along with relevant statistical measures for deeper interpretation.

4.5.5.1 Negative Ranks

These represent cases where social factors were adversely affected after decommissioning. A total of 176 cases exhibited negative ranks, indicating instances where the second measurement after decommissioning yielded lower values compared to the initial measurement taken before decommissioning in Table 4.13. These cases include:

1. Conflicts among Waste Pickers: Instances of conflicts among waste pickers decreased post-decommissioning.
2. Environmental Activism among Residents: Decrease in community activism regarding environmental issues.
3. Incidents of robbery and theft: Increased robbery and theft in communities around the landfill's operations and impacts.
4. Access to Infrastructure: Deterioration in access to good roads and educational facilities.
5. Development and Amenities: Reduction in the availability of amenities due to underdevelopment.
6. Regulatory Enforcement: Decrease in enforcement of environmental regulations and governance laws during decommissioning.

The mean rank of approximately 177.68 suggested that, on average, social factors experienced a slight decline after the landfill's closure. However, the test statistics of -1.055b and the associated p-value of 0.291 indicate that this change was not statistically significant at the conventional significance level of 0.05. In other words, there was no strong evidence to suggest that negative social impacts were a direct result of the decommissioning of the landfill.

The data suggested that there was a notable contrast between negative and positive ranks in the context of social factors associated with the decommissioning of the Kpone Kokompe landfill.

4.5.5.2 Positive Ranks

Conversely, as can be seen from Table 4.13, 189 cases had positive ranks, suggesting situations where the second measurement post-decommissioning surpassed the initial measurement taken prior to decommissioning. These cases include:

1. Increased Social Harmony: Improvement in social cohesion and reduced conflicts among waste pickers.
2. Community Engagement: Rise in community engagement and activism on environmental issues.
3. Enhanced Awareness: Greater awareness among residents about landfill operations and environmental impacts.
4. Improved Infrastructure: Expansion of infrastructure and better access to educational and transportation facilities.
5. Development Initiatives: Introduction of development projects and amenities to improve living standards.

6.Strengthened Regulatory Oversight: Heightened enforcement of environmental regulations and governance laws post-decommissioning.

In contrast, the cases with positive ranks (mean rank 187.95) imply that certain social factors may have improved or remained stable after the landfill's decommissioning. However, the absence of statistical tests for this category makes it challenging to draw firm conclusions based solely on these ranks.

4.5.5.3 Ties

The presence of tied rankings (32 cases) in Table 4.13 highlights the complexity of social factors and the mixed experiences within the community. These tied cases could represent situations where social impacts were both positive and negative, leading to an equilibrium in the rankings.

4.5.5.4 Interpretation of Results

Negative ranks, represented by 176 cases, indicated a decline in various social aspects post-decommissioning, such as conflicts among waste pickers, reduced environmental activism, and deteriorating access to infrastructure. The mean rank of approximately 177.68 suggested that, on average, social factors experienced a slight decline after the landfill's closure. However, the test statistics of -1.055b and the associated p-value of 0.291 indicate that these changes are not statistically significant at the conventional significance level of 0.05. Therefore, while these negative changes were observed, they may not be directly attributable to the landfill closure.

Conversely, positive ranks, represented by 189 cases, highlighted improvements in social cohesion, community engagement, awareness about landfill operations, and

access to infrastructure after decommissioning. The mean rank for positive ranks is approximately 187.95, suggested that certain social factors may have improved or remained stable post-decommissioning. The presence of tied rankings, accounting for 32 cases, indicated a complexity in social impacts, where both positive and negative changes may coexist, leading to an equilibrium in the rankings.

In summary, while the decommissioning of the landfill may have influenced certain social factors, the statistical analysis suggested that the observed changes were not statistically significant. Therefore, further investigation and consideration of broader contextual factors are warranted to fully understand the implications of the landfill closure on social dynamics in Kpone Kokompe.

Table 4. 13; Statistical Comparison of Social Factors Before and After Decommissioning

Ranks	N	Mean Rank	Sum of Ranks	test statistics	p-value
Negative Ranks	176 ^g	177.68	31272.00	-1.055 ^b	0.291
Positive Ranks	189 ^h	187.95	35523.00		
Ties	32 ⁱ				
Total	397				

Source: Fieldwork, 2023.

4.5.6 Evaluating Economic Conditions Pre- and Post-Decommissioning

The Wilcoxon signed rank test, like in the case of environmental and social factors was employed to ascertain the presence of a statistically significant distinction between paired observations for economic factors as well as shown in Table 4.14. The test revealed the following:

4.5.6.1 Negative Ranks (a)

A total of 185 cases exhibited negative ranks, signifying instances where the second measurement, conducted after the decommissioning event, yielded lower values compared to the initial measurement taken before decommissioning. These cases included changes such as:

Decrease in the average selling price per square meter of land in the area (Affordability of Land).

1. Reduction in the number of job openings advertised by local businesses (Formal Employment Opportunities).
2. Decrease in revenue reported by businesses directly reliant on landfill activities (Dependency on Landfill Operations).
3. Increase in the cost of waste collection services for residents (Affordable Waste Disposal).
4. Decline in the number of job postings in the local newspaper (Limited Employment Opportunities).
5. Fewer applications for new business licenses in the municipality (Absence of New Business Developments).
6. Closure of existing shops due to decreased foot traffic in the area (Non-existent New Shops).
7. Reduction in the number of job seekers attending local employment fairs (Emergence of New Jobs).
8. Decrease in the number of transactions recorded by local banks (Economic Activity Density).
9. Reduction in the number of workers employed by waste management companies (Proximity to Landfill Employment).

4.5.6.2 Positive Ranks (b)

There were 205 cases with positive ranks in Table 4.14, indicating situations where the second measurement post-decommissioning surpassed the initial measurement taken prior to decommissioning. These cases included changes such as:

1. Increase in the number of inquiries from potential buyers interested in purchasing land (Affordability of Land).
2. Growth in the number of job postings on online recruitment platforms (Formal Employment Opportunities).
3. Increase in revenue reported by businesses diversifying their revenue streams (Dependency on Landfill Operations).
4. Introduction of subsidised waste disposal programmes by local authorities (Affordable Waste Disposal).
5. Expansion of vocational training programmes to enhance employability (Limited Employment Opportunities).
6. Attraction of external investment leading to the establishment of new businesses (Absence of New Business Developments).
7. Opening of specialty stores catering to niche markets (Non-existent New Shops).
8. Creation of positions specifically targeting unemployed youth (Emergence of New Jobs).
9. Rise in the number of transactions recorded by local businesses (Economic Activity Density).
10. Development of eco-tourism initiatives around the former landfill site (Proximity to Landfill Employment).

4.5.6.3 Ties (c)

In 8 instances, both measurements yielded identical values, resulting in a rank of 0 for these cases. The test statistic, calculated as -0.962, represents the summation of ranks attributed to negative differences (negative ranks) subtracted from the summation of ranks assigned to positive differences (positive ranks). This statistic elucidates both the direction and magnitude of disparities among the paired observations.

The associated p-value for this test was determined to be 0.336, indicating insufficient evidence to reject the null hypothesis. Consequently, we do not ascertain a statistically significant difference between the measurements obtained before and after the intervention or treatment.

In summation, this analysis, as conducted within the economic context of Kpone Kokompe, revealed that there was no statistically significant divergence between pre- and post-intervention measurements based on the available data and the outcomes of the Wilcoxon signed rank test.

Table 4.14: Wilcoxon Signed Rank Test for Economic Factors

Ranks	N	Mean Rank	Sum of Ranks	test statistics	p-value
Negative Ranks	185 ^a	198.98	36811.50	-0.962	0.336
Positive Ranks	205 ^b	192.36	39433.50		
Ties	8 ^c				
Total	398				

Source: Field work, (2023).

4.6 Factors Affecting Quality of Life in Kpone Kokompe Prior to Landfill Decommissioning

The study also presents an examination of factors that affected the quality of life of residents around the Kpone Katamanso landfill decommissioning in Ghana. The study created three (3) indices, namely the environmental, economic and social factors before and after the landfill decommissioning. Each index captured a number of items that measured the factors that affect the quality of life of residents at the study area conditioned on the pre- and post-landfill decommissioning.

4.6.1 Impact of Environmental Factors on Quality of Life before Decommissioning

Regression results indicated that environmental factors had a **negative and significant effect** on the quality of life of residents of Kpone Kokompe before decommissioning. This suggests that as the community became more susceptible to environmental degradation, characterised by an increase in environmental waste materials, residents faced unsustainable living conditions that subsequently reduced their quality of life. This finding aligns with prior research, notably Tafesse et al., (2022), who highlighted the adverse impacts of environmental pollution, including reduced profits, public health risks, and safety concerns stemming from poor construction waste management practices. Such detrimental environmental conditions evidently hinder residents' quality of life.

4.6.2 Impact of Economic Factors on Quality of Life Before Decommissioning

Similar to the trends observed in environmental factors, the analysis of economic factors revealed a **negative and significant effect** on the quality of life of residents in Kpone Kokompe prior to the landfill decommissioning, as shown in Table 4.15. This finding

suggests that although there was a high level of economic activity around the landfill, and many residents depended on it for their daily survival, this did not translate into meaningful improvements in overall well-being.

Table 4.15: Impacts on Quality of Life Before Decommissioning

	QL	QL	QL	QL
VARIABLES	model 1	model 2	model 3	model 4
Environmental factors	-0.0683*** (0.0197)			-0.0352* (0.0199)
Economic factors		-0.0976*** (0.0257)		-0.0167*** (0.00468)
Social factors			-0.0452** (0.0198)	-0.00554** (0.00246)
Gender	0.0708*** (0.00236)	0.00595*** (0.00112)	0.0257*** (0.00889)	0.0111* (0.00634)
Household size	-0.0604*** (0.0151)	-0.143* (0.0823)	-0.0419 (0.0661)	-0.0155*** (0.00554)
Employment status	0.231** (0.109)	0.223** (0.109)	0.225** (0.109)	0.231** (0.109)
Average monthly income	-0.0104*** (0.00240)	-0.0319 (0.0492)	-0.1573* (0.0849)	-0.00147* (0.000791)
Education level	-0.125*** (0.0144)	-0.180*** (0.0654)	-0.249* (0.141)	-0.0261*** (0.00890)
Motivation for staying	0.372*** (0.0838)	0.0108* (0.00604)	-4.61e-05 (0.000597)	0.0116 (0.0746)
Type of Dwelling	0.179*** (0.0511)	0.608** (0.265)	0.0570*** (0.024)	0.0185*** (0.00178)
Tenure/holding Arrangement	-0.137*** (0.0504)	-0.00894 (0.0314)	-0.076*** (0.021)	-0.00510*** (0.00161)
Constant	-0.453*** (0.0751)	-0.443*** (0.102)	-0.490*** (0.0882)	-0.445*** (0.121)
Observations	327	329	330	327

Source: Fieldwork, 2023.

While a number of individuals derived their livelihoods from the landfill and its associated informal economy, such as waste picking, trading, and auxiliary services, the income generated from these activities appeared to be meagre and unstable. The informal nature of these jobs, coupled with lack of job security, contributed to an

environment where economic activity was present but did not equate to economic prosperity for the majority of residents.

Although economic vitality is generally regarded as a driver of regional development, the specific case of Kpone Kokompe before the decommissioning illustrates a disconnect between economic presence and quality of life outcomes. The situation contradicts the typical pattern where increased business activity spurs community well-being, as posited in the research by Schallenberg-Rodriguez and Inchausti-Sintes (2021), which highlights the positive impacts of business expansion on quality of life. In this context, however, the prevailing economic conditions, though visibly active, were not sufficiently empowering or inclusive to elevate the standard of living for most residents. Thus, the pre-decommissioning period in Kpone Kokompe was characterised by a paradox of economic activity that failed to improve, and in some instances may have even diminished, residents' quality of life, highlighting the importance of distinguishing between economic quantity and economic quality in assessing community welfare.

4.6.3 Impact of Social Factors Before Decommissioning

The study also revealed that social factors exerted a **negative and significant effect** on the quality of life of Kpone Kokompe residents before landfill decommissioning. An increase in social activities within a community leads to the generation of more waste materials, thereby affecting residents' living conditions. This finding corroborated the assertion made by Loia et al. (2022), who posited that social factors inherently give rise to consequential outcomes, many of which tend to be adverse in nature. Essentially, the prevailing social dynamics preceding the landfill decommissioning in Kpone Kokompe were shown to be contributing factors to the deleterious social outcomes experienced by

the community. The foregoing accentuates the complex interplay between social factors and the quality of life of residents in the community, particularly in the context of landfill decommissioning.

4.7 Factors Affecting the Quality of Life in Kpone Kokompe Post Decommissioning

The results of the study unveiled a complex interplay of environmental, economic, and social factors in shaping the quality of life of Kpone Katamanso residents following the landfill decommissioning. This section provides a detailed analysis of the said factors.

4.7.1 Impact of Environmental Factors on Quality-of-Life Post Decommissioning

The positive and statistically significant coefficients ($p < 0.01$) in all models in Table 4.16 suggest that an improvement in environmental factors positively affected the quality of life of residents. The higher the coefficient, the greater the positive impact of environmental improvements. The study indicates that environmental factors have a **positive effect**, implying that improvements in environmental conditions lead to an overall increase in the quality of life of residents of Kpone Kokompe. This implies that as environmental conditions improved post-decommissioning, the overall quality of life of residents is enhanced. This positive correlation stresses the pivotal role of landfill decommissioning in safeguarding the environment, which, in turn, contributes to the improved living conditions and improved quality of life of the local community. This aligns with previous research by Capobianco et al., 2022 and Vernet (2002), highlighting the symbiotic relationship between successful landfill decommissioning, environmental protection, and an elevated standard of living for the community.

4.7.2 Impact of Economic Factors on Quality-of-Life Post Decommissioning

Economic factors exhibited a **positive and significant impact** on the quality of life of Kpone Katamanso residents following the landfill decommissioning. This suggests that, contrary to expectations of economic decline, the economic activities that emerged post-decommissioning may have contributed to improvements in residents' well-being. It is probable that the adaptive strategies and alternative livelihoods pursued by residents in response to the decommissioning, such as engaging in small-scale trading, informal services, or other micro-enterprises, generated more stable incomes and enhanced economic resilience.

While economic development is typically driven by vibrant business activity and employment creation, the findings from this study suggest that post-decommissioning adaptation efforts by residents themselves may have been more effective in yielding socio-economic benefits than anticipated. This outcome aligns with the broader notion that local-level innovation and informal economic activity can meaningfully contribute to improved quality of life.

These findings lend empirical nuance to theoretical arguments advanced by Capobianco et al. (2022) and Vernet (2002), who emphasise the potential for landfill decommissioning to deliver positive social and economic outcomes. In this case, the results support their view by illustrating how economic transformation post-decommissioning contributed to improved household livelihoods. However, the findings also point to the importance of designing decommissioning policies that intentionally support and strengthen adaptive economic pathways to ensure that such positive impacts are sustained and inclusive.

Table 4.16 : Impacts on Quality-of-Life Post Decommissioning

	(1)	(2)	(3)	(4)
VARIABLES	model 5	model 6	model 7	model 8
Environmental factors	0.0291*** (0.00380)			0.0479*** (0.00859)
Economic factors		0.0588** (0.0288)		0.00596** (0.00253)
Social factors			-0.000132*** (3.13e-06)	-0.000140*** (4.09e-06)
Gender	0.0884*** (0.0317)	0.0821*** (0.0297)	0.0763** (0.0345)	0.0220*** (0.00648)
Household size	0.206* (0.117)	0.0123** (0.00488)	0.0212*** (0.00216)	0.0514* (0.0309)
Employment status	0.233** (0.109)	0.233** (0.109)	0.222** (0.109)	0.220** (0.109)
Average monthly income	0.00508*** (0.00190)	0.00549*** (0.00195)	0.00583*** (0.00200)	0.0191*** (0.00387)
Education level	0.460 (0.458)	1.229** (0.516)	0.0102*** (0.00121)	0.0169*** (0.00245)
Motivation for staying	0.0132*** (0.00115)	0.547* (0.297)	0.0138*** (0.00116)	0.0208*** (0.00292)
Type of Dwelling	0.380 (0.520)	0.642*** (0.227)	0.00194* (0.00110)	-0.176 (0.119)
Tenure/holding Arrangement	0.637*** (0.200)	0.495** (0.197)	0.357*** (0.113)	0.0217*** (0.00769)
Constant	-0.397*** (0.104)	-0.411*** (0.138)	-0.427*** (0.122)	-0.406** (0.163)
Observations	329	329	327	327

Source: Fieldwork, 2023

4.7.3 Impact of Social Factors Post Decommissioning

Similarly, social factors exhibited a **negative and significant** influence on the quality of life of residents in Kpone Kokompe after the landfill decommissioning. In this study, *social factors* referred to residents' perceptions regarding safety, inclusion, conflict, and the quality of social relations. Specific issues included youth involvement in drug use, theft, expressions of dissatisfaction with environmental conditions (evidenced by protests), and general feelings of social underdevelopment. These elements reflect the broader social environment of Kpone Kokompe, both prior to and following the decommissioning of the landfill. Respondents rated their agreement with statements related to these issues on a Likert scale ranging from 1 (least agreement) to 5 (strong

agreement). A negative coefficient therefore indicates that stronger agreement with these negative social conditions (e.g., more perceived conflict or insecurity) was associated with a lower reported quality of life. Although Kpone Kokompe had existing social networks prior to decommissioning, the persistence or worsening of these issues after decommissioning appears to have undermined residents' quality of life. This finding contrasts with Muniyadi et al. (2020), who had anticipated a positive contribution from social dynamics to post-decommissioning outcomes, but aligns with Loia et al. (2022), who found that adverse social factors tend to dampen quality of life.

The comprehensive analysis of both quantitative and qualitative data unveiled the multifaceted nature of factors that influenced the landfill decommissioning in Kpone Kokompe. Convergence between the two data types is evident, as both consistently highlight the importance of environmental and social factors as primary drivers of the decommissioning decision. Quantitative data provided statistical support for the reduction in pollution levels and community discontent, reinforcing the significance of these concerns prior to the decommissioning. However, a notable divergence arose when the role of economic factors was considered. While the quantitative analysis emphasised, the delayed economic benefits associated decommissioning, the qualitative insights illuminated the immediate and decisive influence of social and environmental concerns on the Government of Ghana's decision to decommission.

The combined analysis of quantitative and qualitative data provides an understanding of the social and economic factors that influenced the landfill decommissioning in Kpone Kokompe. It revealed that while economic factors held significance in the long term, social and environmental concerns took precedence in the immediate decision-making process. The quantitative data quantified the extent of pollution reduction and economic

prospects, while the qualitative data offered depth by contextualising community grievances and recounting critical events like the 2019 landfill fire. The nuanced exploration of the complex dynamics surrounding the landfill decommissioning in Kpone Kokompe, reinforced the conclusion that social and environmental factors were paramount in driving the decision.

4.8 Chapter Summary

Chapter Four sought to examine the social, economic and environmental factors underpinning the decommissioning of the Kpone Kokompe landfill site. It examined these factors and analysed the responses obtained from respondents to ascertain and confirm the validity of these factors. Prior to this, the chapter provided a profile of respondents and their characteristics as well as an overview of the analytical procedures involved in the analysis of data. This chapter concludes on the basis that environmental, social and economic factors were the key catalysts necessitating the decommissioning of the landfill at Kpone Kokompe. Out of these three factors, environmental factors emerged as the most significant factor which pushed the agenda for the decommissioning exercise. Residents and stakeholders affirmed that prior to the decommissioning, the pollution from the landfill disrupted their daily lives and posed significant health risks. Stakeholders also acknowledged that the need to preserve the lives and sanctity of the environment was a key trigger of the decision to decommission the landfill site. The results from this chapter sets the stage for the subsequent chapters, where the findings are comprehensively discussed and contextualised.

CHAPTER FIVE

BENEFITS, CHALLENGES AND ADAPTATION STRATEGIES

AFTER THE DECOMMISSIONING OF THE KPONE KOKOMPE

LANDFILL

5.0 Introduction

This chapter presents an analysis of the multifaceted effects and outcomes resulting from the decommissioning of the Kpone Kokompe landfill site. It is organised into six main sections, each of which explores a distinct dimension of the decommissioning process.

While Chapter Four focused on examining the environmental, economic, and social factors before and after decommissioning, and how these factors influenced the quality of life of residents, Chapter Five shifts the emphasis to a synthesis of the perceived and realised benefits of the decommissioning exercise. Drawing on both quantitative and qualitative data, the chapter highlights the effects of decommissioning from the perspective of the affected community. Section 5.1 explores the benefits that have emerged post-decommissioning, encompassing both community-wide and individual-level advantages. It provides a detailed account of the environmental, health, and socio-economic improvements observed following the landfill's closure. Section 5.2 turns attention to the challenges encountered by various stakeholders-residents, contractors, and the Waste Pickers Association, during and after the decommissioning, with the challenges categorised by their impact on different groups. Section 5.3 examines the adaptation strategies adopted by both residents and stakeholders in response to the immediate impacts of the decommissioning process, documenting the various coping measures and interventions implemented to mitigate associated disruptions. This

discussion is extended in Section 5.4, which focuses specifically on post-decommissioning adaptation strategies within the changed environmental and socio-economic landscape. These strategies are analysed under three broad categories: environmental, social, and economic adaptations.

Section 5.5 assesses the impact of these adaptation strategies on residents' quality of life, evaluating the extent to which they have contributed to improved well-being and socio-economic resilience. Finally, Section 5.6 synthesises the key findings from the chapter, drawing overarching conclusions on the impact of the decommissioning process on the Kpone Kokompe community, and offering reflections on the broader implications for landfill decommissioning policy and practice.

5.1 Benefits of Landfill Decommissioning in Kpone Kokompe

The first theme captured in this chapter relates to the benefits of the landfill decommissioning. The data collected from respondents included some feedback which highlighted some of the benefits of the decommissioning exercise. These included: improvement in standard of living, employment opportunities, improvement in quality of water in the area, reduced health hazards and risks and potential rise in the value of properties. Respondents were of the view that the decommissioning had improved their overall quality of life and standard of living in the community. This view confirmed the perspectives of a recent study by Aryampa et al. (2022) who found that when landfill decommissioning occurs, residents are the prime beneficiaries. Their study delineated three primary advantages of landfill decommissioning: enhancements in quality of life, increased local area liveability, and appreciation in land values.

Exploring and analysing the responses obtained in this study, it is evident that these benefits were also experienced by residents of Kpone Kokompe. These benefits are evident from the excerpts presented below:

5.1.1 Improvement in Standard of Living

The first benefit identified from the responses obtained is in relation to an improvement in the standard of living of residents in the community. From the responses provided, it is evident that the standard of living of residents in the Kpone Kokompe area improved through increased employment opportunities during the process of decommissioning of the landfill. Residents experienced an enhancement in their standard of living, evidenced by an upgraded water supply that enabled them to utilise water for various chores, including washing of clothing. Furthermore, the responses also alluded to increased savings due to the reduction of money spent on hospital bills. This excerpt clearly highlights the benefit of improvement in standard of living.

“The standard of living of the populace has improved. In addition, during the decommissioning, the young men in the area, Kpone Kokompe were employed. We engaged some of them to help us with moving the waste around the cells among others. They were well paid. Further with respect to the quality of the water in the area, the aqua life, the streams, downstream have a lot of improved parameters so fish life has been improved post the decommissioning. The river or water bodies are now safer than before. The residents in the community can use it for washing and other chores. They have no pathogens to care about. Oh yes, I mean once there’s a sanitised environment, property values go up. People have

quality of life, less money spent on hospital bills. Improved quality of life. That for me is the key thing.”

(Officer, EPA, 2023)

The officer from the EPA provided insight into some of the benefits associated with the improvement in the quality of life of residents of Kpone Kokompe as a result of the landfill decommissioning. The respondent from the EPA highlighted critical aspects of improvement in the quality of life of residents, and a key improvement identified was the reduction in the amount of money spent on hospital bills. Prior to the decommissioning, residents spent significant sums of money on medical care due to the pollution and pathogens emanating from the landfill site. However, upon closure of the site, the cost of healthcare has reduced, and residents are also able to access cleaner water which is improving their overall living conditions.

5.1.2 Enhanced Environmental Hygiene

The second conspicuous benefit from the landfill decommissioning from the data was improvement in environmental cleanliness. The responses obtained indicated that prior to the decommissioning, the environment was always polluted with smoke, leachate and the heavy presence of flies which made it difficult to live in the area. However, after the decommissioning, one of the obvious benefits was the improvements in environmental sanitation, as was confirmed in the earlier response by a respondent from the EPA who acknowledged that the water quality in the area for example had improved. One of the responses relating to improvements in the environment is presented below:

“Well, I wanted to say that the landfill is no longer an environmental hazard. For the purpose of this discussion, decommissioning has

significantly reduced the poor sanitary conditions such as litter and leachate seepage into the community. The residents would have benefitted more if the project had been completed fully and the site had been converted into a recreational area where they could have for example, constructed a football field, or where they can hold events. For now, however, the main benefits of decommissioning in my opinion remain environmental. The air quality has improved, the source of water is not contaminated, the flies in the area have drastically reduced. To be honest the place was deplorable prior to the decommissioning but now unless you are told, you will not even know that there was stench or windblown litter.”

(Officer, MSWR, 2023)

The response above confirms that there were environmental benefits which emerged from the landfill decommissioning. The benefits largely related to the reduction in litter and the leachate that seeped into the community prior to the decommissioning. Appendix 6 (e) shows the clean state of the landfill post decommissioning. Before the decommissioning, the community experienced a high degree of environmental pollution, however, post the decommissioning, the clear environmental benefits include better air quality, better water quality, and also a reduction in the presence of flies in the community.

From the interview with the president of the Kpone Waste Pickers Association, it was evident that environmental benefits post decommissioning was profound and conspicuous in the community after the decommissioning exercise. The respondent stated that “...decommissioning has improved...the nature of the environment...” This

confirms the previous excerpts from other respondents and indicates that environmental benefits were achieved post the landfill decommissioning. Further evidence from the officer from the TMA confirmed the environmental benefits of the decommissioning:

“The decommissioning was to make the place habitable as there were already complaints from the residents about the stench emanating from the landfill. The air in the area was also polluted coupled with the heavy industries in the area. Generally, sanitation was poor in the area. One main intended outcome of the decommissioning was to improve the air quality and make the place more habitable. The residents are the first beneficiaries. They were the ones who went on rampage in the streets, holding placards and calling on government to close the landfill site. At some point the youth in the area threatened to prevent the ‘Aboboyaa’s’ from coming to dump waste during the active years of the landfill. They are the chief beneficiaries. No challenges were posed to them. They have been the principal beneficiaries of the exercise. As a consequence of the decommissioning, the people's standard of living has increased. I mean the stench in Kpone Kokompe, and its surrounding towns has drastically reduced; people can walk about freely without fear of being hit by flight litter. Generally, the wellbeing of residents has improved.”

(Officer, TMA, 2023)

5.1.3. Employment Opportunities

Another benefit deduced from responses in the data was employment. According to some responses, during and after the decommissioning, residents have been provided with some employment opportunities which have helped compensate for the loss of revenue due to the decommissioning exercise. The new employment opportunities

included the formation of a new co-operative by waste pickers who have evolved their business practices from picking waste at the landfill site to moving door to door for waste collection from houses in nearby towns. This is succinctly captured by this excerpt from the interview with the officer of the TMA:

“As I stated earlier the waste pickers who were working on the landfill when it was operative have even formed a cooperative after the decommissioning and are now doing house to house collection of waste in the nearby towns within the vicinity.”

(Officer, TMA, 2023)

Another response which confirmed the benefit of employment opportunities was as follows:

“...during the decommissioning, the young men in the area, Kokompe were employed. We engaged some of them to help us with moving the waste around the cells among others. They were well paid...”

(Officer, EPA, 2023)

The above response further indicated that the decommissioning exercise provided employment opportunities for young men in the community. According to the officer from the Environmental Protection Agency, the young men were well paid for their efforts in helping to transport and cart waste around from the site.

5.1.4 Shedding Light on Gender Gaps: A Quantitative Look at Perceived Benefits of Decommissioning

From the survey data, residents' associations with various benefits of decommissioning in Kpone Kokompe were assessed according to gender. As depicted in Table 5.1, while

both genders recognised improvements in the environment and public health benefits, females consistently expressed stronger associations with specific advantages.

Analysis of Table 5.1 reveals significant gender disparities in the perceived benefits of decommissioning in Kpone Kokompe. Females consistently demonstrate higher positive perceptions across several key areas: improvement in standard of living (72% females vs. 65% males, $p=0.024$), enhancement of water quality (48% females vs. 43.2% males, $p=0.0339$), and reduction in health hazards and risks (34% females vs. 31.5% males, $p=0.019$). Conversely, no statistically significant gender differences were observed regarding employment opportunities or potential property value increases ($p>0.05$). These findings demonstrate the importance of gender-specific strategies in policy formulation and communication.

The significant gender differences in perceptions of certain benefits suggest that policymakers and communicators should consider gender-specific strategies when promoting the benefits of decommissioning. Emphasising improvements in standard of living, water quality, and health hazard reduction may resonate more with female audiences. Additionally, understanding the underlying social and cultural factors driving these differences can help in designing targeted environmental interventions.

The foregoing findings bring reveal the importance of gender-sensitive policy frameworks in waste management governance. Recent studies suggest that gender-sensitive approaches to waste management are vital in promoting social equity and inclusiveness in the decision-making processes (Viljoen et al., 2021; Gull et al., 2023, 2022). According to the United Nations Environment Programme (UNEP), gender

mainstreaming in waste management policies is essential for addressing inequalities and enhancing sustainability (UNEP, 2020). Similarly, the World Health Organization (WHO) highlights the importance of considering gender dynamics in environmental health interventions (WHO, 2019).

The decommissioning of the landfill in Kpone Kokompe brought notable benefits to the community, including improved standard of living, employment opportunities, enhanced water quality, reduced health hazards, and potential rise in property values. However, women particularly emphasised the positive impact of the decommissioning on household chores and family well-being, noting improved access to cleaner water for domestic use.

Table 5. 1: Perceptions of Benefits of Decommissioning According to Gender

BENEFITS	GENDER		Chi-Square Tests (P-values)
	Male Percentage (%)	Female Percentage (%)	
Improvement in Standard of Living	65	72	11.238 ^a (0.024)
Employment Opportunities	59.8	56	2.624 ^a (0.0623)
Improvement in Quality of Water	43.2	48	5.673 ^a (0.0339)
Reduced Health Hazards and Risks	31.5	34	11.797 ^a (0.019)
Potential Rise in Property Benefits	10	14	12.014 ^a (0.071)

Source: Fieldwork (2023)

Men highlighted the economic benefits, including the job opportunities generated during the decommissioning process. Residents experienced tangible improvements in quality of life, with decreased healthcare spending and access to cleaner water. Environmental

transformations led to safer water bodies and improved conditions for aquatic life. Overall, the decommissioning positively impacted both social and environmental aspects of the community from the perspective of the residents of Kokompe.

5.2 Adverse Effects of Landfill Decommissioning at Kpone Kokompe

Challenges were another consequence of the decommissioning exercise at Kpone Kokompe. The execution of the project required the efforts of various stakeholders such as the contractor, consultants, the local municipal assembly and waste pickers. Like all projects, carrying out this project entailed some challenges which have been listed in Table 5.2.

Table 5. 2: Adverse effects of Landfill Decommissioning at Kpone Kokompe

No.	Challenge Identified	Stakeholder(s) Affected by Challenge
1.	Lack of Communication, Engagement & Broad Consultation	Residents Waste Pickers
2.	Disruption of Livelihood & Creation of Unemployment	Residents
3.	Inconvenience for Residents & Longer Execution Time	Residents
4.	Health Hazards for Workers and Residents	Project Staff Residents
5.	Absence of Decommissioning Plan for Alternative Livelihood	Residents Waste Pickers
6.	Lack of Advocacy for Waste Pickers	Waste Pickers

Source: Fieldwork (2023)

Lack of communication and intensive community engagement, disruption of livelihood and creation of unemployment, inconvenience for residents, health hazards for workers and residents, the lack of a decommissioning plan to provide alternative sources of livelihood for those whose economic activities were severely affected by the landfill decommissioning, and a lack of advocacy for affected groups in the community were

some of the challenges encountered by the residents. Finally, the execution time for the project exceeded the initial time allocated, thus causing inconvenience and uncertainty for all those involved (See Table 5.2).

5.2.1 Lack of Communication, Engagement and Broad Consultation

The first challenge highlighted in the data related to the lack of communication, engagement and broad consultation amongst stakeholders in the community especially residents and particularly, the waste pickers. Based on the qualitative transcripts, it is clear that whilst some form of engagement and consultation was done, it was not all-inclusive and it appeared to be more of a public relations stunt than a deep commitment to engage with residents and waste pickers, who were the group most affected by the decommissioning of the landfill. Some of the responses which buttress this point are presented below:

“...Residents were not consulted in all the aspects because it was seen as a central government project and as such very little was needed from them. So, by way of challenge I would say it was not participatory enough.”

(Officer, EPA, 2023)

The above response is a quote from the interview with the representative from the EPA. From the response, it is evident that there was an acknowledgement from the EPA that residents were not engaged in a thorough manner on all issues pertaining to the landfill decommissioning. It is interesting that within the answer provided was a justification for this lack of engagement. The respondent claimed that residents were not consulted in all aspects “...because it was seen as a central government project and as such very little

was needed from them.” This is a rather unfortunate perspective given that residents were the primary stakeholders whose socio-economic life was going to be severely impacted, and as such, intensive dialogue and engagement with them was essential.

The challenge of lack of communication, engagement and broad consultation was also echoed by the project officer from WEIGO, the NGO that worked closely with waste pickers in the area. The following response provided supports the argument being made:

“The decommissioning happened at a time that the government did not have any alternative livelihood plans for the workers. There was no consultation at all. Waste pickers were not even informed about the decommissioning prior to the activity taking place. There was also no alternative livelihood programme planned for the workers at all. WEIGO got involved in the discussion because the waste pickers needed advocates to speak to the powers that be on their behalf.”

(Project Officer from WIEGO, 2023)

From this response, there is a similarity in the challenge of lack of engagement and communication. The response highlights the lack of communication in informing waste pickers about the decommissioning prior to its occurrence. This implies that government did not have much consideration for the livelihood of waste pickers, or even recognise their role as important stakeholders whose livelihood and sustenance depended on the activities around the landfill. The response further indicates that the NGO, WIEGO, had to get involved to ensure that the concerns of waste pickers were not ignored. That is another point which is explored in a subsequent discussion.

5.2.2. Disruption of Livelihood and Creation of Unemployment

The second challenge encountered at the landfill decommissioning site was the disruption of livelihood and the creation of unemployment. According to responses analysed, the decommissioning of the landfill affected two categories of people in terms of livelihood; (1) the waste pickers who were directly impacted and (2) food vendors who were also directly and indirectly impacted. The landfill site functioned as an economic hub for the community, providing a source of livelihood for many individuals. Additionally, some residents in the community capitalised on the economic potential of the landfill site to provide food for workers, mostly waste pickers and other associated services rendered by workers who patronised food whenever they came around. Thus, another challenge that was encountered in the decommissioning of the landfill site was the disruption of livelihood which led to the creation of unemployment.

“We got involved because of our interest in the waste pickers. We were worried because our people were going to be affected. We were worried that the waste pickers would lose their livelihood because this was where over 700 waste pickers got their livelihood from. Beyond the waste pickers, there were also some middlemen who bought waste products from the pickers for onward sale to the industries around as well as food vendors in the space who would also lose their livelihood.”

(Project Officer, WIEGO, 2023)

The response above highlights two conspicuous challenges; (i) the loss of livelihood of over 700 waste pickers, and the loss of livelihood to other value chain members such as middlemen and food vendors. Clearly, the landfill decommissioning at Kpone

Katamanso impacted the socio-economic activities of stakeholders in the community, and this challenge was evident in the loss of employment opportunities particularly for waste pickers who had relied on the landfill as a source of income for many years. Waste pickers were thus the group severely impacted by this challenge, although other groups such as food vendors and middlemen were also impacted. This also meant that the community would lose some form of revenue, and this could impact the general standard of living in the community.

The president of the waste pickers association also stated as follows:

“From my perspective, there is no benefit. The decommissioning took away our livelihood. ...the government... took away our source of food. Even now, some people are unemployed; a lot of people actually.”

(President, KWPA 2023)

The president of the waste pickers association has clearly outlined the challenges that they have faced due to the landfill decommissioning. From the response provided above, the respondent claimed that as far as their group (waste pickers) are concerned, the landfill decommissioning has not provided any benefit but has rather created a challenge which is manifest in the form of lack of employment. The specific expression used to highlight this challenge was “...*the government...took away our source of food...*”. This sentiment vividly echoes the frustration experienced by the individual, echoing the sentiments of the broader community of waste pickers whom he advocates for. Judging from this response, it is clear that one of the main challenges of the decommissioning has been the loss of livelihood from waste pickers, resulting in unemployment.

In section 5.1, the socio-economic benefits during the landfill's operational phase were detailed, including significant job creation. The landfill not only provided direct employment to over 700 waste pickers but also spurred ancillary economic activities, such as food vending and middleman services. These activities collectively contributed to the local economy, supporting families and improving the standard of living in the community.

However, the decommissioning of the landfill appears to have reversed these benefits. The immediate cessation of waste picking activities and the subsequent displacement of waste pickers and food vendors have resulted in substantial job losses. The testimony from stakeholders stresses the gravity of these losses. The economic activities that thrived on the presence of the landfill have dwindled, leading to heightened unemployment and economic instability in the community.

It is therefore imperative to weigh the employment gains during the landfill's operational lifetime against the post-decommissioning job losses. While the operational phase provided substantial employment opportunities and stimulated the local economy, the abrupt end of these activities has had a profound adverse impact. The net effect on employment, therefore, appears to be negative post-decommissioning. The loss of a consistent and sustainable source of income for over 700 individuals and additional economic stakeholders signifies a significant socio-economic challenge that dwarfs the previous gains in employment. The decommissioning of the Kpone Katamanso landfill, while perhaps necessary for environmental and health reasons, has brought to light significant socio-economic repercussions. The disruption of livelihoods and the resulting

unemployment highlight a critical need for strategic planning and intervention in the decommissioning process.

5.2.3. Inconvenience for Residents and Longer Execution Time

The third challenge under this general theme was the effect of the decommissioning on residents. The decommissioning has impacted residents in many untold ways. However, analysing the responses, it is clear that the decommissioning has created inconvenience for residents during the period of the decommissioning process. In the context of the decommissioning, the analysis of responses reveals that inconvenience relate to the duration it took for the process to be completed. The decommissioning took exactly twenty (20) months, which is an extra eight (8) months from the estimated completion process. As can be seen from Appendices 6 (b) and 6 (d), the decommissioning was carried out in phases. This disrupted the activities of residents, some of whom were waste pickers who had to be relocated to nearby landfills so as not to entirely lose their source of livelihood. Furthermore, the smoke emission from the landfill site and pollution from the leachate were also factors that created inconvenience to residents in the community as evidenced from the following responses:

“We were worried because our people were going to be affected. They were temporarily moved to the abandoned landfill site close by and we thought that they would be sent back to the decommissioned site but that never happened.”

(Project Officer, WIEGO, 2023)

The response above suggests that the landfill decommissioning at Kpone Katamanso created inconvenience for some residents who were waste pickers because they had to

be relocated to work at an abandoned landfill site in a nearby community, thus creating a disruption in their normal pattern and work routine.

Another response further highlights the inconvenience to residents living in the area emanating from the smoke and other forms of pollution occurring in the area.

“From where I sit and practically, there was profuse smoke emission from the landfill site, there was the free flow of leachate to the surrounding environment i.e. in the Kpone Kokompe area during the decommissioning, there was also pollution of nearby water resources and suspected respiratory challenges.”

(Officer, TMA 2023)

Furthermore, the delay in completing the project on time also had some effects and caused inconvenience to residents. The contractor in charge of the project actually confirmed that the project took longer than expected:

“We were to complete within 12 months, but we sought extension of time.”

(MD, Waste Landfills Ltd, 2023)

From the response above, it is evident that the delay in executing the project would have impacted all stakeholders especially residents. The disruption to the socio-economic lives of residents cannot be understated as a challenge of the landfill decommissioning. This coupled with the relocation of waste pickers from the landfill to an old landfill in a nearby community created inconvenience for residents.

5.2.4 Health Hazards for Workers and Residents

Analysing the responses from the interviewees, it was apparent that some workers of the companies and teams involved in the various engineering and construction activities pertaining to the landfill decommissioning were being afflicted by some respiratory problems which can be captured under the theme of “health hazards for workers”. This represents one of the challenges of the decommissioning for stakeholders, particularly the contractors. The safety and well-being of staff is an important factor that needed to be considered and from the responses obtained, there were some few cases of workers with respiratory problems. This confirms that the decommissioning of the landfill at Kpone Katamanso posed a health threat to workers on site.

Additionally, residents were also subjected to the hazards that the decommissioning of the landfill posed. The stench, the leachate, flies and smoke all contributed to various health risks for workers and residents. The following responses illustrate this point:

“Again, sometime in 2019, it rained the leachate which is black water overflowed to the communities. You see there's a stream down there in Kokompe where the indigenes fetch water from and where the kids play. The overflow from the leachate from Kokompe went into the community and there was a huge mess. The stench was horrible, there were so many flies, you couldn't even stand there without the flies beating you, it was a real battle”

(Lead Consultant, EAP, 2023)

The response above highlights the health hazards posed by the landfill site and its decommissioning. The smoke emanating from the landfill site, the leachate and

pollution of water resources contributed to various health risks, with some suspected respiratory challenges identified.

5.2.5 Absence of Decommissioning Plan for Alternative Livelihood and Lack of Advocacy for Waste Pickers

Another challenge that emanated from the landfill decommissioning was the challenge of finding alternative livelihood for those whose economic activities were affected by the decommissioning. The main people whose livelihood were affected were waste pickers. As established earlier, the waste pickers were not adequately engaged or informed of the decommissioning exercise. As such, there was a lack of advocacy on their behalf, neither was there any government intervention to cater for their loss of revenue and potential livelihood as a result of the decommissioning exercise. This was a very conspicuous challenge that was identified in the analysis of responses. It was found that even though some representatives from Government agencies claimed that there were stakeholder engagement plans, it appears that the plan was either not implemented or implemented effectively.

“There was a document prepared by one Percy Anaan Bukari, who was consulted by the MSWR. The document was on the engagement of various stakeholders for the decommissioning. I will share that document with you as well. It was a comprehensive document which was followed to the letter on how awareness for the project, concerns of residents among others were documented and the recommendations followed to the letter.”

(Officer, MSWR, 2023)

The officer from the MSWR, stated that the government and its agencies had a document for stakeholder engagement which was meticulously followed for stakeholder engagement during the decommissioning. However, conflicting accounts from other stakeholders, especially the representative from the waste pickers and the NGO WIEGO, suggest otherwise. According to the project officer from WIEGO, waste pickers were not informed about the decommissioning in advance, nor were there any plans for alternative livelihoods for them. This is evidenced from the following response:

“There was no consultation at all. Waste pickers were not even informed about the decommissioning prior to the activity taking place. There was also no alternative livelihood programme planned for the workers at all. WEIGO got involved in the discussion because the waste pickers needed advocates to speak to the powers that be on their behalf.”

(Project Officer, WIEGO, 2023)

The foregoing paints a different picture from the narrative offered by the respondent from the MSWR. This excerpt from the interview with a representative of WIEGO, the NGO fighting for the well-being of waste pickers reveals that *“waste pickers were not even informed about the decommissioning prior to the activity taking place.”* This suggests that information asymmetry was present in the communication process regarding the landfill decommissioning at Kpone Kokompe. Aside from the lack of communication, which has been explained in an earlier theme, the central challenge here is on the absence of an alternative livelihood plan and lack of advocacy for waste pickers. Since it has been established that the government did not even inform waste pickers of the decommissioning exercise, it is not hard to fathom that there was also a

lack of advocacy for these stakeholders whose livelihood depended on the decommissioning exercise.

The advocacy was championed or spearheaded by WIEGO, and this was confirmed by other respondents:

“Because the project was sponsored by the World Bank, the locals have an association, and the said association is represented by an NGO so the NGO was engaged and discussions on how they were going to find out alternative livelihood were had. As part of the requirements, the contractors were also to provide a stakeholder engagement plan prior to commencement of the decommissioning. This spelt out how they were going to engage the various stakeholders identified. I attended about 3 of such meetings where the residents and chiefs were present in the conference room of the TMA on the landfill.”

(MD, Waste Landfills Ltd, 2023)

In response to this, an excerpt from the interview with the representative from WIEGO is also presented to offer insight into their perspective on the advocacy:

“The decommissioning happened at the time that the government did not have any alternative livelihood plans for the workers. There was no consultation at all. Waste pickers were not even informed about the decommissioning prior to the activity taking place. There was also no alternative livelihood programme planned for the workers at all. WEIGO got involved in the discussion because the waste pickers needed advocates to speak to the powers that be on their behalf. We spoke to some persons from the Ministry of Sanitation and water resources, the

consultants on the project among others. Although the government and the ministry did not help in any way, we got involved and tried to help the waste pickers.”

(Project Officer, WIEGO, 2023)

The decommissioning of the landfill at Kpone Kokompe resulted in challenges for waste pickers, who were neither informed nor advocated for by the government. Despite claims of stakeholder engagement plans, waste pickers were excluded, leading to an absence of alternative livelihood programmes. WIEGO, an NGO, took on the role of advocating for waste pickers, engaging with government officials and project consultants, though government support was lacking. The foregoing highlights the critical need for inclusive planning and advocacy to address the impacts of landfill decommissioning on marginalised groups.

5.2.6 Decommissioning Challenges in Kokompe: A Gendered Lens

The decommissioning of the landfill in Kpone Kokompe, brought its share of challenges. Through a gender-sensitive lens, the challenges encountered by residents due to decommissioning in Kpone Kokompe was assessed drawing from respondents of the household survey.

A significant challenge for both genders was the lack of communication and broad consultation by the government on the decommissioning process (p value 0.009). However, a slightly higher percentage of males (26.3%) as shown in Table 5.3, expressed dissatisfaction with the lack of communication as indicated possibly reflecting their roles as heads of households and a desire for greater involvement in decision-

making processes, highlighting the importance of inclusive consultations that consider diverse community needs, including those of men (Viljoen et al., 2021).

As observed by Asante et al. (2020) and Chen et al. (2021), who discovered that the adverse socio-economic consequences such as unemployment are occasioned particularly for scavengers or persons engaged in related economic activities, disruption of livelihood and unemployment also emerged as a significant challenge (p value 0.009) of the decommissioning in Kpone Kokompe with a high impact (31.5%) on men when dumpsites are closed.

Inconvenience and longer execution were also concerns. While both genders were affected, a higher percentage of females (21.5%) from Table 5.3 expressed this challenge. This could be due to their roles in managing household routines and primary care givers, potentially amplified by the disruptions caused by the decommissioning process (Chikowore, 2021, Gull et al., 2023, Furrebøe et al., 2023). However, from Table 5.3 the chi-square test value of 7.864 and p-value of 0.097 indicate no statistically significant difference between male and female perceptions. This suggests that both genders share similar views on the disruptions caused by the execution times for the decommissioning process.

Concerns regarding health hazards for workers and residents were a shared concern among residents of Kpone Kokompe. From Table 5.3, the chi-square value of 12.352 and p-value of 0.003 confirm a statistically significant difference in perceptions, indicating differing levels of concern between genders. However, a slightly higher percentage of females (23%) expressed apprehension as compared to men (21.10 %)

This is a reflection of gender bearing roles such as women being the primary caregivers and hence their focus on protecting the health of family members, especially children, who may be more vulnerable to environmental risks. Research highlights the potential for gendered vulnerabilities when it comes to environmental health risks, suggesting that women often bear a greater burden of protecting their families (Von Bülow & Sorensen 1993, Adams & Koki, 2021, Adjei, 2023).

The absence of a clear decommissioning plan addressing alternative livelihoods is a relatively low concern among Kpone Kokompe residents, yet it affects females slightly more, with 3.7 percent expressing concern. This reflects women's focus on long-term sustainability and future generations' well-being (Paxton et al., 2023). The chi-square value of 9.51 and p-value of 0.050 indicate a borderline statistically significant difference between male and female perceptions, suggesting subtle differences in how each gender views the lack of a plan. While not as pronounced as other concerns, this highlights the importance of considering gender perspectives in planning for community resilience.

The challenges posed by landfill decommissioning in Kpone Kokompe revealed the nuanced gender dynamics at play within Kpone Kokompe. Despite shared concerns such as lack of communication and health hazards, subtle variations existed between genders. The research revealed that while both males and females grappled with livelihood disruptions and health risks, males tended to experience slightly higher levels of unemployment and communication-related issues. In contrast, females faced a slightly greater inconvenience due to longer execution times as confirmed by McCright et al., (2003) who discovered that women are often more concerned about health risks

associated with waste management as compared to their male counterparts. The absence of a thorough decommissioning plan further compounded these challenges for both genders. These insights emphasise the imperative of incorporating gender-sensitive approaches in decommissioning initiatives to ensure inclusivity and equitable outcomes for all community members.

Table 5. 3: Adverse effects of Landfill Decommissioning at Kpone Kokompe by Gender

CHALLENGES	GENDER		Chi-Square Tests (P-values)
	Male%	Female%	
Lack of Communication and Broad Consultation	26.3	23.6	13.542 ^a (0.009)
Disruption of Livelihood and Unemployment	31.5	28.3	13.460 (0.009)
Inconvenience and Longer Execution Times	18.7	21.5	7.864 ^a (0.097)
Health Hazards for Workers and Residents	21.1	23	12.352 ^a (0.0030)
Absence of Decommissioning Plan	2.4	3.7	9.51 (0.050)

Source: Fieldwork, (2023)

5.3 Adaptation Strategies Adopted by Residents of Kpone Kokompe to Landfill Decommissioning

This section is a discussion on the adaptation strategies embraced by residents to navigate the effects and outcomes of the decommissioning exercise. This theme also analysed responses pertaining to factors influencing the adaptation strategies adopted by residents, considering insights provided by the Protection Motivation Theory (PMT) and shedding light on individual responses to health and safety threats.

5.3.1 Governmental Intervention for Waste Pickers

Probing residents' responses through the lens of PMT, a notable lack of government support in facilitating adaptation strategies and alternative livelihood plans for residents,

particularly waste pickers were observed. The PMT suggests that individuals rely on both internal cognitive processes and external factors to assess threats and formulate coping strategies (Rogers, 1985; Clubb & Hinkle, 2015). In this context, the absence of substantial governmental assistance, as highlighted by respondents, may hinder residents' perceived ability to effectively mitigate the adverse impacts of landfill decommissioning.

In fact, the responses confirmed that most of the work to help residents (especially waste pickers) adapt to the situation (landfill decommissioning) was implemented by the NGO, WIEGO. Some of the responses on adaptation strategies (or lack of them) are examined:

“The government during the decommissioning provided PPE’s, helmets and safety boots etc. to the waste pickers that were on the Kokompe site.”

(President, KWPA 2023)

The president of the waste pickers association offered his view on the support offered residents during the decommissioning, and from the said response above, it is evident that the only resources provided by government was in the form of safety materials such as personal, protective equipment (PPEs), helmets and safety boots. These resources cannot be classified as interventions for adaptation by residents, especially since the decommissioning of the landfill disrupted the main source of revenue for the waste pickers. In addition, the dissatisfaction with government communication and intervention during the landfill decommissioning process, as noted in Table 5.3, reveals a significant challenge, particularly for males, who may feel a stronger need for

involvement due to their roles as household heads. This highlights the necessity for inclusive consultations that consider diverse community needs, emphasising the importance of effective communication strategies to address the concerns of both genders. From the foregoing discussions, it is evident that this intervention from Government was inadequate in the view of the residents.

5.3.2 Relocation

Another form of adaptation strategy waste pickers used to cope with the decommissioning of the landfill at Kpone Kokompe was to relocate to a nearby landfill. The decision of waste pickers to relocate to nearby landfills in response to the decommissioning of the landfill at Kpone Kokompe highlights one of the adaptive coping strategies employed. According to the Protection Motivation Theory (PMT), individuals evaluate the effectiveness of their coping mechanisms and their confidence in managing potential hazards (Prentice-Dun & Rodgers, 1986). Moving to another landfill, though smaller in size, at least offered them an opportunity to have some form of livelihood, not different from what they had during the active years of the decommissioned landfill, and this served as an adaptation strategy. This relocation provided waste pickers an opportunity to maintain a source of income similar to what they had during the active years of the decommissioned landfill, demonstrating their resilience and adaptation to the evolving situation:

“Yes, that's what most of them have done. When we started the decommissioning process, some of them relocated to other sites, not necessarily the close one. They moved entirely from Kpone to other satellite sites because the reopened landfill was smaller in size than the decommissioned one so all of them could not move there.”

(Officer, MWSR, 2023)

“There are a few waste pickers who I heard have relocated to the active landfill site being manned by TMA not too far from the decommissioned landfill site.”

(Officer, TMA, 2023)

“No, I have not, some of our people who went to other dumpsites were sacked so they returned. We the waste pickers at Kpone are lucky because the operational landfill is close by and as such we moved there although the place could not accommodate all of us.”

(President, KWPA 2023)

As can be gleaned from the above discussion, relocation to another landfill was one of the adaptation strategies that helped some of the residents (waste pickers) cope with the decommissioning of the landfill. Other respondents emphatically stated that there were no interventions or support programmes for residents at Kpone Kokompe. It was the view of a representative from the Tema Municipal Assembly that the residents had benefitted from the decommissioning, and as such, there was no need for any other intervention. This appeared to be a rather presumptuous statement given the fact that even though there were environmental benefits of the decommissioning, the socio-economic life of residents was also impacted, hence requiring some interventions to facilitate adaptation.

Interestingly, some responses attempted to categorise waste pickers as outsiders, perceiving them solely as individuals who came to collect waste from the landfill and then leave. However, this study revealed that such a characterisation was inaccurate.

Many waste pickers were, in fact, residents of Kpone Kokompe and or its environs. They not only earned their livelihoods from the landfill but also lived in the community, maintaining relationships with friends and family. This highlights their integral role within the community beyond just their work at the landfill. Thus, the following response which suggested that the residents did not require government support, but only waste pickers did was in error, as it ignored the reality that some residents were waste pickers, and aside from the economic ramifications of the decommissioning, would have needed some psychological and social support to cope with the event (the landfill decommissioning).

“The scavengers or waste pickers are the people who may need some form of support to adapt to the new environment as with the residents, they are happy with how clean their environment is. For the scavengers, the Decommissioning Plan entails details on how they can be helped. They usually move to other landfills or find alternative livelihoods.”

(Lead Consultant, EAP, 2023)

On adaptation strategies for waste pickers, the officer from the EPA provided some insight on how waste pickers were supported during the decommissioning exercise. According to what the respondent stated, the major intervention was to allow them restricted access to the landfill site during the decommissioning so that they could still gain some form of livelihood. It was also stated that leaders of the waste pickers association were included in meetings and briefed on the process, given the importance of their role. This response therefore appears to suggest that the waste pickers were engaged and not isolated entirely during the decommissioning process. However, it is clear that if there were engagements at all, then they were not enough or inclusive

enough in view of the impact the phenomenon would have on the residents. Furthermore, in terms of adaptation strategies, the respondent from the EPA indicated that waste pickers were allowed controlled access to continue their activities.

“Yes, they're part of the sanitation and ecosystems. We need them. You see because we do not separate our waste, we need them to pick out some things. Their activities reduce landfill mass else our land fill mass will be full in no time. People think they're a nuisance but they're not, they only need to be controlled. So, in our current design for World Bank, they're identified as part of the landfill ecosystem. We've actually met them a couple of times. They're part of site meetings. We need them. If you don't control them, they'll make a mess.”

(Officer, EPA, 2023)

However, these submissions were not corroborated by the waste pickers themselves. According to the president of the waste pickers association, they were not allowed access to the facility and were abruptly informed that the landfill site was being decommissioned. They reported that they were just pounced upon one day and told that they could no longer go to the landfill site and have not been allowed to return since. This stark contrast in accounts suggests that the engagement and support described by the officer from the EPA may not reflect the actual experiences of the waste pickers, who felt marginalised and excluded from the process.

“The waste pickers were not allowed to return to the landfill site because in 2020 in the midst of the COVID and the pandemic, without consultation with waste pickers, the landfill decommissioning was

suddenly initiated, and no resettlement plan was put in place for the waste pickers. The fire outbreak, the pandemic and the decommissioning of the landfill confirmed our fears of loss of livelihood. Nobody talked to us. We were in the neighbourhood when we heard that the minister had come, and I took my bicycle and quickly rushed there only to hear her giving a talk that the landfill was going to be decommissioned and turned into a recreational centre.” **(President, KWPA 2023)**

5.3.3 Integration of Waste Pickers into Formal Waste Management Cycle

In spite of the limited intervention for waste pickers from the government and most of its agencies, the main contractor in charge of the decommissioning offered some insight into measures taken to ensure that the role of waste pickers in the value chain were not ignored. It was determined that there needed to be a policy framework which factored in the role of waste pickers in the formal waste management cycle, to change the traditional notion of waste pickers as nuisance to communities. Furthermore, efforts to integrate waste pickers into the formal waste management cycle reflected a proactive approach to enhancing response efficacy. By empowering waste pickers and recognizing their role in the waste management ecosystem, stakeholders aim to foster a sense of collective efficacy, a key determinant of adaptive behaviour according to PMT (Chamberlain, 2019). This integration not only acknowledges the contributions of waste pickers but also enhances their perceived ability to enact meaningful change in their environment.

“In our model for the World Bank project, we've actually brought the waste pickers into the yard of each landfill. That way, we are able to control them because if they are outside of the landfill as has always been

the case, they are uncontrollable. Again, this is a matter of policy; how to control what is done on the site, how to control middlemen. The answer is to let them be part of the model.”

(MD, Waste Landfills Ltd, 2023)

According to the waste pickers, the cooperative idea and the door-to-door waste picking were initiated as a result of the decommissioning. This initiative aimed to integrate them into a more formal structure within the waste management system.

“For the cooperative idea and the door-to-door waste picking, it came about as a result of the decommissioning. That was the reason why we started. The majority of the waste pickers also have other small, small jobs they do in addition to support themselves and their families.”

(President, KWPA 2023).

This response indicates that the waste pickers themselves started adopting new strategies to sustain their livelihoods post-decommissioning. While the intention to integrate waste pickers into the formal waste management cycle was stated by the main contractor, the practical steps towards this integration were driven largely by the NGO WIEGO and the waste pickers as discussed in the subsequent section.

5.3.4 Support From WIEGO

The support provided by non-governmental organisations such as WIEGO in capacity building and networking initiatives resonates with the concept of information availability in Protection Motivation Theory (PMT). Information serves as a vital

resource for individuals in evaluating threats and formulating effective coping strategies (Rogers, 1985; Clubb & Hinkle, 2015).

The efforts to ensure that waste pickers and residents adapt to the effects of the decommissioning were captured in the response from the president of the waste pickers association, who highlighted the role that WIEGO played in supporting the activities of residents and waste pickers:

“WIEGO has really helped us to strengthen our network and our association post-decommissioning. They created a space for us to advocate for ourselves. WIEGO also connected us to the international association of waste pickers. We usually have exchange programmes and learn from other waste pickers internationally techniques to make our work safer. They train us on capacity building, occupational health and safety training, and leadership training as well. After the decommissioning of the landfill, WIEGO has really supported us. Made us see a different dimension of our work.”

(President, KWPA 2023)

Further emphasising WIEGO’s role, the project officer from the organisation, explained their strategic approach to aid the waste pickers in avoiding the landfill site by providing alternative means to access waste materials:

“For us, decommissioning should be done in a way that takes into account the needs of waste pickers. Thus, our interest is to get the waste materials for the waste pickers, so they do not go to the landfill site. This is the reason for the cooperative we helped the Kpone waste pickers to

form to engage in door-to-door collection, so they do not endanger themselves by spending hours on the landfill site post-decommissioning.”

(Project Officer, WIEGO, 2023)

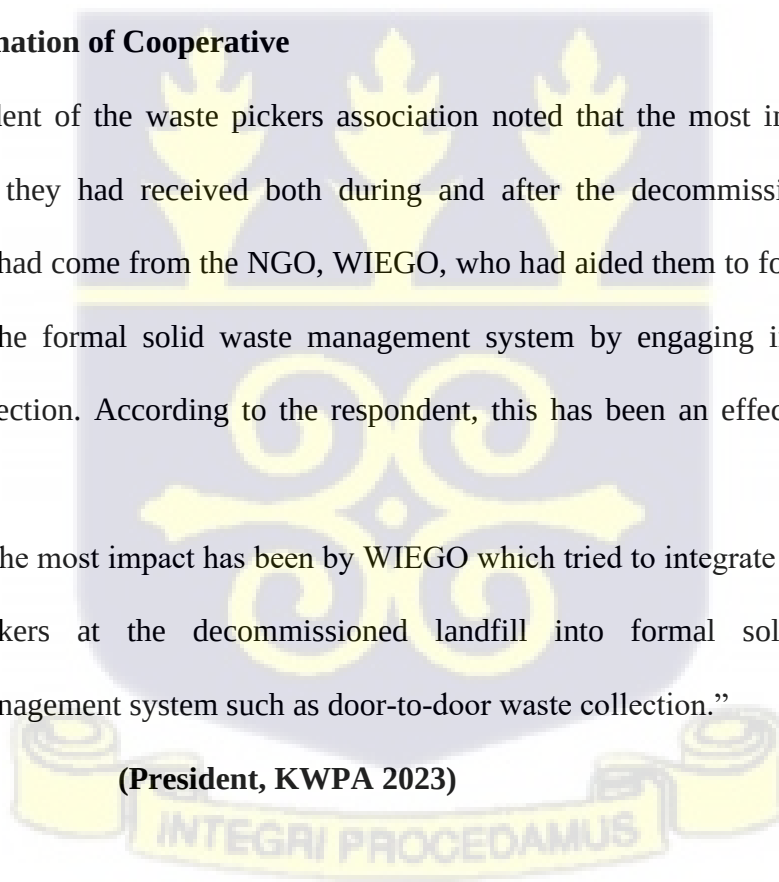
It is evident from the above discussions that WIEGO provided significant support to waste pickers and aided in their adaptation to the decommissioning through various initiatives. These included capacity building, occupational health and safety training, leadership training, and connecting them with international networks of waste pickers. These efforts aimed to empower waste pickers, strengthen their associations, and enhance their resilience post-decommissioning.

5.3.5 Formation of Cooperative

The president of the waste pickers association noted that the most impactful form of assistance they had received both during and after the decommissioning in Kpone Kokompe had come from the NGO, WIEGO, who had aided them to form a cooperative and join the formal solid waste management system by engaging in “door-to-door” waste collection. According to the respondent, this has been an effective intervention strategy.

“The most impact has been by WIEGO which tried to integrate the waste pickers at the decommissioned landfill into formal solid waste management system such as door-to-door waste collection.”

(President, KWPA 2023)



5.4 Post-Decommissioning Adaptation Strategies Adopted by Residents of Kokompe

This analysis examined resident strategies for adapting to the decommissioning of the Kpone Kokompe landfill. Tables 5.4, 5.5, and 5.6 present residents' perspectives on environmental, social, and economic adjustments during this transition.

5.4.1 Environmental Adaptation Strategies

Landfill decommissioning necessitates adjustments in residents' daily routines and waste management practices to adapt to the improved environmental quality. This section explored the environmental adaptation strategies adopted by residents of Kpone Kokompe following the landfill decommissioning.

5.4.1.1 Enhanced Well-being through Environmental Adaptation

Following the decommissioning of the landfill, Table 5.4 revealed that a substantial proportion of residents in Kpone Kokompe expressed relief from environmental pollution (73%) and anticipated improvements in health (79%), aligning with findings that landfill closure reduces air and water pollution (Wilson et al., 2020). Moreover, residents reported increased safety perceptions (63.4%), indicative of reduced hazards associated with the landfill.

5.4.1.2 Waste Management and Protective Measures

Residents adopted new waste disposal strategies (66%) post-decommissioning, signalling openness to improved waste management practices (Oteng-Ababio, 2014; Quaye et al., 2022). However, the lower reported percentage for increased use of protective clothing (52%) from Table 5.4 suggested a decreased need for same due to a

cleaner environment. Educational campaigns are recommended to emphasise the importance of continued safety measures during potential residual contamination phases.

Table 5. 4: Environmental Adaptation Strategies and Resident Utilisation Rates

Environmental Adaptation Strategies	Percentage (%)
The decommissioning has helped us to cope with environmental pollution?	73
I am no longer worried about the harmful effects of the landfill site?	80
I feel safer now that the landfill has been decommissioned?	63
I am sure the quality of health will now improve due to the decommissioning of the landfill site?	79
I have adopted new waste disposal strategies & procedures since the decommissioning of the landfill site?	66
I use more protective clothing and or better safety measures during waste picking.	52

Source: Fieldwork, (2023)

5.4.2 Social Adaptation Strategies

This section explored how residents in Kpone Kokompe adapted to the social changes brought about by landfill closure.

5.4.2.1 Resilience and Renewed Hope

From Table 5.5, residents exhibited a significant degree of resilience in adapting to the new social landscape. This is evidenced by data showing a rise in feelings of psychological calmness (53%) and renewed hope (63%) after decommissioning (Qasim et al., 2019). This resilience is necessary for navigating the period of uncertainty and change that follows landfill closure.

5.4.2.2 Strengthened Community Cohesion

Interestingly, the data suggested a positive impact on community dynamics. Nearly half of respondents (46%) reported a stronger bond between residents and waste pickers

post-decommissioning as depicted in Table 5.5. This finding aligns with observations from other transition contexts, highlighting the potential for shared experiences and a common vision to foster collaboration (Neville et al., 2023).

Table 5. 5: Social Adaptation Strategies and Resident Utilisation Rates

Social Adaptation Strategies	Percentage (%)
Since the decommissioning of the landfill site, I have had to depend on friends and family to support my livelihood?	30.5
Psychologically I have been calm about the changes taking place after the decommissioning?	53
The decommissioning of the landfill site has brought residents and waste pickers together?	46
Myself and other individuals in the community have a renewed sense of hope after the landfill decommissioning?	63
Community leaders have helped us adapt to changes due to the landfill decommissioning?	35
There are avenues for social support from NGOs after the landfill decommissioning?	76
The government has provided some form of relief and incentives for residents after the decommissioning?	22

Source: Fieldwork, (2023)

5.4.2.3 External Support Systems

The analysis emphasises the critical role of external support systems, particularly NGOs, in facilitating social adaptation. A large majority of respondents (76%) as depicted in Table 5.5 acknowledged the positive impact of NGO support. However, a significant gap exists in perceived support from local leaders (35%), highlighting the need for greater involvement from this group.

5.4.2.4 Government Intervention

From Table 5.5, residents' perceptions of government support were moderate (22%). This outlines the importance of effective national policy implementation tailored to the needs of communities undergoing decommissioning. Gaps in local implementation can

weaken the impact of national initiatives, highlighting the need for coordinated efforts between different levels of government (Silva et al., 2021).

5.4.3 Economic Adaptation Strategies

The economic effects of landfill decommissioning in Kpone Kokompe present a nuanced picture, with residents experiencing both opportunities and challenges. This section explores the economic adaptation strategies adopted by residents in response to the closure of the landfill site.

5.4.3.1 Emergence of New Business Opportunities

From Table 5.6, a notable proportion of residents, 44 percent noted the emergence of new business opportunities post-decommissioning. This suggests a potential for economic diversification and growth within the community. Initiatives such as land remediation and construction of waste management facilities, as suggested by Hughes et al. (2021), could further stimulate employment opportunities and economic development in Kpone Kokompe.

Table 5. 6: Economic Adaptation Strategies and Resident Utilisation Rates

Economic Adaptation Strategies	Percentage (%)
The decommissioning of the landfill site has helped attract new business opportunities into the area?	44
I have gained new income sources since the decommissioning of the landfill site?	38
I have lost a source of income and livelihood since the decommissioning of the landfill site?	23
I have changed my line of business since the decommissioning of the landfill site?	18
The decommissioning of the landfill site has helped open up avenues for new economic gains in the community?	46

Source: Fieldwork, (2023)

5.4.3.2 Income Sources and Losses

While some residents reported gaining new income sources (38%) following decommissioning, others experienced income loss (23%) or changes in their line of business (18 %) from Table 5.6. This disparity underscores the varied economic impacts of landfill closure on different segments of the community. The vulnerability faced by informal waste pickers due to disrupted access to materials, as highlighted by Wilson et al. (2020), further exacerbates these challenges.

5.4.3.3 Mitigation Strategies

To address the negative economic consequences of landfill decommissioning, financial support programmes and retraining initiatives are critical. Agyekum et al. (2022) advocate for targeted interventions to mitigate adverse effects, particularly for affected waste pickers. By providing financial assistance and skills development opportunities, authorities can help residents navigate the transition period and build resilience against economic shocks.

5.4.3.4 Government Intervention and Relief Measures

Table 5.6 revealed limited government intervention, with only 22 percent of respondents reporting government relief and incentives post-decommissioning. This underscores the need broad and targeted support measures to mitigate the uneven distribution of economic benefits and ensure equitable outcomes for all residents.

The study uncovered the complex nature of resident adaptation during landfill decommissioning, with simultaneous environmental, economic, and social dimensions. Policymakers and stakeholders are urged to develop targeted interventions to address economic hardships, promote skills development, foster collaboration, and enhance

communication to facilitate an equitable and sustainable transition for the Kpone Kokompe community.

5.5 Effect of Adaptation Strategies on Quality of Life of Residents of Kpone

Kokompe

This section discusses the effects of residents' adaptation strategies on their quality of life. Discussions in this section emphasise the importance of these strategies in influencing the quality of life of residents of Kpone Kokompe and the significance of their implementation in post-decommissioning environments.

5.5.1 Impact of Environmental Adaptation Strategies on Quality of Life

Regression results (*presented in Table 5.7*) indicate that environmental adaptation strategies have a **positive impact** on the quality of life of residents with a coefficient of 0.0520** which is statistically significant ($p < 0.05$). The positive coefficient indicates that as residents employ more environmental adaptation strategies, their quality of life tends to improve. The results of this study align with the findings of Chen et al. (2022), who demonstrated that individuals residing in Shanghai, China who implemented environmental adaptation strategies, such as cultivating their own food, utilising rainwater collection systems, and installing solar panels, indicated increased levels of quality of life compared to those who did not engage in such practices. Additionally, the research revealed that the implementation of these techniques was effective in mitigating residents' exposure to environmental toxins, hence enhancing their overall physical and mental well-being.

Table 5. 7: Impact of Adaptation Strategies on Quality-of-Life Post Decommissioning

	QL	QL	QL	(4)
VARIABLES	model 9	model 10	model 11	model 12
Environmental Adaptation Strategies	0.0520** (0.0218)			0.0536** (0.0251)
Economic Adaptation Strategies		0.142** (0.0679)		0.0545* (0.0292)
Social Adaptation Strategies			0.0323*** (0.0104)	0.0270** (0.0107)
Gender	0.340* (0.177)	0.1000** (0.0428)	0.181*** (0.0360)	0.113* (0.0628)
Household size	1.389*** (0.446)	0.0355 (0.0876)	0.0276 (0.0593)	0.00224* (0.00134)
Employment status	0.232** (0.109)	0.232** (0.109)	0.223** (0.109)	0.231** (0.110)
Average monthly income	0.248*** (0.0806)	0.0220*** (0.00501)	0.268*** (0.0848)	0.0114* (0.00678)
Education level	-0.203 (0.138)	0.346*** (0.105)	0.713*** (0.180)	0.0368*** (0.0129)
Motivation for staying	0.0202*** (0.00261)	0.0216*** (0.00358)	0.0253*** (0.00311)	0.0236*** (0.00432)
Type of Dwelling	0.0640** (0.0265)	0.00312 (0.00475)	0.00751*** (0.00224)	0.00822*** (0.00310)
Tenure/holding Arrangement	0.0552 (0.0602)	0.0537 (0.0602)	0.0454 (0.0601)	0.0468 (0.0605)
Constant	-0.518*** (0.109)	-0.495*** (0.150)	-0.559*** (0.127)	-0.480*** (0.177)
Observations	329	329	330	329

Source: Author's Construct, 2023.

5.5.2 Impact of Economic Adaptation Strategies on Quality of Life

Similarly, economic adaptation strategies **positively** influence the quality-of-life residents with a coefficient of 0.142** which is statistically significant ($p < 0.05$) as shown in Table 5.7 A study conducted by Chen et al. (2022) revealed that the influence of economic adaptation techniques on individuals' quality of life exhibited variability contingent upon the particular approach implemented. Residents who initiated their own entrepreneurial ventures exhibited greater satisfaction with their work-life balance and general quality of life compared to residents who secured employment in alternative sectors. Residents who acquired novel skills demonstrated higher levels of self-esteem

and confidence in comparison to residents who did not acquire new skills. The individuals residing in Kpone Kokompe who pursued various employment opportunities subsequent to the decommissioning process have experienced significant enhancements in their overall quality of life. The results of this study indicate the significance of offering locals a diverse range of economic adaptation measures following the decommissioning of landfills. This will enable the residents to select those options that are most likely to fulfil their peculiar preferences.

5.5.3 Impact of Social Adaptation Strategies on Quality of Life

Social adaptation strategies have a significant **positive** impact on the quality of life of residents with a coefficient 0.0323*** which is highly statistically significant ($p < 0.01$) as depicted in Table 5.7. This suggests that as residents employ more social adaptation strategies, their quality of life is substantially enhanced. This study's findings are consistent with those of other studies that have investigated the relationship between social coping mechanisms and individuals' quality of life. For instance, a study that examined the relationship between social adaptation strategies and quality of life in rural Chinese communities found that those who adopted these strategies reported higher levels of life satisfaction and general well-being (Wang & Li, 2020). This was discovered in a study examining the relationship between social adaptation strategies and quality of life in rural Chinese communities.

The discovery that social adaptation measures can enhance quality of life has significant repercussions for the management of landfills. After a landfill has been decommissioned, it is essential to assist residents in adopting social adaptation strategies. This will contribute to the enhancement of the residents' quality of life. The study reveals that environmental, economic and social adaptation strategies significantly improve the quality of life of residents in neighbourhoods post-landfill closure.

Environmental and social strategies are predictors of better quality of life, while economic adaptation strategies are less noticeable when other factors are considered. Factors like education and reasons for staying also impact residents' quality of life. Multiple adaptation strategies are critical for overall well-being.

5.6 Chapter Summary

This chapter explored the responses pertaining to the benefits, challenges and adaptation strategies of residents at Kpone Kokompe in relation to the landfill decommissioning. The benefits of the decommissioning exercise were examined, and it was determined that environmental and health benefits were the greatest benefits that emerged from the landfill decommissioning in the area.

Furthermore, the social benefits were also profound as respondents confirmed that after the decommissioning, the area is more habitable, and the stench and flies which used to be a common feature at the area has now receded, making the area more habitable. The key challenges encountered by the various stakeholders were also discussed, and from this discussion, it was evident that residents, contractors and organisations associated with the decommissioning exercise all had their fair share of challenges. The analysis highlighted the importance of gender-sensitive approaches and the need for inclusiveness in decommissioning as the challenges and adaptation strategies varied slightly between genders.

Finally, the chapter provided insight into the adaptation strategies of residents in response to the landfill decommissioning which impacted the quality of life of residents in the community.

CHAPTER SIX

NAVIGATING GHANA'S LANDFILL GOVERNANCE: AN IN-DEPTH ANALYSIS OF INSTITUTIONAL AND LEGISLATIVE FRAMEWORKS

6.0 Introduction

Landfill management requires a vigorous legal and institutional framework that outlines procedures, establishes responsibilities, and ensures environmental protection. This chapter delved into the institutional and legislative frameworks governing landfill decommissioning in Ghana. It begun by providing an overview of the national regime on solid waste management, thereby establishing essential contextual background. Subsequently, the chapter examined the specific laws and regulations directly related to landfill decommissioning in Ghana. This analysis aimed at evaluating the effectiveness of the legal and institutional regime in meeting the specific needs and challenges of landfill decommissioning within the Ghanaian context.

6.1 Overview of National Laws and Regulations on Waste Management in Ghana

Over the years, law makers have formulated and passed various laws that govern the management of solid waste. These laws represent standards that stakeholders in the waste management and sanitation sector must adhere to. Some of these laws include: the Land Planning and Soil Conservation Act, 1953 (No. 32), the Criminal and Other Offences Act 1960 (Act 29), the Abandoned Property Disposal Act, 1974 (N.R.C.D.308), the Control and Prevention of Bushfires Act, 1990 (P.N.D.C.L. 229), the Local Governance Act 2016 (Act 936), the EPA Act, (Act 490) and the Environmental Assessment Regulations, 1999 (LI 1652).

There are other laws such as the Water Resources Commission Act, 1996 (Act 522), Pesticides Control and Management Act, 1996 (Act 528) and the National Building Regulations, 1996 (LI 1630). The Public Health Act, 2012 (Act 851) is also another legal instrument governing the management of waste in Ghana. The existence of these laws imply that failure to properly manage waste can attract some penalties and punishment. These laws are also indicative of the fact that Ghanaians owe a duty to the state to abide by the laws on waste management. In this study, the legal and institutional frameworks pertaining specifically to landfill management were examined from the perspective of both the residents who lived in and around Kpone Kokompe before and after the decommissioning of the landfill and governmental and private entities that were involved in the landfill decommissioning.

6.2 National Institutions Responsible for Landfill Management in Ghana

The key institutions involved in the institutional framework for landfill management in Ghana are the Ministry of Sanitation and Water Resources (MSWR), the Ministry of Local Government and Rural Development (MLGRD), the Ministry of Works and Housing (MWH), the Metropolitan, Municipal, and District Assemblies (MMDAs), and the Environmental Protection Agency (EPA). These institutions play essential roles in formulating policies, providing oversight, and enforcing regulations to ensure effective landfill management and environmental protection in the country. The data collected from respondents from the governmental institutions and private contractors confirmed the significant role played by these entities in coordinating and ensuring the successful decommissioning of the landfill site. Some of the responses which confirm the involvement of these institutions are presented below:

“There was a document prepared by one Percy Anaan Bukari, who was consulted by the MSWR. The document was on the engagement of various stakeholders for the decommissioning. I will share that document with you as well. It was a comprehensive document which was followed to the letter on how awareness for the project, concerns of residents among others were documented and the recommendations followed to the letter.”

(Officer, MSWR, 2023)

Based on this response from an officer at the Ministry of Sanitation and Water Resources, it can be deduced that there was some degree of engagement between the Ministry and other stakeholders. These stakeholders included residents, representatives from the EPA, TMA and consultants working on the project. Thus, the decommissioning of the landfill at Kpone Kokompe was an activity that required the involvement and co-operation of various institutions at the national and local government level, as confirmed by the responses obtained during the interview.

6.3 Assessment of the Effectiveness of the Institutional and Legislative Frameworks Governing Landfill Decommissioning in Ghana

This study investigated the effectiveness of the legal and institutional frameworks guiding landfill decommissioning in Ghana, focusing on the case of Kpone Kokompe. While acknowledging the presence of an established legal and regulatory regime for landfill management in general, the research uncovered deficiencies in addressing contemporary practices and stakeholder concerns by the governmental institutions tasked with landfill management in Ghana. Key informant interviews highlighted the

significance of legal standards such as the EPA Landfill Guidelines 2002, alongside a range of other frameworks including the EPA Act 1994 (Act 490), Environmental Assessment Regulations LI 1652 of 1999, the National Environmental Policy 2016, the Waste Management Guidelines of the EPA and the 2016 updated EPA landfill Guidelines which are yet to be released. Despite this framework, gaps persist in communication, engagement, and resettlement strategies, highlighting the need for alignment of the regime with the provisions of the 1992 Constitution of Ghana. Resident perspectives further emphasised the importance of enhanced enforcement, regulatory adequacy, and stakeholder efficiency for effective decommissioning processes.

Some of the responses which discuss these factors are presented and analysed:

“The policies that guide landfill decommissioning in Ghana include:

- Ghana Landfill Management Guidelines 2002 of the EPA
- The National Environmental Policy, 2016
- Waste Management Guidelines of the EPA.”

(Lead Consultant, EAP, 2023)

From the response provided, there are recent documents and guidelines which regulate the process of decommissioning a landfill site. The respondent was interrogated further to provide clarity on the legal instruments backing the process of decommissioning a landfill site in Ghana, and offered the following response:

“The EPA ACT, LI 1652 is the main legal document. The EPA also has Environmental Guidelines as well as the revised Landfill Guidelines although this is yet to be formally adopted. Further, the proponent is required to obtain permits from EPA which specify conditions which should exist prior to the grant of a permit. For landfills, as part of the conditions, a proponent/developer is required to have a Decommissioning

Plan (DP) as well as an Aftercare Plan (AP) before a permit for a project is granted and this is strictly adhered to by the EPA. A DP for the Kpone Kokompe was presented and same accepted by the EPA and a permit issued for the purpose.”

(Lead Consultant EAP, 2023)

From the response above, EPA ACT of 1994, and EPA Regulations, LI 1652 of 1999 were cited as the main legal instruments regulating the decommissioning of landfills in Ghana. The respondent was further questioned on the relevance of the law and whether it still retained contemporary significance. Their response was two-fold, with the respondent indicating that the law was relevant but still needed to be updated and revised periodically to reflect new trends, developments and input from other countries and contexts. This is reflected in the following response:

“Yes and no. Yes, because as I stated there have not been any formal amendments of the EPA Act and the 2002 Landfill guidelines. No because landfill management is a process and at every point in time there is the introduction of some methods from different countries which the various assemblies implement. We employ a pragmatic approach in landfill decommissioning and so the contractors who worked on the Kpone Katamanso landfill for example used other approaches from Ireland and other foreign countries.”

(Lead Consultant, EAP, 2023)

Other responses also provided further insight on the laws regulating landfill decommissioning in Ghana. The interview with an officer from the EPA, provided

insights into the legal regimes for landfill decommissioning in Ghana. The following response was obtained:

“Forget. What the EPA 2002 landfill guidelines provides is not only outmoded but are impracticable to follow under our current circumstances. I saw some of the questions in your interview guide. You asked about policies and principles, they don't exist. Now, no one has been able to categorically provide us with any manual on landfill operation systems in this country.”

(Officer, EPA, 2023)

Other existing legal frameworks were established from an interaction with a respondent representing waste pickers in the community. The individual stated that:

“I know of the following policies for landfill decommissioning in Ghana.

- World Bank Safeguard Policies
- Environmental Assessment (OP 4.01 and BP 4.01)
- Indigenous Peoples (OD 4.20)
- Involuntary Resettlement (OP/BP 4.12).”

(President, KWPA, 2023)

In addition, various responses further confirmed that the 2002 EPA Landfill Guidelines was the central legal framework that influences all activities pertaining to landfill decommissioning in Ghana. Some of the responses include:

“With the framework and the policies, the first one that comes to mind is the EPA Landfill Guidelines 2002, that is number one. Then the other policy is related to sanitation and all that. So, I think what we were doing was related to landfill. With respect to the guidelines that guided the

project, what we adopted in the Kpone Kokompe landfill goes way beyond what is in our guidelines in Ghana.”

(Officer, MSWR, 2023)

The interviews more importantly sought to probe the respondents on the effectiveness of the legal and institutional regime for landfill decommissioning in Ghana, and in response to that, the representative from the Ministry of Sanitation and Water Resources stated that:

“The bye laws vary. They are mostly sanitation laws. When it comes to other institutions the sanitation, local government, EPA, MDA’s. We don’t have any bye laws dealing with landfills. Anything wastes disposal you’ll find in the EPA Landfill Guidelines. There are also district waste management plans. Once the EPA landfill guidelines are updated it should be enough because it will encompass all the activities that fall within the space.”

(Officer, EPA, 2023)

Additionally, the officer from the TMA also commented on the laws and policies governing landfill decommissioning and provided insight into some of the laws. The response captured the 2002 guidelines of the EPA, reflecting the old framework and some revised frameworks which are yet to be adopted:

“I know of the Decommissioning Guidelines of the EPA, the national environmental policy of Ghana, the waste management guidelines also of the EPA, the EPA 2002 Ghana Landfill Management Guidelines among others. The EPA ACT is the main legislation, the EPA regulations i.e., LI 1652. There are also various Standards for Effluence, Standards for composting within the EPA framework. The proponent of any

decommissioning will have to seek appropriate permits from the EPA who will then ensure that the permit granted conforms with the Decommissioning plan which was submitted prior to the grant of the permit for the project to commence in the first place.”

(Officer, TMA,2023)

The foregoing is indicative that there are legal frameworks and guidelines that regulate the process of landfill decommissioning in Ghana, and further revealed that stakeholders within the sector had knowledge of the existence these instruments. The responses further reveal that the Kpone Kokompe landfill decommissioning was guided by the consultant’s guidelines, which complemented existing policies and the legal regime on landfill decommissioning in Ghana. The representative from the TMA however noted that there needed to be revisions to the legal frameworks as same had not been amended over the years:

“It appears the laws on decommissioning have not been amended over the years. What usually happens in this sector is that there are soft law principles which are encouraged from time to time by way of international best practice. So even though the current laws on decommissioning in Ghana appear to be outmoded, there are various environmental principles and standards that we are bound by in doing our jobs.”

(Officer, TMA,2023)

While there is no specific law solely dedicated to landfill decommissioning in Ghana, various laws and regulations under the EPA framework and other institutions come into play during the decommissioning process. The EPA Landfill Guidelines of 2002

provided guidance for landfill decommissioning, but they are outmoded and impracticable to use in certain situations, as noted by interview respondents. The EPA has initiated the process of reviewing and updating these guidelines to align with the 1992 Constitution of Ghana and international conventions.

6.3.1. Effectiveness through a Resident Lens: Variables and Stakeholder

Perceptions Intertwined

This study examined residents' view of the effectiveness of the legal and institutional frameworks for landfill decommissioning in Ghana. The analysis focused on a range of indicators necessary for assessing effectiveness of the legal and institutional regime for decommissioning, including enforcement of laws, resident knowledge, regulatory adequacy, institutional adequacy, and stakeholder efficiency. Effective legal and institutional regimes hinge on robust enforcement of rules and laws (Adu-Acheampong et al., 2021). Knowledge about these laws by the citizenry empower participation and accountability (Mamokhere & Meyer, 2023). A clear and effective regulatory framework is essential for an assessment of effectiveness of the regime as a whole as highlighted by Ivan (2023). Furthermore, a well-functioning institutional framework requires inter-agency collaboration for seamless decommissioning (Mwenje & Kumar, 2024). Stakeholder efficiency, the adherence of waste management companies to protocols and effective execution of plans are also indicative of the effectiveness of a regulatory regime (Basu & Mishra, 2024). Local government efficiency is also paramount as the local government oversees the implementation of these laws or institutional standards at the local level and aid in addressing resident concerns (Sarfo-Mensah et al., 2019). Resident perceptions on the efficiency of laws and institutions inform improvements and foster trust within communities (Mamokhere & Meyer, 2023).

Key indicators of effectiveness as shown in Table 6.1 were assessed from the views of the residents and using descriptive statistics, frequencies and percentages, the responses were analysed in the subsequent paragraphs.

Table 6. 1: Household Perception on Effectiveness of Decommissioning Laws/Institutions

Variable	Frequency Effective	Frequency Ineffective	Percentage Effective	Percentage Ineffective (%)	Total
Knowledge about Legal & Institutional Regime	220	176	55.56	44.44	396
Enforcement of Decommissioning Laws	215	181	54.29	45.71	396
Adequacy of Regulatory Framework	240	156	60.61	39.39	396
Adequacy of Institutional Framework	224	172	56.57	43.43	396
Stakeholder Perception on:					
Efficiency of Waste Management Companies	178	218	44.95	55.05	396
Efficiency of Local Government Authorities	266	130	67.17	32.83	396
Efficiency of Government	240	156	60.61	39.39	396

Source: Fieldwork, (2023)

6.3.1.1 Knowledge about Legal and Institutional Regimes

The data revealed a split perception among residents regarding their knowledge of the legal and institutional regime governing decommissioning in Ghana. Out of 220 residents who stated that they had knowledge about the legal and institutional regime for decommissioning in Ghana, about 56% stated that the legal and institutional regimes were effective, whereas about 44% of residents who had knowledge about the legal and institutional regime stated that they were ineffective. Odunaiya et al. (2024) have recently highlighted the limited public knowledge of environmental regulations, particularly in developing contexts. Understanding of the gaps in residents' knowledge

by policy makers is necessary for developing targeted communication strategies to enhance public participation the decommissioning process.

6.3.1.2 Enforcement of Decommissioning Laws and Regulatory Frameworks

From Table 6.1, majority of residents (215) stated that decommissioning laws were enforced by the institutions, whereas quite a number (181) were also of the view that decommissioning laws were not enforced by the institutions responsible. Out of the number of residents who stated that decommissioning laws were enforced by the institutions, about 54 percent stated that enforcement was effective, while another 44 percent stated that enforcement was ineffective.

6.3.1.3 Adequacy of Regulatory and Institutional Framework

On the adequacy of the regulatory framework for decommissioning, majority of the residents (240) indicated that same was adequate and about 156 residents were of the view that the regulatory framework was inadequate as shown in Table 6.1. Out of the number that stated that the regulatory framework was adequate majority (60.61%) stated that it was effective, and a small percentage (39.39%) stated that it was ineffective as shown in Table 6.1.

On the adequacy of the institutional framework, majority of the residents (224) were of the view that the institutions were adequate while a smaller number (172) stated that the institutions responsible for decommissioning in Ghana were inadequate. A little over 56 percent of residents who stated that the institutional framework was adequate stated that they were effective in the performance of their roles, while 43.43 percent stated that although the institutions were adequate, they were ineffective in performing their roles.

6.3.1.4 Stakeholder Perception on Efficiency of Local Government Authorities and Waste Management Companies

Additionally, Table 6.1 revealed that residents differed in their perception of stakeholder efficiency. Local government authorities were viewed more favourably among those who have knowledge of their existence (67.17% effective) compared to waste management companies (WMCs) which were viewed as 44.95 percent effective by residents. This finding is at variance with research by Agyekum et al. (2022) who found that residents in Ghana expressed greater trust for private waste management entities as compared to local government authorities. Effective decommissioning however requires collaboration among all stakeholders, including residents (Bessette al., 2024). Understanding the drivers behind these perceptions can inform strategies to foster greater trust and collaboration in decommissioning efforts.

6.3.1.5 Government Efficiency

From Table 6.1, residents stated that the efficiency of central government in the decommissioning processes was about 61percent. This finding may reflect a general sense of trust in the government or perhaps limited knowledge about the specific actions and resources the central government allocated for the decommissioning in Kpone Kokompe as discovered by Rouyre et al. (2024).

Resident perceptions offer valuable insights into the perceived effectiveness of the legal and institutional regime for landfill decommissioning in Ghana. While some residents acknowledged positive aspects of the legal and institutional regime for decommissioning, concerns persist regarding enforcement, knowledge gaps, and

stakeholder efficiency. These findings are indicative of the need for multifaceted interventions by government in landfill management in Ghana.

6.4 Decommissioning of Landfills in Ghana: Addressing the Gap Between Technical Guidelines and Socio-Legal Considerations

6.4.1. The Revised EPA Guidelines (2016): A Step Forward

Ghana's legal framework for landfill decommissioning comprises a complex network of laws and regulations, overseen primarily by the EPA and relevant ministries as discussed in this study. The 2002 EPA Landfill Guidelines offered initial guidance, but its outdated nature and impracticalities were identified through interviews with key stakeholders such as officers of the EPA, the TMA and the private consultants interviewed in this work. Some of the challenges identified by stakeholders were what prompted the EPA to revise the EPA 2002 landfill guidelines in the year 2016.

The EPA Landfill Guidelines, 2002 is a 70- page document including 4 annexures. It comprises an introduction; Policy; Institutional and Regulatory Frameworks; Landfill Classification; Design of Landfills; Upgrading Existing Dumping Sites; Operation and Maintenance and Landfill Closure, Restoration and Aftercare.

The Revised EPA Landfill Guidelines was completed in November 2016, but it is yet to be adopted. The 177- page Document plus annexures is a drastic improvement on the 2002 Document; and contains the following:

- Introduction
- Policy Institutional and Regulatory Framework
- Landfill Classification

- Landfill Site Identification
- Landfill Technology
- Design of Landfills
- Upgrading Existing Dump Sites
- Operation and Maintenance
- Landfill Closure, Restoration and Aftercare
- Landfill Monitoring

The Guidelines thus appear to cover the required technical aspects of the subject; but still fall short of other legal, and socio-economic aspects of the subject as uncovered in this study. As noted, these include insufficient communication, engagement and broad consultation among stakeholders in the community, especially residents and waste pickers in addressing their concerns; lack of alternative livelihood, resettlement and adaptation plans and strategies for the workers and inhabitants; and limited local residents and civil society involvement in the decommissioning exercise. These matters, though very critical for ensuring a satisfactory and/or safe decommissioning process, appear to have been overlooked by drafters of the Revised 2016 EPA Guidelines; and same ought to be included.

6.4.2. Legal and Institutional Frameworks for Land Acquisition, Resettlement, and Public Consultation in Landfill Decommissioning

The 1992 Constitution and certain international rules and best practices provide pointers and/or indications as to how these matters could be addressed. The subject is discussed under the following broad but interrelated topics: land acquisition and compensation, resettlement and public consultation and participation.

6.4.2.1 Land Acquisition and Compensation

Where decommissioning will entail acquisition of land or resettlement of affected persons, the 1992 Constitution provides a basis and/or framework for dealing with the subject. The 1992 Constitution leaves intact the State's power to acquire land compulsorily for public use or public purposes. However, the Constitution provides rules as to how this is to be done. Under Article 20 (1) of the Constitution, compulsory acquisition of land can be effected under two main conditions precedent:

- (a) the taking of possession or acquisition must be necessary in the interest of defence, public safety, public order, public morality, public health, town and country planning or the development or utilisation of property in such a manner as to promote the public benefit; and
- (b) the necessity for the acquisition is clearly stated and is such as to provide reasonable justification for causing any hardship that may result to any person who has an interest in or right over the property.

Further, under Article 20 (2) compulsory acquisition of property by the State shall only be made under a law which makes provision for –

- (a) the prompt payment of fair and adequate compensation.
- (b) a right of access to the High Court by any person who has an interest in or right over the property whether direct or an appeal from any other authority for the determination of his interest or right and the amount of compensation to which he is entitled.

6.4.2.2 Resettlement

Article 20 (3) of the 1992 Constitution is very significant for present purposes. It provides:

“Where a compulsory acquisition or possession of land effected by the State in accordance with clause (1) of this article involves displacement of any inhabitants, the State shall resettle the displaced inhabitants on suitable alternative land with due regard for their economic well-being and social and cultural values.”

These constitutional imperatives cannot be glossed over by decommissioning implementing authorities in Ghana.

There are also other relevant international instruments and best practices on the subject in the area of land acquisition and resettlement of affected communities. Most significant for present purposes is the World Bank Operational Directive 4.30 on Involuntary Resettlement which aims at improving and/or restoring standards of project affected persons to pre-project levels (World Bank, 2016). Among its policy objectives are:

“i. that resettlement activities should be conceived as sustainable development programmes, in which displaced people share in project benefits and are meaningfully consulted; and

ii. that displaced persons should be assisted in their efforts to improve their livelihoods or at least restore them to pre-displacement levels.”

The prescribed resettlement measures include livelihoods restoration:

“where necessary to achieve its objectives, the plan or framework should also include measures to ensure that displaced persons are (i) offered support after displacement for a transition period; (ii) provided with development assistance in addition to compensation measures; and (iii) provided with support such as land preparation, credit, and training or job opportunities.”

The Policy mandates special consideration for vulnerable groups within displaced communities. Additionally, it requires that displaced individuals and their host communities receive timely and relevant information, be consulted on resettlement options, and be given opportunities to participate in the planning, implementation, and monitoring of resettlement processes. Furthermore, appropriate and accessible mechanisms for addressing grievances must be provided (World Bank, 2016).

6.4.2.3. Public Consultation and Participation

One of the important outcomes of the 1992 World Conference on Environment and Development (WCED), was the adoption by the international community of the Rio Declaration on Environment and Development (Rio Declaration) comprising some 27 principles governing the subject of sustainable development. Many of these soft law principles have attained the status of customary international law. Prominent among these is Principle 10 of the Rio Declaration which states that:

“Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.”

Inherent in Principle 10 are three fundamental rights: **access to information**, **access to public participation** and **access to justice**, as key pillars of sound environmental governance. These rights are now recognised as important tools for the promotion of transparent, inclusive and accountable environmental governance.

Access to information empowers citizens, encouraging them to engage in decision-making and policy processes in an informed manner. Public participation is of utmost importance in addressing environmental issues and promoting sustainable development, as it motivates governments to adopt policies and enact laws that consider community needs. Access to justice underpins these “access rights” by enabling the public to enforce their rights to participation, information, and holding regulators and polluters accountable for environmental harm (World Bank, 2016).

In 2010, during the 11th Special Session of UNEP’s Governing Council/Global Ministerial Environmental Forum in Bali, Indonesia, governments adopted the Guidelines for the Development of National Legislation on Access to Information, Public Participation, and Access to Justice in Environmental Matters, known as the Bali Guidelines. This initiative aimed to accelerate the implementation of Principle 10 by states.

Since their adoption, the Bali Guidelines have informed the development of national environmental legislation in various countries. To further promote the implementation of Principle 10 and the Bali Guidelines, UNEP released an Implementation Guide for the Bali Guidelines in 2015 (UNEP, 2015).

The above Constitutional and best practices on the subject could constitute norms and/or benchmarks for addressing the gaps and/or omissions identified in the 2016 Revised Ghana Landfill Guidelines. The Constitutional imperatives set out in Article 20 of the 1992 Constitution cannot be deviated from. As regards the World Bank Policy and Principle 10, even though these are not directly enforceable, they constitute international best practices that ought not be ignored or deviated from in projects of this nature. Indeed, it is arguable that Principle 10 has assumed the status as customary international law.

Further, the Revised EPA Landfill Guidelines of 2016, as its name implies, is in the form of 'Guidelines'. By their very nature, guidelines are recommended procedures, processes or practices to be adopted. They do not have the force of law to ensure their performance and thus enhance their enforceability. These Guidelines could thus be enacted as Subsidiary Legislation in the form of the Legislative Instrument (L.I) pursuant to the EPA Act, 1994 (Act 460)³ to give force and effect to them in law. Further, as an L.I, same can be periodically revised and/or updated in consonance with changed circumstances without resort to the tedium entailed in substantive legislative amendments.

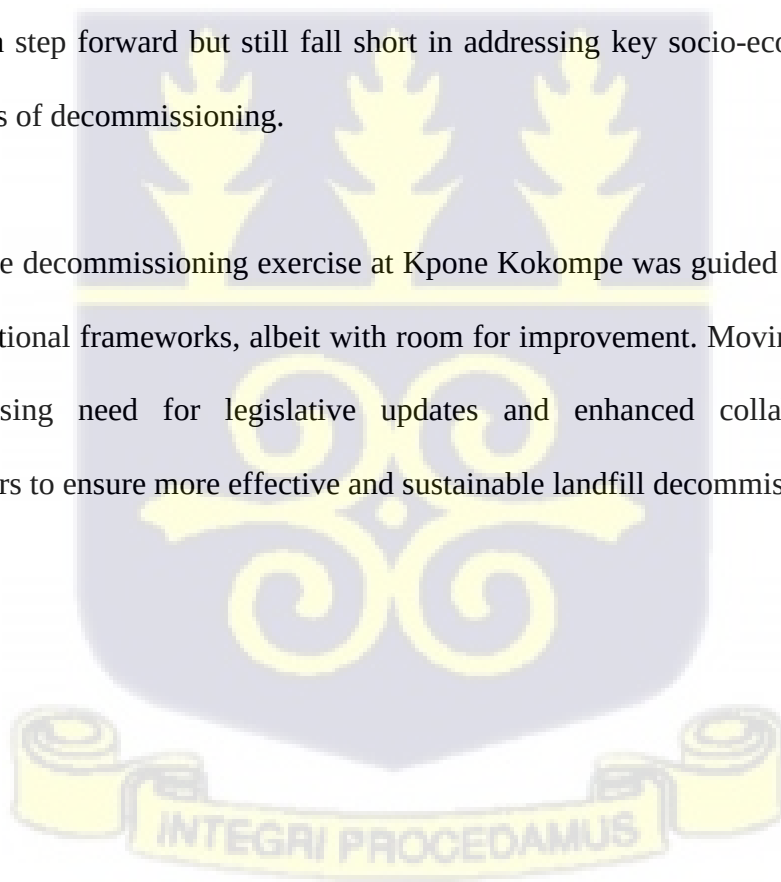
6.5 Chapter Summary

This chapter examined the legal and institutional frameworks governing landfill decommissioning in Ghana, blending insights from qualitative interviews and residents' views of efficiency. Beginning with an overview of national laws and regulations, the analysis narrowed down to specific policies guiding landfill decommissioning.

³ Section 62 of Act 490.

Residents' perceptions shed light on the nuanced landscape of legal and institutional effectiveness. While there was a general awareness of existing laws, concerns linger regarding enforcement and regulatory adequacy. For instance, while majority perceived decommissioning laws to be well enforced, a significant portion disagreed with this position, revealing potential implementation gaps. Similarly, perceptions on institutional adequacy varied, with the majority viewing the existing framework as adequate. Notably, local government authorities received higher favourability ratings compared to waste management companies, highlighting differing perceptions of stakeholder efficiency. Government efficiency in the decommissioning process is generally viewed positively by residents, indicating a sense of trust. The Revised EPA Guidelines of 2016 represent a step forward but still fall short in addressing key socio-economic and legal dimensions of decommissioning.

Overall, the decommissioning exercise at Kpone Kokompe was guided by existing legal and institutional frameworks, albeit with room for improvement. Moving forward, there is a pressing need for legislative updates and enhanced collaboration among stakeholders to ensure more effective and sustainable landfill decommissioning practices in Ghana.



CHAPTER SEVEN

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

7.0 Introduction

This chapter is the culmination of the study, delivering a concise summary of the key findings in relation to the stated research objectives outlined in the introductory chapter. The chapter also elucidates policy implications stemming from the research findings and identifies areas for future research endeavours as well as limitations of the study and contribution to knowledge.

The purpose of this study was to assess the environmental, social, economic, institutional and legislative context of the Kpone Kokompe landfill decommissioning in the Greater Accra region of Ghana. This purpose led to the formulation of three (3) research objectives which were:

- (1) To examine the environmental, social and economic factors that pertained in Kpone Kokompe prior to the decommissioning and how these factors affected the quality of life of residents.
- (2) To assess the challenges, benefits, and adaptation strategies to decommissioning adopted by residents of Kpone Kokompe.
- (3) To analyse the effectiveness of the institutional and legislative frameworks and policies governing landfill decommissioning in Ghana.

The study employed a sequential exploratory mixed method design, allowing for the collection of both qualitative and quantitative data in a systematic manner. Qualitative data collection methods included face-to-face interviews with key stakeholders and

secondary data collection. The quantitative aspect involved conducting a household survey among 396 households selected through multistage sampling.

Thematic analysis was predominantly used to analyse the qualitative data, focusing on identifying patterns and themes within the collected information. In addition to descriptive statistics, the study employed inferential estimation techniques to analyse the examine the responses from the household survey. Principal Component Analysis (PCA) was used to reduce dimensionality and identify underlying factor structures among the variables influencing the decommissioning activity. Furthermore, a probit regression model was adopted to examine the relationship between these factors and the dependent variable, quality of life of residents. The use of these models allowed for cross-validation of the results and offered deeper insights into the probability of quality-of-life outcomes based on observed characteristics. These combined methods ensured a comprehensive analytical approach to assess both the validity and impact of the factors under investigation.

Following the analysis of data, key findings were obtained, aligning with the research objectives. These findings are presented and discussed in detail in the subsequent sections, providing insights into the factors driving the decommissioning process and their implications for waste management policies and practices.

7.1 Summary of Key Findings

The first research question focused on the environmental, social, and economic factors that prevailed in Kpone Kokompe prior to the decommissioning of the landfill and their impact on the quality of life among residents. This study not only examined these

factors but also explored their socio-economic and environmental implications at Kpone Kokompe. This study revealed that, among the three key factors - environmental, social, and economic, that pertained prior to the landfill decommissioning at Kpone Kokompe, environmental factors emerged as the most significant.

7.1.1 Environmental Factors as Primary Drivers

The analysis revealed that the primary reason for decommissioning of the landfill at Kpone Kokompe was the significant environmental threat it posed to residents in the community. Per the field data, it emerged that various environmental concerns including the fire from a factory which spilled over into the landfill creating a hazardous atmosphere of smoke in the surrounding areas was a major reason for decommissioning. These issues, among others, are discussed in detail below.

7.1.1.1 Airborne Assault: Pollution and Quality of Life

Pollution, particularly dust pollution, emerged as a primary factor driving the decommissioning of the Kpone Kokompe landfill. Residents reported significant issues with dust, which affected air quality and daily life. The high volume of truck traffic associated with landfill operations exacerbated air pollution and disrupted routines, leading to increased fuel consumption and productivity losses. Noise pollution from the landfill activities further degraded living conditions, heightening stress levels. These pollution factors collectively created a hostile environment for residents, necessitating the landfill's closure.

7.1.1.2 Noxious Nuisance: The Stench Factor

The persistent and pervasive stench from the landfill was a critical driver for its decommissioning. The odour from decomposing waste not only diminished the quality of life for nearby residents but also deterred investments in the area. The unpleasant smell was a constant reminder of the deeper environmental and health hazards posed by the landfill. The community's strong opposition to the stench played a significant role in the decision to decommission the site, as it directly impacted residents' daily lives and well-being.

7.1.1.3 Toxic Tides: Leachate Overflow

This study found that leachate overflow presented a severe environmental hazard, compelling the decision to decommission the landfill. This toxic liquid, generated by decomposing waste, contaminated local water sources, leading to waterborne diseases and other health issues. Residents were particularly concerned about the leachate seeping into their community, affecting local streams and posing serious health risks. The significant threat posed by leachate contamination was another reason for the urgent need for decommissioning to protect public health and the environment.

7.1.1.4 Health Havoc: Chronic Illnesses and Risks

The study revealed that health concerns were paramount in driving the decommissioning of the landfill. Emissions from the site contributed to a range of health problems, including respiratory issues like asthma, skin infections, gastrointestinal illnesses, and chronic diseases such as cancer. The landfill also became a breeding ground for disease-carrying pests, exacerbating public health risks. The overall unsanitary conditions and

the potential for disease transmission highlighted the urgent need to address these health hazards, making health a key factor in the decommissioning decision.

7.1.1.5 Fiery Fears: Safety Hazards and Fire Risks

One of the most critical environmental concerns necessitating the decommissioning of the Kpone Kokompe landfill was the recurring outbreak of fires on-site. These fires, often caused by the spontaneous combustion of decomposing waste and the accumulation of flammable gases such as methane, created dangerous conditions that compromised the structural stability of the landfill. The 2019 fire was particularly significant, as it led to the widespread release of toxic smoke and hazardous gases into the atmosphere, raising alarm over the long-term environmental and health implications. These fire risks posed a direct threat not only to the landfill workers but also to the integrity of the surrounding ecosystem, reinforcing the urgent need to shut down the facility. The persistent risk of fire outbreaks highlighted serious deficiencies in landfill management, making continued operation unsustainable from a public health and environmental protection standpoint.

7.1.2 Social Imperatives Behind Decommissioning

The study identified that social factors significantly influenced the decision to decommission the landfill site. These factors included the inconvenience caused to residents and the community, as well as regulatory injustices, among other issues discussed below.

7.1.2.1 The Smoke Signal: Fire Hazards and Community Safety

Beyond the environmental and operational concerns, the 2019 fire incident had a profound social impact, particularly on the nearby Kpone Kokompe community. The fire, initially ignited by a nearby factory blaze that spread to the landfill, generated dense plumes of noxious smoke that blanketed the area, disrupting daily life and triggering health emergencies. Residents reported respiratory difficulties, eye irritation, and general discomfort, prompting widespread complaints to local authorities and environmental agencies. This incident catalysed community-led calls for government intervention, revealing the extent to which the landfill had become a public safety liability. The strong community reaction and visible health impacts played a pivotal role in accelerating the decommissioning process, as government agencies faced growing pressure to act decisively in response to citizen concerns. Thus, social perceptions of safety, amplified by direct experience of the 2019 fire, became a powerful driver behind the decommissioning decision.

7.1.2.2 Silent Voices: Lack of Environmental Advocacy

A notable social factor before the decommissioning of the landfill was the lack of environmental activism among Kpone Kokompe residents. The study found that the community had limited engagement in advocacy efforts, which hindered awareness and action regarding the impact of the landfill. This lack of activism suggested a need for stronger environmental education and information campaigns to empower residents and promote a more active role in environmental stewardship prior to the decommissioning.

7.1.2.3 Infrastructure Injustice: Underdevelopment and Accessibility Issues

Kpone Kokompe's underdevelopment and limited access to essential infrastructure were significant social drivers for decommissioning. The study found that residents faced poor road conditions and inadequate educational facilities, reflecting broader socio-economic vulnerabilities due to the location of the landfill within the area. The lack of infrastructure not only affected daily life but also heightened the community's exposure to environmental hazards. Addressing these issues by decommissioning the landfill was thus necessary to improve the quality of life and resilience of Kpone Kokompe's residents.

7.1.2.4 Governance Gaps: Regulatory Ineffectiveness

Before decommissioning, there were perceived gaps in the enforcement and effectiveness of environmental regulations and local governance in Kpone Kokompe. The study found that residents reported low awareness and enforcement of key regulatory frameworks, such as the Environmental Protection Agency Act (1994 ACT 490) and the Local Governance Act, (2016 ACT 936). This perceived regulatory ineffectiveness revealed the need for more robust and thorough environmental governance. Strengthening these frameworks and enhancing community engagement in regulatory processes were found to be essential for addressing the social and environmental challenges posed by the landfill.

7.1.3 Economic Considerations: Motivating Factors for Landfill Decommissioning

Economic factors that equally played a significant role in the decommissioning initiative were found per the analysis. Immediate considerations included reducing maintenance costs and the potential of converting the landfill into a recreational site. These economic

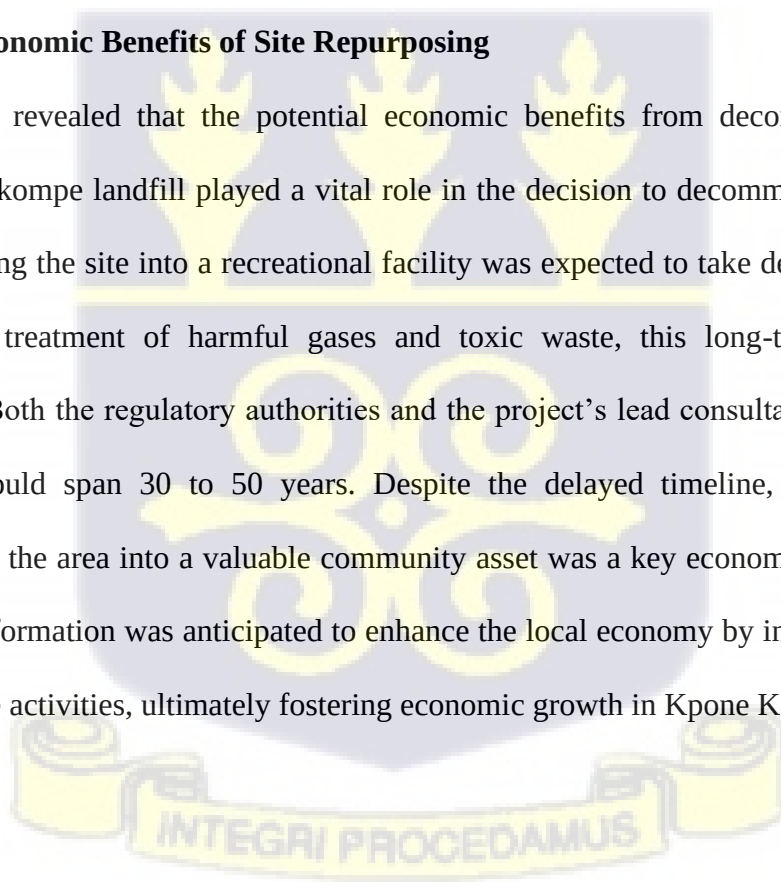
incentives were pivotal in the decision to decommission the Kpone Kokompe landfill as discussed below.

7.1.3.1 Cost Implications of Maintaining the Landfill

Maintaining the landfill posed significant financial burdens on the budget of the KKMA primarily due to management and environmental remediation costs as the landfill reached capacity. The study revealed that the decision to decommission was driven by the need to reduce these costs and redirect resources towards more sustainable urban development projects in Kpone Kokompe.

7.1.3.2 Economic Benefits of Site Repurposing

The study revealed that the potential economic benefits from decommissioning the Kpone Kokompe landfill played a vital role in the decision to decommission. Although transforming the site into a recreational facility was expected to take decades due to the necessary treatment of harmful gases and toxic waste, this long-term vision held promise. Both the regulatory authorities and the project's lead consultant estimated this process could span 30 to 50 years. Despite the delayed timeline, the prospect of converting the area into a valuable community asset was a key economic consideration. This transformation was anticipated to enhance the local economy by increasing tourism and leisure activities, ultimately fostering economic growth in Kpone Kokompe.



7.2 Benefits, Challenges and Adaptation Strategies of Residents from Decommissioned Landfill Site and the Effect of the Adaptation Strategies on Quality of Life

The study sought to uncover the challenges, benefits, and adaptation strategies emerging from the decommissioning of the Kpone Kokompe landfill and how the adaptation strategies affect the quality of life of residents. The key findings related to these phenomena are discussed in the subsequent sections.

7.2.1 Benefits of Decommissioning

Following the decommissioning, residents enjoy a cleaner environment, employment opportunities among others. The upcoming section discusses findings pertaining to the benefits of the decommissioning of the Kpone Kokompe landfill.

7.2.1.1 Elevated Living Standards: A Healthier Community

The study revealed that the decommissioning of the Kpone Kokompe landfill has significantly improved the standard of living for residents. Enhanced water quality, reduced health hazards, and increased savings on medical bills were notable benefits. Clean water access allowed residents to perform daily chores without fear of contamination, while the reduction in healthcare costs had a direct impact on household finances. The study found that landfill decommissioning primarily benefits residents by elevating their quality of life and overall well-being.

7.2.1.2 Cleaner Environment: A Breath of Fresh Air

One of the most evident benefits post-decommissioning was the marked improvement in environmental hygiene. The study found that Kpone Kokompe an area, once plagued by

pollution, smoke, and leachate, had seen a significant reduction in these pollutants. The air and water quality had improved, making the environment safer and more habitable. This was corroborated by residents and officials alike, who noted a drastic reduction in flies and litter. The environmental improvements not only enhanced the aesthetic appeal of Kpone Kokompe will also contribute to better health outcomes for the community.

7.2.1.3 Employment Opportunities: A Boost for Local Economy

The decommissioning process created employment opportunities for local residents particularly young men who were engaged in the waste management activities. This provided a source of income during the decommissioning phase, mitigating some of the economic impacts of closing the landfill. Additionally, waste pickers in Kpone Kokompe have adapted by forming cooperatives and engaging in door-to-door waste collection, demonstrating resilience and innovation in the face of economic changes. These new employment avenues have helped sustain the local economy and provided new livelihoods for residents.

7.2.1.4 Gender-Sensitive Benefits: Highlighting Household and Economic Gains

The study revealed that the benefits of the landfill decommissioning were perceived differently across genders. Women particularly noted improvements in household well-being and access to cleaner water, which facilitated daily chores and family health. Men, on the other hand, emphasised the economic benefits, including the job opportunities generated during the decommissioning. The study found that this gendered perspective highlighted the importance of considering diverse viewpoints in waste management policies, ensuring that both social and economic benefits are equitably distributed.

7.2.2 Challenges Posed by Landfill Decommissioning

In terms of the challenges caused by the decommissioning, the study uncovered a number of obstacles ranging from delays in execution, to health issues and inadequate community engagement. This section details the key obstacles identified during the decommissioning process, emphasising the multifaceted nature of the problems encountered.

7.2.2.1 Communication Breakdown and Stakeholder Engagement

A significant challenge in the decommissioning process at Kpone Kokompe was the lack of effective communication and stakeholder engagement. The study found that despite some efforts, the engagement appeared superficial and insufficient, particularly for the most affected group, the waste pickers. The decommissioning was treated primarily as a central government project, leading to minimal consultation with local residents. This oversight not only created a gap in the participatory process but also left many stakeholders feeling marginalised and unheard.

7.2.2.2 Economic Disruption and Unemployment

The decommissioning of the landfill led to significant economic disruption and unemployment, particularly affecting waste pickers and food vendors. The landfill served as a vital economic hub, providing livelihoods to a large number of waste pickers and additional income opportunities for food vendors and middlemen. The abrupt cessation of landfill activities resulted in a loss of income for these individuals, creating a ripple effect of economic instability within the community.

7.2.2.3 Prolonged Execution Times and Resident Inconvenience

It was discovered that the decommissioning project exceeded its initial timeline by six months, causing prolonged inconvenience for local residents. The extended duration disrupted the daily lives of residents, particularly those who had to be relocated to nearby landfill sites. Additionally, the process involved significant smoke emissions and leachate pollution, further inconveniencing the community and raising concerns about environmental and health impacts.

7.2.2.4 Health Hazards for Workers and Residents

Health hazards emerged as a critical challenge during the decommissioning process, affecting both workers and residents. The study found that workers involved in the decommissioning activities faced respiratory issues and other health risks due to exposure to pollutants and hazardous conditions at the site. Residents also experienced health impacts from smoke, leachate overflow, and pollution of water resources. These health risks underscore the importance of implementing stringent safety measures and health protections for both workers and the local population during such projects.

7.2.2.5 Lack of Alternative Livelihood Plans and Advocacy

The absence of a decommissioning plan that included alternative livelihood options for those affected by the landfill decommissioning was a major challenge. Waste pickers, in particular, were left without viable economic alternatives, leading to increased unemployment and financial hardship. Additionally, there was a noticeable lack of advocacy from the government for these individuals, leaving NGOs like WIEGO to step in and provide support. This gap highlights the necessity for proactive planning and the inclusion of sustainable livelihood strategies in decommissioning projects to ensure that affected communities are not left in a vulnerable position.

7.2.3 Effect of Adaptation Strategies on Quality of Life

Significantly, this study has uncovered a neglected topic: the adaptation of residents to the decommissioning process and the effect of the strategies on the quality of life of residents. Programmes were introduced to integrate the waste pickers into the formal solid management system, alternative income sources and enhanced community cohesion among others.

7.2.3.1 Governmental and NGO Interventions

Residents of Kpone Kokompe faced challenges due to the lack of substantial government support in adapting to the landfill decommissioning. The study discovered that most governmental interventions were limited to providing personal, protective equipment (PPEs), which were inadequate for addressing the socioeconomic impact of the phenomenon. However, NGOs like WIEGO played a significant role, providing capacity building, leadership training, and connecting waste pickers to international networks. This support helped waste pickers adapt better, highlighting the critical role of NGOs in community resilience.

7.2.3.2 Relocation: An Immediate Response

Faced with the sudden closure of the landfill, a number of waste pickers relocated to nearby smaller landfills. This move was driven by the need to maintain their livelihoods, as the decommissioned site was their primary source of income. The study found that despite the challenges of moving to smaller or more distant sites, this strategy allowed some waste pickers to continue working in their familiar trade, demonstrating their resilience and adaptability in the face of disruption.

7.2.3.3 Integration into Formal Waste Management: A New Beginning

Efforts to integrate waste pickers into the formal waste management system emerged as a key adaptation strategy. This study discovered that the formation of cooperatives and engagement in door-to-door waste collection allowed waste pickers in Kpone Kokompe to find new avenues for income. This shift not only provided a structured approach to waste management but also helped change the perception of waste pickers from nuisances to valuable community members. Such integration initiatives were vital for ensuring sustainable livelihoods post-decommissioning.

7.2.3.4 Environmental and Social Adaptations: Improved Well-being and Community Cohesion

The decommissioning of the landfill led to significant environmental improvements, with residents reporting relief from pollution and increased safety perceptions. These changes positively impacted health and overall well-being. Additionally, this study discovered that social dynamics saw a positive shift, with strengthened community bonds and a renewed sense of hope among residents. The role of external support systems, particularly NGOs, were critical in fostering these social adaptations, though there remained a gap in support from local leaders and government.

7.2.3.5 Economic Adjustments: New Opportunities and Challenges

Economically, residents experienced a mix of new opportunities and challenges. While some found new business ventures and income sources, others faced losses and had to switch professions. The results of this study show that financial support programmes and retraining initiatives were identified as essential for mitigating these negative impacts. Limited government intervention in providing economic relief indicated the

need for more exhaustive support to ensure equitable outcomes for all residents. This study stresses the necessity of targeted policies to address the diverse economic realities of communities undergoing such transitions.

7.3 Effectiveness of the Institutional and Legislative Frameworks and Policies

Governing Decommissioning Practices Used in Kpone Kokompe Landfill

Decommissioning

The third research objective for this thesis was to examine the effectiveness of the institutional and legislative frameworks and policies governing landfill decommissioning in Ghana. The findings indicated varied effectiveness in the institutional and legislative frameworks governing landfill decommissioning in Ghana as discussed below.

7.3.1 Outdated Frameworks and Guidelines

The study revealed that while there are existing institutional and legal frameworks for decommissioning in Ghana, these frameworks are outdated and do not reflect contemporary practices. The 2002 EPA Landfill Guidelines, which are commonly cited as the primary regulatory framework, fail to align with current global standards. Despite the revision of these guidelines in 2016, the updated guidelines have not yet been published, hindering their practical application and improvement over their predecessor. This finding indicated a significant gap between regulatory intent and practical implementation.

7.3.2 Stakeholder Communication and Engagement

Another significant finding from this study is the insufficient communication, engagement, and broad consultation among stakeholders, particularly local residents and waste pickers which affected the perception of effectiveness of the regulatory regime on decommissioning in Ghana. The study highlighted the lack of effective communication channels and stakeholder engagement processes in the decommissioning framework. The study found that oversight has led to a disconnect between policymakers and the affected communities, resulting in dissatisfaction and resistance from those impacted by the decommissioning activities.

7.3.3 Community Involvement and Civil Society Participation

The limited involvement of residents and civil society in the decommissioning process was another critical concern on the perception of the effectiveness of the institutional regime for decommissioning. The study found that the exclusion of these groups from decision-making processes undermined the legitimacy and effectiveness of the decommissioning efforts. Enhancing community involvement and ensuring active participation of civil society are imperative for fostering a sense of ownership and cooperation among stakeholders.

7.4 Conclusions

This research examined the decommissioning of the Kpone Kokompe landfill site through the lens of the Integrated Sustainable Landfill Management (ISLM) framework, which emphasises a balance between environmental protection, social inclusion, and economic viability in landfill planning and closure. The study revealed that the primary driver of the decommissioning decision was environmental concern, particularly

following a fire outbreak at a nearby factory that intensified smoke and pollution hazards. These environmental threats, such as air pollution, leachate discharge, and contamination of nearby water bodies, triggered urgent stakeholder intervention to safeguard public health and the ecosystem.

Social and economic considerations also played a significant role. Post-decommissioning, there have been observable socio-economic improvements in the community, particularly due to the intervention of WIEGO, which facilitated the integration of displaced waste pickers into the formal solid waste management value chain. These developments have contributed to improved livelihood opportunities and enhanced residents' overall quality of life. Furthermore, the study highlighted the role of existing legal and institutional frameworks in supporting stakeholder collaboration. Key actors such as the MSWR, EPA, TMA, WIEGO, and EAP Consult were instrumental in facilitating the decommissioning process. However, the research also found that these frameworks require updating to align with best practices in sustainable landfill management globally.

Overall, the study validates the core tenets of the ISLM framework. It demonstrates that when environmental, social, and economic dimensions are considered together, landfill decommissioning can yield sustainable and community-oriented outcomes. However, it also suggests that for full alignment with ISLM principles, legal and institutional reforms are necessary to ensure long-term sustainability and resilience in post-closure landfill management.

7.5 Recommendations

The decommissioning of the Kpone Kokompe landfill led to notable environmental, social, and economic benefits, facilitated by robust legal and institutional frameworks. Effective coordination among state, private, and NGO agencies played a key role, with some providing vital support to help residents adapt to economic changes. The following recommendations aim to build on these successes and address remaining challenges.

7.5.1 Update and Enforce EPA Landfill Guidelines

This study recommends that the EPA updates its unpublished Revised Landfill Guidelines of 2016. The decommissioning of the Kpone Kokompe landfill represents a viable case study for assessing the effectiveness of current legal frameworks, and the findings of this study indicate that the legal framework of the EPA is inadequate and requires revision. Specifically, the study recommends that the Revised 2016 EPA Landfill Guidelines be updated to include clear provisions on: (i) land acquisition and compensation procedures; (ii) resettlement and adaptation support for affected communities; (iii) promotion of alternative livelihood schemes for informal waste workers; (iv) structured mechanisms for public participation in the decommissioning process; and (v) integration of waste value addition strategies to shift the focus from mere disposal towards resource recovery, recycling, and circular economy practices. The study further recommends that the EPA undertake periodic revisions of its Landfill Guidelines to adapt to changing circumstances without requiring major legislative amendments, and to involve stakeholders in keeping the regulatory framework responsive to emerging issues in landfill decommissioning.

The enforceability of the 2016 Revised EPA Guidelines could then be strengthened by enacting them as subsidiary legislation under the EPA Act, 1994 (Act 460), through a Legislative Instrument (L.I.).

7.5.2 Development of Inclusive Institutional Frameworks

Furthermore, it is recommended that the MSWR collaborates with the EPA to develop policies for alternative livelihoods, resettlement, and adaptation for affected individuals and communities, including waste pickers during the process of decommissioning to minimise employee and community health hazards as were encountered. The World Bank Operational Directive 4.30 on Involuntary Resettlement and the 1992 Constitution of Ghana offer vital guidelines for fair land acquisition and compensation as well as resettlement guidelines for restoring pre-project livelihoods and supporting vulnerable groups.

7.5.3 Enhancement of the Role of Local Government

The TMA played a good role in facilitating community involvement and coordination amongst the stakeholders of the landfill decommissioning. This study therefore recommends that local government authorities in Ghana be educated on their role in landfill decommissioning and briefed on the recent decommissioning of the Kpone Kokompe landfill as a case study on best practices and related issues pertaining to landfill decommissioning in Ghana. Local governments authorities should ensure effective project management and adherence to timelines to minimise disruptions and ensure a smoother transition for all stakeholders involved. Residents and civil society as a matter of priority must also be involved in the decommissioning process thereby enhancing transparency and inclusivity.

7.5.4 Strengthen and Advocate for Waste Pickers' Associations

It is recommended that the leadership of the Kpone Waste Pickers Association develop a database of members and ensure collective organisation to receive the recognition they deserve for their vital role in the waste management value chain. Leadership should also undertake training programmes to enhance capacity building and public relations skills, necessary for conveying the sentiments of members during significant activities such as landfill decommissioning. Regular training programmes for members should be held to educate and foster closer collaboration with WIEGO and other stakeholders in the decommissioning value chain on best practices and relevant skills.

WIEGO played a key role in identifying intervention programmes for the waste pickers at Kpone Kokompe and advocating on their behalf during the landfill decommissioning process. However, challenges encountered reveal that more efforts are needed to ensure that minority groups like waste pickers are recognised and integrated into government policies on waste management and landfill decommissioning. This study recommends that WIEGO engage with relevant government institutions and policymakers to ensure priority is given to waste pickers due to the importance of their activities.

7.5.5 Strengthening Adaptation Strategies for Affected Communities

To mitigate the socio-economic impacts of landfill decommissioning, this study recommends the adoption of inclusive and sustainable adaptation strategies aimed at empowering affected communities. These strategies should include targeted vocational and technical skills training in sectors such as agribusiness, recycling, and green enterprise development. Additionally, accessible microfinance schemes and start-up support must be introduced to enable individuals to transition into alternative

livelihoods. The establishment of buy-back centres in strategic locations is also essential to promote waste value addition, enhance recycling efforts, and create sustainable economic opportunities. Community-based livelihood hubs should be established as focal points for training, mentoring, and business incubation. These interventions should be implemented through multi-stakeholder partnerships involving government agencies, the private sector, and civil society organisations, with a strong monitoring and evaluation framework to ensure accountability, efficiency, and long-term sustainability.

7.6 Limitations of The Study

The process of landfill decommissioning is a pivotal aspect of waste management, carrying significant environmental, social, and economic implications. While this study explored these aspects extensively, the impacts identified are those within three years post-decommissioning. The short-term focus of the study left gaps in understanding the long-term economic benefits of decommissioning.

To gain an in-depth understanding of landfill decommissioning further, longitudinal studies extending beyond the immediate aftermath of landfill decommissioning are necessary for tracking long-term impacts and comparing different sites. Such studies allow researchers to monitor changes and developments over time, offering valuable insights into trends and patterns that emerge. The current study focused on the impacts of the decommissioning of the Kpone Kokompe landfill within a limited time frame and thus there is the need for further investigation.

Moreover, this study did not also address employment patterns and how decommissioning can affect it. Further analyses could investigate employment patterns,

especially for those previously engaged in landfill-related activities, like factory workers or waste pickers.

7.7 Areas for Further Research

Future research should focus on the long-term economic implications of landfill decommissioning. Uncovering sustained economic benefits, such as cost savings from reduced operational expenses and new revenue streams from repurposing sites for renewable energy or recreational use are necessary for sustainable development.

Future research should also examine the impact of landfill decommissioning on employment patterns, particularly in areas with potential environmental hazards and limited job options such as Kpone Kokompe. The informal waste-picking sector, which employs a significant portion of the Kpone Kokompe community, operates with unique income dynamics driven by skills in waste scavenging and market navigation for recyclables. Investigating these aspects will offer valuable insights into the broader socioeconomic effects of landfill decommissioning.

7.8 Contribution to Knowledge

This study examined the multifaceted impact of the Kpone Kokompe landfill decommissioning on the quality of life of residents, focusing on environmental, social, economic factors and the legal regime for landfill decommissioning in Ghana. Unlike most landfill management literature which typically focus on single aspects of the phenomenon such as environmental impacts or costs analysis of maintaining landfills.

The findings of this study contribute to knowledge in waste management, especially in developing countries, revealing how environmental threats drive policy decisions that

affect community health and socio-economic conditions. The study further highlights the importance of the legal and institutional frameworks in effective decommissioning and the need for adaptive strategies to support vulnerable groups like waste pickers.

The study demonstrates that successful decommissioning requires robust environmental and health policies, along with inclusive socio and economic strategies addressing all stakeholders' needs.

The novelty of this research lies in its holistic examination of the decommissioning process, incorporating various stakeholders' perspectives and emphasising the interconnectedness of environmental, social, and economic factors. It offers actionable insights for policymakers to enhance environmental health, improve social wellbeing, and promote economic stability through integrated approaches.

This study further provides a valuable framework for policymakers to design effective and equitable waste management strategies, ultimately improving the quality of life for communities impacted by landfill sites.

Using the Integrated Sustainable Landfill Management (ISLM) framework, the study evaluates Ghana's landfill decommissioning approach, highlighting challenges and opportunities in transitioning to sustainable waste management practices. The Institutional and Protection Motivation Theories are employed to explore how regulations, socio-cultural dynamics, and individual perceptions of environmental risks influence landfill management decisions and community resilience. The integration of qualitative and quantitative methods ensure robust data interpretation and practical insights for improving waste management policies in Ghana and similar contexts.

REFERENCES

- Abdu, H., & Seyoum, G. (2019). Prevalence And Outcomes of Birth Defects in Newborns of South Wollo and Oromia Zones of Amhara Regional State: A Retrospective Study. *African Journals on Line* 1021-6790.
- Abduli, M. A. (1995). Solid Waste Management in Tehran. *Waste Management & Research*, 13(5), 519-531.
- Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., Alshihri, F. S., Alshammari, M. S., Adams, E. A., Adams, Y. J., & Koki, C. (2021). Water, Sanitation, And Hygiene (WASH) Insecurity Will Exacerbate the Toll Of COVID-19 On Women and Girls in Low-Income Countries. *Sustainability: Science, Practice and Policy*, 17(1), 85-89.
- Accra Metropolitan Assembly. (2020.). Change of name publication in Gazette. https://ama.gov.gh/news_details.php?n=OTU3NTU5MjUxNXMwNTcwcDYxczhxczFzb3Izc3M0MHI2cHMyNDYycw==.
- Achamwie, P. K., & Danso-Wiredu, E. Y. (2021). The rental system in Ghana's low-income housing communities, challenges and adaptation strategies. *Town and Regional Planning*, 79, 67-78.
- Addai, I. (2023). An Empirical Analysis of Household Formal Education Expenditure in Ghana. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2023.2292863>.
- Adams, E. A., Adams, Y. J., & Koki, C. (2021). Water, sanitation, and hygiene (WASH) insecurity will exacerbate the toll of COVID-19 on women and girls in low-income countries. *Sustainability: Science, Practice and Policy*, 17(1), 85-89.
- Addaney, M., & Oppong, R. A. (2015). Critical Issues of Municipal Solid Waste Management in Ghana. *JENRM*, 2(1), 30-36.
- Adeleke, O., Akinlabi, S. A., Jen, T. C., & Dunmade, I. (2021). Application Of Artificial Neural Networks for Predicting the Physical Composition of Municipal Solid Waste: An Assessment of The Impact of Seasonal Variation. *Waste Management & Research*, 39(8), 1058-1068.
- Aderemi, A.O. and Falade, T.C. (2012) Environmental and Health Concerns Associated with the Open Dumping of Municipal Solid Waste: A Lagos, Nigeria

- Experience. *American Journal of Environmental Engineering*, 2, 160-165.
<http://dx.doi.org/10.5923/j.ajee.20120206.03>.
- Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation To Climate Change in The Developing World. *Progress In Development Studies*, 3(3), 179-195.
- Adjei, M. (2023). Gendered Spaces and Entanglements: Analysis of Fisher Couples' Decision-making and Practices in Ghana's Western region. *Gender, Place & Culture*, 1-23.
- Adzawla, W., Tahidu, A., Mustapha, S., & Azumah, S. B. (2019). Do Socio-Economic Factors Influence Households' Solid Waste Disposal Systems? Evidence From Ghana. *Waste Management & Research Landfilling in Developing Countries. Waste Management & Research*, 31(1), 1-2. Agamuthu, P. (2013).
- Afrin, T., & Yodo, N. (2020). A Survey of Road Traffic Congestion Measures Towards a Sustainable and Resilient Transportation System. *Sustainability*, 12(11), 4660.
- Afriyie, Samuel O (2020). Socioeconomic Analysis of Improper Solid Waste Disposal in Ghana. A Thesis Submitted to the Department of Economics, University of Ghana, Legon In Partial Fulfilment Of The Requirements For The Award Of Master Of Philosophy (M.Phil.) Degree In Economics.
- Afrobarometer Reports (2022) Dispatch No. 573 | 16 November 2022 Amid Persistent Gender Inequalities, Ghanaians Call for Government Action to Bridge the Gaps.
- Agamuthu, P., & Dadrasnia, A. (2013). Potential of biowastes to remediate diesel fuel contaminated soil. *Global NEST Journal*, 15(4), 474-484.
- Agrawal, A. (2008). *The Role of Local Institutions in Adaptation to Climate Change*. Routledge.
- Agyekum, N. K., & Wilson Ansah, E. (2022). Medical Waste Management Practices at Healthcare Facilities in Cape Coast Metropolis. *Advanced Journal of Social Science*, 10(1), 63–74. <https://doi.org/10.21467/Ajss.10.1.63-74> Accessed On 20th November 2022
- Agyemang-Badu, S. Y., Awuah, E., Oduro-Kwarteng, S., Dzamesi, J. Y. W., Dom, N. C., & Kanno, G. G. (2023). Environmental Management and Sanitation as A Malaria Vector Control Strategy: A Qualitative Cross-Sectional Study Among Stakeholders, Sunyani Municipality, Ghana. *Environmental Health Insights*, 17, 11786302221146890.

- Ahmed, S. M. S., & Alrawaf, T. I. (2022). Environmental Sustainability Impacts of Solid Waste Management Practices in The Global South. *International Journal of Environmental Research and Public Health*, 19(19), 12717.
- Ajayi, V. O. (2017). Primary Sources of Data and Secondary Sources of Data. *Benue State University*, 1(1), 1-6.
- Akparorue, O. & Denloye, A.A. & Ajelana, A. (2020). Health Conditions of Landfills Workers, Lagos State, Nigeria. *Journal of Health and Medical Sciences*. 3.
- Alao, J. (2024). The Factors Influencing the Landfill Leachate Plume Contaminants in Soils, Surface and Groundwater and Associated Health Risks: A Geophysical and Geochemical View. 1. 20-43. 10.70737/7ejde223. 10.31014/aior.1994.03.04.141.
- Alemzero, D. A., Iqbal, N., Iqbal, S., Mohsin, M., Chukwuma, N. J., & Shah, B. A. (2021). Assessing The Perceived Impact of Exploration and Production of Hydrocarbons on Households' Perspective of Environmental Regulation in Ghana. *Environmental Science and Pollution Research*, 28, 5359-5371.
- Aliyu, A. A., Singhry, I. M., Adamu, H. A. R. U. N. A., & Abubakar, M. A. M. (2015, December). Ontology, Epistemology and Axiology in Quantitative and Qualitative Research: Elucidation of The Research Philosophical Misconception. In *Proceedings of The Academic Conference: Mediterranean Publications & Research International on New Direction and Uncommon* (Vol. 2, No. 1, Pp. 1054-1068).
- Amasuomo, E., & Baird, J. (2016). The Concept of Waste and Waste Management. *J. Mgmt. & Sustainability*, 6, 88.
- Amoako, C., & Frimpong Boamah, E. (2015). The three-dimensional causes of flooding in Accra, Ghana. *International Journal of Urban Sustainable Development*, 7(1), 109-129.
- Annorbah, R. (2014). Environmental Impacts of Active and Decommissioned Landfill Sites in the Accra Metropolis: A Case Study of the Painting and Mallam Landfill Sites. Thesis, University of Ghana
- Anoop Kumar, A. N., & Aneesh, E. M. (2022). A Critical Assessment of Mosquito Control and The Influence of Climate Change on Mosquito-Borne Disease Epidemics. *Environment, Development and Sustainability*, 24(6), 8900-8929.
- Antwi, E., Anang, D. A., Marfo, E. O., Bediako, M., Ribeiro, J., Boahen, B., & Opoku, G. (2022). Decentralized Solid Waste Management in Rural Ghana: A Case

- Study of Assin Kushea Community in Assin North Municipality. *Journal of Applied Sciences and Environmental Management*, 26(10), 1657-1661.
- Appiah Boamah, L. (2011). The Environmental Sanitation Policy of Ghana (2010) and Stakeholder Capacity: A Case Study of Solid Waste Management in Accra and Koforidua. (Dissertation). Retrieved from <https://doi.org/10.21467/Ajss.10.1.63-74>. Accessed On 20th November 2022
- Aryampa, Basant Maheshwari, Elly N. Sabiiti, Najib L. Bateganya, Christopher Olobo, Understanding the impacts of waste disposal site closure on the livelihood of local communities in Africa: A case study of the kiteezi landfill in Kampala, Uganda, *World Development Perspectives*, Volume 25, 2022, 100391, ISSN 2452-2929
- Asante, F. A., Agyekum, A. A., & Bekoe, M. A. (2020). Livelihood Strategies of Waste Pickers in The Vicinity of Dumpsites in Ghana. *Sustainability*, 12(14), 5513. <https://doi.org/10.3390/Su12145513>. Assessed On 20th December 2022.
- Ashley, M. C., Mangi, S. C., & Rodwell, L. D. (2014). The Potential of Offshore Windfarms to Act as Marine Protected Areas—A Systematic Review of Current Evidence. *Marine Policy*, 45, 301-309.
- Azorín, J. M., & Cameron, R. (2010). The Application of Mixed Methods in Organisational Research: A Literature Review. *Electronic Journal of Business Research Methods*, 8(2), Pp95-105.
- Baah, D., & Kharlamova, M. (2018). Sustainable Utilization and Processing of Municipal Solid Waste in Ghana. (6-1(72)), *International Research Journal*, 6(72). <https://doi.org/10.23670/IRJ.2018.72.6.020>.
- Bacinschi, Z., Rizescu, C. Z., Stoian, E. V., & Necula, C. (2010, July). Waste Management Practices Used in The Attempt to Protect the Environment. In *Proceedings of the 3rd WSEAS International Conference on Engineering Mechanics, Structures, Engineering Geology* (Pp. 24-26).
- Badi, Dr. Sulafa and Papadonikolaki, Dr. Eleni and Surlantzi, Eleni and Ochieng, Edward G., Blockchain-based Innovation in UK Construction: A User Perspective (May 12, 2021). Available at SSRN: <https://ssrn.com/abstract=3844535> or <http://dx.doi.org/10.2139/ssrn.3844535>
- Bartl, A. (2014). Moving From Recycling to Waste Prevention: A Review of Barriers and Enables. *Waste Management & Research*, 32(9_Suppl), 3-18.

- Basu, D., & Mishra, S. (2024). Mine Reclamation Practices and Effects of Stakeholder Perception—A Case Study of Saoner Mines, Maharashtra, India. *Journal Of Engineering and Applied Science*, 71(1), 62.
- Becerra, M. (2022). Gentrifying Force or A Force for Environmental Justice? A National Assessment of Brownfield Redevelopment and Gentrification in The United States From 2006 To 2015. *American Behavioural Scientist*, 00027642221140839.
- Beranek Jr, W. (1992). Solid Waste Management and Economic Development. *Economic Development Review*, 10(3), 49.
- Berkhout, F. (2012). Adaptation To Climate Change by Organizations. *Wiley Interdisciplinary Reviews: Climate Change*, 3(1), 91-106.
- Berman, L., Morar, C., Unkart, S., & Erdal, S. (2022). An Overview of Brownfields Redevelopment In The United States Through Regulatory, Public Health, And Sustainability Lenses. *Journal Of Environmental Health*, 84 9, 8-14.
- Bessette, D. L., Hoen, B., Rand, J., Hoesch, K., White, J., Mills, S. B., & Nilson, R. (2024). Good Fences Make Good Neighbours: Stakeholder Perspectives on The Local Benefits and Burdens of Large-Scale Solar Energy Development in The United States. *Energy Research & Social Science*, 108, 103375.
- Bevan, W. (1965). The Concept of Adaptation in Modern Psychology. *The Journal of Psychology*, 59(1), 73-93.
- Boateng, G., & Frimpong, A. (2020). The Ghanaian Manufacturing Sector: Challenges and Prospects for Growth and Job Creation. *Journal Of African Development*, 23(2), 121-139.
- Bollen, K. A., & Bauldry, S. (2011). Three Cs in measurement models: Causal indicators, composite indicators, and covariates. *Psychological Methods*, 16(3), 265–284. <https://doi.org/10.1037/a0024448>.
- Boslaugh, S. (2007). An Introduction to Secondary Data Analysis. *Secondary Data Sources for Public Health: A Practical Guide*, 2-10.
- Bowling, A. (2005). Mode Of Questionnaire Administration Can Have Serious Effects on Data Quality. *Journal Of Public Health*, 27(3), 281-291.
- Brandon, R. N. (1978). *Adaptation And Evolutionary Theory*. Routledge.
- Braun, V., & Clarke, V. (2019). Reflecting On Reflexive Thematic Analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589-597.

- Braun, V., Clarke, V., & Hayfield, N. (2022). ‘A Starting Point for Your Journey, Not A Map’: Nikki Hayfield in Conversation with Virginia Braun and Victoria Clarke About Thematic Analysis. *Qualitative Research in Psychology*, 19(2), 424-445.
- Brunner, P. H., & Rechberger, H. (2015). Waste To Energy—Key Element for Sustainable Waste Management. *Waste Management*, 37, 3-12.
- Bryman, A., & Cramer, D. (2011). *A Guide for Social Scientists*. Routledge.
- Bull, A. S., & Love, M. S. (2019). Worldwide Oil and Gas Platform Decommissioning: A Review of Practices and Reefing Options. *Ocean & Coastal Management*, 168, 274-306.
- Burton, I., Huq, S., Lim, B., Pilifosova, O., & Schipper, E. L. (2002). From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy. *Climate Policy*, 2(2-3), 145-159.
- Butti, L., Peres, F., Lops, C., 2019. Legal Framework of Landfilling in Different Areas of The World. In Cossu, R., Stegmann, R. *Solid Waste Landfilling, Concepts, Processes, Technology*. Chapter 1.3, 41-52. Elsevier, 2018, ISBN: 9780128183366.
- Capobianco, N., Basile, V., Loia, F., & Vona, R. (2022). End-Of-Life Management of Oil and Gas Offshore Platforms: Challenges and Opportunities for Sustainable Decommissioning. *Sinergie Italian Journal of Management*, 40(2), 299-326.
- Carter, Michael & Fuller, Celene. (2015). Symbolic Interactionism. *Sociopedia.isa*. 10.1177/205684601561.
- Carvalho, A. (2020). *Media And Environmental Communication*. Routledge.
- Chamberlain, W. O. (2019). Inclusive Business as Employment Generator In Rural Settlements.
- Chandler, A. J., Eighmy, T. T., Hjelm, O., Kosson, D. S., Sawell, S. E., Vehlow, J., & Hartlén, J. (1997). *Municipal Solid Waste Incinerator Residues*. Elsevier.
- Chandrappa, R., & Das, D. B. (2012). *Solid Waste Management: Principles And Practice*. Springer Science & Business Media.
- Chang, K. C. (2011). A Path to Understanding Guanxi in China's Transitional Economy: Variations on Network Behaviour. *Sociological Theory*, 29(4), 315-339.
- Chen, C. S., Tu, C. H., Chen, S. J., & Chen, C. C. (2016). Simulation Of Groundwater Contaminant Transport at A Decommissioned Landfill Site—A Case Study,

- Tainan City, Taiwan. *International Journal of Environmental Research and Public Health*, 13(5), 467.
- Chen, L., Zhang, B., & Liu, P. (2022). Environmental Adaptation Strategies of Residents After Landfill Decommissioning: A Case Study of Shanghai, China. *Environmental Research*, 206, 112537.
- Chikowore, N. (2021). Factors Influencing Household Waste Management Practices in Zimbabwe. *Journal Of Material Cycles and Waste Management*, 23(1), 386-393.
- Choi, Jieun; Dutz, Mark; Usman, Zainab. 2020. The Future of Work in Africa: Harnessing the Potential of Digital Technologies for All. Africa Development Forum. © Washington, DC: World Bank.
- Christensen, T. H. (1989). Cadmium Soil Sorption at Low Concentrations. VII: Effect Of Stable Solid Waste Leachate Complexes. *Water, Air, And Soil Pollution*, 44, 43-56.
- Christian, E. I. (2010). Potential Impacts of Climate Change on Solid Waste Management in Nigeria. *Abbreviation Of Institute of Electrical and Electronics Engineers*, 1-9.
- Chu, Y., Zhang, Q., & Xu, D. (2008). Advanced Treatment of Landfill Leachate from A Sequencing Batch Reactor (SBR) By Electrochemical Oxidation Process. *Journal Of Environmental Engineering and Science*, 7(6), 627-633.
- Church, R. M. (2002). The Effective Use of Secondary Data. *Learning And Motivation*, 33(1), 32-45.
- Clubb, A. C., & Hinkle, J. C. (2015). Protection Motivation Theory as A Theoretical Framework for Understanding the Use of Protective Measures. *Criminal Justice Studies*, 28(3), 336-355.
- Couper, M. P. (2011). The Future of Modes of Data Collection. *Public Opinion Quarterly*, 75(5), 889-908.
- Creswell, J. W. (2014). *A Concise Introduction to Mixed Methods Research*. SAGE Publications.
- Creswell, J. W. (2019). *Research Design: Qualitative, Quantitative, and Mixed Method Approaches*. Sage Publications.
- Dagwar, P, Dutta, D. (2024). Landfill leachate a potential challenge towards sustainable environmental management, *Science of The Total Environment*, Volume 926, 171668, ISSN 0048-9697, <https://doi.org/10.1016/j.scitotenv.2024.171668>.

(<https://www.sciencedirect.com/science/article/pii/S0048969724018102>).

Danthurebandara, M., Van Passel, S., Nelen, D., Tielemans, Y., & Van Acker, K. (2012). Environmental and socio-economic impacts of landfills. *Linnaeus Eco-Tech*, 2012, 40-52.

De Leeuw, E., Hox, J., & Luiten, A. (2018). International Nonresponse Trends Across Countries and Years: An Analysis Of 36 Years of Labour Force Survey Data. *Survey Methods: Insights From the Field*, 1-11. Department of Methodology & Statistics, Utrecht University Annemieke Luiten, Statistics Netherlands.

Denscombe, M. (2003). *The Good Research Guide*, Maidenhead (2nd ed.). Open University Press.

Denscombe, M. (2014). *The good research guide: For small-scale social research projects* (5th ed.). McGraw-Hill Education.

De Vaus, D. (2001). Research Design in Social Research. *Research Design in Social Research*, 1-296.

Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising Awareness on Solid Waste Management Through Formal Education for Sustainability: A Developing Countries Evidence Review. *Recycling*, 6(1),

Degu, G., & Yigzaw, T. (2006). Research Methodology: Lecture Notes for Health Science Students. *Addis Ababa: The Carter Center (Ethiopian Public Health Training Initiative)*, 45-50.

Diener, H. C., Sacco, R. L., Easton, J. D., Granger, C. B., Bernstein, R. A., Uchiyama, S., ... & Toyoda, K. (2019). Dabigatran for prevention of stroke after embolic stroke of undetermined source. *New England Journal of Medicine*, 380(20), 1906-1917.

Dell'Anna, F. (2021). Green Jobs and Energy Efficiency as Strategies for Economic Growth and The Reduction of Environmental Impacts. *Energy Policy*, 149, 112031.

Delmelle, E.C. (2021). Transit-Induced Gentrification and Displacement: The State of the Debate. *Advances in Transport Policy and Planning*, 1, 97–117. <https://doi.org/10.1016/bs.atpp.2021.02.005>.

Demirbas, A. (2011). Waste Management, Waste Resource Facilities and Waste Conversion Processes. *Energy Conversion and Management*, 52(2), 1280-1287.

- Denutsui, D., Akiti, T. T., Osae, S., Tutu, A. O., Blankson-Arthur, S., Ayivor, J. E., & Fianko, J. R. (2012). Heavy metal contamination of surface soil in the vicinity of a municipal solid waste landfill site in Accra, Ghana. *International Journal of Environmental Science & Technology*, 9(3), 579–586. <https://doi.org/10.1007/s13762-012-0052>
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, Phone, Mail, And Mixed-Mode Surveys: The Tailored Design Method*. John Wiley & Sons.
- Dolk, H., Vrijheid, M., Armstrong, B., Abramsky, L., Bianchi, F., Garne, E., ... & Tenconi, R. (1998). Risk Of Congenital Anomalies Near Hazardous-Waste Landfill Sites in Europe: The Eurohazcon Study. *The Lancet*, 352(9126), 423-427.
- Douti, N. B., Abanyie, S. K., & Ampofo, S. (2017). Solid Waste Management Challenges in Urban Areas of Ghana: A Case Study of Bawku Municipality. *International Journal of Geosciences*, 8, 494-513. Doi: 10.4236/ijg.2017.84026.
- Du, S., Scussolini, P., Ward, P. J., Zhang, M., Wen, J., Wang, L., ... & Aerts, J. C. (2020). Hard Or Soft Flood Adaptation? Advantages Of a Hybrid Strategy for Shanghai. *Global Environmental Change*, 61, 102037.
- Egbi, C. (2012). Leachate Characterization and Assessment of Unsaturated Zone Pollution Near Municipal Solid Waste Landfill Site at Oblogo, Accra-Ghana. *Research Journal of Environmental and Earth Sciences*, 4(2), 134-141.
- Elliott, S. J., Taylor, S. M., Hampson, C., Dunn, J., Eyles, J., Walter, S., & Streiner, D. (1997). 'It's Not Because You Like It Any Better.': Residents' Reappraisal of a Landfill Site. *Journal of Environmental Psychology*, 17(3), 229-241.
- Ensor, J., & Berger, R. (2009). Community-Based Adaptation and Culture in Theory and Practice. *Adapting To Climate Change: Thresholds, Values, Governance*, 227-239.
- Environmental Protection Agency (EPA). (2002) Ghana Landfill Guidelines. Environmental Protection Agency, Accra, 81.
- Etea, T., Girma, E., & Mamo, K. (2021). Risk Perceptions and Experiences of Residents Living Nearby Municipal Solid Waste Open Dumpsite in Ginchi Town, Ethiopia: A Qualitative Study. *Risk Management and Healthcare Policy*, 2035-2044.

- European Commission, (2013), Commission Decision of 4 March 2013 establishing the user's guide setting out the steps needed to participate in EMAS, under Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) (notified under document C(2013) 1114) (Text with EEA relevance) (2013/131/EU).
- Environmental Protection Agency Act, 1994 (Act 490). (1994). Ghana Legal. Retrieved from https://ghanalegal.com/laws_subdomain/acts/id/126/environmental-protection-agency-act/
- Farrell, H. (2018). The Shared Challenges of Institutional Theories: Rational Choice, Historical Institutionalism, and Sociological Institutionalism. *Knowledge And Institutions*, 23-44.
- Flick, U. (2014). Challenges For Qualitative Inquiry as A Global Endeavour: Introduction to The Special Issue. *Qualitative Inquiry*, 20(9), 1059-1063.
- Fobil, J. N., Carboo, D., & Armah, N. A. (2005). Evaluation Of Municipal Solid Wastes (MSW) For Utilisation in Energy Production in Developing Countries. *International Journal of Environmental Technology and Management*, 5(1), 76-86.
- Friel, D. (2017). Understanding Institutions: Different Paradigms, Different Conclusions. *Revista De Administração (São Paulo)*, 52, 212-214.
- Fu, J., Liu, J., Tian, H., Li, Y., Bao, Y., Fang, Z., & Lu, H. (2019). Dual Attention Network for Scene Segmentation. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (Pp. 3146-3154).
- Furrebøe, E. F., Nyhus, E. K., & Musau, A. (2023). Gender Differences in Recollections of Economic Socialization, Financial Self-Efficacy, And Financial Literacy. *Journal Of Consumer Affairs*, 57(1), 69-91.
- Ghana Statistical Service (GSS). (2012). *2010 Population and Housing Census: Summary report of final results*. Accra: Ghana Statistical Service.
- Ghana Statistical Service (GSS). (2021). *2021 Population and Housing Census: General report volume 1A – Demographic characteristics*. Accra: Ghana Statistical Service.
- Ghana Statistical Service (GSS). (2022). *2021 Population and Housing Census: Analytical report – Housing characteristics and conditions*. Accra: Ghana Statistical Service.

- Ghimire, U., Sarpong, G., & Gude, V. G. (2021). Transitioning wastewater treatment plants toward circular economy and energy sustainability. *ACS omega*, 6(18), 11794-11803. Macherie Fynella Grant.
- Gillham, B. (2000). *Case study research methods*. London: Continuum.
- [SCIRP+2SCIRP+2nsuworks.nova.edu+2](#)
- Grant, M. F. (2020). An Analysis of the Implications of Squatting on Peri-Urban Protected Environmental Areas in Jamaica: An Assessment of Governance and Squatter Perception.
- Gregory, T. R. (2009). Understanding natural selection: essential concepts and common misconceptions. *Evolution: Education and Outreach*, 2(2), 156-175.
- Grimaldi, D., Fernandez, V., & Carrasco, C. (2019). Heuristic For the Localization of New Shops Based on Business and Social Criteria. *Technological Forecasting*.
- Gull, A. A., Atif, M., & Hussain, N. (2023). Board Gender Composition and Waste Management: Cross-Country Evidence. *The British Accounting Review*, 55(1), 101097.
- Gyampo, R. (2016). Dealing with Winner takes All Politics in Ghana: The Case of National Development Planning. *Journal of Social Sciences Research* 41-46.
- Haerani, D., & Budi, S. S. (2019). Review Modelling of Solid Waste Transportation Routes Using Geographical Information System (GIS). In *E3S Web of Conferences* (Vol. 125, P. 07006). EDP Sciences.
- Hamer, G. (2003). Solid Waste Treatment and Disposal: Effects on Public Health and Environmental Safety. *Biotechnology Advances*, 22(1-2), 71-79.
- Hanck, C., Arnold, M., Gerber, A., & Schmelzer, M. (2024). *Introduction to econometrics with R*. Universität Duisburg-Essen.
- Hannabuss, S. (1996). Research Interviews. *New Library World*, 97(5), 22-30.
- Hannun, S. M. (2024). Community-Led Waste Management and Wastewater Treatment Initiatives in Kalicode: A Holistic Approach to Public and Environmental Health. *Journal Aisyah: Journal Ilmu Kesehatan*, 9(1).
- Harding, S. (2016). Marine Debris: Understanding, Preventing and Mitigating the Significant Adverse Impacts on Marine and Coastal Biodiversity. Secretariat of the Convention on Biological Diversity.
- Hartson, R., & Pyla, P. S. (2012). *The UX Book: Process and Guidelines for Ensuring a Quality User Experience*. Elsevier.

- Hashimov, E. (2015). *Qualitative Data Analysis: A Methods Sourcebook and The Coding Manual for Qualitative Researchers*: Matthew B. Miles, A. Michael Huberman, And Johnny Saldaña. Thousand Oaks, CA: SAGE, 2014. 381 Pp. Johnny Saldaña. Thousand Oaks, CA: SAGE, 2013. 303.
- Holden, M. T., & Lynch, P. (2004). Choosing The Appropriate Methodology: Understanding Research Philosophy. *The Marketing Review*, 4(4), 397-409.
- Hong, S. B., & Park, J. H. (2005). Waste Management in Decommissioning Projects At KAERI. In *Workshop* (Pp. 290-299).
- Hoornweg, D., & Bhada-Tata, P. (2012). *What A Waste: A Global Review of Solid Waste Management*. World Bank Group.
- Hotta, Y., & Aoki-Suzuki, C. (2014). Waste reduction and recycling initiatives in Japanese cities: Lessons from Yokohama and Kamakura. *Waste Management & Research*, 32(9), 857-866. [http://kkma.gov.gh/wp-content/uploads/2021/10/2020-KPONE KATAMANSO-BUDGET-14-11-2019.pdf](http://kkma.gov.gh/wp-content/uploads/2021/10/2020-KPONE-KATAMANSO-BUDGET-14-11-2019.pdf). Accessed on 20th January 2022.
- <https://wedocs.unep.org/handle/20.500.11822/8648> Accessed on 15th January 2022.
- <https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities/solid-waste-management> Accessed on 18th January 2022.
- <https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management> Accessed on 15th January 2022.
- Hughes Kayleigh, Hisne Fairul Izmal Jamal, Su Li Yuen (2021) Environmental Considerations for Decommissioning. *The Appeal Journal* **61**, 33-41. <https://doi.org/10.1071/Aj20095>
- Iddrisu, T. I., & Debrah, K. D. (2021). Consequences Of Poor Landfill Management on The People of Gbalahi in The Sagnarigu Municipality of Northern Ghana. *Journal Of Geoscience and Environment Protection*, 9(8), 211-224.
- Immurana, M., Kisseih, K. G., Yakubu, M. Z., & Yusif, H. M. (2022). Financial Inclusion and Households' Choice of Solid Waste Disposal in Ghana. *BMC Public Health*, 22(1), 1117.
- Infrastructure Global. (2022). *Kpone Landfill Decommissioning and Re-engineering*. Retrieved April 14, 2025, from <https://infra.global/projects/kpone-landfill-decommissioning-and-re-engineering/>
- Intergovernmental Panel on Climate Change. (2014). *Climate change 2014: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth*

- Assessment Report of the Intergovernmental Panel on Climate Change (H.-O. Pörtner, D. C. Roberts, M. Tignor, et al., Eds.). Cambridge University Press.
- Iravanian, A., & Ravari, S. O. (2020, December). Types Of Contamination in Landfills and Effects on The Environment: A Review Study. In *IOP Conference Series: Earth and Environmental Science* (Vol. 614, No. 1, P. 012083). IOP Publishing.
- Ivan, N. (2023). Analyzing The Effectiveness of The Legal and Regulatory Framework Governing the Social License to Operate in Uganda's Oil and Gas Industry (Doctoral Dissertation, Institute of Petroleum Studies-Kampala).
- Jacek, G., Rozan, A., Desrousseaux, M., & Combroux, I. (2022). Brownfields Over the Years: From Definition to Sustainable Reuse. *Environmental Reviews*, 30(1), 50-60.
- Jakubowicz, A. (2004). Vietnamese In Australia: A Generation of Settlement and Adaptation. *University Of Technology Sydney. (Unpublicized Report)*.
- Jang, S., & Lee, S. (2023). The Digital Divide and Environmental Risk Communication: A Case Study of PFOA Contamination. *Journal Of Environmental Communication*, 17(1), 112-127.
- Johansson, M. (2013). 'If you obey all the rules, you miss all the fun': a study on the rules of guilds and clans in online games. *Journal of Gaming & Virtual Worlds*, 5(1), 77-95.
- Japan Environmental Solution Centre. (2012). *Waste management in Japan: Rules and reality*. Japan Environmental Solution Centre.
- Kairuz, T., Crump, K., & O'Brien, A. (2007). Tools For Data Collection and Analysis. *The Pharmaceutical Journal*, 278.
- Kebede, A., Ermolo, T., Demie, T., Huluka, T., & Tsega, W. (2017). Household Solid Waste Generation Rate and Onsite Handling Practices in Debre Berhan Town, Ethiopia. *Science Journal of Public Health*, 5(1), 31-34.
- Kim, K. R., & Owens, G. (2010). Potential For Enhanced Phytoremediation of Landfills Using Biosolids—A Review. *Journal Of Environmental Management*, 91(4), 791-797.
- Kothari, C. R. (2004). *Research Methodology: Methods And Techniques*. New Age International. Publishers, New Delhi.
- Kpone Katamanso Municipal Assembly (KKMA). (2019). *Composite budget: For the 2019 fiscal year*. Kpone Katamanso Municipal Assembly.

- Kpone Katamanso Municipal Assembly (KKMA), Statistics Department. (2022). *Annual statistical report*. Kpone Katamanso Municipal Assembly.
- Kumar, V. (2021). Methodology for Proposing and Planning Solid Waste Management in A Religious City: Case of Varanasi. *International Journal of Innovative Research in Science Engineering and Technology* Volume 6(Issue 3):48-55.
- Kusi, E., Nyarko, A. K., Boamah, L. A., & Nyamekye, C. (2016). Landfills: Investigating Its Operational Practices in Ghana. *International Journal of Energy and Environmental Science*, 1(1), 19-28.
- Kyere, R., Addaney, M., & Akudugu, J. A. (2019). Decentralization And Solid Waste Management in Urbanizing Ghana: Moving Beyond The Status Quo. In *Municipal Solid Waste Management*. Intech Open.
Doi:[10.5772/Intechopen.81894](https://doi.org/10.5772/intechopen.81894) Corpus Id: 198971101.
- Lelieveld, J., Klingmüller, K., Pozzer, A., Burnett, R. T., Haines, A., & Ramanathan, V. (2019). Effects of fossil fuel and total anthropogenic emission removal on public health and climate. *Proceedings of the National Academy of Sciences*, 116(15), 7192–7197. <https://doi.org/10.1073/pnas.1819989116>
- Lemasson, A. J., Knights, A. M., Thompson, M., Lessin, G., Beaumont, N., Pascoe, C., ... & Somerfield, P. J. (2021). Evidence For the Effects of Decommissioning Man-Made Structures on Marine Ecosystems Globally: A Systematic Map Protocol. *Environmental Evidence*, 10(1), 1-11.
- Lissah, S. Y., Ayanore, M. A., Krugu, J. K., Aberese-Ako, M., & Ruiter, R. A. (2021). Managing Urban Solid Waste in Ghana: Perspectives and Experiences of Municipal Waste Company Managers and Supervisors in An Urban Municipality. *National Library of Medicine* 16(3), E0248392.
- Lober, D. J., & Green, D. P. (1994). NIMBY Or NIABY: A Logit Model of Opposition to Solid-Waste-Disposal Facility Siting. *Journal Of Environmental Management*, 40(1), 33-50.
- Loia, F., Capobianco, N., & Vona, R. (2022). Towards A Resilient Perspective for The Future of Offshore Platforms. Insights From a Data Driven Approach. *Transforming Government: People, Process and Policy*, 16(2), 218-230.
- McCright, A. M., Xiao, C., & Dunlap, R. E. (2021). Gender and environmental concern: Insights from recent research. *Environmental Sociology*, 7(1), 1-13.

- Maheshwari, S., & Deswal, S. (2017). Role Of Waste Management at Landfills in Sustainable Waste Management. *International Journal on Emerging Technologies*, 8(1), 324-328.
- Maio, S., Sarno, G., Tagliaferro, S., Pirona, F., Stanisci, I., Baldacci, S., & Viegi, G. (2023). Outdoor air pollution and respiratory health. *The International Journal of Tuberculosis and Lung Disease*, 27(1), 7-12.
- Mamokhere, J., & Meyer, D. F. (2023). Towards an Exploration of the Significance of Community Participation in the Integrated Development Planning Process in South Africa. *Social Sciences*, 12(5), 256
- Mani, S., & Singh, S. (2016). Sustainable Municipal Solid Waste Management in India: A Policy Agenda. *Procedia Environmental Sciences*, 35, 150-157.
- Morais, J., Corder, G., Golev, A., Lawson, L., & Ali, S. (2022). *Global review of human waste-picking and its contribution to poverty alleviation and a circular economy*. *Environmental Research Letters*, 17(6), 063002
- March, J. G., & Olsen, J. P. (1996). Institutional Perspectives On Political Institutions. *Global Governance: Critical Concepts in Political Science*, 9(3), 247-264.
- March, J. G., & Olsen, J. P. (2004). The New Institutionalism. *Global Governance: Critical Concepts in Political Science*, 1(3), 271.
- March, J. G., & Olsen, J. P. (2006). 6. James G. March and Johan P. Olsen. 1984. "The New Institutionalism: Organizational Factors in Political Life." *American Political Science Review* 78 (September): 734-49 *American Political Science Review*, 100(4), 675-675.
- Mataloni, F., Badaloni, C., Golini, M. N., Bolignano, A., Bucci, S., Sozzi, R., & Ancona, C. (2016). Morbidity And Mortality of People Who Live Close to Municipal Waste Landfills: A Multisite Cohort Study. *International Journal of Epidemiology*, 45(3), 806-815.
- Matheka, V. K. (2023). *Environmental Effects and Health Risks Associated with The Location Of Kalundu Dumpsite, Kitui County To Local Residents* (Doctoral Dissertation).
- Mavhura, E. (2019). Systems Analysis of Vulnerability to Hydrometeorological Threats: An Exploratory Study of Vulnerability Drivers in Northern Zimbabwe. *International Journal of Disaster Risk Science*, 10, 204-219.

- Mavhura, E., & Manyangadze, T. (2021). A Comprehensive Spatial Analysis of Social Vulnerability to Natural Hazards in Zimbabwe: Driving Factors and Policy Implications. *International Journal of Disaster Risk Reduction*, 56, 102139.
- Mavhura, E., Manyena, B., & Collins, A. E. (2017). An Approach for Measuring Social Vulnerability in Context: The Case of Flood Hazards in Muzarabani District, Zimbabwe. *Geoforum*, 86, 103-117.
- McBride, N. J., & Bagshaw, R. (2018). *Tort law* (6th ed.). Pearson Education Limited.
- Mcwatters, R. S., Jones, D. D., Rowe, R. K., & Markle, J. M. (2020). Investigation Of a Decommissioned Landfill Barrier System Containing Polychlorinated Biphenyl (PCB) Waste After 25 Years in Service. *Canadian Geotechnical Journal*, 57(6), 882-902.
- Mechler, R., Singh, C., Ebi, K., Djalante, R., Thomas, A., James, R., ... & Revi, A. (2020). Loss And Damage and Limits to Adaptation: Recent IPCC Insights and Implications for Climate Science and Policy. *Sustainability Science*, 15, 1245-1251.
- 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*, 46, 15-27.
- Mishra, A. R., Mishra, S. A., & Tiwari, A. V. (2014). Solid Waste Management-Case Study. *International Journal of Research*, 2(1).
- Mohsenizadeh, M., Tural, M. K., & Kentel, E. (2020). Municipal Solid Waste Management with Cost Minimization and Emission Control Objectives: A Case Study of Ankara. *Sustainable Cities and Society*, 52, 101807.
- Mubaslat, E. A. (2021). Introduction To Waste Management. The Hashemite Kingdom Of Jordan. The Deposit Number at The National Library (2021/3/1816).
- Mudavanhu, N. (2020). An Analysis of Livelihood of Landfill Waste Pickers In South Africa. [Master's thesis, University of South Africa]. UNISA Institutional Repository. <https://uir.unisa.ac.za/handle/10500/26877>.
- Mudu, P., Akua Nartey, B., Kanhai, G., Spadaro, J. V., Fobil, J., & World Health Organization. (2021). Solid Waste Management and Health in Accra, Ghana. *Solid waste management and health in Accra, Ghana*. Geneva: World Health Organization. <https://apps.who.int/iris/handle/10665/345836>.
- Mundy, B. (1992). The Impact of Hazardous Materials on Property Value. *The Appraisal Journal*, 60(2), 155.

- Muniyandi, A., & Nagarajan, M. (2020). Social Impacts of Landfill Decommissioning: A Case Study of Kodungaiyur, Chennai, India. *Environment, Development and Sustainability*, 22(1), 67-82.
- Mutz, M., & Müller, J. (2016). Mental Health Benefits of Outdoor Adventures: Results from Two Pilot Studies. *Journal Of Adolescence*, 49, 105-114.
- Mwenje, E., & Kumar, P. (2024). Challenges For Mainstreaming Climate Adaptation in African Cities. A Case Study of Kigali, Rwanda. *Landscape And Urban Planning*, 245, 105017.
- Nain, P., & Kumar, A. (2020). Identifying Issues in Assessing Environmental Implications Of Solar Pvs-Related Waste. *Recent Developments in Waste Management: Select Proceedings Of Recycle 2018*, 71-90.
- Nanda, S., & Berruti, F. (2021). Municipal Solid Waste Management and Landfilling Technologies: A Review. *Environmental Chemistry Letters*, 19, 1433-1456.
- Nanor, M. A., Adarkwa, K. K., & Poku-Boansi, M. (2018). A subjective measurement of the determinants of quality of life in Kumasi. *African Review of Economics and Finance*, 10(1), 212–242.
- Nayak, J. K., & Singh, P. (2021). *Fundamentals Of Research Methodology Problems and Prospects*. New Delhi: SSDN Publishers & Distributors.
- Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation To Environmental Change: Contributions of A Resilience Framework. *Annu. Rev. Environ. Resources.*, 32, 395-419.
- Neville, L., & Tovar Cortés, L. F. (2023). Waste Pickers' Formalisation from Bogotá to Cartagena De Indias: Dispossession and Socio-Economic Enclosures in Two Colombian Cities. *Sustainability*, 15(11), 9047.
- Njoku, P. O., Edokpayi, J. N., & Odiyo, J. O. (2019). Health And Environmental Risks of Residents Living Close to A Landfill: A Case Study of Thohoyandou Landfill, Limpopo Province, South Africa. *International Journal of Environmental Research and Public Health*, 16(12), 2125.
- North, D. C. (1990). A Transaction Cost Theory of Politics. *Journal Of Theoretical Politics*, 2(4), 355-367.
- Nsiah-Asare, A., Cobbina, S. J., & Basu, N. (2020). Environmental Injustice and Health Risks in Communities Residing Near Dumpsites In Sub-Saharan Africa: A Systematic Review. *Environmental Health Perspectives*, 128(1), 016002.

- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.
- Nuripuh, J. G., Duwiejuah, A. B., & Bakobie, N. (2022). Awareness And Health Risk Protection Behaviours of Scavengers in The Gbalahi Landfill Site, Ghana, In the Era of Sustainable Development. *Discover Sustainability*, 3(1), 1.
- Ntaji, A. S., et al. (2020). The importance of community participation in promoting community empowerment. *Journal of Social Development*, 12(2), 150-165
- Nyame, F. K., Tigme, J., Kutu, J. M., & Armah, T. K. (2012). Environmental Implications of The Discharge of Municipal Landfill Leachate into The Densu River and Surrounding Ramsar Wetland in The Accra Metropolis, Ghana. *Journal Of Water Resource and Protection*, 4(08), 622.
- O'brien, M. J., & Holland, T. D. (1992). The Role of Adaptation in Archaeological Explanation. *American Antiquity*, 57(1), 36-59.
- Obuobi-Donkor, G., Doku, D., & Mensah, A. (2021). Depression and quality of life among older adults in Ghana: A cross-sectional study. *BMC Geriatrics*, 21, 1–10. [PMC](#)
- Odonkor, S. T., & Mahami, T. (2020). Microbial Air Quality in Neighbourhoods Near Landfill Sites: Implications for Public Health. *Journal Of Environmental and Public Health*, 2020.
- Odunaiya, O. G., Nwankwo, E. E., Okoye, C. C., & Scholastica, U. C. (2024). Behavioural Economics and Consumer Protection in the US: A Review: Understanding How Psychological Factors Shape Consumer Policies and Regulations. *International Journal of Science and Research Archive*, 11(1), 2048-2062.
- Oduro-Appiah, K., Afful, A., & Osei-Tutu, H. (2024). Using An Extended Model of The Reasoned Action Approach to Explore Individual Behavioural Intentions Regarding Litter and Plastic Pollution Prevention in A Developing Country. *Frontiers In Psychology*, 14, 1274765.
- Ofori, P. (2021). Waste Disposal Sites and Residential Rental Values Nexus: An Appraisal of Agogo Asante Akyem Dumps. *African Journal of Science, Technology, Innovation and Development*, 13(2), 223-233.
- Oishi, S., & Schimmack, U. (2019). The psychology of residential mobility: Implications for the self, social relationships, and well-being. *Perspectives on Psychological Science*, 15(1), 36–54.

- Ojedokun, O., Henschel, N., Arant, R., & Boehnke, K. (2022). Applying The Theory Of Planned Behaviour To Littering Prevention Behaviour In A Developing Country (Nigeria). *Waste Management*, 142, 19-28.
- Olanrewaju Timothy Dada. (2021). Environmental And Health Hazards of Residents Domiciled Around Africa's Largest Landfill. *Journal Of Environmental Planning and Management, Taylor & Francis Journals*, Vol. 64(9), Pages 1642-1667.
- Omilusi, M. O. (2020). Thinking Global Through Consensual and Reformist Approaches: Considered Governance Innovations for Lagos Mega-City Status. *Bangladesh E-Journal of Sociology*, 17(1).
- O'Neil, J. M., Hammer, J. H., & Wester, S. R. (2018). A short form of the Gender Role Conflict Scale: Psychometric properties and implications. *Psychology of Men & Masculinity*, 19(2), 248–256.
- Opoku, M. P., Nketsia, W., & Agyei, D. (2022). Teachers' access to professional development in inclusive education in Ghana: A study of secondary schools. *International Journal of Inclusive Education*, 26(5), 543–558.
- Orlova, T., Melnichuk, A., Klimenko, K., Vitvitskaya, V., Popovych, V., Dunaieva, I., ... & Garmanov, V. (2017, October). Reclamation Of Landfills and Dumps of Municipal Solid Waste in An Energy Efficient Waste Management System: Methodology and Practice. In *Conference Series: Earth and Environmental Science* (Vol. 90, No. 1, P. 012110). IOP Publishing.
- Ortmann, S., & Ortmann, S. (2017). The Failure to Implement Environmental Policies. *Environmental Governance in Vietnam: Institutional Reforms and Failures*, 99-126.
- Osei, J., Osaе, S. K., Fianko, J. R., Adomako, D., Laar, C., Anim, A. K., ... & Nyarko, E. S. (2011). The Impact of Oblogo Landfill Site in Accra-Ghana on The Surrounding Environment. *Research Journal of Environmental and Earth Sciences*, 3(6), 633-636.
- Oteng-Ababio, M. (2011) Missing Links in Solid Waste Management in the Greater Accra Metropolitan Area in Ghana. *Geographical Journal*, 76, 551-560. <http://dx.doi.org/10.1007/s10708-010-9363-9>
- Oteng-Ababio, M. (2014). “Guilty With Explanation”: Rethinking the Destiny of Landfills in A Millennium City in Ghana. *Management Of Environmental Quality: An International Journal*, 25(2), 200-215.

- 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.
- Owusu Amo-Asamoah, M., Afrane, S. K., & Osei, Y. (2020). Waste-to-energy technologies: A review of the potential for Ghana. *Renewable and Sustainable Energy Reviews*, 119, 109562.
- Owusu, G., Nketiah-Amponsah, E., Codjoe, S. N. A., & Afutu-Kotey, R. L. (2014). How Do Ghana's Landfills Affect Residential Property Values? A Case Study of Two Sites in Accra. *Urban Geography*, 35(8), 1140-1155.
- Owusu-Nimo, F., Oduro-Kwarteng, S., Essandoh, H., Wayo, F., & Shamudeen, M. (2019). Characteristics And Management of Landfill Solid Waste in Kumasi, Ghana. *Scientific African*, 3, E00052.
- Owusu-Sekyere, E. (2018). Re-Thinking Landfills as Asset: Empirical Evidence from Urban Ghana. *Nova Science Publishers, Inc.*
- Owusu-Sekyere, E. (2020). The impact of urban agriculture on food security in Kumasi, Ghana. *Urban Agriculture & Regional Food Systems*, 5(1), e20008.
- Owusu-Sekyere, E. (2022). Altered Urban Landscape: Shedding Light on Conflicts in A Landfill Community in Ghana. *African Journal of Science, Technology, Innovation and Development*, 14(1), 76-85.
- Owusu-Sekyere, E., Bagah, D. A., & Quansah, J. Y. D. (2015). The Urban Solid Waste Management Conundrum in Ghana: Will It Ever End? *World Environment*, 5, 52-62.
- Ozbay, G., Yilmaz, M., & Demir, A. (2022). Evaluating the environmental impacts of landfill sites: A case study from Turkey. *Environmental Monitoring and Assessment*, 194(3), 1–15.
- Pandey, P., & Pandey, M. M. (2015). *Research methodology: Tools and techniques*. Bridge Center.
- Park, S., & Hong, S. (2005). Environmental justice and the politics of waste management in South Korea. *Environmental Politics*, 14(1), 71–89.
- Parker, A. (2003). Motivation and incentives for distance faculty. *Online Journal of Distance Learning Administration*, 6(3).

- Parmenter, K., Waller, J., & Wardle, J. (2021). Demographic variation in nutrition knowledge in England. *Health Education Research*, 15(2), 163–174.
- Patil, A., & Sharma, P. (2022). The socio-economic impact of landfill closures on waste pickers in India. *Journal of Environmental Management*, 306, 11432.
- Pawar, N. (2020). Type Of Research and Type Research Design. *Social Research Methodology*, 8(1), 46-57.
- Paxton, T. K., Donnellan-Fernandez, R., & Hastie, C. (2023). An Exploratory Study of Women and Midwives' Perceptions of Environmental Waste Management—Homebirth As Climate Action. *Midwifery*, 127, 103844.
- Peters, R. M. (1999). Institutional Context and Leadership Style: The Case of New Gingrich. *New Majority or Old Minority*, 43-68. Rowman & Littlefield.
- Pickett, C. L., Gardner, W. L., & Knowles, M. (2019). Getting a cue: The need to belong and enhanced sensitivity to social cues. *Personality and Social Psychology Bulletin*, 30(9), 1095–1107.
- Pires, A., Martinho, G., Rodrigues, S., & Gomes, M. I. (2019). *Sustainable Solid Waste Collection and Management* (Pp. 45-59). Cham: Springer International Publishing.
- Polcarová, E., & Pupíková, J. (2022). Analysis Of Socially Vulnerable Communities and Factors Affecting Their Safety and Resilience in Disaster Risk Reduction. *Sustainability* 2022, 14(18), 11380; <https://doi.org/10.3390/su141811380>.
- Polit, D. F., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Wolters Kluwer. [Lehman Library Guides+1SCIRP+1](#).
- Prajapati, P., Varjani, S., Singhania, R. R., Patel, A. K., Awasthi, M. K., Sindhu, R., ... & Chaturvedi, P. (2021). Critical Review on Technological Advancements for Effective Waste Management of Municipal Solid Waste—Updates and Way Forward. *Environmental Technology & Innovation*, 23, 101749.
- Prentice-Dunn, S., & Rogers, R. W. (1986). Protection Motivation Theory and Preventive Health: Beyond the Health Belief Model. *Health Education Research*, 1(3), 153-161.
- Qasim, M., Xiao, H., He, K., Noman, A., Liu, F., Chen, M. Y., Hussain, D., Jamal, Z. A., & Li, F. (2020). Impact Of Landfill Garbage on Insect Ecology and Human

- Health. *ActaTropica*, 211,105630.
- <https://doi.org/10.1016/j.actatropica.2020.105630>. Accessed 10th May 2023.
- Quaye, I., Amponsah, O., Azunre, G. A., Takyi, S. A., & Braimah, I. (2022). A Review of Experimental Informal Urbanism Initiatives and Their Implications for Sub-Saharan Africa's Sustainable Cities' Agenda. *Sustainable Cities and Society*, 83, 103938.
- Rahi, S. (2017). Research Design and Methods: A Systematic Review of Research Paradigms, Sampling Issues and Instruments Development. *International Journal of Economics & Management Sciences*, 6(2), 1-5.
- Ramadass, P., & Aruni, A. W. (2019). Research And Writing Across the Disciplines. Chennai, India: *MJP Publishers*.
- Ready, R. C. (2005). Do landfills always depress nearby property values? *Journal of Real Estate Research*, 30(3), 321–339.
- Reichert, A., Small, M., & Mohanty, S. (1992). The Impact of Landfills on Residential Property Values. *Journal Of Real Estate Research*, 7(3), 297-314.
- Risal, A., Manandhar, K., & Sharma, P. (2020). Quality of life among residents living near landfill sites in Nepal. *Environmental Health and Preventive Medicine*, 25(1), 1–9.
- Risbey, J., Kandlikar, M., Dowlatabadi, H., & Graetz, D. (1999). Scale, Context, And Decision Making in Agricultural Adaptation to Climate Variability and Change. *Mitigation And Adaptation Strategies for Global Change*, 4, 137-165.
- Robinson, H. (1987). Design And Operation of Leachate Control Measures at Compton Bassett Landfill Site, Wiltshire, UK. *Waste Management & Research*, 5(2), 107-122.
- Rodriguez, L. (2021). The impact of waste management policies on informal sector workers in Latin America. *Waste Management & Research*, 39(5), 567–575.
- Rogers, R. W. (1985). Attitude Change and Information Integration in Fear Appeals. *Psychological Reports*, 56(1), 179-182.
- Rouyre, A., Fernandez, A. S., & Estrada, I. (2024). Co-Evolution of Governance Mechanisms and Coopetition in Public-Private Projects. *Journal Of Operations Management*, 70(1), 50-79.
- Roy, S., Majumder, S., Bose, A., & Roy Chowdhury, I. (2023). Does Geographical Heterogeneity Influence Urban Quality of Life? A Case of a Densely Populated Indian City. *Papers In Applied Geography*, 9(4), 395-424.

- Sackey, L. N., Kočí, V., & Van Gestel, C. A. (2020). Ecotoxicological Effects on Lemna Minor and Daphnia Magna of Leachates from Differently Aged Landfills of Ghana. *Science Of the Total Environment*, 698, 134295.
- Salah, M. M., Al-Sari', M. I., Al-Khatib, I. A., & Kontogianni, S. (2020). Local Residents' Perception of Landfill Impacts in Palestine: The Case of Zahrat Al-Finjan Landfill. *Journal Of Material Cycles and Waste Management*, 22, 673-681.
- Salaria, N. (2012). Meaning Of the Term Descriptive Survey Research Method. *International Journal of Transformations in Business Management*, 1(6), 1-7.
- Salifu, L. Y. (2019). Environmental and Social Audit of Kpone Landfill Draft Final Report presented to the Ministry of Works and Housing Government of Ghana.
- Sanders, R. (2006). A Market Road to Sustainable Agriculture? Ecological Agriculture, Green Food and Organic Agriculture in China. *Development And Change*, 37(1), 201-226.
- Sarfo-Mensah, P., Obeng-Okrah, K., Arhin, A. A., Amaning, T. K., & Oblitei, R. T. (2019). Solid Waste Management in Urban Communities in Ghana: A Case Study of The Kumasi Metropolis. *African Journal of Environmental Science and Technology*, 13(9), 342-353.
- Sarpong, G. A (2018). Ghanaian Environmental Law, International and National Perspectives (Wildy, Simmonds & Hill).
- Sasao, T. (2004). An Estimation of The Social Costs of Landfill Siting Using A Choice Experiment. *Waste Management*, 24(8), 753-762.
- Saunders, M., Lewis, P., & Thornhill, A. (2009). Research Methods for Business Students. *Pearson Education*.
- Saunders, P. U., Garvican-Lewis, L. A., Chapman, R. F., & Périard, J. D. (2019). Special Environments: Altitude And Heat. *International Journal of Sport Nutrition and Exercise Metabolism*, 29(2), 210-219.
- Schallenberg-Rodriguez, J., & Inchausti-Sintes, F. (2021). Socio-Economic Impact of A 200 MW Floating Wind Farm in Gran Canaria. *Renewable And Sustainable Energy Reviews*, 148, 111242.
- Schiffer, E., & Hauck, J. (2010). Net-Map: Collecting Social Network Data and Facilitating Network Learning Through Participatory Influence Network Mapping. *Field Methods*, 22(3), 231-249.

- Schmidt, V. A. (2010). Taking Ideas and Discourse Seriously: Explaining Change Through Discursive Institutionalism as The Fourth 'New Institutionalism'. *European Political Science Review*, 2(1), 1-25.
- Scott, J. (2017). *Social network analysis (4th ed.)*. SAGE Publications.
- Stakeholder Democracy Network. (2015). *Communities, companies and conflict: A guide for communities on corporate social responsibility in the Niger Delta*. Stakeholder Democracy Network. (SDN).
- Sekaran, U. (2003). Towards A Guide for Novice Research on Research Methodology: Review and Proposed Methods. *Journal Of Cases of Information Technology*, 8(4), 24-35.
- Serrat, O., & Bosch, J. (2020). Knowledge solutions: Tools, methods, and approaches to drive organizational performance. *Springer*.
- Shah, S. A. R., Zhang, Q., Abbas, J., Tang, H., & Al-Sulaiti, K. I. (2023). Waste Management, Quality of Life and Natural Resources Utilization Matter for Renewable Electricity Generation: The Main and Moderate Role of Environmental Policy. *Utilities Policy*, 82, 101584.
- Shanahan, D. F., Astell-Burt, T., Barber, E. A., Brymer, E., Cox, D. T. C., Dean, J., Depledge, M., Fuller, R. A., Hartig, T., Irvine, K. N., et al. (2019). Nature-based interventions for improving health and wellbeing: The purpose, the people and the outcomes. *Sports*, 7(6), 141.
- Shaibu, M. H., Al-Hassan, S., & Abubakari, A. (2023). Assessing the Role of Strategic Groups in the Formulation of Composite Budgeting in the Tamale Metropolitan Assembly, Ghana. *European Journal of Development Studies*, 3(1), 1-10.
- Shekdar, A. V. (2009). Sustainable Solid Waste Management: An Integrated Approach for Asian Countries. *Waste Management*, 29(4), 1438-1448.
- Shilpa S. Shetty, Deepthi D, Harshitha S, Shipra Sonkusare, Prashanth B. Naik, Suchetha A. C., & Oeng, M. Y. (2020). Co-Existence of Formal and Informal Waste Management Systems in Developing Countries: Opportunities for Integrated Sustainable Waste Management. *Heliyon*, 9(9), e19496. <https://doi.org/10.1016/j.heliyon.2023.e19496>.
- Shinn, M., Samuels, J., Fischer, S. N., Thompkins, A., & Fowler, P. J. (2015). Longitudinal Impact of a Family Critical Time Intervention on Children in High-

- Risk Families Experiencing Homelessness: A Randomized Trial. *American Journal of Community Psychology*, 56, 205-216.
- Siddiqua, A., Hahladakis, J. N., & Al-Attiya, W. A. K. (2022). An Overview of The Environmental Pollution and Health Effects Associated with Waste Landfilling and Open Dumping. *Environmental Science and Pollution Research*, 29(39), 58514-58536.
- Siedlecki, K. L., Salthouse, T. A., Oishi, S., & Jeswani, S. (2019). The relationship between social support and subjective well-being across age. *Social Indicators Research*, 117(2), 561–576
- Silva, A. R., Pereira, A. M., & Silva, C. F. (2020). The impact of environmental policies on waste management: A case study in Portugal. *Waste Management*, 102, 1–9.
- Silva, E., Castro, Luís & Miguel, Ingrid & Citeli, Nathalie & de-Carvalho, Mariana. (2021). Boletín de la Sociedad Zoológica del Uruguay. 30. 664.10.26462/30.1.6.
- Simone, A. (2010). *City Life from Jakarta to Dakar: Movements at The Crossroads*. Routledge.
- Slovin, E. (1960). Slovin's formula for sampling technique. Retrieved from <https://www.scirp.org/reference/referencespapers?referenceid=2717038>
<https://www.scirp.org/reference/referencespapers?referenceid=2717038>
- Smit, B., & Skinner, M. W. (2002). Adaptation Options in Agriculture to Climate Change: A Typology. *Mitigation And Adaptation Strategies for Global Change*, 7(1), 85-114.
- Smith, J. B., Huq, S., & Klein, R. J. (2003). Climate Change, Adaptive Capacity and Development. *Imperial College Press*.
- Smith, J. A., Flowers, P., & Larkin, M. (2009). Interpretative phenomenological analysis: Theory, method and research. *SAGE Publications*.[scirp.org](https://www.scirp.org)
- Smith, M. K. (2010). Quality of life: A review of the literature. *Social Indicators Research*, 99(1), 1–20.
- Smith, J. A., Flowers, P., & Larkin, M. (2019). Interpretative phenomenological analysis: Theory, method and research. *SAGE Publications*.
- Srivastava, R. (2016). Situational analysis of dropouts. Arts & Science Academic Publishing.[Milton Public Library](https://www.miltonpubliclibrary.org/).

- Soroui, S. T. (2021). Understanding The Drivers and Implications of Remote Work from The Local Perspective: An Exploratory Study into The Disembedding Dynamics. *Technology In Society*, 64, 101328.
- Sovacool, B. K. (2011). An International Comparison of Four Polycentric Approaches To Climate And Energy Governance. *Energy Policy*, 39(6), 3832-3844.
- Sovacool, B. K., Axsen, J., & Sorrell, S. (2018). Promoting Novelty, Rigor, And Style In Energy Social Science: Towards Codes Of Practice For Appropriate Methods And Research Design. *Energy Research & Social Science*, 45, 12-42.
- Staines, A., Crowley, D., Bruen, M., & O'Connor, P. (2004). Public Health and Landfill Sites. *Department of Public Health and Epidemiology University College, Dublin*.
- Stankov, S., & Stepančev, B. (2022). Noise And Its Influence on Human Health. *Medicinski Casopis*.
- Steinmo, S., Thelen, K., & Longstreth, F. (Eds.). (1992). Structuring Politics: Historical Institutionalism in Comparative Analysis. *Cambridge University Press*.
- Stenzel, A. G., Kwadwo, V. O., & Vincent, R. C. (2024). Free Secondary Education Policy and Education Attainment. *International Journal of Educational Development*, 106, 103021.
- Sukamolson, S. (2007). Fundamentals Of Quantitative Research. *Language Institute Chulalongkorn University*, 1(3), 1-20.
- Sutton, J., & Austin, Z. (2015). Qualitative Research: Data Collection, Analysis, And Management. *The Canadian Journal of Hospital Pharmacy*, 68(3), 226.
- Taber, K. S. (2018). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Research In Science Education*, 48, 1273-1296.
- Tabiri, M. O. (2015). Perennial problem of floods in Accra: What is the way forward. *Int J Adv Res Edu Technol (IJARET)*, 2(3), 198-201.
- Taché, A. (2004). Adaptation: A Systemic Sociological Concept. *The Sociological Turn of Adaptation Studies* .1-364.
- Tafesse, S., Girma, Y. E., & Dessalegn, E. (2022). Analysis Of the Socio-Economic and Environmental Impacts of Construction Waste and Management Practices. *Heliyon*, 8(3).
- Taylor, D. (1999). Talking Trash: The Economic and Environmental Issues of Landfills. *Environmental Health Perspectives*, 107(8), A404-A409.

- Tchobanoglous, G., Theisen, H., & Vigil, S. A. (1993). Integrated solid waste management: Engineering principles and management issues. *McGraw-Hill Education*.
- Tchobanoglous, G., & Kreith, F. (2002). Handbook Of Solid Waste Management. *McGraw-Hill Education*.
- Tekin, I. (2021). Reconciling Environment and Employment: The Role of Renewable Energy Investments. *SSRN Electronic Journal*.
- Tenodi, S., Krčmar, D., Agbaba, J., Zrnić, K., Radenović, M., Ubavin, D., & Dalmacija, B. (2020). Assessment of the environmental impact of sanitary and unsanitary parts of a municipal solid waste landfill. *Journal of Environmental Management*, 258, 110019.
- Terry, G., Hayfield, N., Clarke, V., & Braun, V. (2017). Thematic analysis. *The SAGE Handbook of Qualitative Research in Psychology*, 2, 17-37.
- Tomita, A., Cuadros, D. F., Burns, J. K., Tanser, F., & Slotow, R. (2020). Exposure To Waste Sites and Their Impact on Health: A Panel and Geospatial Analysis of Nationally Representative Data From South Africa, 2008–2015. *The Lancet Planetary Health*, 4(6), E223-E234.
- Townsend, T. G., Powell, J., Jain, P., Xu, Q., Tolaymat, T., & Reinhart, D. (2015). Sustainable Practices for Landfill Design and Operation. *Springer*.
- Twumasi, E., & Akwasi, K. E. (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.
- Umukoro, Emuesiri & Eduviere, Anthony Taghogo & Ahama, Efe & Moke, Emuesiri & Edje, K.E. & Omorodion, Iziegbe & Ovigwe, C. (2021). Substance Abuse: Awareness and Attitude among Secondary School Students in Sapele, Nigeria. *Journal of Applied Sciences and Environmental Management*. 25. 347-351. 10.4314/jasem. v25i3.7.
- United Nations Environment Programme. (2010). Waste and climate change: Global trends and strategy framework. Nairobi, Kenya: *United Nations Environment Programme. Environment Programme UNEP*.
- United Nations Environment Programme. (2015). Global waste management outlook. Nairobi, Kenya: *United Nations Environment Programme. Environment Programme UNEP*.

- United Nations Environment Programme. (2015). Putting Rio Principle 10 into action: An implementation guide for the UNEP Bali Guidelines for the development of national legislation on access to information, public participation and access to justice in environmental matters. *United Nations Environment Programme. Environment Programme*. <https://wedocs.unep.org/handle/20.500.11822/11201>
- United Nations Environment Programme. (2021). Food Waste Index Report 2021. *United Nations Environment Programme. Environment Programme UNEP*. <https://www.unep.org/resources/report/unep-food-waste-index-report-2021> [scirp.org](https://www.unep.org/resources/report/unep-food-waste-index-report-2021).
- Unece (2020). Compliance and Enforcement Mechanisms. *Research Handbook on EU Environmental Law*.
- Urme, S. A., Radia, M. A., Alam, R., Chowdhury, M. U., Hasan, S., Ahmed, S., ... & Quayyum, Z. (2021). Dhaka Landfill Waste Practices: Addressing Urban Pollution and Health Hazards. *Buildings & Cities*, 2(1), 700.
- U.S. Environmental Protection Agency (EPA). (2016.). *Landfills*. Retrieved April 13, 2025, from <https://www.epa.gov/landfills>.
- Van de Klundert, A., & Anschütz, J. (2001) Integrated Sustainable Waste. *Routledge*.
- Van den Bosch, M., & Sang, Å. O. (2017). Urban natural environments as nature-based solutions for improved public health – A systematic review of reviews. *Environmental Research*, 158, 373–384.
- Vandenbroek, M. (2021). Sampling Essentials: Practical Guidance for Drawing Samples in Survey Research. *SAGE Publications*.
- Vaverková, M. D. (2019). Landfill Impacts on The Environment. *Geosciences*, 9(10), 431.
- Venter, T. (2020). Brownfield Development Is the New Green for Sustainable Mine-Dump Redevelopment. *Town And Regional Planning*, 76, 42-55.
- Vernet, J. B. (2002). Social And Economic Aspects of The Decommissioning of Nuclear Installations. *Safe Decommissioning for Nuclear Activities*, 14, 403.
- Viljoen, J. M., Schenck, C. J., Volschenk, L., Blaauw, P. F., & Grobler, L. (2021). Household Waste Management Practices and Challenges in A Rural Remote Town in The Hantam Municipality In The Northern Cape, South Africa. *Sustainability*, 13(11), 5903.

- Von Bülow, D. & Sørensen, A. (1993). Gender and Contract Farming: Tea Out grower Schemes in Kenya, *Review of African Political Economy* 20(56):38-52. March 1993
- Vrijheid, M. (2000). Health Effects of Residence Near Hazardous Waste Landfill Sites: A Review of Epidemiologic Literature. *Environmental Health Perspectives*, 108 (Suppl 1), 101-112.
- Wagenaar, M. (2005). Student Teachers' Experiences of Practice Teaching (*Doctoral dissertation, University of South Africa*). University of South Africa Institutional Repository. <https://uir.unisa.ac.za/handle/10500/1906>
- Wang, D., Tang, Y. T., Long, G., Higgitt, D., He, J., & Robinson, D. (2020). Future Improvements on Performance of an EU Landfill Directive Driven Municipal Solid Waste Management for a City in England. *Waste Management*, 102, 452-463.
- Wang, L., & Ready, R. C. (2005). *Spatial econometric approaches to estimating hedonic property value models* (No. 378-2016-21322).
- Wang, Y., & Li, X. (2020). Economic Adaptation Strategies and Quality of Life In Rural Communities In China. *Journal of Rural Studies*, 76, 116-126.
- Waste Aid. (2024). *Turning waste into wealth: How WasteAid is creating jobs and tackling the global waste crisis*. Retrieved from <https://wasteaid.org/>
- World Health Organization. (2019). WHO guidelines on sanitation and health. WHO. <https://www.who.int/publications/i/item/9789241514705>
- Wassermann, G., Binner, E., Mostbauer, P., & Salhofer, S. (2005, October). Environmental Relevance of Landfills Depending on Different Waste Management Strategies. Institute of Waste Management, Department Water Atmosphere Environment, BOKU University of Natural Resources and Applied Life Science, Muthgasse 107, 1190 Vienna.
- Weiner, R., & Matthews, R. (2003). *Environmental Engineering*. Butterworth-Heinemann.
- Wenger, G. C. (2021). *The supportive network: Coping with old age*. Routledge.
- White, P. R., Franke, M., & Hindle, P. (1995). Integrated Solid Waste Management: A Lifecycle Inventory: A Lifecycle Inventory. *Springer Science & Business Media*.
- Wijekoon, P., Koliyabandara, P. A., Cooray, A. T., Lam, S. S., Athapattu, B. C., & Vithanage, M. (2022). Progress And Prospects in Mitigation of Landfill

- Leachate Pollution: Risk, Pollution Potential, Treatment and Challenges. *Journal of Hazardous Materials*, 421, 126627.
- Williams, P. A., Narra, S., Antwi, E., Quaye, W., Hagan, E., Asare, R., & Ekanthalu, V. S. (2023, March). Review of Barriers to Effective Implementation of Waste and Energy Management Policies in Ghana: Implications for the Promotion of Waste-to-Energy Technologies. *In Waste* (Vol. 1, No. 2, pp. 313-332). MDPI.
- Williams, P. T. (2005). *Waste Treatment and Disposal*. John Wiley & Sons.
- Wilson, E. J., McDougall, F. R., & Willmore, J. (2001). Euro-Trash: Searching Europe for A More Sustainable Approach to Waste Management. *Resources, Conservation and Recycling*, 31(4), 327-346.
- Wilson, D. C. (2007). Development Drivers for Waste Management. *Waste Management & Research*, 25(3), 198-207.
- Wilson, D. C., Velis, C. A., & Rodic, L. (2013, May). Integrated Sustainable Waste Management in Developing Countries. *Proceedings Of the Institution of Civil Engineers-Waste and Resource Management* (Vol. 166, No. 2, Pp. 52-68). ICE Publishing.
- Wilson, D. C., Thorpe, C. L., Horsfall, M., & Somneni, W. (2017). Dumping On the Poor? The Socio-Economic and Health Equity of Open Dumpsites in Sub-Saharan Africa. *BMJ Global Health*, 2(4), E004639.
- Wilson, D. C., Rodic, L., Modak, P., Soos, R., Carpintero, A., Velis, C., Iyer, M., & Simonett, O. (2020). Global waste management outlook. Nairobi, Kenya: *United Nations Environment Programme* (UNEP).
- Witting, C. (2015). *Street on torts* (14th ed.). Oxford University Press.
- Wong, M. S., Bray, M., & Adams, D. (2020). The impact of landfill sites on residential property values: A spatial hedonic analysis. *Journal of Environmental Economics and Management*, 101, 102–118
- World Bank. (2016). International Bank for Reconstruction and Development 1818 H Street NW, Washington, DC 20433.
- World Bank. (2020, 08 17). *Solid Waste Management*. Retrieved 2022, from worldbank.org:
<https://www.worldbank.org/en/topic/urbandevelopment/brief/solid-waste-management>. Accessed on 4th January 2023.

- Wright, C. Y., Norval, M., & Reeder, A. I. (2015). Solar ultraviolet radiation exposure and human health in South Africa: An overview. *South African Medical Journal*, 105(10), 848–853.
- Xu, M. A., & Storr, G. B. (2012). Learning The Concept of Researcher as Instrument In Qualitative Research. *Qualitative Report*, 17, 42. 1-18. <https://doi.org/10.46743/2160-3715/2012.1768>.
- Xu, N., Zhao, Y., Li, J., Wang, J., & Wang, S. (2020). Environmental And Economic Assessment of Landfill Leachate Treatment Technologies. *Journal of Cleaner Production*, 232, 1013-1022.
- Xu, Z., Elomri, A., Pokharel, S., Zhang, Q., Ming, X. G., & Liu, W. (2017). Global Reverse Supply Chain Design for Solid Waste Recycling Under Uncertainties and Carbon Emission Constraint. *Waste Management*, 64, 358-370.
- Yadav, P., & Samadder, S. R. (2014). Life Cycle Assessment of Solid Waste Management Options: A Review. *Recent Research in Science and Technology*, 6(1).
- Yadav, V., & Karmakar, S. (2020). Sustainable Collection and Transportation of Municipal Solid Waste in Urban Centres. *Sustainable Cities and Society*, 53, 101937.
- Yang, M. (2019). From Dislocated to Local: Policy Implications of “Educational Aid for Tibet”. *Asian Studies Review*, 43(1), 94-113.
- Yeley, A. (2021). Developing and Disseminating the Children’s Environmental Health Index with Web GIS. Georgia State University.
- Zhang, L., & Klenosky, D. B. (2016). Residents’ Perceptions and Attitudes Toward Waste Treatment Facility Sites and Their Possible Conversion: A Literature Review. *Urban Forestry & Urban Greening*, 20, 32-42.



APPENDICES

Appendix 1: Household Survey Questionnaire

UNIVERSITY OF GHANA
INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH
(ISSER)

LANDFILL MANAGEMENT IN KPONE KATAMANSO, GREATER
ACCRA: DECOMMISSIONING CONTEXTS, EFFECTS AND
CHALLENGES

HOUSEHOLD SURVEY QUESTIONNAIRE

This survey is aimed exploring the environmental, socio-economic, institutional and legislative context of the Kpone Kokompe landfill decommissioning in Kpone Katamanso in Ghana. This survey is being conducted as part of the data collection requirements for my PhD Thesis in Development Studies. Results from this study will be used primarily for research and educational purposes. Your responses will be treated with the utmost confidentiality. I greatly appreciate your co-operation.

All information provided will be treated as strictly confidential and will be used only for purposes of this research. There will be no penalty for people who decide not to be a part of it. If you begin it, you are also allowed to quit from being a part of it without being penalized. However, we will very much appreciate it if you would be part of this study. It will only take us about 20-30 minutes to complete this interview.

Do you have any questions for me before we begin this interview?



Secti on A	Composition/Demographic characteristics					Hhold ID								
Perso n ID														
		B03	B04	B05	B06	B07	B08	B09	B10	B11				
	Period of stay in community	Were you born in this community? If yes move to next question if no move to next question and Answer Reason for moving to this area:	Age	Sex	Household size	Occupation	Marital status	Ethnicity	Religion	Average monthly household income GHC	Level of education	Reason for moving to the area:	Type of Dwelling:	Status of accommodation:
			1. 18 - 20 years	Male	1. 1-5	1.Factory worker	1.Single (never married)	1.Asante "	1. Christian "	1.Below 400	1.None (No formal education)	1. Accommodation	1.Separate House (Detached)	1. Rented
			2. 21 - 30 years	Female	2. 6-10	2. Banker	2.Consensual/cohabitation	3.Ga/Dangme "	2. Moslem "	2. 450-1,000 "	2.Primary "	2. Business market access	2. Semi-Detached House	2. Family house
			3. 31-40years ☐		3. Above 10	3. Teacher "	3. Married "	5.Akuapem "	3. Traditional "	3. 1,001 – 2000 "	3.JSS/JHS/Middle School "	3. Native of the area	3. Kiosk / uncompleted house	3. Owner-Occupied
			4. 41 - 50 years			4. waste picker "	4. Divorced "	7.Dagomba/Dagbani "	4. Other (please specify) "	4.2001 – 3,000 "	4.SSS/SHS /Vocational /Technical "	4. Employment	4. Other (kindly describe)	4. Squatter

			5. 51 years and above			5. Trader "	5. Separated "	9.Guan "		5. 3,001 – 4000 "	5.HND/Diploma	5. Other (please specify)		5. Other (kindly specify)
						6. Unemployed "	6. Widowed "	11.Brong "		6. 4001-5000	6.Graduate (Tertiary)			
						7. Agriculture "		13.Sissala "		7.Above 5000	7.Postgraduate			
						8. Pensioner "		15.Ahanta "			8. Other (Please specify)			
						9.Clerical		17.Mamprusi "						
						10. Other (Please specify) "		2.Fanti "						
								4.Kassen "						
								6.Ewe "						
								8.Sefwi "						
								10.Wali/Dagaari "						
								12.Buli "						
								14.Nzema "						
								16.Frafra/Gruni "						
								18.Other (Please specify) "						



Over the period of execution, do you find landfill decommissioning important in your area,
Yes [] No []

If yes, what is the degree of importance?

Very [1] moderate [2] less important [3] cannot tell [0]

SECTION B: Validity of the Socio-Economic and Environmental factors that influenced the Landfill Decommissioning among Residents of Kpone Katamanso

Kindly indicate your level of agreement or disagreement with the following statements by ticking (✓) the appropriate box. 1= **Strongly Disagree**, 2= **Disagree**, 3= **Neutral**, 4= **Agree**, 5= **Strongly Agree**.

SOCIO-ECONOMIC EFFECTS OF DECOMMISSIONING					
A.	BEFORE DECOMMISSIONING				
	Environmental Factors				
1.	Before decommissioning, the land fill site produced a lot of odours?				
2.	Before decommissioning, there was a lot of vehicular traffic in the area?				
3.	Before decommissioning, there was a lot of littering of the environment by residents?				
4.	Prior to the decommissioning, the area was generally unhygienic or had unsanitary conditions?				
5.	Before decommissioning there were a lot of mosquitoes, flies and rodents in the area.				
6.	Before decommissioning, respiratory and breathing disorders were common.				
7.	Prior to decommissioning there was the contamination of the surroundings by leachate from the landfill				
8.	Before decommissioning there was a lot of dust in the environment and the quality of the air was poor.				
9.	Before decommissioning the area was very noisy from the landfill bulldozers among others?				
10.	Before decommissioning babies were born with health defects.				
11.	Before Decommissioning the following diseases were prevalent:				
	a. Malaria				
	b. Cancers when heavy metals were inhaled				
	c. Memory disturbances				
	d. Cholera				
	Economic Factors				
12.	Before decommissioning the cost of land in the area was cheaper?				
13.	Before decommissioning there were a lot of jobs/economic activities in the area?				
14.	Before decommissioning many businesses depended on the operations of the landfill site?				
15.	Before decommissioning waste, disposal was affordable?				
16.	Before decommissioning there were not many businesses in the area.				
17.	Before decommissioning the new development of businesses that exist currently did not exist.				
18.	Before decommissioning the new shops that have opened up were non-existent.				
19.	Before decommissioning the new jobs people in the area have currently obtained did not exist.				
20.	Before decommissioning there were more economic activities in the area.				

21.	Before decommissioning more residents were working around the landfill site.				
22.	Before decommissioning waste, disposal was cheaper than it is now.				
	Social Factors				
23.	During the operation of the landfill there were conflicts among the waste pickers?				
24.	Before decommissioning there was less environmental activism among residents (Very few or no environmental advocacy groups and community organisations addressing landfill related issues)				
25.	Before decommissioning there was Youth Involvement in drug use				
26.	Before decommissioning residents did not have access to good roads and educational facilities				
27.	Before decommissioning the place was generally under developed with very few amenities				
28.					
29.	Would you say the authorities adhered to the following laws and regulations in the management of the landfill before decommissioning?				
a.	Ghana Landfill Guidelines EPA 2002				
b.	Local Governance Act, 2016 Act 936				
B					
	Environmental Factors				
	Decommissioning activities have led to less odour from the site?				
30.	Decommissioning activities have reduced vehicular traffic in the area?				
31.	Decommissioning has reduced littering of the environment?				
32.	Decommissioning has improved sanitary conditions in the area?				
33.	Decommissioning has reduced the mosquitoes, flies and rodents in the area.				
34.	Respiratory and breathing disorders in the vicinity have reduced after decommissioning.				
35.	Decommissioning has reduced the leachate in the environment.				
36.	Decommissioning has reduced the dust in the environment and has led to improvement in the quality of the air.				
37.	Decommissioning activities have reduced noise in the area?				
38.	Babies born in the vicinity after decommissioning have less birth defects				
	Decommissioning has reduced the incidence of the following diseases:				
	Malaria				
	Cancers associated with heavy metal inhalation				
	Memory disturbances				
	Cholera				

	Economic Factors				
	Decommissioning activities have created new jobs for the residents?				
39.	Decommissioning has increased the value (price) of the land in the area?				
40.	Decommissioning has resulted in increased demand for accommodation in the area?				
41.	Decommissioning has led to the closure of some businesses? that depend on the operations of the site?				
42.	Decommissioning has led to the development of new businesses in the area?				
43.	New shops have opened up since the decommissioning was completed?				
44.	People have obtained new jobs in the area since the decommissioning started and was completed?				
45.	Decommissioning has negatively affected economic activities in the area?				
46.	Decommissioning has led to some residents losing their jobs?				
47.	Decommissioning has led to an increase in the cost of waste disposal?				
48.	Social Factors				
49.	After the decommissioning there have been less conflicts among waste pickers?				
	Decommissioning has resulted in environmental activism (environmental advocacy groups or community organisations addressing landfill related issues)				
50.	Post decommissioning there is still youth involvement in drug use				
51.	Decommissioning has led to the roads being constructed and better access to education				
52.	Decommissioning has opened up the place for development and improved the social fabric of the society				
53.	Would you say the authorities adhered to the following laws and regulations in the management of the landfill after the decommissioning?				
	a. Ghana Landfill Guidelines EPA 2002				
	b. Local Governance Act, 2016 Act 936				
	c. ADAPTATION AND OR COPING STRATEGIES ADOPTED BY RESIDENTS DUE TO DECOMMISSIONING				

E. Based on your responses, has your quality of life changed over the last five years?

Yes [] No []

If yes, to what extent has your quality of life changed?

Greatly decreased [] Decreased [] moderately improved [] improved [] highly improved []

Appendix 2: Interview Guide for Companies/ Experts

UNIVERSITY OF GHANA INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)

THESIS TITLE:

LANDFILL MANAGEMENT IN KPONE KATAMANSO, GREATER ACCRA: DECOMMISSIONING CONTEXTS, EFFECTS AND CHALLENGES

Interview Guide for Companies /Experts

Opening Remarks: My name is Maame Sarpong, a PhD candidate at the University of Ghana Institute of Statistical, Social and Economic Research (ISSER). My research seeks to examine the environmental, socio-economic, institutional and legislative context of the Kpone Kokompe landfill decommissioning in Kpone Katamanso in Ghana. This interview is being conducted as part of the data collection process to meet the requirements for the completion of my PhD Thesis in Development Studies. All information provided will be used primarily for research and educational purposes. Your responses will be treated with the utmost confidentiality. I greatly appreciate your co-operation.

SECTION A:

1. Organisational and Respondent Profile:

Respondent Classification: Expert [] Company []

2. Name of Organisation/Institution:

3. Year of Establishment:

4. Core Business/Area of Specialisation:

5. Location of Head Office:

6. Environmental Certifications:

7. How many years have you specialised in landfill decommissioning and issues related to environmental sustainability?

SECTION B: Role in Landfill Decommissioning at Kpone Kokompe

1. In what ways was your firm involved in the landfill decommissioning at Kpone Kokompe?

2. Which government agency awarded your firms with the contract to execute the landfill decommissioning at Kpone Kokompe?

3. What procurement processes did your firm follow before being awarded with the landfill decommissioning project at Kpone Kokompe?

4. Why did your firm choose to get involved in the decommission the Kpone Kokompe landfill?

5. Was the landfill decommissioning at Kpone Kokompe necessary? (If yes, kindly explain your reasons)

6. Were there initial factors that led to the decommissioning of the landfill at Kpone Kokompe?
7. What was the main purpose for the landfill decommissioning at Kpone Kokompe?
8. How will the landfill decommissioning improve the life of residents and the community?

SECTION C: Community and Stakeholder Engagement in Landfill Decommissioning at Kpone Kokompe

1. What kind of engagement and interaction did your firm have with residents before the project commissioned?
2. Did your firm liaise with government agencies to provide some form of socio-economic relief to residents of Kpone Kokompe? (What kind of relief/intervention did your firm provide?)

SECTION D: Project Execution and Timelines

1. How long did it take your firm to complete the decommissioning of the landfill at Kpone Kokompe? (Did your firm exceed the intended deadline or finish before the deadline?)

SECTION E: Post-Decommissioning Engagement and Effects

1. How do the decommissioning processes influence sanitary conditions in the area?
2. In what ways has the decommissioning influenced waste disposal in the area?
3. What are the effects of the decommissioning processes on the residents?
4. How useful will the decommissioned landfill be to the community?
5. What adaptation methods will residents need to adopt during and after the decommissioning?

SECTION F: Socio-Economic and Environmental Impact of Landfill Decommissioning at Kpone Kokompe

1. In what ways will the landfill decommissioning impact on the social life of residents at Kpone Kokompe?
2. What economic effects will the landfill decommissioning have on residents of Kpone Kokompe?
3. Do you perceive the quality of life of residents of Kpone Kokompe will get better as a result of the landfill decommissioning? (If yes, how so?)
4. What is the environmental impact of the landfill decommissioning at Kpone Kokompe?

SECTION G: Prospects of Landfill Decommissioning in Ghana

1. What is your take on the replication of the decommissioning of landfills across the Country? Do you think this initiative should be replicated all over Ghana? (If Yes, briefly explain)

SECTION H: Legal/institutional frameworks for Land fill decommissioning in Ghana

1. What legal instruments back the decommissioning of landfills in Ghana? (Kindly state the Act and the year of the legal instrument)
2. What role do institutions play regarding landfill decommissioning in Ghana?
3. Do you know any of the institutional frameworks pertaining to landfill decommissioning in Ghana? (What procedures do these institutions follow to execute landfill decommissioning in Ghana?)
4. What laws support landfill decommissioning in Ghana?
5. Have the laws on landfill decommissioning in Ghana been amended over the years? (If yes, what amendments have been made?)
6. Which institutions are mandated by the law to enforce or handle issues related to landfill decommissioning in Ghana?
7. Are there bye laws by the various Assemblies on landfill decommissioning that you know of? (If yes. Please mention them and state the purpose of the bye laws). Any other comments?

Closing Remarks: Thank you for your time, response and participation. Once again, be rest assured that all information provided will be used strictly for academic purposes.



Appendix 3: Interview Guide for Local Authorities
UNIVERSITY OF GHANA
INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)
THESIS TITLE:
LANDFILL MANAGEMENT IN KPONE KATAMANSO, GREATER ACCRA:
DECOMMISSIONING CONTEXTS, EFFECTS AND CHALLENGES

Interview Guide for Local Authorities

Opening Remarks: My name is Maame Sarpong, a PhD candidate at the University of Ghana Institute of Statistical, Social and Economic Research (ISSER). My research seeks to examine the environmental, socio-economic, environmental, institutional and legislative context of the Kpone Kokompe landfill decommissioning in Kpone Katamanso in Ghana. This interview is being conducted as part of the data collection process to meet the requirements for the completion of my PhD Thesis in Development Studies. All information provided will be used primarily for research and educational purposes. Your responses will be treated with the utmost confidentiality. I greatly appreciate your co-operation.

SECTION A: Respondent Profile

Respondent Classification: Chief/Traditional Ruler [] Representative(s) of Chief/Traditional Ruler [] Opinion Leader [] Employee of Kpone Kokompe Municipal Assembly [] President of Waste Pickers Association []

2. Gender: Male [] Female []

3. Age (as of your last birthday): _____ years

4. How many years have you stayed in this community?

SECTION B: Purpose of Landfill Decommissioning in Ghana

1. What can you tell me about the landfill decommissioning at Kpone Kokompe? (When did you get to know about it, what did you hear in relation to its purpose and what was your initial response to this project?)
2. When did the decommissioning commence and how long did the process last from beginning to completion?
3. What do you know about the environmental factors that led to the decommissioning?
4. What economic factors that led to the decommissioning?
5. What social factors accounted for the decommissioning?

SECTION C: Role of Local Authorities

5. What role did the chieftaincy and traditional rulers play in the process leading up to the landfill decommissioning?
6. What role did the local municipal authority play in the landfill decommissioning at Kpone Kokompe?

SECTION D: Proposed Benefits

1. What were the proposed and intended benefits of the decommissioning of the landfill site at Kpone Kokompe?
2. Have these benefits been achieved in your view?

3. How has landfill decommissioning contributed to the socio-economic well-being of residents in the community?
4. In what ways has the landfill decommissioning improved the quality of life of residents in the area?

SECTION E: Community Engagement and Stakeholder Opinions

1. Did the government/company engage local authorities prior to the commencement of the project?
2. Were residents of the community involved in the dialogue related to the proposed landfill decommissioning? (If yes, how were they engaged?)
3. In your opinion do you consider that the authorities had sufficient engagement with all stakeholders (residents, local authorities and opinion leaders) prior to the commencement of the project? (Kindly explain your answer)
4. What was the reaction of residents to the proposed landfill decommissioning?

SECTION F: Policy Frameworks Governing Landfill Decommissioning in Ghana

1. What policies govern landfill decommissioning in Ghana?
2. When were the policies governing landfill decommissioning in Ghana introduced?
3. Which government(s) introduced the policy on landfill decommissioning in Ghana?
4. Have there been new policies on landfill decommissioning in the past six years?
5. Any other comments?

SECTION G: Legal Frameworks Governing Landfill Decommissioning in Ghana

8. What legal instruments back the decommissioning of landfills in Ghana? (Kindly state the Act and the year of the legal instrument)
9. What laws support landfill decommissioning in Ghana?
10. Have the laws on landfill decommissioning in Ghana been amended over the years? (If yes, what amendments have been made?)
11. Which institutions are mandated by the law to enforce or handle issues related to landfill decommissioning in Ghana?
12. Are there bye laws by the various Assemblies on landfill decommissioning that you know of? (If Yes, Please mention them and state the purpose of the bye laws). Any other comments?

SECTION H: Institutional Frameworks Governing Landfill Decommissioning in Ghana

1. What role do institutions play regarding landfill decommissioning in Ghana?
2. Do you know any of the institutional frameworks pertaining to landfill decommissioning in Ghana? (What procedures do these institutions follow to execute landfill decommissioning in Ghana?)

SECTION I: Adaptation Strategies (FOR WASTE PICKERS ONLY)

Environmental adaptation strategies

1. How do you cope with your environment after the decommissioning?

Economic adaptation strategies

1. Have you changed your work due to the absence of the landfill after the decommissioning?
2. Have you learnt a new trade after the decommissioning of the landfill?

Social adaptation strategies

1. How have you and your colleague waste pickers mobilized to deal with the effects of decommissioning on your work?
2. Have you considered relocating to other landfills after the decommissioning?

Closing Remarks: Thank you for your time, response and participation. Once again, be rest assured that all information provided will be used strictly for academic purposes.



Appendix 4: Interview Guide for Non-Governmental Organisations

**UNIVERSITY OF GHANA
INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH
(ISSER)**

THESIS TITLE:

**LANDFILL MANAGEMENT IN KPONE KATAMANSO, GREATER ACCRA:
DECOMMISSIONING CONTEXTS, EFFECTS AND CHALLENGES**

Interview Guide for NGOs

*Opening Remarks: My name is Maame Sarpong, a PhD candidate at the University of Ghana Institute of Statistical, Social and Economic Research (ISSER). My research seeks to examine the environmental, **socio-economic, institutional and legislative context of the Kpone Kokompe landfill decommissioning in Kpone Katamanso in Ghana**. This interview is being conducted as part of the data collection process to meet the requirements for the completion of my PhD Thesis in Development Studies. All information provided will be used primarily for research and educational purposes. Your responses will be treated with the utmost confidentiality. I greatly appreciate your co-operation.*

SECTION A:

1. Name of NGO: _____
2. Year of Establishment: _____
3. Area of Specialisation: _____
4. Location of Head Office: _____
5. How many branches does your NGO have? _____

SECTION B: Role in Landfill Decommissioning at Kpone Kokompe

6. Can you tell me a bit about your NGO, its mission, vision and purpose?
7. How many years has your NGO been involved in landfill decommissioning and issues related to environmental sustainability?
8. In what ways was your NGO involved in the landfill decommissioning at Kpone Kokompe?
9. Why did your NGO choose to get involved in the decommissioning of the Kpone Kokompe landfill?
10. How does your NGO secure funding to engage in its activities at Kpone Kokompe?
11. How will the role your NGO plays in the landfill decommissioning improve the life of residents and the community?
12. What is your take on the replication of the decommissioning of landfills across the Country? Do you think this initiative should be replicated all over Ghana? (If Yes, briefly explain)

Closing Remarks: Thank you for your time, response and participation. Once again, be rest assured that all information provided will be used strictly for academic purposes.



Appendix 5: Ethical Clearance ECH 161/22-23.



UNIVERSITY OF GHANA
ETHICS COMMITTEE FOR THE HUMANITIES (ECH)

P. O. Box LG 74, Legon, Accra, Ghana

My Ref. No: ECH 161/ 22-23

April 19, 2023

Maame Ofewah Sarpong
Institute of Statistical, Social and Economic Research
University of Ghana
Legon

ETHICAL CLEARANCE (ECH 161/ 22-23)

The Ethics Committee for the Humanities (ECH) conducted a full board review and approved your protocol titled:

LANDFILL MANAGEMENT PRACTICES AND CHALLENGES: AN ANALYSIS OF
THE
**SOCIO-ECONOMIC, INSTITUTIONAL AND LEGAL CONTEXT OF
THE**

DECOMMISSIONED SITE IN KPONE KATAMANSO IN THE GREATER ACCRA
REGION OF GHANA

PRINCIPAL INVESTIGATOR: MAAME OFEWAH SARPONG

Please note that the final review report must be submitted to the Committee at the completion of the study. Your research records may be audited at any time during or after the implementation. Any modification of this research project must be submitted to ECH for review and approval prior to implementation.

Please report all serious adverse events related to this study to ECH within seven (7) days verbally and in writing within fourteen (14) days.

This certificate is valid until April 18, 2024. You are required to submit annual reports for continuing review.

Please accept my congratulations.

Yours Sincerely,

Professor C. Charles Mate-Kole
ECH Chair

CC: Professor Felix Ankoma Asante, ISSER, UG

Dr Simon Bawakyillenuo, ISSER, UG

Dr. Cynthia Addoquaye Tagoe, ISSER, UG

Tel: +233-303933866

Email: ech@ug.edu.gh

Appendix 6: GALLERY



Appendix 6 (a) State of Kpone Kokompe Landfill prior to Decommissioning

Source: EAP Consult, 2022



Appendix 6 (b) Stages in the Decommissioning Process

Source: EAP Consult, 2021.



Appendix 6 (c) Leachate from the Kpone Kokompe Landfill prior to Decommissioning. Source: EAP, Consult, 2023



Appendix 6 (d) Final Stages of Decommissioning of Kokompe Landfill
Source: EAP Consult, 2023



Appendix 6 (d) Final Stages of Decommissioning of Kokompe Landfill
Source: EAP Consult, 2023





Appendix 6 (e) Kpone Kokompe Landfill Post Decommissioning
Source: Fieldwork, (2023)

