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ASSESSING INDIVIDUALS' LITTERING BEHAVIOUR IN PUBLIC SPACES IN THE GREATER ACCRA METROPOLITAN AREA

BY

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DECLARATION

I declare that except for other persons whose work have been cited and duly acknowledged, this thesis is the outcome of my original research carried out in the institute for environment and sanitation studies, University of Ghana.

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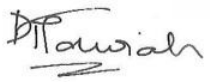

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ABSTRACT

Littering is a social and environmental behaviour involving indiscriminate waste disposal practice that challenges the government's quest for a clean city environment. This study explores individuals' littering behaviour in four urban public spaces in Metropolitan Accra, using cross-sectional convergent parallel mixed methods, including in-depth interviews, focus group discussion, and litter characterisation. The qualitative data analysis employed a thematic approach, while the quantitative data used descriptive statistics and binary logistic regression with IBM-SPSS version 23.

Individuals' perceptions revealed that littering is an everyday practice in public spaces resulting from collective action and a strategy to minimise private costs. Norms such as weak law enforcement, lack of litter bin, ineffective informal social controls, and absence of written prompts prohibiting littering were cited as justification for littering. Critical litter abatement approaches recommended included an adequate supply of litter bins, intensifying public education, and strict law enforcement. A binary logistic regression analysis revealed that participant age, group size, gender, activity engagement, litter items, crowdedness, existing litter in the environment, and distance to the litter bin significantly influenced littering behaviour. Also, age and littering behaviour depended on distance and vice versa.

The litter characterisation and branded audit recorded 37,280 pieces of items, with two-thirds, i.e., 78% being plastics, while paper recorded 14%, and organic, 2%. Broadly, the water and beverage industry litter, with Kasapreko, Multi Pac Limited, and Special Ice industries were dominant. The study identified factors that drive littering behaviour, including individual and contextual factors such as bad governance and leadership and incompatibility between local cultural norms and policies. The study recommends that the sector Ministry promotes civic responsibilities while urging the manufacturing industry and brand owners to channel corporate social responsibility activities towards post-consumer packaging litter management.

DEDICATION

This thesis is dedicated to my husband, Isaac Butias, with whom I have four lovely girls, Martha, Jessica, Mirabel, and Jolene, as well as the entire Butias and the Yandam family for their sacrifice, and love.

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LIST OF ABBREVIATION AND ACRONYMS

AMA	Accra Metropolitan Assembly
CBD	Central Business District
CBO	Community Based Organization
EPA	Environmental Protection Agency
ESP	Environmental Sanitation Policy
FGD	Focus Group Discussion
FMCG	Fast Moving Consumer Good
GAMA	Greater Accra Metropolitan Area
GRIPE	Ghana Recycling Initiative by Private Enterprises
MESTI	Ministry of Environment, Science, Technology, and Innovation
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Ministries, Metropolitan, and District Assemblies
MoH	Ministry of Health
MSWR	Ministry of Sanitation and Water Resources
NEAP	National Environmental Action Plan
PPEs	Personal Protective Equipment
PPP	Public Private Partnership
SDG	Sustainable Development Goal
SIP	Sanitation Improvement Package
SWM	Solid Waste Management
UNEP	United Nations Environment Programme

CHAPTER ONE

GENERAL INTRODUCTION

1.1 Background to the Study

Littering is a widespread environmental problem many cities face worldwide (Thushari, & Senevirathna, 2020; Oteng-Ababio & Nikoi, 2020). The practice is an indiscriminate solid waste, i.e., litter disposal behaviour (Moqbel et al., 2019). As rightly noted by Thushari and Senevirathna (2020), a litter is any domestic or commercial solid waste including debris or rubbish that is not placed in the right receptacle. Technically, people do litter for various reasons, yet the dynamic nature of littering makes its interpretation rather broad. Be that as it may, one thing is however clear, that, without human beings, littering would not exist. The practice may be aptly described as an attitudinal problem, an instinct, and a repetitive behaviour with significant negative consequences for the quality of the environment and public health.

Globally, structural changes such as increased population growth have aggravated solid waste generation and its accompanying protracted management problems, including litter, and littering in public spaces increasingly becoming problematic (Oteng-Ababio, 2020). Significantly, the public attitude towards littering can be characterised as the inclination to react positively or negatively towards throwing away waste or rubbish (Ojedokun, 2011). Nonetheless, littering behaviour can be distinguished from illegal dumping of bulk waste. Like littering, illegal dumping is also a global waste disposal problem (Olayiwola et al., 2017). Thus, both concepts are associated with the unlawful disposal of waste materials in unauthorized places. The difference lies in the quantity of materials disposed.

On the one hand, the Moreton Bay Regional Council's 2021-2026 Littering and Illegal Dumping Plan defined *illegal dumping* as the disposal of waste materials 200 litres and more (Moreton Bay Regional Council, n.d.). Similarly, the NSW Office of Environment and Heritage (2011) describe it to span from *"small bags of rubbish in an urban environment to larger-scale dumping of waste materials in isolated areas, such as bushland."* For Keep Pennsylvania Beautiful (2013), "*Illegal dumping often involves large items or large quantities of small items – appliances, tires, bags of daily trash, furniture, construction and demolition debris, and other household wastes*."

On the other hand, the practice of littering, i.e., littering behaviour is both a social, behavioural, and environmental problem (Schultz & Stein, 2009) which to date lack consensus in its definition. Therefore, in most cases, scholars do adapt definitions depending on the goal and context of a particular study, leading to several but related definitions of litter and littering. That notwithstanding, concerning the quantitative definition of illegal dumping as unlawful disposal of waste 200 litres and more, *littering behaviour* can then be defined as the disposal of waste not up to 200 litters. Likewise, the NSW Office of Environment and Heritage (2013) also defined litter as 'any abandoned material that can be held or carried in a person's hand', including such things as; drink cans, paper, and plastic bags, etc. So, for this study, littering behaviour is seen as the illicit disposal of pocket-sized waste materials in unauthorized places.

The position of this study in relation with the definition of litter and littering behaviour compares with the most commonly used definition which sees litter as 'waste in the wrong place' caused by human agency (Lyndhurst, 2012; Maier, 2019). It is further in sync with Beck's (2007) which defines litter (the item) as "*any abandoned material that can be carried in a person's hand."* Thus, from the study's position, a litter includes but

was not limited to "*any glass, chinaware, earthenware, tin, carton, paper, bottles, nails or other sharp substances, orange peel, banana skin or the skin of any fruit or the leaves or refuse, of any vegetable or rubber/polyethylene or empty sachet water bag or empty drinking water/soft drink container or any offensive, unwholesome or dangerous substance*" as stated in the Tamale Metropolitan Assembly Bye-Laws (2018).

The waste problem, and for that matter littering, has at its core specific interconnected structural changes with social fabric-altering capabilities including population outbursts, urbanization, industrialization, mass production/consumption, economic development, and rising affluence. The problem of poor waste management is a consequence of high population growth, rapid and unplanned urbanization, increasing urban affluence, and unsustainable consumption pattern (Suthar & Singh, 2015; World Bank, 2012). The problem is alarming in developing countries, including Ghana.

According to the World Bank (2012), urbanization is taking place at an unmanageable speed. It has also been outpaced by the quantum of solid waste produced in developing countries. Even so, these occurrences are amid inadequate local government capacities for urban service provision and sufficient waste management base for that matter (Jambeck et al., 2015). The consequence is mismanagement and incorrect waste disposal, including littering and illegal dumping in public spaces.

Since the Industrial Revolution, industrialization and mass production/consumption of fast-moving consumer goods (FMCGs) have been the foundation of massive waste generation and littering behaviour. Since the 1930s, when industrialization and mass production/consumption grew steeply and internationally and became globally widespread, litter discourse also gained universal popularity (Grubler, 1995; Reeve, 2005). At this time, there was a realization that environmental and human wellbeing was

threatened by the heightened disposal and waste and litter accumulation in the environment.

Packaging waste, especially plastic materials, is the worst culprit regarding urban waste disposal and littering. The birth of packaging and plastic products (mostly non-biodegradable) with the waste thereof has become the new normal globally. For instance, packaging waste constituted about 28.1% of municipal solid waste generated in the United States in 2018 (US-EPA, 2020). Consumption of packaging products in developing countries follows the same trajectory (Kaza et al., 2018) hence more packaging waste generation and disposal.

However, waste collection in developing countries is still rudimentary and ineffective because the material cultural change from less packaging and biodegradable items to mass production of non-biodegradable items has increased the amount of disposable waste in cities. A typical example in Ghana is the transition from the use of clay pots and cups for drinking water sales to the use of plastic sachet bags. Alternatively, waste disposal methods have not received the commensurate adjustment to manage such waste materials, rendering streets and other public spaces littered.

Again, rapid population growth, especially in developing countries escalates levels of consumption. This is tied to consumerism, a culture that encourages mass consumption of FMCGs coupled with what Chirisa (2013) called the 'buy, use, and throw-away' culture is a phenomenon that leads to the generation of waste. A phenomenon Hansmann & Steimer (2016) suggested leads to increased littering in public spaces.

Furthermore, the increasing employment rate in urban centres, longer working hours, and busy lifestyles accompanying economic growth have occasioned higher consumption of goods (Schultz, 2002) outside the home. Individuals, in many cases, make do with 'retail

therapy' according to Roach et al. (2019) as a coping strategy for such busy lifestyles. This pattern of consumption has been aided by the proliferation in the production of short-lived-single- use products that are convenient to consume on the go. Consequently, society has associated high consumption and throw away culture to affluence (Chirisa, 2013). Thus, the current way of life that Toffler (1970) called "The Throw- Away society" has escalated the problem of littering in public spaces.

Littering defies geographical boundaries, and everyone is prone to littering in time and specific contexts (‘Keep America Beautiful’, 2009a; Lyndhurst, 2012; Schultz et. al., 2013; Tanyanyiwa, 2015; Weaver, 2015; Williams et al., 1997). Regarding the spatial distribution of litter, the rate of accumulation is relatively higher in transitional areas where many people converge at a time, and a wide array of human activities are transpiring (Baabereyir, 2009). These transitional areas are mainly in public spaces like streets, walkways, transport terminals, parks, public open spaces, markets, shopping centres, and so on.

Aside from providing a platform for public life to thrive (Poklembovái et al., 2012), public spaces have physical, political, ecological, and other functions (Ercan, 2007). Public spaces play a crucial role in the achievement of sustainable development goals, particularly SDG 11.7 (Sustainable Development Solutions Network, 2015). Besides, public spaces are part of the urban environment which Hess, (2008) referred to as urban commons, a clear example of publicly shared resources, the use of which is open to all, and its management is by the community/ local government.

Individual actors/ users of these public spaces face a common dilemma (Kolodko et al., 2016). Because public spaces are shared spaces, and the fact that an individuals' single act of littering is perceived to be insignificant, people tend to litter more. This

phenomenon explains why the most cited litter hot spots are public spaces and why littering behaviour in public spaces has received more scholarly attention in recent times (Al-Mosa et al., 2017; Schultz et al., 2013).

However, public spaces, especially in developing countries, are characterized by inadequate waste management infrastructures, such as the inadequate supply and servicing of litter bins leading to constantly overflowing bins, inadequate disposal sites, and transfer stations. The result is a high occurrence and accumulation of littering and litter in public spaces, respectively, which also explains why public spaces have received much attention in littering behaviour studies within and outside academia as well as the focus of this thesis.

Littering comes with a consequence. For example, littered solid waste, especially plastic carried by runoffs ending in the marine environment, causes approximately US$ 13 billion per year of environmental damage to marine ecosystems according to a UN news in 2014 (Aretoulaki et al., 2021). Litter clean-up presents a substantial financial burden to many local authorities (Maier, 2019), exceeding $68.5 million per annum in some cities in Pennsylvania (‘Keep Pennsylvania Beautiful’, 2020). Other costs of managing litter include but are not limited to public health and risk of sanitation-related disease outbreak, lowering property value, and perennial flooding due to chocked of drains (Garg & Mashilwane, 2015; Khan & Ghouri, 2011; Yang et al., 2017). This consequence of littering has led scholars to call for more research in the field of litter and littering behaviour to ascertain the determinants of littering behaviour (Pahl & Wyles, 2017).

The magnitude of the effect littering has on the environment, society, economy, and ultimately human health and well-being has led several national and local governments to design and adopt varied strategies to reduce littering. A review by Hogg et al. (2012) identified five main littering interventions or approaches adopted over the years, namely,

environmental design, clean-up of prior litter, beautification, prompts, environmental education, and environmental participation. Other international experiences include the deposit refund scheme in the United States (Lewis et al., 2009), strict law enforcement, and hefty fines for littering in Singapore (Straughan et al., 2011).

In the case of Ghana, several initiatives have been adopted for litter reduction, including The National Sanitation Day campaign characterized by nationwide clean-up exercises, which started in November 2014. It was found, however, that the National Sanitation Day campaign was challenged by the absence of a legal framework to back its implementation and low community participation (Baidoo, 2017). A recent iconic litter reduction intervention is the Ghana government's 'litter bin project' which piloted the distribution of about 5,100 waste bins to some MMDAs, including Accra, Kumasi, Takoradi, Tamale, Ho, Dambai, and Cape Coast. The bins were placed along selected streets and public places to reduce the amount of litter that ends up on the streets. Despite these interventions, littering remains at the forefront of environmental problems, posing a challenge to city authorities in developing and developed countries alike (‘Keep America Beautiful’, 2009a). This persistent littering problem, therefore, requires more research to understand the problem of littering behaviour to come up with the best-suited interventions to reduce the litter problem.

1.2 Problem Statement

Littering remains a global environmental problem and has become a way of life, particularly in African countries (Hing & Gunggut, 2012). Abalo et al. (2017) pointed out that since waste and sanitation management became the sole responsibility of local government, community apathy to waste issues has increased, with rampant littering in public spaces. Litter and littering are impacting the environment, the economy, human health, and society at large. For this reason, the fundamental problem of interest for this

study is litter and littering behaviour in public spaces in the Greater Accra Metropolitan Area (GAMA). As a foundation for this study, four main problems are identified.

The first prevailing issue is a lack of research on litter and littering within the Ghanaian public spaces and by extension, developing country context. Scholars thus, calls for further research in littering behaviour within the developing countries , including Ghana, given that littering, like any human behaviour is rooted in local contexts. There is, therefore, the need to study littering within specific social, environmental, and political settings within which the behaviour is occurring to contextualize our understanding of littering behaviour.

Besides, owing to the differences between developed and developing countries regarding broader socio-cultural, economic, environmental, and political state-of-affairs, factors influencing littering behaviour may be different (Santos et al., 2017). So local interventions cannot confidently use the findings of research from the developed countries context. This is because developing countries are quite peculiar, more importantly in their levels of waste management services and infrastructural development, policies, and scale of programs adopted for litter prevention, waste financing, among others. For instance, Straughan et al. (2011) found in a study that poor waste management is a contributing factor to individual littering behaviour.

This is further revealed in an assertion by Straughan et al. (2011) that though waste and litter volumes are relatively lower in developing countries, they are the main offenders in waste and litter-related environmental pollution. Not surprisingly, Al-Mosa et al. (2017a), in their review of the literature, called for scholars to extend their understanding of the littering problem to the otherwise insufficiently explored developing countries settings.

To further reiterate the study gap on litter and littering behaviour, it is worth mentioning that literature on waste management in Ghana, including all the hierarchies and aspects, is robust (Adu et al., 2020; Ahmed & Isaac, 2016; Fagariba & Song, 2017; Korley & Richmond, 2017; Miezah et al., 2017; Oduro-appiah et al., 2017; Oteng-Ababio, 2012). However, with respect to litter and littering studies in Ghana, scholars have often concentrated on the marine and coastal environment (Van Dyck et al., 2016; Himans, 2013; Tettey, 2015; Tsagbey et al., 2009). The terrestrial environment, specifically public spaces thus require further exploration with respect to litter and littering behaviour.

Second, scholars including Amankwah-Poku (2020) and Ocansey, (2006), who studied why people litter in Ghana, explored a homogenous population, i.e., students in an educational institution, the findings may not reflect behaviour tendencies of the general population in Ghana. This presents an opportunity for this study to focus on the general public in multiple public spaces to understand why people litter. Additionally, because, self-report surveys as employed in these two studies have been found to produce biased findings and potentially underreporting littering behaviour (Rundle-Thiele et al., 2012; Schultz & Stein, 2009). There is the need for this study to complement the self-reported methods with observation method to achieve a more accurate measure of littering behaviour (Anderson & Francois, 1997; Pahl & Wyles, 2017) as well as a comprehensive view of littering behaviour.

Third, data on municipal solid waste composition abound ranging from household and other institutional waste (Miezah et al., 2015; Peprah, 2013) to marine litter composition (Van Dyck et al., 2016; Himans, 2013; Tettey, 2015; Tsagbey et al., 2009). Yet, more needs to be done on public space litter composition in Ghana, to provide reliable data to inform local assemblies litter management and recovery strategies.

Furthermore, it is common knowledge that c However, less is known about the specific brands that dominate the litter stream in Ghana. On the international front, branded litter audit is gradually receiving research interest, especially from state and city agencies (Environmental Resources Planning, LLC, 2012; Stevens, 2008), but more is yet to be done (Kerdpitak & Mekkham, 2019). This study was therefore carried out to enhance our understanding of the brands dominating the litter steam in four public spaces in GAMA.

Finally, policy implementation is widely recognised as a major challenge in developing countries (Ekane, 2018), including Ghana, and the sanitation and waste management sector is no exception. This problem is strongly articulated in key sanitation policy documents, including the Ghana *Environmental Sanitation Policy* (2010) and the *National Plastics Management Policy* (2020). However, a myriad of p olicy implementation related studies abound in the developed country context, thus, creating a knowledge gap in the developing countries context (Ekane et al., 2019). This study therefore sought to assess the policy implementation challenges and the ways to forward for effective policy implementation.

1.3 Purpose Statement

The purpose of this study was to explore individual littering behaviour in public spaces in GAMA, intending to expand understanding of the factors influencing individual littering behaviour, litter composition and brands dominating the litter stream in public spaces, policy implementation, and littering law enforcement challenges, as well as identify possible intervention paths for litter abatement in Ghana. In other words, the research attempted to address issues relating to the drivers of individual littering behaviour in public spaces in GAMA. So, the objectives that guided the study are,

1.4 General Objective

The main objective was to understand individual littering behaviour in public spaces in GAMA.

1.4.1 Specific Objectives

Specifically, the following objectives were set to address the general objective.

1. To assess individuals' perception about littering in public spaces in GAMA.
2. To determine the factors influencing individual littering behaviour in public spaces in GAMA.
3. To assess the litter composition and identify the brands dominating the public space litter stream in GAMA.
4. To explore the challenges of littering abatement policy implementation and enforcement.

1.5 Research Questions

The following research questions were set to address the research objectives,

1. How do individuals perceive littering in public spaces in GAMA?
2. What are the factors influencing individual littering behaviour in public spaces in GAMA?
3. What is the material composition of litter and the brands dominating public space litter stream in GAMA?
4. What are the challenges of littering abatement policy implementation and enforcement?

1.6 Significance of the Study

The study presents a response to the call by scholars for the use of broader perspectives to guide investigation into behavioural issues like littering and guide effective behaviour change intervention planning (Al-Mosa et al., 2017a; b; Luca & Suggs, 2013; Truong,

2014). It further considered applying an ecological model to serve as a framework to investigate broader variables not examined in prior studies (Al-Mosa et al., 2017a; b; (Schultz et al., 2013).

It Also extends knowledge on the psychological and environmental factors influencing littering behaviour to the Ghanaian, and hence sub-Saharan Africa and the developing country context as extensive literature abound in the western country's contexts (Chaudhary et al., 2021; Moqbel et al., 2019; Oluyinka, 2011). It will serve as a framework to guide effective litter management intervention design and evaluation in Ghana. Moreover, to complement the studies in Ghana that are limited by their use of self-reported measures on a homogeneous population (Amankwah-Poku, 2020; Ocansey, 2006), the current study combines self-reported method with behaviour observation to study the general public in four public spaces which offers a comprehensive picture of littering behaviour in Ghanaian. Finally, the study provides data on the composition and brands dominating the public spaces litter stream in GAMA to inform appropriate policy directions.

CHAPTER TWO

LITERATURE REVIEW

The chapter presents a literature review on litter and littering behaviour. The review covers materials related to the following; the definition of basic concepts, a general overview of related studies, the effect of the litter problem, international experience in litter prevention, policy framework for litter prevention and management in Ghana. It concludes with a methodological review and the theoretical framework for the current study, integrating the empirical evidence from prior littering behaviour studies.

Litter and littering are a worldwide sore-point (Leijdekkers et al., 2015; Maier, 2019), creating a nuisance in the environment and the public (Muñoz-cadena et al., 2012). It is both a human behavioural and environmental problem (Schultz & Stein, 2009). The litter problem has been viewed in diverse ways. Drawing from some subdisciplines like behaviourist and social psychologists, littering behavior has commonly been defined as an individual behavioural issue (Hogg et al., 2012) that stem from the social norm and individual behavioural intentions and choices. Others have taken the economic perspective defining the litter problem as an externality of economic production, marketing, and consumption, an unintended economic cost (NSW Office of Environment and Heritage, 2013). Notwithstanding, littering is the inappropriate disposal of pocket-sized waste materials in this study.

2.1 Global Snapshot of Litter and Littering Behaviour

Globally, littering has been found to be widespread with almost everyone susceptible to it at some point and in different circumstances irrespective of a person's gender, age, race, income, and educational level (Lyndhurst, 2012). Littering behaviour is practiced both in developed and developing countries (Chaudhary et al., 2021; 'Keep America

Beautiful', 2009a; Tanyanyiwa, 2015;) alike. Evidence of this has been reported internationally from surveys and behaviour observation studies.

In Scotland, a survey revealed that about 80% of streets were littered, and about 73% of respondents reported that the problem of littering has remained steady since 2013 (Keep Scotland Beautiful, 2016). Reports from the United Kingdom showed a worsening case of the littering problem, with an estimated 500% increase in littering rate annually since the 1960s (Eccleston, 2008). However, in the United States, while the general litter rate recorded a reduction of 61%, plastic litter increased by 165% using 1969 as a baseline (Schultz & Stein, 2009). Reports from the developed countries, notwithstanding their highly efficient waste collection systems, demonstrate how persistent the litter and littering problem is in the global community.

Littering seems acceptable in individuals' daily lives in developing countries (Tanyanyiwa, 2015). Reports of littering show an even staggering situation, mainly because of developing countries' relatively ineffective solid waste management services, inadequate waste management infrastructure, and weak financial and institutional capacities. Comparatively developing country case has not been extensively documented due to relatively limited research on litter and littering behaviour compared to the developed countries (Chaudhary et al., 2021).

Notwithstanding, a study by Nkwocha and Okeoma (2009) involving Six thousand participants living along 120 streets in 20 towns in Nigeria found litter rating on all the streets to range from "very high" to "high." In Jordan, littering has been considered a norm, with about 70% of respondents asserting this fact (Moqbel et al., 2019). This trend in littering in developed and developing countries highlights the surge of interest in littering behaviour studies from scholars across disciplines in recent times and the need

for more exploration of the problem to expand knowledge and inform policy on appropriate litter control measures.

Despite the universality in the prevalence of littering worldwide, littering behaviour varies across and within countries (Lewis et al., 2009). A review of country and state-level studies shows variations, especially in the number of respondents who admit to having littered at some point in time and under certain conditions. For instance, the rate of littering in developed countries varies from about 48% in Scotland (Eccleston, 2008), 40-50% in the US (Lewis et al., 2009) to as low as 20% in England and 16% in New Zealand (Keep New Zealand Beautiful, 2018).

In developing countries, littering rates can get as high as 70% in Palestine, as revealed in a study by Arafat et al. (2007). Also, Nkwocha and Okeoma (2009) found a similar rate, with 78.8% of respondents admitting to littering the streets in Nigeria. Similarly, Moqbel et al. (2019) found a 70% rate of littering in Jordan. However, in their study, Al-Mosa et al. (2017b) found a lower littering rate of 48% from three parks in Saudi-Arabia.

Consequentially, the reports discussed in the preceding paragraph may not offer the true picture of littering rates because of some methodological weaknesses associated with self-reported behaviour. This is an important caveat to note, especially from self-report surveys, because littering in some contexts or cultural settings is perceived to be a shameful act. Thus, people may be tempted to give socially desirable responses. In their study, Schultz & Stein (2009) found that 35% of participants who were observed littering moments before being interviewed reported that they had not littered in the past month. A national survey in New Zealand also found that about 42% of respondents who had just been observed littering cigarette butt moments ago said they had never littered or

had not littered in ages ('Keep New Zealand Beautiful', 2018). This can lead to underreporting of actual littering behaviour (‘Keep America Beautiful’, 2009a).

Besides, variation in these results may also result from the differences in sample sizes of these studies and the cultural and political setting within which these studies took place (Lyndhurst, 2012). For example, in many developing countries, littering is a widely accepted practice, considered a norm (Moqbel et al., 2019; Garg & Mashilwane, 2015), in which case individuals are more likely to admit to littering. This informed the methodological choice in the current study. Thus, to overcome this methodological problem, this study utilized naturalistic observation approaches to study individuals’ behaviour in public spaces to ascertain the factors influencing littering behaviour.

2.2 Why Do People Litter?

Why do people litter? This is one frequently asked question in attitude and behaviour surveys in littering research. A review of the literature has presented varied reasons why individuals litter since littering as a human behaviour varies based on psychological, social, and situational factors (Al-Mosa et al., 2017a; Schultz et al., 2013). Surveys in the developing countries often state reasons such as no litter bin, lack of law enforcement, laziness, area is already littered, litter clean-up is someone else’s job, ignorance, and others (Freije et al., 2019; Moqbel et al., 2019; Nkwocha & Okeoma, 2009; Shimazu, 2018).

Respondents stated similar reasons for littering in the developed countries (Beck, 2007; Lewis et al., 2009; Lyndhurst, 2012; Schultz & Stein, 2009). A study in Jordan by Moqbel et al. (2019) solicited participants responses regarding why they littered. Their findings suggested that people littered because they perceived that maintaining a clean environment was not their responsibility and that it was an accepted norm to litter. Their

study also revealed a conflicting finding where participants were found to have a negative attitude towards littering, i.e., littering is bad, at the same time, about 70% asserted they would litter based on the descriptive littering norm that many people litter in Jordan.

Another study in Nigeria revealed that littering was an expression of participants' anger and frustration towards institutional and governmental failure in providing proper waste management and other basic urban services (Nkwocha & Okeoma, 2009). This highlights the level of subjectivity and context-sensitivity in the reasons individuals associate with their littering behaviour. Further, the majority of individuals who littered (54%) and general respondents (69%) pointed to the inconvenience of holding on to their litter items as the reason for their littering at Nagase River (Shimazu, 2018).

Again, based on a sociological stance, the mere interpretation of litter can account for individuals littering behaviour or otherwise. In one survey, individuals stressed that dropping biodegradable items does not constitute littering (Lewis et al., 2009; Lyndhurst, 2012; Schultz & Stein, 2009). The perception is that biodegradable items pose no risk to the environment, which justifies littering.

A related justification for individual littering based on perceived negligible environmental consequence is the size of the litter item in question. Thus, littering or otherwise is often interpreted based on the size of the litter item disposed. Dropping small items like toffee wrappers, cigarette butts, and chewing gum are not considered littering because they are too small to impact the aesthetic quality of the environment (Maier, 2019). In America, irrespective of the low frequency of littering, many participants admitted to not opposing littering if the litter item is small like cigarette butt and confection, biodegradable like food remnants, thus, causing less harm to the

environment (Schultz & Stein, 2009). In line with this, ‘keep America Beautiful' (2009b) found a statistically significant relationship between respondents littering behaviour and litter item evaluation as biodegradable.

Surveys have also revealed that individuals stressed the importance of convenience regarding litter handling. Not only do individuals not want to experience the inconvenience of carrying litter around for disposal in a bin but not wanting to soil themselves with messy, wet, and sticky litter items (Williams et al., 1997). It is evident that the motivation and barriers of littering can be intrinsic, i.e., psychological/cognitive factors and at best subjective and extrinsically driven, i.e., influenced by contextual factors. Thus, the reasons behind littering behaviour are perception-based and context-driven. Hence, the need for the current study to undertake a context-based exploration of the reasons why people litter in public spaces in GAMA. This review reveals that individuals’ reasons for littering are based on certain beliefs stemming from the social, political, and physical environment. Thus, objective one of this study intended to assess individuals’ perceptions about littering in public spaces in GAMA.

2.3 Effects of Litter

The environmental implication of litter and littering goes beyond its loss of esthetic quality to include pollution, especially from plastic and cigarette butt litter that releases toxic substances into the environment during decomposition (Hansmann & Steimer, 2016; Muñoz-Cadena et al., 2012; Rudolph et al., 2011). Respondents in Maier's (2019) discussion paper listed the perceived impact of littering according to the magnitude of impact as follows; threat to wildlife, high costs for the removal of littering, aesthetic problem, danger to human health, negatively impact waterways, the introduction of microplastics, release of harmful substances, harm to ecosystems, and threat to marine life.

Evidence also suggests that littering and litter in an environment has a spill-over effect of not only leading to environmental defacement but also other anti-social behaviour and incivility. It has been demonstrated in several studies that litter attracts more litter (Al-Mosa et al., 2017a; Bergquist et al., 2021; Tehan et al., 2017; Weaver, 2015). This effect of litter transcends environmental implications to include economic and social implications. The economic implication is that litter cleanup will have to be very frequent to avoid more litter accumulation in the environment, thus leading to higher clean-up costs.

Socially, litter in the environment acts as a source of information, signaling a descriptive norm favouring delinquent behaviour, including crime, petty theft, and others, thus, activating the broken window effect (Keizer et al., 2008; Wilson & Kelling, 1982). Hansmann and Steimer (2016) further stressed that litter affects residents' quality of life and general well-being. Additionally, Garg and Mashilwane's (2015) study revealed a negative association between a littered environment and residents' pride and morale. It is not surprising that Kim (2010), Latkin and Curry (2003), Powell-Wiley et al. (2013), and Shenassa et al. (2006) found littering to be associated with other social problems like low physical activity, obesity, and depression.

Further, litter has undesirable economic effects. It has been shown to diminish existing business and property value within littered vicinities and discourage direct investment in such polluted environs ('Keep America Beautiful', 2009b; 'The Abell Foundation', 2011). A survey by Garg and Mashilwane (2015) in South Africa indicated that respondents stressed that businesses are affected immensely by litter and littering.

Other surveys have linked the presence of branded litter to the diminishing of such brands' reputation and image. If individuals are exposed to brands as litter, their

perception of the brand image and reputation is affected negatively (Kolodko et al., 2016). This has been estimated to reduce the amount customers are willing to pay for their products, i.e., a cheeseburger by 4 pence (Parker et al., 2015; Roper & Parker, 2006; 2013).

The tourism industry is another hard-hit area with regards to litter effects. Litter affects people's place satisfaction and willingness to patronize public spaces, particularly beaches (Saidan et al., 2017). Similarly, marine litter has become an major topic of discourse on the global agenda due to litter and waste leakage from the formal waste management systems worldwide, of which land-based littering is no exception (Maier, 2019).

It is apparent from this discussion that the consequence of littering is a clear threat to achieving the global sustainable development goals (SDGs). Its impact on the SDGs is deleterious because it affects several SDGs simultaneously, including SDG 3, 6, 11, 14, and 15. Thus, the need for further exploration of litter and littering to inform policy and litter management interventions.

2.4 Litter and littering Prevention and Management Approaches in Singapore and Rwanda.

Singapore and Rwanda's experiences in litter and littering management are discussed to demonstrate some of the innovations that have been adopted in various countries. Singapore and Rwanda are of particular interest because of their strives in keeping cities clean despite their challenging developmental history (Mbuligwe, 2013; Yew, 2019). Like Ghana, both countries are former colonies and gained independence around the same time though years after Ghana's independence. Singapore and Rwanda attained independence in 1965, and 1962 respectively (Lorrainedzeka, 2020; Yew, 2019). Unlike

Rwanda and Ghana who are still developing and urbanising, Singapore is currently far advanced in development and urbanised. However, about four decades ago, all three counties were less developed with issues of waste and environmental pollution, including littering.

Like Rwanda and many other countries, Singapore's litter control approaches consist of public education campaigns, frequent litter clean-ups, distinctive use of strict law enforcement and hefty fines for littering, among other measures. Singapore adopted a public education campaign in 1968 with the aim of changing individual littering behaviour dubbed 'Keep Singapore Clean' (Straughan et al., 2011), which is similar to campaigns in other countries, like 'Keep America Beautiful,' 'Keep New Zealand Beautiful,' and 'Keep Britain Tidy' in the USA, New Zealand, and Britain, respectively ('Keep America Beautiful', 2009a; 'Keep New Zealand Beautiful,' 2018). However, such educational campaigns have been demonstrated to be ineffective in changing individual littering behaviour without accompanying structural and regulatory systems needed to support and sustain such behaviour changes. Straughan et al. (2011) stressed this point in the case of Singapore, where the incidence of littering had increased during the campaign 'Keep Singapore Clean,' attributing it to the leniency of the law at the time. Ong & Sovacool (2012) expressed a similar sentiment indicating a rise in littering offences of about 27000 in 2008 over 2005 figures after four decades of implementing the public education programs thus, calling for other littering abatement approaches.

The failure of educational approaches for litter abatement in Singapore called for strict law enforcement. Litter-related law enforcement became the hallmark of Singapore's littering prevention measures. The 1968 Environmental Public Health Act (EPHA) of Singapore criminalised littering, and offenders are slapped with hefty fines not more than S$2,000, S$4,000, $10,000, in 2014, doubling over the 2013 fines for first-time, second-

time, and third-time and above offenders respectively (Khew, 2015; Ong & Sovacool, 2012). Also, "Corrective Work Orders" is another punitive measure for littering introduced in 1992 in Singapore. Section 21A of the 1968 Environmental Public Health Act (Chapter 95) pronounced the punishment for littering offenders above age 15 years to clean up some public places for about 12 hours as a way to reform their behaviour and clean up the environment (Chan, 2003). These offences are detailed under sections 17 or 19 of the Environmental Public Health Act. However, there are divergent views on the effectiveness of the corrective work order in deterring littering behaviour in Singapore. Authors like Chan (2003) have argued that the effectiveness of such an approach is short-lived. Nonetheless, empirical evidence from the field demonstrates otherwise. In a study by Straughan et al. (2011), more than two-thirds of respondents perceived the corrective work order to reduce littering behaviour. Besides, Singapore has since kept many parts of the country free of litter, indicating that such interventions do have littering reduction efficacy.

In the case of Rwanda, a participatory approach to education and community sensitisation was adopted in 2009, dubbed 'Umuganda' (Hakuzimana, 2021). 'Umuganda' is characterised by monthly clean up exercise involving all citizens between the ages of 18 and 65 years, thus, strengthening the social capital, i.e., fostering trust, citizen cooperation, and national sense of pride towards the achievement of litter-free cities (Lorrainedzeka, 2020; Torgler & Garcia-Valiñas, 2011). The success story of Umuganda is linked to the high political commitment with the president and cabinet members frequently gracing the occasion, as well as a legislative backing and active involvement of law enforcement agencies (Lorrainedzeka, 2020). Thus building a positive pro-environmental attitude and behaviour among citizens

Like, Singapore, Rwanda has not relented in strict penal and law enforcement measures to litter prevention. Solid waste management, including litter control in Rwanda, is strongly supported by the policy, regulatory framework, and enforcement (Mbuligwe, 2013). For example, fines of about 5,000 francs are levied against eligible citizens who default in participating in 'Umuganda' (Yee, 2018). Rwanda also embarked on the provision of public space litter bins to support correct litter disposal behaviour (Mbuligwe, 2013), which re-enforces the environmental consciousness of the masses, thereby impacting positively on their correct litter disposal choices.

Moreover, a legislative approach through a ban on the production and use of specific plastics like plastic bags (Danielsson, 2017) and street vending (Nilingiyimana & Shukla, 2018) has contributed immensely to keeping Rwanda free of litter. Plastics dominate the litter stream in many countries, especially developing countries (Awusi & Kyei, 2017; Van Dyck et al., 2016; Environmental Resources Planning, LLC, 2015), so a ban of such stature will invariably reduce the rate of litter accumulation in public spaces.

Other international experiences in litter and littering abatement include economic instruments such as taxes, charges, subsidies, deposit-refund systems, among others (Oosterhuis et al., 2014; UNEP, 2020). For instance, deposit-refund schemes have been implemented in several countries, including the United Kingdom, Germany, United States of America, Maryland, Scotland and others (The University of Maryland Environmental Finance Center, 2011; Hogg et al., 2010). The purpose of such schemes is to retrieve existing litter and prevent further accumulation of such litter in the environment (Hogg et al., 2010), and have been argued to reduce litter and littering significantly (The University of Maryland Environmental Finance Center, 2011). Also, in counties like Germany, South Africa, Japan and others, littering has been significantly reduced through Extended Producer Responsibility (EPR) (UNEP, 2018), a concept that

places the responsibilities of litter control on manufacturers and brand owners through product design or end-of-life management of waste from their outfits.

Furthermore, the industry have attempted to address littering and post-consumer waste management through voluntary measures like Corporate Social Responsibilities (CSR) and committing to some formal but voluntary agreements. For instance, at the 2018 World Economic Forum, 11 brand owners and major industry players pledged to encourage waste reduction, reuse, and recycling through product design (Godfrey, 2019). Despite these interventions and strides by many countries to ensure clean and sustainable cities, littering remains a global environmental and health problem, hence requiring further exploration to inform policy decisions in that regard.

2.5 Litter and Littering Prevention and Management Approaches in Ghana

2.5.1 Programmes and Projects for Litter Management in Ghana

Ghana has adopted a combination of approaches in curbing litter and littering, albeit with varying success. Ghana has established sanitation courts to preside over waste and sanitation-specific infringements in Ghana. Some prosecutions for indiscriminate dumping of bulk waste and the littering offence have been made in recent times, especially in AMA. For instance, the La District Sanitation and Motor Court fined a littering offender GHc360.00, translating to about 30 penalty units, and subsequently sentenced the offender to serve a prison term of two months for inability to pay the cash fine. Also, on 13th March 2018, three persons were imprisoned for eight months upon failure to pay the fine of Six Hundred Ghana Cedis (GHc600.00) each for violation of Public Health Act 2012, Act 851 under section 56 (a) and (b). In July 2017, the Abeka Sanitation and Motor Magistrate Court fined nineteen people to an amount to Seven Hundred and Twenty Ghana Cedis, an equivalent of Sixty penalty units for violations of the same Public Health Act. It is clear from these actions by the courts that sanitation and

littering issues are of great importance in Ghana. However, the challenge is that enforcement is still lacking because of the widespread littering versus the frequency of prosecutions being done by the sanitation courts.

Moreover, various MMDAs in Ghana undertake frequent public cleansing through Public-Private Partnerships, PPPs with the private sector institutions to ensure litter-clean public spaces (*Solid Waste Management Model / Strategy for Ghana-Draft*, 2019). For instance, public space waste collection and street cleansing activities in Ghana are undertaken under the Sanitation Improvement Package (SIP), a PPP between the various MMDAs and a private waste service provider. Furthermore, another litter abatement strategy in Ghana is public education and sensitisation aimed at changing people's waste management behaviour. In this regard, the "National Sanitation Day" campaign, similar to "Umuganda" in Rwanda, characterised by monthly clean up exercises, was initiated in 2014. It was, however, found that the National Sanitation Day campaign was challenged by the low community participation and absence of a legal framework to back its implementation (Baidoo, 2017), which led to its short lifespan.

In addition, a mass street litter bin provision in major urban streets is being rolled out to reduce the rate of littering through the 'litter bin project' by a collaborative action between the various MMDAs and the Ministry of Sanitation and Water Resources. Also, some industry players, specifically manufacturing companies in 2017, committed to contributing to reducing littering and the environmental effect of end-of-life plastic materials through a coalition called "Ghana Recycling Initiative by Private Enterprises" (GRIPE) (Kutten, 2019). However, activities of GRIPE are geared towards public education and awareness-raising, advocacy and stakeholder collaborations rather than contributing to the physical management of post-consumer waste materials. Much effort

and resources have been invested in managing litter and littering in Ghana, but with room for improvement given that the litter problem persists.

2.5.2 Legal and Policy Framework for Litter and Littering Management in Ghana

Ghana has instituted a solid legal and regulatory framework targeting litter prevention and SWM in general. This is reflected in many statutes prohibiting littering and the illegal disposal of solid waste in unauthorised places. For instance, chapter six of the 1992 Constitution of The Republic of Ghana, under the directive principles of state policy, pronounced that the duties of a citizen include,

> *(k) "to protect and safeguard the environment".*

Also, clause 9 under the economic objective of the same chapter states that,

> *"The State shall take appropriate measures needed to protect and safeguard the national environment for posterity; and shall seek co-operation with other states and bodies for purposes of protecting the wider international environment for mankind"* (Ghana's Constitution of 1992 (Rev.1996).

Correspondingly, Paragraph 1 of section 296 of Ghana's Criminal Code (Amendment) Act, 2003 (Act 646) criminalises indiscriminate waste disposal practices like throwing rubbish in the street, indiscriminate dumping of bulk waste, littering, among others pronouncing it as causing a public nuisance. It states that,

> *"(1) in any town places, or causes or permits to be placed, any carrion, filth, dirt, refuse, or rubbish, offensive or otherwise unwholesome matter, on any street, yard, enclosure, or open space, except a place as may be set apart by the local authority or the health officer for that purpose; or Nuisances"* (Criminal Code, 1960, Act 29 (Amended 2003)

Littering is also a public health concern and has been prohibited in item (3) paragraph (d) of section 148 under the guidelines and code of practice in the Public Health Act 2012 (Act 851);

> *"prohibiting or restricting […] littering the premises where food for human or animal consumption is manufactured or stored, or sold, offered or exposed for distribution or sale".*

Following this trajectory, regulations under the sanitation byelaw of the Accra Metropolitan Assembly's 2019 byelaw penalises offenders,

> *"to a fine, not more than hundred penalty units or a term of imprisonment of not less than thirty days and not more than six months or to both; and in case of a continuing offence, is liable to a fine of not more than one penalty unit for each day that the offence continues."*

It is clear from these legal provisions that litter and littering is a well-recognised problem in Ghana, thus many attempts have been made from the public health and environmental perspectives to reduce the problem to the barest minimum.

2.5.3 Policy Framework for Litter and Environmental Management

The National Environmental Policy of 1995, is the overarching policy document regarding general environmental protection and management and The National Environmental Action Plan (NEAP) sets the framework to guide action to ensure sustainable management and conservation of the environment, including waste management and, by extension, litter and littering reduction. Comparably, Ghana's Environmental Sanitation Policy, 2010, provides direction for the sanitation sector practices and procedures. Also, the National Plastics Management Policy, 2020, seeks to promote environmental cleanliness and human health through sustainable management of plastic waste within the circular economy framework.

Other policies and Acts of parliament relating to litter control and environmental management include the Ghana Local Government Act 1993 (Act 462), placing the responsibility of waste and litter management to local assemblies. The Ghana National Procurement Act 2003, Amended Act 2016 (Act 914) and other national legislative

instruments that provide rules for solid waste management contract procedures and actions. All these policies and Acts of Parliament aim at effective environmental and waste management, including littering.

2.5.4 Institutional Framework for Litter Management in Ghana

Environmental, waste, and sanitation, and hence litter management governance involve multilevel governance where varied responsibilities are spread horizontally and vertically among different governmental agencies. In Ghana, the lead agency regarding environmental management and sustainability providing oversight regulatory responsibility is the Environmental Protection Agency, EPA, while policy formulation lies with multiple central government ministries. For instance, the Ministry of Environment, Science, Technology, and Innovation, MESTI, is responsible for formulating policies, monitoring the implementation of sector programmes and projects covering general environmental issues, including sanitation, waste, and littering control. The Ministry of Sanitation and Water Resources, MSWR, oversees policy and plans preparation specific to sanitation and waste management issues. The Ministry of Local Government and Rural Development, MLGRD, deals with policies and plans for promoting local governance and the decentralisation framework. The Ministry of Health, MoH, deals with health sector-specific waste and sanitation issues while waste and sanitation financing planning lie with the Ministry of Finance. The Ministry of Education and the Ghana Education Service, GES, plans for sanitation and hygiene educations in schools, and the list goes on.

Implementation of waste and sanitation responsibility lies with local government agencies, i.e., the various MMDAs, in collaboration with the private sector through Public-Private Partnerships (PPPs) and other contractual arrangements, as well as some Community Based Organisations (CBOs), and informal actors in the sanitation sector

and the waste value chain. Thus, environmental, waste and sanitation responsibilities have been fragmented among government agencies without clear segregation of duties, which makes accountability and implementation problematic (Coleman, 2018). Policy implementation and enforcement challenges have been emphasised by (Akurugu et al., 2018), as well as key sanitation policy documents, including the Ghana Environmental Sanitation Policy (2010) and the National Plastics Management Policy (2020) in Ghana. The consequence of weak policy implementation and enforcement is the poor waste disposal behaviour, including littering (Attafuah-Wadee, 2018). Thus, the fourth objective of this study aims to assess the policy implementation challenges specific to littering and waste management and the ways forward for effective policy implementation.

2.6 Litter and Littering: The Role of Industry

Despite the enormity of information available on litter and littering behaviour, limited literature has been documented exploring the contribution of industry in general and specific brands to the litter and littering problem. Research hardly attributes the litter and littering problem to industry even though packaging materials that are often littered are produced by industry (Roper & Parker, 2006). This trend in litter research can be explained by the fact that most of littering research is undertaken from the psychological and sociological fields (NSW Office of Environment and Heritage, 2013). The limited studies that have taken an economic stance have often tried to link litter to place attitude, brand image, the anticipation of incivilities, perceptions of crime, and brand evaluation (Medway et al., 2016; Parker et al., 2015; Roper & Parker, 2013).

This line of inquiry also does not explicitly portray the contributing role of brand owners to the volumes of litter accumulated in the environment. Nonetheless, they recommend that manufacturers, i.e., brand owners must ensure that their brands do not end up as

litter due to the negative effect on the brand image (Roper & Parker, 2006). There is a rising interest to investigate and identify the brands dominating the litter stream because of the increasing recognition of the role of industry in litter generation and its management. Several national and city-wide litter audits have begun to be documented, including Environmental Resources Planning, LLC (2012; 2013), Muñoz-Cadena et al., (2012), and Okuku et al. (2020)

There is evidence that industry and brands have varying levels of pollution (Cingolani et al., 2016), as with some packaging materials per the design (Tehan et al., 2017; Wever et al., 2010). Thus, to have a comprehensive understanding of the litter problem, the role of industry in contributing to the problem and the solution is crucial. This informed the goal of this study to assess the litter composition and dominant brands in public space litter stream. This will inform material recovery strategies and direct the focus of policies concerning litter management.

2.7 Perspectives and Methodological Trends in Littering Behaviour Studies

Littering as an environmental problem has received enormous attention from researchers in various scientific disciplines and sub-disciplines (Schultz et al., 2013; NSW Office of Environment Heritage, 2013). Some include behavioural psychology, social psychology, sociology, environmental education, marketing, and others.

The foremost approach in littering studies was behavioural science, where researchers tried to study littering from the behavioural psychological viewpoint. The focus of these studies was the individual-level determinants of littering behaviour i.e., individual demographic characteristics such as age and gender and psychological/cognitive factors like perceptions, awareness, personal norm, motivation, and barriers to littering, and so on.

A review by Chaudhary et al. (2021) indicated that the earliest litter and littering behaviour-related studies between the 1970s and 90s attempted to change individual littering behaviour through the use of instructions and messaging, then to prompts following recommendation thereof. Their review also revealed that methodologically, the earlier studies typically adopted quantitative (experimental) research approaches.

From the 90s to 2000, researchers began to get less rigid in their research approaches by including observations and surveys (Meeker,1997). However, the focus was still on littering prevention through public education and awareness creation. By this time, sociological and social perspectives in littering studies had emerged where scholars began to explore social influences on littering behaviour and litter reduction. Some of the notable work around this time is Cialdini et al. (1990) and Kallgren et al. (1993).

The emergence of the sociological perspectives was because of the influential role social context play in modeling individual behavioural outcomes. It was apparent that in addition to individual psychological factors, contextual factors, i.e., the physical environment and social norms play an immense role in influencing behaviour (Lockwood et al., 2020). Scholars then began to call for more comprehensive approaches to studying littering behaviour.

The focus had expanded to include trying to explore the key determining factors of individual littering behaviour. Scholars studied the interrelationship between the individual-level factors, i.e., psychological and demographic factors, and interpersonal-level factors i.e., social norm and the environmental, i.e., state of the physical environment, and how they can best explain littering behaviour. The approach assumes that behaviour is context dependent. For instance, Schultz et al. (2013) studied the personal and environmental determinants of individual littering behaviour in some

outdoor public locations across the United States. They found 15% variance in individual littering behaviour was accounted for by environmental factors like existing litter in the environment and availability of litter bins.

Al-Mosa et al. (2017) took it a step further, by studying individual, social, and environmental-level determinants of littering behaviour across three different parks in Saudi Arabia. Their findings compare favourably with Schultz and his colleagues (2013) study. Furthermore, Lockwood and colleagues, in 2020, building on Schultz et al., (2013), studied the spatial patterns of litter in Philadelphia and found that physical environmental context is essential in explaining littering behaviour.

Most recent studies, including those discussed here, are characterized by observational research methods due to self-report surveys' inability to elicit honest responses about behaviour (Rundle-Thiele et al., 2012) and experimental methods' limitation to study naturally occurring behaviour in a natural setting (Szostak, 2015). Observational methods have been preferred in recent studies and in the current study as they have been proven to be a more accurate measure of actual behaviour (Pahl & Wyles, 2017). Thus, this study employed a naturalistic observation method to determine the factors influencing littering behaviour in public spaces in the Greater Accra Metropolitan Area.

2.8 Review on Theoretical Application in Litter and Littering Behaviour Studies

Theory-based research is a later development in littering behaviour studies, a phenomenon that began around the 1990s (Chaudhary et al., 2021). Following earlier conceptualisation of littering behaviour as individuals psychological problem, theories that focused on intrapersonal and psychological perspectives saw more application in the field including, Theory of Planned Behaviour (Carmi et al., 2015; Hu et al., 2018; Liu & Sibley 2004).

Studies taking a sociological stance were guided by interpersonal theories like the Focus Theory of Normative Conduct (Bateson et al., 2013; Cialdini et al., 1990; De Kort et al., 2008; Hansmann & Scholz, 2003; Weaver, 2015). Studies that conceived of littering beyond psychological and sociological perspectives to consider the physical environmental and broader societal aspects call for applying Ecologically based theories like the Behaviour Ecological Framework (Al-Mosa et al., 2017a) and others.

The ensuing section reviews literature on the commonly applied theoretical frameworks including The Theory of Planned Behaviour and The Focus Theory of Normative Conduct following the intrapersonal and interpersonal perspectives respectively to illustrate how theory based littering behavior studies have been undertaken, the relevance of the theories in explaining littering behavior, their limitations that justifies the application of broader theoretical frameworks including the Social Ecological Model. The section further reviews literature on the Social Ecological Model demonstrating the model's ability to integrate the intrapersonal and interpersonal perspective including broader societal factors in a single study in explain littering behavior. Following the review, a conceptual framework based on the adapted social ecological model is presented. It then concludes with a review of empirical evidence presented according to the level of influence as proposed by the Social Ecological Model.

2.8.1 Intrapersonal Influences: Theory of Planned Behaviour

The Theory of Planned Behaviour is a belief-based theory that associates behavioural outcomes to peoples' beliefs (Pourmand et al., 2020). The Theory was born out of the weakness of its antecedent, the Theory of Reasoned Action, specifically, in its assumption that people have absolute power to determine or make decisions about their behavioural choices without actually considering the ability of external factors to facilitate or impede such behaviour initiatives (Ajzen, 2012).

However, the Theory of Planned Behaviour still has the basic proponents of the Theory of Reasoned Action, which has behaviour intention as the primary determinant of behaviour outcome. Thus, in the context of littering behaviour, an individual's intention to litter or disposal correctly is the primary determinant of their behaviour choices. Working backwards, individual's attitude, i.e., a product of the person's belief about littering and the assessment of the consequence of littering and subjective norm, a product of normative belief and motivation to comply with the norm, be it littering or correct disposal, are the two determinants of a persons' intention to litter (Chan & Bishop, 2013).

The unique differences between the Theory of Planned Behaviour and the Theory of Reasoned Action are Azjen's introduction of the individual's perceived degree of control over the behaviour that is direct and indirect, mediated by intention to determine behaviour. This factor holds that an individual assesses her/his capability to perform the behaviour that influences the intention to perform the act. Nonetheless, the Theory of Planned Behaviour has since gained popularity in diverse academic fields. It has been successfully applied in explaining varied human behaviour including health telemedicine adoption (Godin et al., 2003), self-care in patients with hypertension (Pourmand et al., 2020), recycling (Aboelmaged, 2021; Chan & Bishop, 2013), conservation (Karimi & Saghaleini, 2021), and the list goes on.

However, like other intrapersonal or individual-level theories, the Theory of Planned Behaviour poses some theoretical challenges. First, the theory operates on rational choice. It assumes that individuals are rational beings and make decisions through a cost-benefit analysis of their litter disposal choices (Kombat & Wätzold, 2019). Thus, they assume littering behaviour as a linear function of its predictors, i.e., intention, attitude, and social norms.

On the contrary, behaviour has been found by prior research to be more complex and context-driven (Cialdini et al., 1990; Dur & Vollaard, 2015; Weaver, 2015). Therefore, such a simplistic assumption cannot grant a comprehensive understanding of the problem without considering a wider array of other broader societal-level factors. For example, structural processes like infrastructure, national policy, availability and accessibility of litter bins, broader societal and cultural norm, and others are essential in explaining littering behaviour (Bergquist et al., 2021; Schultz et al., 2013). Consequentially, it is a common finding that individuals are more susceptible to litter in an area already littered, with graffiti, and disorderly environment than a clean and orderly one (Ong & Sovacool, 2012: Weaver, 2015; Al-Mosa et al., 2017a; Schultz et al., 2013; Keizer et al., 2013).

Additionally, albeit the Theory of Planned Behaviour assumption that behaviour is primarily born out of individual personal attributes (Hill et al., 2013), it does not consider some other crucial personal attributes, precisely individuals' biological disposition like age and gender, that has been found to be significant in explaining littering behaviour (Bator et al., 2011; Schultz & Stein, 2009; Muñoz-Cadena et al., 2012; Norrgren & Swahnberg, 2016). For example, Freije et al. (2019) found that attitude, a principal concept in the Theory of Planned Behaviour, was influenced by an individual's age and gender, concepts which are beyond the scope of the Theory of Planned Behaviour.

Again, not all littering behaviour is based on conscious mental activity as proposed by the Theory of Planned Behaviour. In this light, in some instances littering has been adjudged to be accidental (Straughan et al., 2011; US-EPA, 2016; Williams et al., 1997). Similarly, Sibley and Liu (2003) distinguished between active and passive littering, albeit they did not provide what constitutes passive littering, whether or not an individual engages in conscious, deliberate decision to leave litter. Instead, they emphasised on the length of time between placing the litter and vacating the location with litter left behind.

The point here is that behaviour in general, and in this case, littering, can occur outside an individual's consciousness, which is not integrated into the Theory of planned behaviour.

Furthermore, other socio-demographic factors that influence littering behaviour are not considered by the Theory of Planned Behaviour, including income, educational level, religious conviction, and marital status (Al-Khatib et al., 2009; Eastman et al., 2013; Norrgren & Swahnberg, 2016). Therefore, it is evident that littering behaviour is influenced by factors beyond the scope of the Theory of Planned Behaviour, thereby making it less suitable for the current study.

2.8.2 Interpersonal/Social Influences

2.8.2.1 The concept of social influence

The basic nature of human existence and survival is built upon social learning and interdependence (Li, 2020; Mcdonald & Crandall, 2015; Mead et al., 2014) that engender social influences. In other words, social influence is an inevitable drive of human social behaviour. Divers studies confirm the powerful influence of social pressure on varied behaviour (Farrow et al., 2017; Mcdonald & Crandall, 2015). Social influence operates to alter human behaviour through the mechanism of social norm, mimicry, and others (Spotswood & Whitaker, 2018). Social influence is the pressure from other people emanating from daily interpersonal interactions within a social space that guide individuals' behaviour choices (Fairchild, 2018). Inasmuch as littering is conceived as an environmental pollution problem, it is centred on human litter disposal behaviour.

2.11.2.2 Social Norms

Social influences are experienced in the form of social norms, which are the criterion of social behaviour co-created out of people's collective actions and inactions, and can be formal or informal, explicit or implicit (Farrow et al., 2017). Social norms are the beliefs and values people form (Fairchild, 2018), which stems from exposure to varied contexts like social, physical, symbolic environment (Mead et al., 2014).

Different forms of norms have therefore been defined based on the differences in the forces that drive such norms and their associated influences. Cialdini et al. (1990; 2012) distinguished two types of social norms, namely, descriptive norm, which is an individual's belief, whether real or perceived, about what others are doing in the particular social space and subjective norm, which is an individual's belief about what counts as appropriate or socially approved and disapproved behaviour. These two forms of social norms border on social conformity (Heinzen & Goodfriend, 2018). Thus, scholars have found the concept of conformity as an important mechanism to explain how social norms influence behaviour.

2.11.2.3 The concept of conformity

Conformity to norms refers to individuals behaving in a way that is consistent with behaviour and or behavioural expectations of others in society (Fairchild, 2018). This concept has been found to be a significant mechanism of social influence owing to individuals' innate appetite for social approval like reward, likeability, or social inclusion and or aversion for social disapproval like punishment or social exclusion (Farrow et al., 2017). This influence has been shown beyond human behaviour to include animal behaviour (Dindo et al., 2009; Danchin et al., 2019).

Thus, social influence, through conforming to what others are observed doing, i.e., descriptive norm or behavioural expectations of others i.e., injunctive norm, defies rationality (Lorenz et al., 2011; Muchnik, 2013). Thus, social influences have been applied to understanding littering behaviour through the focus theory of normative conduct (Bergquist et al., 2021; Bateson et al., 2013; Cialdini et al., 1990).

2.8.3 The Focus Theory of Normative Conduct and Littering Behaviour

The focus theory of normative conduct is one of the group or interpersonal behaviour decision making theories with social influences through norms as a primary determinant of behaviour (Cialdini et al., 1990). The theory holds manifest norms as key to determining individual behaviour choices (Cialdini et al., 1990; Cialdini, et al., 2012). Behaviour is, therefore, influenced by norms only when the individuals' attention has been drawn to the norm operating in the specific social situation.

The norm focused theory has therefore informed numerous littering studies, including Bateson et al. (2013), Cialdini et al. (1990), De Kort et al. (2008), Hansmann & Scholz (2003), and Weaver (2015). Cialdini et al. (1990) are one of the remarkable studies that developed and adopted the theory to study the influence of social norms on littering behaviour. Their experiment, which included both descriptive and injunctive norm activation, confirmed the assertion of the model that social norms of any kind, when activated, can influence littering significantly. For example, their study found that individuals littered less when their attention was drawn to a descriptive norm of not-littering while exposed to an environment with a single litter in a clean environment. Thus, seeing a single piece of litter in such a clean environment drew passersby's attention to the fact that most people within the vicinity did not litter, hence their compliance to the norm of not littering.

This experiment was replicated by Bergquist et al. (2021), which supported their theory except for the single-piece-of-litter experiment that had the opposite effect. Social influence has therefore been documented as a key concept explaining littering behaviour and so its integration into the social ecological model to guide the current study.

2.9 The Social Ecological Model

> *"Behaviour never occurs in a vacuum; it is the end result of the interaction between the child and his or her environment, and the environment includes the people in it."*
>
> *By Dr. Temple Grandin*

The limited scope of individualistic models and frameworks explains the attempt of recent scholars' to apply broader and integrated theories like the Integrative Behaviour Model (Hansmann & Steimer, 2017; Hansmann & Steimer, 2015), Coleman's Model of Micro-Macro Relations (Beeharry et al., 2017) and Behavioural Ecological Framework (Al-Mosa et al., 2017a) in studying littering behaviour. Aside from responding to scholars' suggestion to use broader theories (Al-Mosa et al., 2017a), the Social Ecological Model as employed in the current study is based on the models' ability to concurrently study factors within and beyond the intrapersonal and interpersonal theories to include broader societal and policy level factors in studying behaviour (Sallis et al., 2008).

The Social Ecological Model by McLeroy *et al.* (1988), a theory that stems from Bronfenbrenner's Theory of Bioecological Human Development, was in response to the limited scope of research being conducted by development psychologists at the time. According to Bronfenbrenner, there is a bidirectional interaction between the individual and the environment, the ecological system, which encompasses the microsystem,

mesosystem, exosystem, and macrosystem of influence (Bronfenbrenner, 1977; 1994; Mcleroy et al., 1988).

In the same light, McLeroy et al. (1988), in their Social Ecological Model, proposes that individual behaviour has multiple influences across five levels. i) intrapersonal/individual-level, i.e., the cognitive and social demographic attributes of the individual. ii) interpersonal level, i.e., a person's immediate social networks, social support systems from significant others like peers, family, and co-workers. iii) organisational/institutional level comprises of institutions, such as religious organisations, workplaces, and schools. iv) community level, i.e., the domain where networks, institutional, and organisational processes interact to influence behaviour. v) societal or policy level local, state, and national policies that affect behaviour. Following the assumptions of the Social Ecological Model, the current study alludes that multiple factors across multiple levels influence individual litter disposal choices, i.e., littering, or correct disposal and that there are cross-level interactions and individually and collectively, they influence littering behaviour outcomes.

2.9.1 Conceptual Framework

The left side of the conceptual framework, presents the Social Ecological Model, showing the various levels of influence embedding the individual at the centre. The factors corresponding to each level of influence as depicted in the middle of the conceptual framework directly and or through interactions influence littering behavior. Thus, littering behavior is depicted to the right in the conceptual framework as the outcome variable. The cross-level interactions of the factors is depicted by the U-shaped arrow while the straight arrows depict the direct influence of the factors on littering behavior.

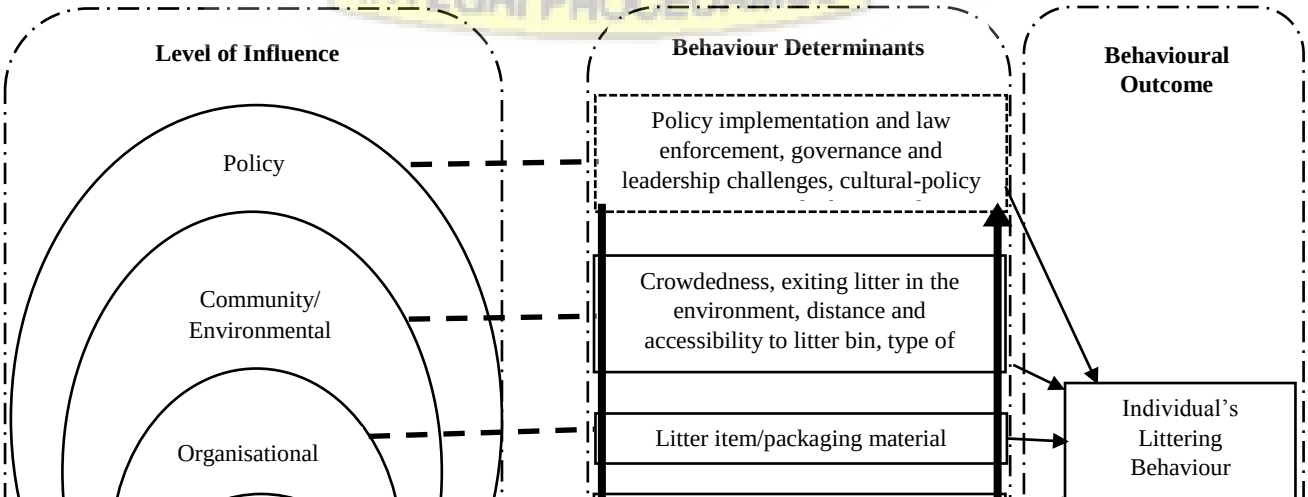


Figure 2.1 Conceptual Framework Source: Student's construction

2.10 Situating the Empirical Evidence of Littering in the Social Ecological Model: Specifying variables of interest

2.10.1 The Individual-level Factors and Littering Behaviour

The intrapersonal/individual-level factors refer to the cognitive and social demographic attributes of the individual. The commonly researched psychological and cognitive influences are those discussed earlier on the Theory of Planned Behaviour. Others have explored socio-economic influences such as educational level, income, marital status, religious conviction, and place of residence (Ajaegbo et al., 2012; Al-Khatib et al., 2009; Eastman et al., 2013; Slavin et al., 2012).

Also, biological influences like race, age, gender (Al-Mosa et al., 2017a; Campbell et al., 2014; Schultz et al., 2013; Tettey, 2015) have been explored. Notably, findings in this level factors lack consistency across studies. These inconsistencies may be because of the varied methodologies, i.e., surveys, observation or experimental, sample sizes, study location type, i.e., rural or urban, developed or developing country, and others (Lyndhurst, 2012). Thus, the current study's inclusion of individual-level factors in the current study in assessing the factors influencing littering behaviour. The individual-level factors are found to be very significant influential factors of littering across several

studies. For instance, Schultz et al. (2013) found that 85% of littering was explained by individual-level factors when analysed simultaneously with contextual factors.

With respect to age and littering behaviour, studies have generally found a negative relationship but with some exceptions where no significant difference was found. Thus, the common finding is that individuals will litter less as they advance in age (Al-Mosa et al., 2017a; Campbell et al., 2014; Cialdini et al., 1990; Lewis et al., 2009; Ong & Sovacool, 2012; Schultz et al., 2013; Norrgren & Swahnberg, 2016). Tettey (2015) found a similar result in a survey at five lagoons along the eastern coast of Ghana. The negative correlation between age and individuals' littering behaviour is somewhat expected because it is assumed that as individuals advance in age, their awareness and knowledge of environmental problems like littering, and social status will increase.

Likewise, Campbell et al. (2014) and Norrgren & Swahnberg (2016) found that individuals litter less as their environmental knowledge increases. The implication is that more litter is expected to accumulate in locations frequented by younger people. Therefore, litter management interventions must be tailored to suit this segment of the population even though there have been cases where no correlation was found between age and littering behaviour (Cialdini et al., 1990), while in other studies, a positive relationship was observed (Arafat et al., 2007; Campbell et al., 2014; Oguntayo et al., 2019).

The relationship between gender and littering behaviour is also equivocal. On the one hand, some studies hold that littering rate is higher with males than females (Freije et al., 2019; Muñoz-Cadena et al., 2012; Oguntayo et al., 2019; Tettey, 2015). On the other hand, others found no difference between males and females in their littering rate (Al-Mosa et al., 2017a; Bator et al., 2011; Cialdini et al., 1990; Schultz et al., 2013). This

leaves room for the second objective of the current study to further exploration to clarify the gender effect on littering behaviour.

Though documented in limited littering literature, this study examines the relationship between time of day and littering rate. Few studies that documented the effect of time of day and littering behaviour shows no consistency. Williams et al. (1997) observed that individuals were more likely to litter within the later hours of the day, specifically between 3:00 pm to 5:00 pm. In Schultz et al. (2013), there was no statistically significant relationship between time of day and littering of general waste and cigarette butt littering.

These notwithstanding, there is the need to study these factors to broaden our understanding of the individual-level factors influencing littering behaviour in urban public spaces in GAMA in the bid to address the second objective of this study. Besides, interventions targeting the individual as a unit requires knowledge about the individual-level factors that significantly influence littering behaviour.

2.10.2 The Interpersonal-level Factors and Littering Behaviour

At the interpersonal level, the Social Ecological Model proposes that individual behaviour is affected by actions and or inactions of persons within the individual's close social circle/network or with whom they interact in the setting like family, friends, co-workers, etc. Even the mere presence of other people in the setting at the point of behaviour performance, whether the individual has an existing relationship with them or not, can affect the way an individual behaves in that situation (Baron & Branscombe, 2012; Bateson et al., 2015; Ernest-Jones et al., 2011).

Several studies with varied methodological approaches, including experimental (Cialdini et al., 1990; Ernest-Jones et al., 2011), quasi-natural experimental (Weaver, 2015), and

natural observational studies (Al-Mosa et al., 2017a; Schultz et al., 2013), and surveys (Long et al., 2014) has confirmed the significance of social influence on individual littering behaviour. For instance, individuals during a focus group discussion attested that their littering and recycling behaviour is influenced directly by that of their friends (Long et al., 2014). Ernest-Jones et al. (2011) reported less littering when individuals perceived that their behaviour was being watched.

Owing to the widely accepted influence of others on individual littering behaviour, scholars in littering behaviour research often test the littering frequency of individuals when they are alone versus in a group, effects of group size, age composition and gender composition of group members with reference to the target participant. Generally, there have been mixed findings with respect to littering frequencies of individuals who are alone versus in a group.

On the one hand, many have commonly found that individuals litter more when in the company of others (Garg & Mashilwane, 2015; Bator et al., 2011; Ernest-Jones et al., 2011; Schultz et al., 2013; Meeker, 1997). Similarly, others found an even higher littering frequency for younger people when in a group. In comparison, the opposite was observed for older people (Williams et al., 1997). It can be inferred from these findings that younger people conform more to group pressure than older people. In other words, group effects have higher efficacy on younger people than older ones. This suggests that any effective littering reduction interventions must focus on group-level changes especially for younger individuals.

On the other hand, in Bator et al. (2011), littering occurred less, though not statistically significant, when individuals were with others than alone. Consistent with the finding by (Meeker, 1997). Also, Ernest-Jones et al. (2011) found individuals to litter less when

near a group of people. However, others did not find individuals who were alone to have significant explanatory power for littering behaviour (Bator et al., 2011; 'keep America Beautiful', 2009a; Schultz et al., 2013)

Some scholars have widely conceived that the number of people present at the point of behaviour performance is likely to influence behaviour by providing social normative cues. Generally, Durdan et al. (1985) posited higher anti-social and, by extension, littering behaviour with the increasing number of people present within a social space. Ernest-Jones et al. (2011) also suggested that littering rates increased with the number of people present. Therefore, this proposition has led scholars, including the current researcher, to study the relationship between group size and littering rate.

Consistent with this assumption, Meeker (1997), Wever et al. (2006) and, Curnow and Spehr (2001) found a positive relationship between littering rate and the number of people present. Al-Mosa and his colleagues, in their 2017b study, reported a similar but distinguishable finding. They reported that the littering rate was higher in groups with less than five (5) people and lower rates with group size above four people. From these studies, though not exhaustive enough to make an emphatic conclusion, there seems to be a tentative relationship between group size and individual littering behaviour. This observation conflicts with the finding that littering rates are lower when individuals perceive that they are being watched (Bateson et al., 2015) because of the presence of group members. Thus, this relationship requires further exploration in different contexts to expand current knowledge on the subject matter.

Studies from other behavioural settings suggest that group gender composition can exert immense influence on the behaviour of males. For instance, there is strong evidence from some studies that, in mixed-sex groups, males tend to behave pro-socially and by

extension pro-environmentally than when in single-sex groups (Babinski et al., 2014). This observed pattern in male behaviour in mixed-sex group situations is corroborated in older studies including Aries (1976).

In the light of littering behaviour, Meeker (1997) observed less littering occurring within mixed-sex groups than same-sex groups. This is suggestive that less littering will occur in spaces inhabited by both sex because individuals tend to be mindful about their behaviour in the presence of the opposite sex than when with the same sex. Nonetheless, more exploration is required to fully understand the mechanisms and the social processes that explain the influence of mixed-sex groups over same-sex groups on behaviour.

The current study supposes that group age composition may be an important interpersonal factor influencing littering behaviour. Following common findings in littering studies in relation to age and littering relationship, a group of youngsters are expected to litter more as proclaimed by Williams et al. (1997). However, younger individuals in the company of older ones are likely to exhibit lower littering for fear of possible scolding by the older individual. Conversely, older individuals in the company of younger ones or others in general may refrain from littering and behave pro-socially because of higher self-concept, personal norms and fear of social exclusion (Tittle, 1980).

Still on the social influences and littering behaviour, individuals' perceived activity engaged in in the public space at the point of observation or disposal is seldom explored. This study draws from literature on place attachment and individual behavioural outcomes (Counted, 2016; Omale et al., 2017). Place attachment is found to be an important factor in determining a wide array of behaviour, including environmental behaviour (Kuo et al., 2021; Uzzell et al., 2002). Thus, individuals working or using a

public space consistently through daily interaction with the public space are more likely to develop a sense of place and responsibility that can influence their behaviour. The aim here is to determine if people's use of public spaces influences on their littering behaviour, thus answering the second objective of this study.

2.10.3 The Organisational-level Factors and Littering Behaviour

Litter, as an item, is a consequence of economic productions and distribution of goods and services. Few scholars have tried to investigate the role of product design and the effect of litter items on littering behaviour (Sadeleer et al., 2021). However, it has been found that some packaging materials per their design, size and type are more inclined to be disposed of immediately after their intended use. For instance, some of the characteristics of litter items that have been studied include size of the litter items, e.g., handbills (Krauss et al., 1978), type of litter items, e.g., cigarette butts vs other litter (Cialdini et al., 1990), and packaging design, e.g., labelling and reclosability (Wever, 2010). This is consistent with Arafat et al. (2007) findings that single-use packaging items like toffee wrappers, confectionary products, sachet water bags and others are more likely to be littered. Similarly, packaging items that are messy and uncomfortable to handle after they have been separated from the products have higher propensity of being littered (Williams et al., 1997). Thus, the second objective of this study seeks to determine if the type of litter item has any bearing on the frequency of littering.

2.10.4 Environmental or Community-level Factors and Littering Behaviour

Littering literature has extensively documented the influence of context or built environment on individuals litter disposal outcomes and other behaviour in general (Baron & Branscombe, 2012). The geospatial characteristics have consistently demonstrated the ability to send visual cues about what transpires or what is done in a particular environment that influence behaviour (Vos et al., 2018; Weaver, 2015). In a

study by Schultz et al. (2013), the environmental-level factors accounted for a 15% variance in littering, demonstrating the relevance of physical environment in understanding littering behaviour.

In an earlier national study, 38% of cigarette butt littering was linked to environmental factors ('Keep America Beautiful', 2009a). Also, in a broader but related study, Keizer et al. (2008) buttressed these findings by studying individual anti-social behaviour, including littering, trespassing and stealing while exposed to a disorderly environment characterized with litter, graffiti, and unreturned shopping carts. They also found that being exposed to a disorderly environment encouraged further incivility, including a higher littering rate.

One commonly studied spatial characteristic in littering literature is prior litter in the environment. This variable has had the most consistent findings from naturalistic-observational (Al-Mosa et al., 2017a; Schultz et al., 2013) and experimental (Cialdini et al., 1990; Keizer et al., 2008; Tehan et al., 2017; Weaver, 2015). These studies reveal a positive relationship between an already littered environment and littering rate. In the study of Cialdini et al. (1990), there was 18% more littering in the littered environment over the 14% littering in the non-littered environment. It is, therefore, a common conclusion that individuals are more prone to littering than disposing correctly in a littered and, by extension a disorderly environment. Thus, this study tested the relationship between litter levels in public spaces in relation to the second objective.

The spread of disorder theoretically explains this phenomenon based on the broken window theory, which postulates an unintended multiplying effect of a disorderly physical environment and associated anti-social behaviour (Wilson & Kelling, 1982). A similar explanation can be seen in the light of the mechanism dubbed the

"neighbourhood effect" (Weaver, 2015). Disordered conditions signal relaxed social controls and social norms that accommodate such behaviour.

Thus, individuals exposed to a littered or disorderly environment are more inclined to exhibit littering and other antisocial behaviour like burglary (Defrances & Titus, 1993), theft (Keizer et al., 2008), crime and disorderly behaviour (Braga et al., 2008). Therefore, this variable presents itself as an important element in understanding individual littering behaviour, hence its inclusion in the current study.

Another attribute of the physical environment often studied is the availability, accessibility, and distance to litter bin in relation to littering frequency. It has been established that less littering occurs with available, highly accessible and conveniently located litter bins in a particular location at the point of litter disposal (Foxall et al., 2006; Ong & Sovacool, 2012). Studies based on surveys eliciting respondents opinions often cited the availability and otherwise of litter bins to be a significant motivator or hindrance to correct disposal in developing (Ajaegbo et al., 2012; Muñoz-Cadena et al., 2012) and developed countries (Lyndhurst, 2012). Surveys in Nigeria (Nkwocha & Okeoma, 2010), Ghana (Tettey, 2015), Singapore (Straughan et al., 2011), and Australia (Williams et al., 1997) found about 88%, 37%, 48%, and 19% of respondents respectively, attributing the littering problem to accessibility or distance to the nearest litter bins. In other observational studies, individuals litter less with closely located litter bins (Bator et al., 2011; Meeker, 1997; Schultz & Stein, 2009).

However, there have been some equivocal findings in the relationship between distance to a litter bin and littering frequencies. Some studies suggested that the closeness of litter bins does not guarantee their usage. For instance, many people littered about 3 metres (Curnow & Spehr, 2001) and within 5 metres ('Keep New Zealand Beautiful', 2018)

from a litter bin. This also has been the case irrespective of countries economic status and hence level of waste infrastructural development (Williams et al., 1997). Therefore, the second objective of the current study is explored to determine if the distance from the litter bin influence littering behaviour in public spaces in GAMA.

The type of public space and their associated level of human traffic and blend of activities going on is important in understanding littering. For instance, Ajaegbo et al. (2012) found that more than a third of all littering occurred in such areas. Dur and Vollaard (2015) also attested that there had been differences in the level of litter accumulation across different locations. This may be associated with the physical and social differences of each location or site type (Meeker, 1997).

Following this view, keep America Beautiful (2009b) found higher littering rate at medical and recreational sites than retail and city centres. In Nigeria, streets, markets, and street malls attracted higher littering (Nkwocha & Okeoma, 2009). In a survey, respondents reported littering more in the mall, public building, event, and parks than they did in a festival, waterfront, and beach. Consequentially, it became important for this research to explore how littering incidence relates to different public spaces with varying physical and social characteristics. The goal here is to gauge the intensity of littering occurrence and possible litter 'hot spots' for proper targeting of interventions. Thus, the second objective of this study assessed how different public spaces influence littering behaviour.

Furthermore, the level of crowd, defined by the relative density of people in a public space (Bator et al., 2011) is of significant importance in influencing human behaviour (Baron & Branscombe, 2012; Leary, 2001). The variable has been sparsely explored in the domain of littering behaviour (Bator et al., 2011). Besides, findings from the few

studies have been inconsistent. For instance, while crowdedness was not a significant contributor to littering behaviour in Al-Mosa et al. (2017b), Bator et al. (2011) recorded higher littering frequencies in large crowd situation than in small crowds.

In contrast, Ong and Sovacool (2012) found that less littering occurred in crowded places than in open spaces and along major roads. This is consistent with the assertion that people are more likely to act prosocial, including not littering when in a crowded situation (Baron & Branscombe, 2012). The inconsistency of the effect of crowdedness on littering behaviour may be due to differences in prevailing normative behaviour of the crowd. This is because of the argument that people will most likely conform to what the masses are doing (Bond, 2005). Meaning that littering frequencies are likely to be low in crowded situations of the crowd behaviour supports correct disposal. Nevertheless, prior research is equivocal regarding the effect of crowdedness on littering behaviour, hence its inclusion to in the current study to determine factors influencing littering behaviour in GAMA and the need for the current study.

The study's general objective was to understand littering behaviour in the Greater Accra Metropolitan Area public spaces. Therefore, the current chapter reviewed the existing body of knowledge on littering behaviour, focusing on theoretical and empirical studies. It soought to ascertain the general trends in littering behaviour studies, sieving out the factors influencing littering behaviour, industry contribution to litter stream, and policy issues specific to litter prevention to identify the gaps in the literature, which this study soought to fill.

CHAPTER THREE

METHODOLOGY

This chapter describes the socio-spatial characteristics of the study area, data collection methods and analytical techniques employed to address the research questions.

3.1 Study Area

3.1.1 Socio-spatial Description of Study Area

This study was undertaken in the Greater Accra Region of the Republic of Ghana. Ghana is a coastal country with a 550km coastline, situated at latitude 7.9465°N and longitude 1.0232°W, covering 227,540 Km². Ghana is in West Africa, boarded by la Cote d'Ivoire, Burkina Faso, Togo, and the Gulf of Guinea to the West, North, East, and South, respectively. The population of Ghana is about 31 million, with a population density of 137 per Km2, and more than half living in urban areas (Ghana Statistical Service, 2021).

The Greater Accra Region is located along the coast, occupying the smallest land size of 1453.53 km² compared to the other regions in Ghana (Brookins, 2019; Oduro-Appiah et al., 2021). Its shoreline, of about 200km, served as an opening to the rest of the world, encouraging businesses abroad to establish and conduct business. However, the region's location relative to the Gulf of Guinea with the shoreline serves as a portal for waste materials carried by runoff from the city into the sea. Moreover, its attributes, i.e., hosting the national capital, Accra, and the centre for government administration, improved infrastructural development, and communication network, has made the region the economic hub, housing the more significant proportion of industries and manufacturing activities in Ghana.

In addition, there is an influx of tourists to the region because of the shore with beautiful beaches. Thus, due to in-migrants from other regions and abroad, coupled with high natural increase in population, the region is the populous in Ghana growth (Ghana Statistical Service, 2021). The region's population is currently estimated to be about 5.4 million, with the highest population density of 1,235.8 persons per square kilometre. Though the region is the most urbanized, contributing about a quarter to Ghana's gross national income (Oduro-Appiah et al., 2021), it also burdens the urban infrastructure and services, including waste management. The study therefore focused on the Greater Accra Metropolitan Area, GAMA, not as a formal administrative boundary but a catchment area housing nearly the entire urban population of the Greater Accra Region.

Due to the increasing population, urbanization, and the important role in contributing to national development through vigorous industrial and economic activities, GAMA presents a challenge regarding environmental pollution, waste generation and management, including littering. Based on the average generation rate of 0.72kg (Miezah et al., 2015), about 3312 tonnes of municipal solid waste is generated in GAMA daily (EPA, 2017; Ghana Statistical Service, 2014). Though the various MMDAs in GAMA invest about two-thirds of their internally generated fund in managing the waste generated, about a quarter of daily waste generated remains uncollected (Vorgbe, 2018), thus, polluting the environment. Also, packaging manufacturing, consumption and disposal are higher, and because of the region's coastal location, higher leakage of littered plastic waste to the marine environment is inevitable.

The region being urban and a cosmopolitan centre of attraction for various reasons means that it hosts a mix of people from diverse cultural backgrounds. However, according to the 2010 population census report, the dominant ethnic groups in the region are the Akan, Ga-Dangme, and Ewe, with the region's female population slightly

outnumbering the male population. The region holds slightly above a quarter of total employment in Ghana and 38% of urban employment with a higher rate of youth employment, particularly between the ages of 15 and 24 years, compared to their rural counterparts. The informal economy accounts for about 80% of the labour force with females outnumbering males in the informal sector employment, majority of whom are engaged in occupations such as trade, street hawking, and others (Baah-Boateng & Vanek, 2020), indicating more waste generation of waste in public spaces where these activities are carried out.

3.1.2 Description of Study Sites

The study sites included four public spaces, namely the Kaneshie market, Odawna lorry station, Maamobi general hospital, and the University of Ghana, located in the Accra Metropolitan Assembly, Ayawaso Central, Ayawaso North, and Ayawaso West, respectively all in the Greater Accra Metropolitan Area. The Kaneshie market and Odawna lorry station at the Kwame Nkrumah Circle are hubs for economic activities, mostly informal businesses and transportation services (Baidoo, 2017), thus, attracting people from all over the country and internationally.

The Kaneshie market, located in a middle-income community houses a formal private market, with some informal traders perching around the market edifice and ongoing hawking and "Kayaye" activities. It also has an adjoining large transportation hub connecting people within and outside Accra. Additionally, Kaneshie hosts one of Ghana's biggest spare parts dealers and car repair shops. The mix of activities with high vehicular and human aggregation leads to more waste generation, hence littering.

The Odawna lorry station, located within Kwame Nkrumah Circle in a densely populated low-income residential area, is one of the biggest transport hubs with "*trotro"*

and taxis conveying people from the CBD to the peripheral areas. It also hosts the largest intercity transport terminals with buses transporting people to other regions and neighbouring countries. The high vehicular and human activities also attract hawkers who come in to transact business mainly in the sale of food, water, and beverages to the commuters and the transport workers. Hawking at Odawna poses many challenges to city authorities, which led to constructing a pedestrian market to divert the hawking activities there. However, the solution proved futile as the hawkers resisted to relocation plan (Broadbent, 2012). Additionally, the state of sanitation is poor, with about 90% of residents in Odawna lacking access to toilet facilities, thereby making the practice of flying toilets, i.e., defecating in a polyethylene bag and disposing on the streets and other open spaces rampant (Vorgbe, 2018). There have been reports of flooding that has been linked to clogging drains with uncollected solid waste (Owusu & Obour, 2021), which to date remains problematic and encourage littering.

The Maamobi General Hospital, formerly a polyclinic, constructed in 1969, serves the Maamobi community and surrounding neighbourhood. Its bed capacity is about 77, with services including serving as the first point of contact and continuous care for many patients, alongside other specialized services like general disease control, dental, eye care, ear, nose and throat care, and allied services. The Hospital is a government hospital located in a densely populated, low-income residential area. Waste management and recurring flooding pose serious challenges (Baabereyir, 2009; Owoahene-Acheampong & Prempeh, 2020; Owusu & Obour, 2021). Maamobi is a Zongo community in Accra, housing the Maamobi market, the Maamobi General Hospital, and a high mix of economic activities. It attracts many people from the Northern part and other regions of the country, with many of the residents engaged in trading, commercial vehicle drivers, and formal worker (Sarpong-anane, 2015). Formal and informal waste collectors provide

waste collection services (Erman et al., 2018). Nonetheless, waste management is inadequate with unsightly environment.

The University of Ghana, established in 1948, is the oldest and largest public university in Ghana. It is a model University with a mission of driving national and global development through revolutionary research and top-notch teaching and learning. The University of Ghana is a collegiate University with colleges, including the college of Basic and Applied Sciences, Education, Health Sciences and Humanities, alongside several institutes and centres for research and learning. The student population as of the year 2020 was 53,643, from the 1961 figure of 682, with 1.17% of who are international students from about 70 countries, indicating that students represent people from diverse nationalities and cultures. Female enrolment has improved over the years with the current male population, 52.6% being slightly above the female population of 47.4% from the initial male and female populations of 91% and 9%, respectively, in 1961. Waste generation in the university is incessant because the school is in session all year round. Also, the continual increase in student population indicates an ever-increasing waste generation and management requirement. Also, supporting services in the university such as eateries, provision shops, a clinic, and other basic infrastructure and services has implications on waste generation, hence the likelihood of littering occurring.

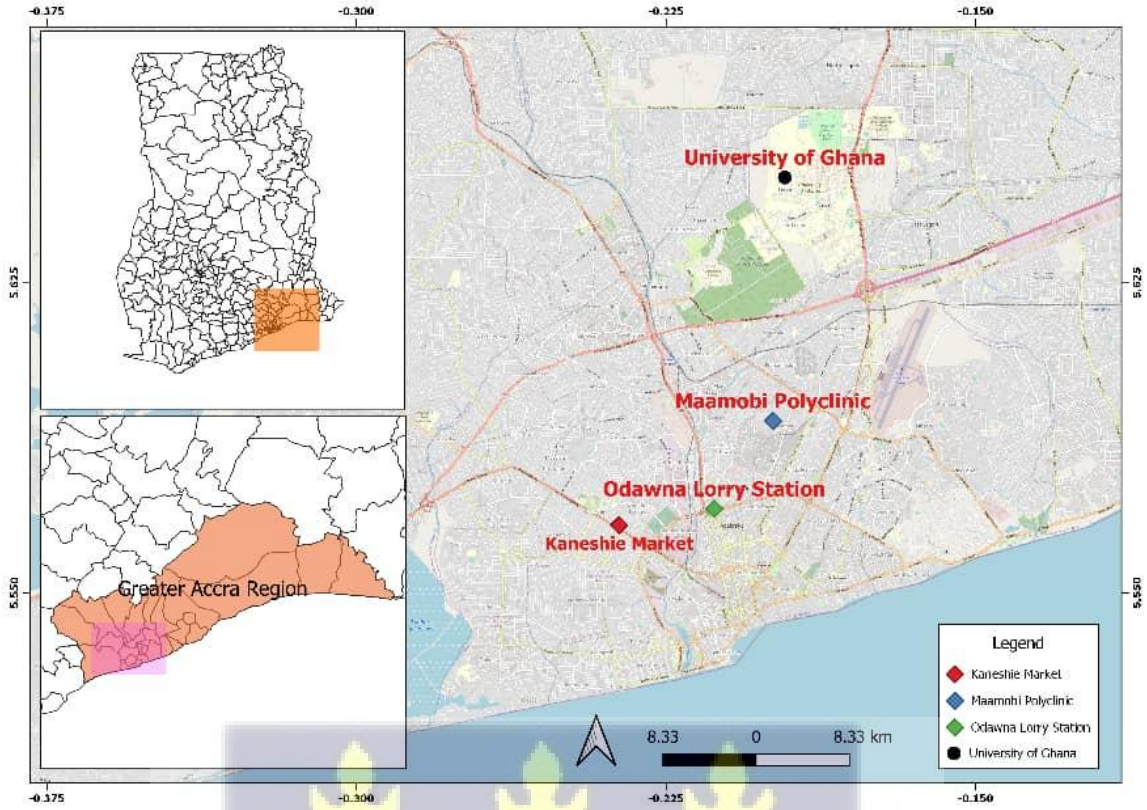


Figure 3.1: The study area **Source: Student's work**

3.1.3 Observed Environmental and Waste Infrastructural Conditions of Study Sites

All the sites except the market had several types and sizes of litter bins. The site with the most significant number of litter bins observed during the period was the educational institution recording as high as 30 bins of different sizes ranging from 30 to 240 litter bins and baskets in some locations. The health facility and lorry station had about 15 and 10 of the 240L bins, respectively, while the market had none. Other containers were also used for waste storage, including buckets, baskets, sacks, and boxes. The litter bins were generally spread across the study sites. Many of them had a significant amount of waste in them except those at the health facility, which had very few pieces of litter items. In general, this means that except the market, all the sites had waste bins available with room for correct litter disposal.

Though there was no visible waste bin on-site in the market, there was a designated place where waste was accumulated and collected after some days. A payloader and some tipper trucks were observed collecting the accumulated waste on three occasions during the two weeks of observation at the market. However, the shop owners inside the market building had some form of containers and boxes they used for waste storage in their shops. The presence of these waste containers and boxes was mainly for the first floor of the building, probably due to strict monitoring and supervision because it hosts the market administration office, banking halls, a health facility, and other institutions. The opposite was observed on the other floors, which had no form of waste storage. Waste from traders was seen everywhere, with rodents running in and out of the shops.

Only the health facility was consistently clean during the observation period, with few visible litter items within the observation zone. All others had a significant amount of visible litter present. The health facility and the educational institution had some level of landscaping/beautification, including presence and care for plants, flowers, trees, groomed bushes, and others. There was also a high level of walkability, including quality sidewalks, safety, and buffer from moving traffic. In contrast, the market and lorry station had none. However, all four sites had some level of economic activities going on and only the educational institution had few anti-littering posters.

3.2 Research Design

The study employed a cross-sectional convergent parallel mixed-method research approach to understand individuals' littering behaviour in public spaces in AMA. The nature of littering behaviour and the positioning of the study following the pragmatic orientation called for the use of a mixed-method ethnographic approach. The aim of mixing-method was to comprehensively understand littering behaviour involving both micro-level, i.e., individuals and interpersonal-level as a units of analysis and macro-

level, i.e., organisational, community, and political context as a unit of analysis (Schensul et al., 2013). Besides, littering, like other antisocial behaviour, are usually hard to speak of because it is associated with the feeling of guilt or shame (Nakamata & Abe, 2016). Thus, often resulting in underreporting such behaviour (Rundle-Thiele et al., 2012; Schultz & Stein, 2009). It was therefore essential for the researcher to study the behaviour both objectively to determine the factors as well as assess individuals and key informants' perception of littering in public spaces, including the policy implementation challenges in abating littering.

3.2.1 Mixed-method Design

Following the pragmatic epistemological and methodological stance, the study drew methods from both the quantitative and qualitative approaches. The study employed independently, quantitative methods, specifically, structured observation, and litter characterisation and brand audit, as well as qualitative methods using in-depth interviews, i.e., both informal conversation and semi-structured interviews and focus group discussions to answer the research questions.

The type of mixed-method design adopted in the current study is the convergent parallel mixed-method design, symbolically expressed as Qual + Qual (Creswell, 2014). The implication is that both methods are independent of each other, where both data were collected and analysed independently with the aim of answering different questions about littering behaviour. The point of the merger of both data forms was at the discussion stage to give a comprehensive understanding of littering behaviour.

Accordingly, the emphasis on the method used was based on completeness and comprehensiveness of knowledge. This highlights some key advantages of using mixed-method research (Giddings & Grant, 2006) and that, unlike the single method design, its

focus is broader. It can gather more information in varying modes about a single phenomenon; thus, it has the ability to study complex social problems holistically or study the phenomenon in a real-world setting (Sung, 2017). Also, it compensated for the limitations of each single method design by employing pluralistic approaches hence bringing value to the research process.

On the other hand, adopting the mixed-method design also came with some limitations. It required more time both in planning and execution, more rigorous and costly than the single method designs. A mastery of the mixed-method research design and both quantitative and qualitative research methods was required of the researcher (Creswell et al., 2003; Giddings & Grant, 2006). To address these challenges to the barest minimum, the researcher relied on online and offline resources, workshops, and training programmes for quantitative, qualitative, and mixed-method data gathering and analysis. Also, the researcher engaged a competent research team with diverse expertise in conducting each research method.

3.3 Data Collection Methods

3.3.1 Individuals' Perception about Littering in Public Spaces in GAMA

The researcher conducted focus group discussions (FGDs) and semi-structured interviews to understand individuals' perceptions about littering in public spaces in GAMA. To achieve this objective, the study employed a qualitative research design involving semi-structured interviews and FGDs to gather in- depth data on the individuals' perception about littering, why people litter, and possible interventions for litter reduction in public spaces in GAMA.

One focus group discussion was conducted in each of the public spaces to get a broader sense of how littering is perceived in public spaces in GAMA. Specific topics of

discussion bordered around accounts of how individuals' litter, attitude towards littering or otherwise, the reason why people litter and possible interventions for litter reduction in public spaces. A semi-structured interview guide was then developed based on the responses from the FGDs.

Participants for the FGDs were recruited based on their presence at the public space and willingness to participate in the FGDs, hence, a non-random sampling technique referred to as convenience sampling was used (Neuman, 2014). The technique was used to recruit participants in equal proportions at each of the four public spaces to complete interviews. The perspectives of individuals utilising the public spaces were important to understand how littering is perceived and why people litter in the public spaces.

The study participants generally included traders, customers, drivers, driver-mates, commuters, administrative staff at the public spaces, patients, health workers, students, and staff members.

3.3.1.1 Inclusion and exclusion criteria for participants

Participants were included to participate in the interviews and focus group discussions based on three main criteria as follows; a) Persons who have attained the legal age of 18 years as defined by Ghana's Constitution of 1992 (Rev.1996). Thus, children were excluded. It is assumed that older individuals tend to be more knowledgeable about littering and environmental issues (Norrgren & Swahnberg, 2016); b) persons physically present in the public space during the study; c) persons prepared to provide informed consent and participate in the study. Consequentially, persons below the age of 18 years, those who were unwilling to provide informed consent and complete the interviews, as well as those who were not present in the public space during the study were excluded from the study.

3.3.1.2 Sample size determination

The determination of the sample size for the FGDs and individual interviews were based on the principle of theoretical saturation, where patterns and themes became established and no new perspectives were gained by additional data (Farr, 2008; Patton & Cochran, 2002). The sample size for the FGDs were 16 individuals, i.e., 4 individuals in 4 Focus groups, and 28 participants for the individual interviews, which corresponds to the average sample size recommended to attain data saturation (Curry et al., 2009). Thus, a total sample size of 44 participants was recruited for the objective one.

3.3.1.3 FGD and in-depth interview guide

The FGDs took the form of informal, unstructured conversations involving broad topics of discussion, including a) participant demographic characteristics; b) general solid waste management, like frequency public space cleaning and litter bin servicing, c) perception about waste service quality; d) understanding about littering, e) attitude about littering, f) reasons why people litter and g) possible litter reduction approaches. The interview questions were developed based on responses from the FGDs, which covered issues like a) participant demographic characteristics; b) their own and others' litter disposal methods c) attitude about littering d) reasons why people litter, and e) strategies for littering reduction. Interview guides for the FGDs and individual interviews are presented in **appendix 4**

3.3.1.4 Administration of FGDs and in-depth interviews

The researcher conducted the interviews on one-on-one bases, while the FGDs were conducted with groups of four participants, all within the public spaces. The in-depth interviews and FGDs were administered in 'Twi' in the market, lorry station, and the health facility, while English language was used in the educational institution. The interviewer, i.e., the researcher briefed the interviewees about the objectives of the study,

read the informed consent form and then sought permission through signing or thumb printing of the consent form.

The researcher asked the questions following the guide, and participants provided answers to them. The researcher asked probing questions for clarifications on participants' responses where necessary. The sessions, both FGDs and in-depth interviews, were audio-recorded using digital audio-recorders after seeking participants' consent to audio record and to take still photographs. The average duration for the FGDs was 35 minutes and 16 minutes for the in-depth interviews.

3.3.1.5 Data recording, transcription, and Analysis

The researcher audiotaped the interviews and transcribed verbatim except in cases that bordered on ensuring anonymity, like names of participants or other individuals mentioned during the discussions. Transcription was done in Microsoft word document and coded in Microsoft Excel under broad themes and subsequent sub-themes. Data collection took place concurrently with data transcription and analysis, documenting themes following the thematic analysis procedure outlined in Nowell et al. (2017).

The researcher constituted and led a team to undertake the qualitative analysis of the data which was done in six distinct phases.

1. The first phase involved the data analysis team individually reading the text multiple times, documenting general areas that could help structure to make sense of the raw data.
2. Discussions were made that resulted in consensual identification of three broad topics relating to the research objective, namely, *cognitive ideations about littering*, *norms influencing littering*, and *littering prevention measures*. These main themes provided a thematic framework to guide further the coding process.

3. Based on these broad themes, all the data were assigned a unique code to be analysed under each theme. All the coded data were then sorted and organised under each broad theme under phase three.
4. In phase four, a group review of the themes and the quotes organised under them conveyed consistent ideas, and those quotes that lacked consistency were realigned under an appropriate main theme.
5. The team reviewed the themes to ensure that the captions truly portray peoples' perception about littering behaviour.
6. The report was compiled using supporting direct quotes and presenting converging and divergent ideas from individuals' perceptions about littering behaviour.

3.3.2 Factors Influencing Individual Littering Behaviour in Public Spaces in GAMA.

3.3.2.1 Behaviour Observation

To determine the factors influencing littering behaviour in public spaces in GAMA, the study used an observation method. Following a positivist stance, the observation method employed a structured, closed-ended response protocol and code sheet adapted from Schultz et al. (2013). The method employed a naturalistic observational approach where litter disposal behaviour were observed and recorded without the researcher manipulating the research context (Szostak, 2015).

The study adhered to ethnographic principles, allowing the team to get immersed in the field, permitting direct contact with the everyday litter disposal practices of participants in their natural setting (Schensul et al., 2013). To avoid participant reactivity, the observation was a disguised one, where study participants were unaware of their behaviour being observed except a few members of the management staff of the public

spaces from whom the researcher sought permission. The method enabled the researcher to collect data about individuals littering behaviour that participants would not have accurately reported (Rundle-Thiele et al., 2012)

3.3.2.2 Sample size and Sampling strategy for observation

The determined sample size used the Cochran (1977) formula;

$$n = \frac{Z^2PQ}{d^2}$$

Where n is the number of individual litter disposal behaviour to be observed; Z is the reliability coefficient for 95% confidence level interval; P is the proportion of the population in the public space who possessed litter item requiring disposal, i.e., because the number of individuals who were present at the public spaces and possessed a litter item could not be estimated, 50% was used for the estimation. Q is 1- p; d represents the degrees of accuracy at .05. The sample size arrived at was 384 participants. This figure, according to the Cochran (1977) formula is sufficient enough to solicit data that can represent the general population under study. However, Covid-19 and its associated mandatory social distancing and the virus transmission issues (Harper et al., 2020; Rashid & Yadav, 2020) coupled with financial limitations for data collection made it difficult for the researcher to recruit 384 participants per study site. The difficulty in the research participants' recruitment was higher particularly in the educational institution because the data collection coincided with the beginning of school closure in the country and the health facility because relatively less people were found in the hospital compared with the market and the lorry station. Consequently, a total number of 300 observations were made per public space, summing up to a total sample size of 1200 individual observations.

Given that the observation was carried out within the positivist stance, a simple random sampling strategy was used. The researcher sampled the *n*th person based on the human

traffic flow in a public space. At high traffic areas like the market and lorry station, every 10th person who was observed having a litter item in the hand that required disposal was sampled, while every 1st and 2nd person observed was sampled in the low and medium traffic areas like the hospital and the educational institution, respectively. Participants were included based on their physical presence in the public spaces at the time of observation and possessed a litter item.

3.3.2.3 Pilot Observation and training

The observation was piloted prior to the actual study. The exercise was done at a bus stop at the 37 Military Hospital, Accra, to give the researcher an opportunity to practice observation, behaviour interpretation and recording process. The pilot study data was recorded in printed tally sheets. During the pilot exercise, some challenges were identified with the use of paper and pen for data recording because it attracted the attention of people to the observer (the researcher), which led many people to ask questions about the exercise. This defeated the unobtrusive goal of the observation. The researcher, therefore, resorted to using Android tablet devices for the actual study.

3.3.2.4 Validity and Reliability

To ensure consistency and reliability of observational data, a clear and precise operational definitions of behaviour codes were stated. Also, observer was trained adequately on the interpretation of behaviour observed and the use of the behaviour recording coding system. The researcher practised how to use the coding system, compared, and discussed the results with the trainer to resolve any differences in the way they were using the coding system. This process was repeated until they achieved 95% agreement in the coding of behaviour. This process was crucial to ensure the objectivity of the process as observation was subjective, thus, based on observers' interpretations, e.g., approximating the ages of participants, interpreting the form of behaviour as

littering varied in forms, like fragrant fling, inch away, drop with intent, wedging, etc. (Williams et al., 1997) which needed to be recorded.

3.3.2.5 Data recording

Data recording included field notes, observation score sheets, and still pictures and video recording whenever possible to enhance the completeness of data capturing. The behaviour was recorded using Android tablet devices, while the observer pretended to play games on the device to avoid participants noticing their actions. The researcher resorted to this method because of the problems encountered during the pilot study. Individuals at the site became uncomfortable and continuously asked questions about what the researcher was recording in papers. Besides, holding the paper and pen made the observer conspicuous and unable to blend into the study setting.

The tally sheet used to record the behaviour was based on protocols used in previous littering behaviour studies, specifically one developed and used by Schultz et al. (2013). Broadly, the score sheet contained the codes under which actual behaviour was recorded, including, a) The litterer code, consisting of attributes of the participants like age, gender, and other characteristics; b) Site code or environmental characteristics, i.e., existing litter, antilittering signs, litter bins present, and distance of waste bins, crowd, existing litter on the ground, beautification effort, etc.; c) The behaviour code including the type of behaviour exhibited by the participant, disposal outcome, e.g., littering, pocketing, or dropping in a bin as well as latency/ reaction time and duration of behaviour; and d) Litter code, i.e., types of litter items disposed.

Table 3.2 Operational definition of variables and measurements

S/N	Variable Name	Measure	Categories	Operational Definition
	Outcome Variable:			
1	Littering Occurrence	Nominal	1. Correct disposal 2. Littering	Correct disposal, i.e., dropping litter in a bin or littering, i.e., accidentally or deliberately dropping litter on the ground, bushes, planters, benches, or anywhere except in a bin.
Explanatory Variables				
2	Age	Scale	N/A	Refers to the estimated age (in years) of the individual
3	Gender	Nominal	1. Male 2. Female	Referring to participant sex
4	Time of day	Nominal	1. Morning (6:00am to 11:59am) 2. Afternoon (12:00pm to 3:59pm) 3. Evening (4:00pm to 6:00pm)	Specific time at which an individual was observed exhibiting a litter disposal behaviour spanning between 6:00am and 6:00 pm.
5	Participant activity	Nominal	1. Eating/drinking 2. Selling 3. Shopping/ Buying 4. Standing at one spot 5. Waiting to pick a car 6. Walking through 7. Working at the location	This denotes the perceived activity a participant was engaged in at the point of sampling and subsequent observation.
6	Group Setting	Nominal	1. Alone 2. A member of a group	Whether participant was either alone or in a group, i.e., a group of people within the participants' close circles or people with whom participant interacted at the point of litter disposal
7	Group size	Scale	N/A	Refers to the number of people constituting the group with target participant
8	Group Age Composition	Nominal	1. Peers 2. Younger 3. Older 4. Both older and younger	Refers to the age category of group members in reference to the age of the target participant.
9	Group Gender	Nominal	1. Same sex 2. Opposite sex	Refers to the sex composition of group members in reference to

	Composition		3. Mixed sex	the sex of the target participant.
10	Litter item	Nominal	1. Water and beverage bottles, cups, and cans, glass 2. Combo/ Mixed waste 3. Disposable food utensils 4. Food wrapper (Paper, Leaves, plain plastic film) 5. Food/Fruit remains 6. Paper/Tissue 7. Plastic film bag (take away and water sachet bags)	Material or type of object disposed
11	Crowdedness	Ordinal	1. Small crowd 2. Medium crowd 3. Large crowd	Crowdedness here refers to how crowded the site was at the point of behaviour observation. So, to make measurement easy, a small, medium, and a large crowd is defined to constitute below 20, 20-50, and above 50 people within a ten-metre radius around the target participant, respectively.
12	Accessibility of bins	Nominal	1. Accessible 2. Not Accessible	*Accessibility* denotes convenience and ease (with respect to time and effort) to correctly use a litter bin. So, this variable looked at whether the bin was conveniently located relative to the target participants' position and whether the bin had room for correct disposal. It asked two questions, i.e., i) is the bin located where it is highly visible and within reach to the participant, and ii) is the bin full or have room for proper disposal?
13	Existing litter	Ordinal	1. Not at all littered 2. Slightly littered 3. Heavily littered	*Not at all littered* refers to a complete absence of litter on the ground, *slightly littered* refers to the presence of 1 to 20 litter items on the ground, and *heavily littered* refers to litter

				items above 20 pieces on the ground at the point of behaviour observation.
14	Level of economic activities	Ordinal	1. Low 2. Medium 3. High	*The level of economic activities* in this study is defined, specifically to retail of fast moving-consumer goods that facilitate higher consumption and possible disposals. Thus, the number of permanent and temporal vending spots, including shops, kiosks, sheds, stands, etc. Therefore, low, medium, and high level of economic activities correspond to below 5, between 5 and 10, and above 10 vending spots respectively.
15	Distance from bin	Scale	N/A	Distance (in metres) to the nearest litter bin at the point of disposal
16	Site Type	Nominal	1. Market, 2. Lorry station, 3. Educational institution, 4. Health facility	Public spaces here are spaces within the urban centre to which the public have equal rights, thus, accessible to all individuals.

Operational definition of the themes

	Theme	**Operational definition**
	Cognitive ideations about littering	Relates to individuals' conscious reasoning or intellectual activity that forms their ideas or concept about littering behaviour.
	Norms influencing littering	Refers to individuals' shared standards of acceptable behaviour that informs or serve as a cue for individuals' litter disposal choices.
	Littering prevention measures	The littering abatement strategies or interventions
	Governance and leadership challenges	The system through which institutions including structures and processes for actions towards littering abatement and general solid waste management.
	Incompatibility between cultural norms and policy	A situation whereby shared customs, traditions and ideas, and social behaviour are not compatible with the principles of state policies.
	Educational gaps	The difference or the gap between the skills and knowledge received from educational institutions and the skill requirement for real world or workplace practical application

3.3.2.6 Data Management and Analysis

The researcher checked the completed tally sheets at the end of every observation session to ensure completeness of data and corrected errors. The data was coded in SPSS version 23 (IBM) software (SPSS Inc. Chicago, IIIinois, USA) in preparation for data analysis. A multistage data analysis process was employed, including univariate analysis, i.e., descriptive statistics, Chi-Squared Goodness of Fit test, Shapiro-Wilk Test; bivariate analysis to test for associations between variables; and multivariate binary logistic regression analysis to determine the factors influencing littering behaviour.

The descriptive analysis phase involved data exploration to ascertain the frequencies and proportions of categories measured under each categorical variable and distributions of scale variables in the sample. To determine if the variables measured mirrored the distribution of the population under study, a univariate analysis of all the variables was done. A Chi-Squared Goodness of Fit test was performed for all categorical explanatory variables to compare each category's observed and expected frequencies, assuming all categories contained equal proportions. Thus, the Chi-Squared Goodness of Fit test determined how well the observed frequencies fit with expected frequencies. This was done using SPSS v23 non-parametric test- legacy dialogue-chi squared route.

Further Shapiro-Wilk Test was used to test the equality of the continuous variables against reference probability. It is a test like Chi-Squared Goodness of Fit test for categorical variables. Like the Chi-Squared Goodness of Fit test, it estimates the maximum difference between the two cumulative distributions, a p-value and sample sizes. A Shapiro-Wilk test shows a normal distribution of observed data if the P-value is greater than the conventional alpha value of 0.05 or non-normal at a p-value less than 0.05.

To test for significant bivariate association between explanatory variables and the outcome variables, a chi-square test of association between the categorical explanatory variables and the outcome variable alongside the test of independence and p-values for each relationship was performed. Also, for the continuous predictor variables, a Spearman's correlation, i.e., two-tailed, was performed to test the association with the outcome variable. A Spearman's correlation was used instead of a Pearson's correlation because of the degree of non-normality in the data as suggested by the Shapiro-Wilk test and test of skewness. Results at the bivariate analysis stage revealed some insignificant explanatory variables, namely, participant gender and time of day, and so were excluded from further multivariate analysis.

To ensure that each explanatory variable measured a different construct (Stockemer, 2019), a collinearity test was performed using the linear regression route and requesting collinearity diagnostics. Each variable was entered as a dependent variable, and the procedure was done iteratively for all the variables while checking for the minimum tolerance level cut-off point of 0.1 and maximum variable inflated factor, VIF, above 10 to signal collinearity (Mertler & Vannatta, 2005).

This test was important prior to building any regression model because the presence of collinearity can impact parameter estimations greatly (Heeringa et al., 2010). Some variables were found to be highly correlated, e.g., existing litter and type of public space, level of economic activities and accessibility of bin, level of economic activities and crowdedness had a correlation coefficient of -0.894**, -0.943**, and -0.943** with p-value less than 0.01. To address the problem, the level of economic activities, accessibility, and type of public spaces were thus excluded from further analysis.

To ensure that all the explanatory variables satisfied the assumptions of the binary logistic regression procedure, all the variables were checked. The result shows that i) a good case to variable ratio, aided by the large sample size of 1200 observations; ii) none of the variables had missing values; iii) two variables, i.e., *gender* [$\chi^2(1200) = 2.059$, p=0.151], and *time of day* [$\chi^2(1200) = 0.870$, p=0.467] were not significantly associated with the outcome variable (p=.863), thus, excluded from further analysis; (4) collinearity was revealed among four variables, i.e., *level of economic activities, accessibility, type of public space,* and *crowdedness*. The first three variables were excluded from analysis, because when the three were removed, no collinearity was identified.

3.3.2.7 The multivariate binary logistic regression model

Finally, a multivariate analysis to build a model that best describes the relationship between the outcome variable and the explanatory variables was performed (Hosmer & Lemeshow, 1989). The model building used the binary logistic regression because the outcome variable was dichotomous, i.e., coded 0 = correct disposal, and 1= littering (Field, 2005) and can model both scale and categorical variables, including nominal and ordinal variables in a single equation (Heeringa et al., 2010) as was done in this study.

After excluding the non-significant and highly correlated variables, ten variables that met the assumptions for a logistic regression model remained, namely, *age, group setting, group age composition, group gender composition, group size, activities engaged in at the location, crowdedness, existing litter, litter item, and the distance to the nearest litter bin in reference to the point of litter disposal (hereafter, distance).* These variables were simultaneously entered into the logistic regression to test the relative effect of each explanatory variable on individuals' litter disposal outcome holding all other covariates constant.

The fitted model revealed two non-significant explanatory variables namely, *group setting*, with p-value= .607, and *group age composition*, with p-value= .707, thus, removed from the model. The remaining eight statistically significant variables were then used to fit the final model. The logistic regression model fitted with the eight explanatory variables to determine the likelihood of individuals littering was statistically significant, [χ^2(829.148), 20, p<.001], explaining about 67.4% variance of the litter disposal behaviour according to the Nagelkerke R^2 value. The main effect of each explanatory variable on an individual's disposal outcome was then examined, and all were significant in explaining the outcome variable.

The main effect of *distance* was observed to be significantly high, and because there were no scientific bases to assume interaction with any of the covariates, interaction terms were created between distance and all the covariate to test for significant interactions. The interaction term between *distance* and *age* came out significant, with a p-value <.001 when the interaction term was modelled with the other covariates, there was significant improvement (p-value<.001) in the model's explanatory power of 1.2% over the model without interaction term, i.e., Nagelkerke R^2 value of 68.6%.

This indicated that the relationship between a persons' age and their litter disposal behaviour was influenced by the distance to the nearest litter bin and vice versa. To enable plotting this interaction effect, distance was recorded as a categorical variable, i.e., 0-5 metres= short distance, 6-10 metres = medium distance, and >10 metres= long distance. This was then plotted in a simple scatter plot using SPSS version 23 revealing differences in the regression slopes of the relationship between *age* and *littering behaviour* at different *distances*. The binary logistic regression model showing the probability of individuals littering was then presented in odds ratios.

3.3.3 Litter Composition and Brand Audit

The current objective aimed to determine the physical composition of litter and the brands dominating the litter stream in public spaces in GAMA to inform policy decisions and intervention planning for the management of litter.

3.3.3.1 Data Collection Procedure: Training and Orientation

The Researcher recruited a three research assistants for the litter sorting and branded litter audit. The contribution of the research assistants was limited to sorting and counting litter items under the strict supervision of the researcher. The researcher educated the research assistants on the objective of the study. The orientation of the research assistants covered topics like the appropriate use of PPEs, ensuring safety during the field exercise, sorting procedures, identification and correct classification of various litter material types, measurement, and data entry into the score sheet, among others. This was to equip them with the requisite skill to perform a litter and brand audit and to ensure the quality of work.

3.3.3.2 Pilot survey

A pilot study was performed before the litter characterisation and brand audit. The pilot exercise was done using litter from two bus stops at the 37military hospital in Accra. The area size was 30m (98ft) in length and extended 1.5m (5ft) into the street on both sides of the bus stop. The exercise was to reinforce the orientation and training given to the litter sorting team to ensure that the team understood the litter categorisation and brand recognition process. It was also to test the appropriateness of litter and brand audit score sheets.

3.3.3.3 Sample collection for the main exercise

Samples were collected in the evenings during the time the public spaces were swept each day and stored in a temporary storage area to be sorted the following day. Only the litter that was swept from the ground were collected. Thus, excluding litter from the waste bins and historical waste, i.e., uncollected waste from the previous day. The samples were collected from multiple spots within each study site due to perceived spatial variation in the litter composition. Collected samples were contained in 240l plastic bags and labelled appropriately with the site name and sample identification, and stored at a temporary storage space near the sorting area. Table 3.1 shows the tools used for the characterisation exercise.

Table 3.1: Tools used

S/N	Sorting tools	Function
1.	240l plastic bags	Use as sample bags
2.	Wheelbarrow	Carrying samples
3.	Rake	Gathering litter
4.	Sorting Mat	A platform on which litter was sorted
5.	Brooms	To sweep sorting area
6.	A4 sheets	To write labels on sample bags
7.	White board marker	To write labels on A4 sheet
8.	Sellotape	To stick A4 sheet on sample bags
9.	Measuring tape	Measure area size for sample collection
10.	Boots	Personal Safety gear
11.	First aid kit	First aid
12.	Hand sanitiser	Disinfecting hand
13.	Soap	Hand washing
14.	Water	Hand washing
15.	Hand towels	Drying hands
17.	Hand gloves	Personal protective gear
18.	Nose masks	Personal protective gear
19.	Pens	Data recording
20.	Score sheet	Recording litter survey data
21.	Note pads	Taking other relevant notes from the field
22.	Overall coats	For protection

3.3.3.4 Location of the sorting area

The sorting area was located under a shade at the University of Ghana Campus near '*bush canteen'* waste container sites. This was strategically located because it was spacious with a lot of shade and near the communal containers that made it easy to dispose of non-recyclable litter after sorting was completed. Additionally, it presented a serene environment with minimal interference from people because the exercise took place during holidays when students were off-campus.

3.3.3.5 Litter sorting guidelines

The litter sorting will be based on the modified guidelines proposed by Worrell et al. (2016) for litter studies as follows.

1. All pieces larger than 2.5cm, i.e., 1inch was counted, thus excluding items less than 2.5cm, e.g., a removable tab from a beverage can, cigarette butt, etc.
2. Any litter item that was judged as not being dropped by a person was not counted, e.g., leaves, branches, rocks, or animal dropping and so on.
3. Pieces of any items obviously belonging to one item was counted as one, e.g., pieces of a broken bottle, disposable cups, spoons, etc.
4. All containers containing liquids or solids were emptied before collection except for two bottles that contained urine.

3.3.3.6 Pre-sorting Procedure

1. Photographs of all sites were taken across the length and breadth before the field activities to provide in-depth context data of the public spaces.
2. The litter research assistants were trained on the identification of litter types, categories, sorting, procedures, brand identification, and data recording.
3. The hazards, procedures, and use of PPEs were reviewed with litter sorting personnel before conducting the field activities.

4. All litter found on the ground within the public space were swept and collected manually into pre-labelled 240l plastic bags.
5. Site factors, e.g., anthropogenic variables, were recorded, including perceived crowdedness of the area, the distance between litter bins, vehicular traffic, etc.).
6. A flat and secured location was selected, swept, and covered with a durable tarp for manual sorting activities. This was to avoid any contamination of the sample.
7. Count method was used to record data.

3.3.3.7 Description of sorting process and procedure

The sorting area was cleared of all existing litter around the area to avoid contamination of the sample. The already collected waste was moved from the temporary storage area to the sorting area. The sorting was done by a three research assistants led by the current researcher. Each research assistant was assigned to sort one litter type at a time and were provided bags to store the sorted items to be counted later.

Litter characterisation was done first to identify the composition of litter in the public spaces. Carrying out a litter characterisation first made it easy for brand audit to be done. For the litter characterisation, litter was sorted into broader categories based on the material types. These included plastics, food/fruit remains, papers, textiles, metals, glass, rubber and leather, and any waste which could not be classified were categorised under others.

Some of the sub-categories encountered under each broad category included a) Plastic, e.g., Polyethylene terephthalate (PET), High-density polyethylene (HDPE), Low-density polyethylene (LDPE), and Polyvinyl chloride (PVC); b) Paper, e.g., cardboard, newsprint, office paper, paper towel; c) Textile, e.g., cloths/garments; d) Metal, e.g., cans, tins, bottle caps; e) Others/Miscellaneous e.g., synthetic hair, human waste, i.e.,

faeces and urine, artificial nails, and nail file), f) E-waste, e.g., mobile phone accessories, and others.

This classification was adapted categories from (Miezah *et al.*, 2015). This was to enable comparability of litter composition within the Ghanaian setting. After sorting and categorising, each category was counted and recorded in a score sheet. This followed the recovery and subsequent sorting of all litter items that were displaced and trapped on the barricade-like grasses. The sorting area was then prepared for the brand audit.

The second phase was the brand audit. Each category of sorted litter from the characterisation phase was re-sorted according to the brand names and industry of origin. Litter from each brand was kept in a separate bag, labelled appropriately. Counting items of each brand name was done and recorded in a score sheet.

3.3.3.8 Data recording

The score sheet for the litter characterisation and brand audit contained details about the items sorted. The litter characterisation score sheet indicated the date and day, site identification number, recording person, material type, e.g., plastic, paper, metal, etc. A column for the count of each item and a provision to record otherwise unexpected items. Some examples of the unexpected items found were faeces, a used sanitary pad, and urine in bottles that were encountered during sorting.

Likewise, the brand audit score sheet included day and date, site identification number, material type, e.g., plastic, brand name, e.g., storm energy drink, Company/Manufacturer name, e.g., Kasapreko Company Limited, industry, e.g. beverage, industry sub-category, e.g., sport drink, and country of origin, e.g., Ghana. The litter items that could not be identified by brand because the details were peeled off were categorised as unidentified. Some others were not branded like '*sobolo*', i.e., Hibiscus leave drink, and '*Burkina*',

i.e., a drink made from millet and pasteurised milk bottles, were categorised as unbranded litter items. Refer to the appendix for samples of the score sheets for both litter characterisation and brand audit.

Data was recorded per the categories detailed in the score sheet. The researcher was responsible counting the litter items and recording. After recording each category, the researcher double-checked each item for confirmation to ensure accuracy and resolve possible differences in the data. The characterisation and brand audit exercise took 7 days. To ensure that any fluctuations of litter dropped was taken care of, the sorting took place daily, from Monday to Sunday. The sorting for the pilot exercise was excluded from the data. Figure 3.2 shows the litter characterisation and brand audit procedure.

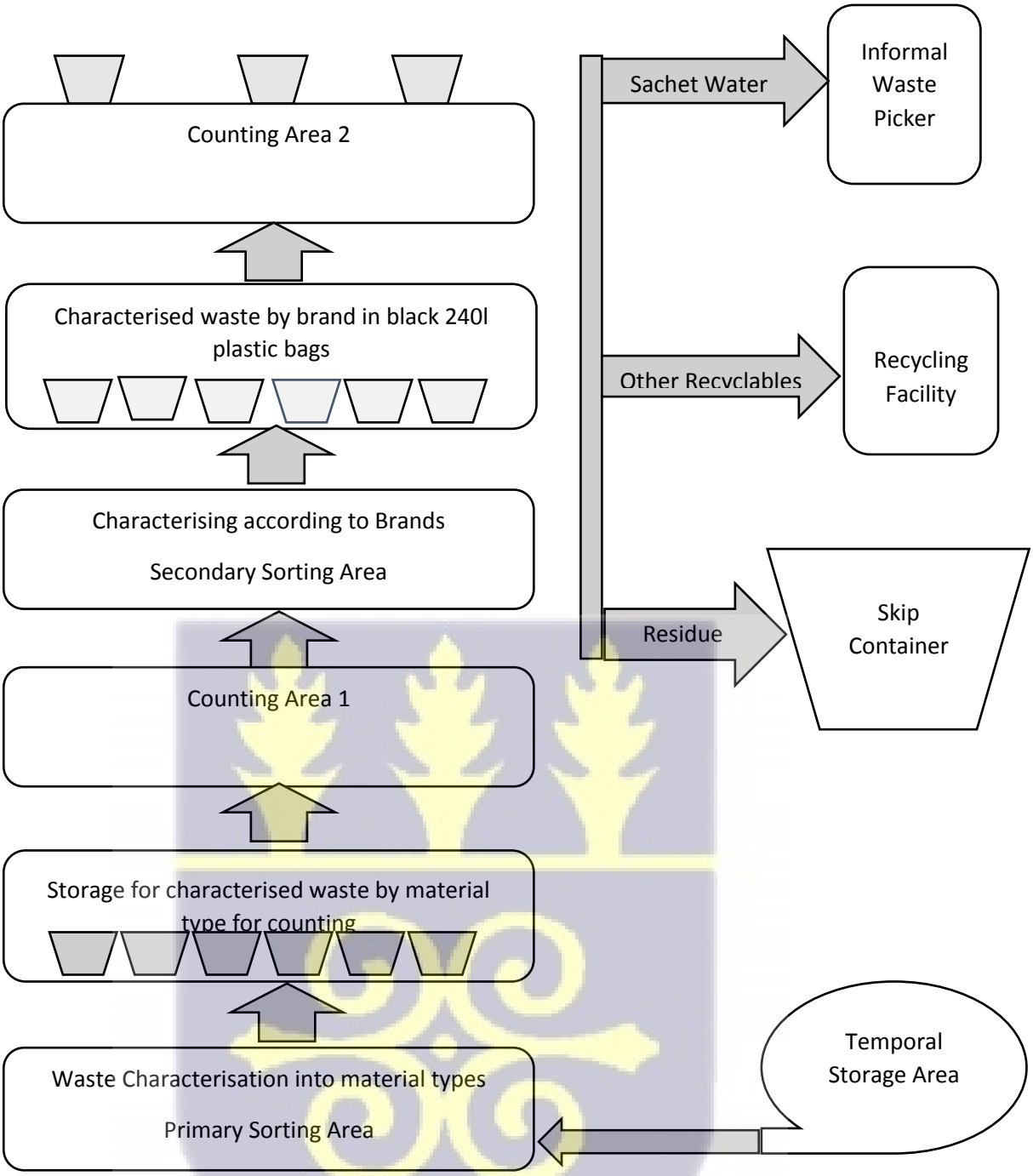


Figure 3.2: Schematic representation of the litter characterisation and brand audit procedure.

Source: Student's construction

3.3.3.9 Post-sorting disposal plan

After the sorting and counting, the sachet water bags were collected by an informal waste picker for sale. The other recyclables, particularly plastics, were sent to a recycling facility, while the rest were dumped in the skip container located near the sorting area.

3.3.3.10 Limitations and mitigation measures

The litter characterisation and brand audit did not occur without challenges. For instance, ideally, the exercise should have taken place multiple times to ensure that the study covers seasonal variations or special recurring events that might affect litter composition. However, this could not be done due to limited time and resources for the study. Another limitation for this study was the fact that litter characterisation and brand audit was undertaken during the covid-19 pandemic period, and so the researcher needed to avoid prolonged contact with waste to reduce the risk of infection. This explains why the exercise was limited to one week.

Again, because the weight of some of the sorted materials was negligible, like the scratch cards from the telecommunications, plastic film bags, especially in small quantities in some of the samples, etcetera, weighing became unfeasible. The researcher resorted only to count as a method of measurement. Thus, it became impossible to measure food remains in that manner. The food remains were measured by weight so that was not left out of the study.

The weather posed another challenge as exercise risked wind blowing away the lightweight litter items like plastic film bags and pieces of paper. Though the effect of the wind was minimal, the grasses around served as a good trap for the blown away items. To ensure that litter blown away by wind were recovered, after sorting and characterising each sample, the researcher picked up all the items and characterised and added them to the count of their appropriate component.

Fly-tipping or illegal dumping of bulk waste (mainly household waste) from the adjourning communities to the public spaces presented a threat to the current study. This was particularly for the market and lorry station. This is because the current study

concerned a different category of municipal solid waste that does not include household waste but rather waste generated and disposed of in public spaces. Fortunately, these were usually found tied up in sacks and plastic bags and were easily identified and excluded from samples. That also is one of the justifications for collecting samples in the evenings.

3.3.3.11 Data Analysis and reporting

The litter classification by material components was grouped based on Miezah et al., (2015) categorisation. Also, the litter was categorised by brand/manufacturer name and then industry of origin. Descriptive statistics were then used to describe the proportion and frequency of occurrence.

3.3.4 Challenges of Environmental Policy Implementation

Semi-structured in-depth interviews were conducted with 5 purposively sampled stakeholders in the environmental sanitation sector in Ghana. The purpose of the study was to ascertain expert opinions about environmental policy implementation challenges in Ghana with a focus on littering reduction and prevention. Participants included individuals from the Regulatory agency, i.e., EPA, Policy formulation, i.e., Ministry of Sanitation, Local Assembly, i.e., AMA, Low enforcement, i.e., Ghana Police Service, and the public space administrators. To ensure the anonymity of the key informants, they have been coded as KI-1 to KI-5, where 'KI' means key informant.

3.3.4.1 In-depth Interview Guide

The in-depth interview guide comprised broad areas, including a) participant demographic characteristics; b) perception about littering in public spaces; and c) perception about environmental and waste management policy implementation challenges.

3.3.4.2 Interview administration and analysis

The administration of the in-depth interviews were done in the English language, with each session lasting about 45 minutes. The sessions were audiotaped to ensure the smooth progress of the session and completeness of data. Also, analyses of the data followed a thematic analysis procedure by Nowell et al. (2017) as described earlier in the qualitative data analysis procedure for the first objective of this study.

CHAPTER FOUR

RESULTS

The findings of the study to understand individuals' littering behaviour in public spaces is presented in the following order: individuals' perception about littering, the factors influencing littering behaviour, the composition of litter and brands dominating the liter stream in the study area as well as policy issues, including implementation, and litter abatement challenges. The section is then concluded with a summary of the study findings.

4.1. Individuals' Perception about Littering in Public Spaces in the Greater Accra Metropolitan Area.

This section presents the findings from the thematic analysis of the individual in-depth interviews and focus group discussions, including the quotes that best-expressed participants' individual and co-construction of littering behaviour. In instances of disagreement between the individual and the group construction of the issues, the researcher used quotes from both interviews and focus group discussions to present such conflicting expressions.

A sample size of 44 was used, composed of 28 individual interview participants and 16 focus group participants. The researcher recruited groups of four members to participate in 4 focus group discussions. The age range of participants was between a minimum and maximum age of 19 and 52 years, and a mean age of 37 years. About 66% of the participants were males, with 70% married. Further, all but 3 of the participants had formal education.

4.1.1 Theme and Sub-themes of Individuals' Perception of Littering in Public Spaces

This study's thematic analysis of the interview and focus group discussions generated three main themes and twelve sub-themes, as summarised in Table 4.1. The main themes generated were *cognitive ideations about littering*, *norms influencing littering*, and *littering prevention measures*.

Table 4.1: Summary of main themes and subthemes generated in the study

Main Themes	Sub-themes
1. Cognitive ideation about littering	1 Account of how littering occurs in public spaces
	2. Littering as a collective action
	3. Act of ignorance and foolishness
	4. Desire to minimise private cost
	5. Source of income and someone paid to clean
2. Norms influencing littering behaviour	1. Lack of and irregular servicing of litter bins
	2. No anti-littering prompts
	3. Informal social controls
	4. Weak law enforcement
3. Litter prevention measures	1. An adequate supply of litter bins
	2. Intensify public education
	3. Strict law enforcement

4.1.2 Cognitive Ideation about Littering Behaviour

The cognitive ideation is participants' interpretation of littering behaviour. Twenty-six participants' out of forty-four shared their views on this main theme. This section presents the sub-themes as portrayed by direct quotes from the participants' expressions. The participants in this study shared their insights about littering in public spaces in

GAMA. The subthemes that emerged were accounts of '*how littering occurs in public spaces'*, '*littering as a collective action', 'act of ignorance and foolishness', 'the desire to minimise private cost',* and *'source of income and someone paid to clean'.*

4.1.2.1 How Littering Occurs in Public Spaces

Interviewees' narrative of this issue shows that littering persists despite the regular cleaning activities and the presence of litter bins in public spaces. The absence of written prompts prohibiting or directing litter disposal behaviour also emerged as a reason for some participants' littering behaviour, a consensus elicited from a focus group discussion confirmed this view.

> *"[…] if I drink water, I will throw it (litter) on the ground. Abroad, they write 'do not throw rubbish here' but here, it is not written. So, what should I do? I will drop it* (litter) *on the ground"* (IP19, male, 37 years).
>
> "*As you can see with your own eyes, they dump right here, on the ground. Meanwhile the dustbin is standing right there. They sweep the place every morning and evening, and yet filth persists……"* (FG2-P1, Female, a 32-years, trader)

Even though 21 participants cited the absence of litter bins as a justification for their littering behaviour, the researcher's observation and some interviewees' verbal accounts confirmed the presence of litter bins in the public spaces.

Furthermore, though 58% of the participants exhibited an aversion to littering, they admitted to littering the environment. Thus, there is a common mismatch between participants' attitude and their behavioural outcomes based on the accounts of their behaviour.

> *"It (throwing litter on the ground) will not help us. It will not help anyone […]. If the bin is full and no one comes to empty it, and nothing happens, and then we come to dump, and the bin is full then we will also dump anyhow. If I come and it*

is empty, I will dispose correctly, but if it is full, I will throw it anywhere" (IP1, male, 38 years).

The above extract also hints at an influence of waste collection service quality on littering behaviour. The state of waste management, for example, overflowing litter bins is a source of a normative cue suggesting that littering is justified under such conditions.

4.1.2.2 Littering as a collective action

About 49 % of the participants' interpretations indicate that incorrect litter disposal behaviour by many people results in littering in public spaces. Excerpts from the in-depth interviews and focus groups strongly acknowledged their personal and collective role in contributing to the littering problem and the solution.

"We are all part of the problem. How we can keep the environment clean is not a government issue. It is us, the citizens. We must do the right thing and not litter the ground. That is why in every station there are litter bins" (FG4-P2: 25 years-Trotro-mate).

"We come to buy items consume and litter the place" (IP26, Male, 19 years)

4.1.2.3 Littering as an act of ignorance and foolishness

Under this sub-theme, participants described littering behaviour as an act of ignorance and 'foolishness' on the part of individuals who litter. There was consensual acknowledgement about the ineffectiveness of public education and informal controls on individual littering behaviour. Thus, people litter irrespective of the public education going on the radio. The quotes also revealed an utter disregard for informal controls, such as verbal prompts from others. These narrations suggest that more than education and prompts are required to alter the littering behaviour of individuals effectively.

"Those who litter are ignorant. They need to be educated……. We are all part of the problem". (IP12. male 41 years, driver)

> *"It is foolishness (εyε gyimia). They have heard them saying this on the radio- If you drink water, throw the rubber in the dustbin. But they will still throw rubbish on the ground. If you talk, they will not listen."* (FG3-P4, male 36 years, trader)

4.1.2.4 Desire to minimise private cost

The accounts from 32 participants revealed that individuals make their litter disposal decisions after engaging in a cost-benefit analysis of the alternate course of action or behavioural outcomes, and then choose the action that comes with less cost and higher benefit to the individual. The theme was a dominant view of participants (n= 15) that they would rather litter if the correct disposal involves walking a certain distance. The response by an interviewee to the interviewer's probe best articulates this view.

> *"If the bin is standing over there, and I have walk there to dump, it will pain me (IP22, male, 28 years)."*

A similar notion was obtained based on a consensual construction from two focus group discussions that people will try to avoid the private financial cost of disposing of their household waste. The second quote suggests a transfer of household waste from the adjourning communities to public spaces in an attempt to avoid paying for collection. It is evident that not only does littering in public spaces result from incorrect disposal of solid waste generated in public spaces but also from some households.

> *"… Common fifty pesewas that they will spend to protect the environment i.e., dispose in a bin, they won't do that. We have cautioned people to no avail" (IP13, 29 years, and a market taskforce)*

> *"Other people will carry their waste from their homes to dump in the market as well. So, if you see waste that is tied in a bag, then it is from a house" (FG2-P4, 38 years, market task force)*

4.1.2.5 Someone paid to clean and source of income

About 67% of the participants perceived that throwing litter on the ground is not such a bad thing, because not only are people employed to clean, but it is also an avenue for some waste pickers to make a living.

> *"They have contracted people to clean, and they pay them. That is how the cleaners who work here make ends meet. Besides, there are some informal waste pickers who come to pick up the rubbers and sell them to earn income"* (IP28, 39 years, male).

> "*We throw any other waste in the bin, but the sachet water bags are thrown on the ground for a waste picker who comes here every day to pick them to sell"* (FG4-P4, male, 39 years)

These narratives indicate that some people perceive littering as a favour to the waste pickers. Consistently, the researcher observed some activities of waste picking and sweeping in the cause of this study. Thus, participants see littering in a positive light, which can motivate people to litter more.

4.1.3 Norms Influencing Littering Behaviour in Public Spaces.

Norms influencing littering behaviour emerged as the second main theme. Under this theme, participants shared their opinion about the norm that influence littering in public spaces. Four sub-themes were identified, namely, *lack of and irregular servicing of litter bins, no anti-littering prompts, informal social controls*, and *weak law enforcement*, representing the norms influencing littering.

4.1.3.1 Lack of Litter Bins

About 52% of the participants pointed to the absence of, and irregular emptying of litter bins as a justification for littering. The excerpts below represent this point.

> *"If you go abroad, there are litter bins everywhere. But in Ghana, we do not have sufficient litter bins" (IP13, 29 years, male)*

"If the bin is full and no one comes to empty it, and nothing happens, then when we come to dump and the bin is full, we will litter" (FG2-P4, male, 45 years)

4.1.3.2 No anti-littering prompts

About two-thirds of participants cited the absence of written messaging at the public spaces prompting them to dispose correctly and hence their littering behaviour.

"Abroad, they write 'do not throw rubbish here'. But here, it is not written. So, what should I do? I will dump it on the ground. You see that they wrote do not urinate here. So, we don't urinate there" (IP5, 30 years, male).

An observation from the field further revealed that except at the educational institution, there was no form of written messages posted at the sites about litter disposal. However, the researcher observed a written messages prohibiting urinating at the lorry station and health facility. This suggests that some people look out for such written prompts to guide their behaviour in situations where the norms are not explicit.

4.1.3.3 Informal social control

Thirty-one participants reveal that social control does exist in the form of verbally reproaching people who litter. Nineteen of them stated that they have received verbal reprove and or chastised people they observed littering. They did indicate, however, that such social consequences are often ineffective.

"I threw rubbers in the bush on my way to Akosombo. And there was a private car behind me. I noticed that the private car overtook me. Then, I got to the police barrier there and they stopped me. They asked me what I threw into the bush. I told them that oh it is rubbers they used to package rice that I bought. They ordered me to go back and pick it up. And there were passengers in the car. So I begged for pardon. And they said go. Next time (a verbal warning)" (IP2 32 years, male, driver)

"Yes. I am number one. There is another man called 'XYZ' (name concealed). When we see someone litter, we will let the person pick it and put it in the bin. We

talk among ourselves to stop littering. For some people, no matter how much you talk, they won't listen" (IP4, 51 years, male).

4.1.3.4 Weak law enforcement

Laxed law enforcement came out strongly as a reason for the persistent littering behaviour.

> *"Madam, even AMA, they are not serious. (Why do you say that? Interviewer probe). Here, they gave the cleaning on contract. If the contractor is not doing the job well, what is AMA supposed to do? Penalise them. But, they will not do that. So they are all thieves. Instead, they come here to seize people's things (goods). Only those traders who give them money on the roadside are left to sell". (FG2-P2, male, 27 years).*

> *"Ghana, the democracy is too much. During Rawlings' regime, you could not eat and drop litter on the ground. It is the discipline. Now everything is in a mess. Even in Togo, you can't eat and drop the litter anyhow. Also, in Cote d'ivoire, if you go there, it is like abroad. If you misbehave there, they will punish you".*

4.1.4 Littering Prevention Measures

Finally, about 24 participants made some suggestions for litter abatement, from which the last main theme emerged. Three sub-themes represented the approaches for litter prevention identified from 15 participants' narratives. The subsequent paragraphs discuss the approaches for litter prevention.

4.1.4.1 Supply of Litter Bins

The Participants viewed the provision of adequate litter bins in public spaces as an important measure for reducing littering. About 18 participants suggested that surveillance on individuals litter disposal behaviour should accompany litter bin adequate supply in public spaces to ensure effective bin use.

> *"What will solve the litter problem is the provision of more dustbin and security guards. If the Authorities position dustbins everywhere and people litter, then they must be arrested"* (FG1-P1, 41 years, male)

4.1.4.2 Intensify Public Education

Many participants perceived intensive environmental education as a necessary tool for poor litter disposal behaviour change. They stressed that public education should inform people about the human health implication of environmental pollution.

> *"More talks on the radio, TV, and others. If people know that living in a dirty environment is what is making all of us sick, then they will stop throwing rubbish on the ground"* (IP124, female, 37 years)

4.1.4.3 Strict Law Enforcement

About 85% of the participants believe that the deployment of the military at vantage points in public spaces can be an effective deterrent to individuals littering behaviour. Similarly, others have expressed that democracy did Ghana no good and has contributed immensely to the country's current waste and littering levels. Only military rule, they say, can change individuals' behaviour. This is a potential control measure for both self and others' littering behaviour, according to this study's participants.

> *"What will help is for the military to be deployed into town to monitor litter disposal. If a military person is standing there, who will litter the ground? That is the only thing that will help us in Ghana. If not the waste issues in Ghana will not stop".*

> *"Also, they should deploy the military here. Me for example, if there is a soldier here, I will not drink water and throw the litter on the ground. If there is a soldier here and litter, they will beat me? So, I will not do that".*

The quotes presented under this subtheme emphasises the perceived importance of tactical community policing as a littering behavioural preventive measure. This is related to the establishment of 'on-the-ground' littering prevention program using the military.

While 37 participants suggested this strategy, there was no mention of the role of the Police Service which is the main law enforcement agency in Ghana. These narratives highlight a low public confidence in the Police Service in crime (littering) prevention.

This study sought to assess individuals' perception of littering behaviour in public spaces in the Greater Accra Metropolitan Area. The thematic analysis revealed widespread littering. The reasons for littering included a perceived absence of litter bins and written caution prohibiting littering, presence but ineffective informal social controls and weak law enforcement. Participants perceived that adequate litter bins, intensifying public education and strict law enforcement will help reduce littering in urban spaces.

4.2 Factors Influencing Individual Littering Behaviour in Public Spaces in GAMA

4.2.1 Descriptive Statistics

4.2.1.1 Demographic Characteristics

The total number of observations made across the four public spaces was 1200 over a forty-day period. The observations were made simultaneously across the study sites. This was done every other day at each site, starting from 6:00 am to 6:00 pm. Overall, 50%, 42%, and 8% of all observations were made in the afternoon, morning, and evening, respectively. The afternoon and morning recorded the most disposals. Males constituted 63% of the participants, with 37% females. The mean age was 29, and the median age of 28, with the minimum and maximum age of 6 and 68, respectively. Further, regarding the spread of the participant ages, the 25^{th}, 50^{th}, and 75^{th} percentile ages were 22, 28, and 35 years, respectively. It shows that the majority (75%) of the participants were 35years and below. Table 4.2 presents the descriptive statistics of the observation study.

Table 4.2: Demographic Characteristics

Variable	**Total = 1200**	
Time of Day	**Frequency**	**Valid (%)**
Morning (6:00am-11:59am)	500	42
Afternoon (12:00pm-3:59pm)	600	50

Evening (4:00pm-6:00pm)	100	8
Total	**1200**	**100**
Gender	**Frequency**	**Valid (%)**
Male	754	63.0
Female	446	37.0
Total	**1200**	**100.0**
Age Range	**Frequency**	**Valid (%)**
<21	219	18.0
21-30	524.0	44.0
31-40	279.0	23.2
41-50	137	11.4
>50	41	3.4
Total	**1200**	**100**
Mean=29; Median= 28; Std. Deviation = 10.14; Range= 62; Min =6, Max =68		

About 60% of participants were alone at the point of sampling, while 40% were in a group. Approximately 67.7% of the participants who were in a group were with their peers, 22% were in the company of both younger and older people, and the least 3.4% were in a group of people who were older. About 78.8% of participants were in a group with the same sex as the target participant, about 14% in a mixed-sex group, and the least, 7.1% were in a group with the opposite sex relative to the participants. The Table 4.3 presents the social setting of participants and the frequency of observation.

Table 4.3: Social Setting and frequency of observation

Group setting	**Frequency**	**Valid (%)**
Alone	723	60.0
In a group	477	40.0
Total	**1200**	**100.0**
Age Category of Group Members	**Frequency**	**Valid (%)**
Peers	323	67.7
Older	16	3.4
Younger	31	6.5
Both older and younger	107	22.4

Total	**477**	**100.0**

Gender Composition of Group	**Frequency**	**Valid (%)**
Same-sex as participant	376	78.8
Opposite sex as participant	34	7.1
Mixed-sex	67	14.0
Total	**477**	**100.0**

4.2.1.2 Litter Disposal Behaviour Exhibited

Table 4.4 shows that 98% of observations resulted in disposal, i.e., correct/properly or littering, while only 2% did not result in disposal i.e., pocketing the litter item. About 61% of the 1180 disposals resulted in littering. About 86% of participants' disposals were with intent, i.e., they dropped the litter items, and the behaviour appeared to be intentional.

Table 4.4: Litter disposal behaviour exhibited

Behaviour Outcome Observed	**Frequency**	**Valid (%)**
Non-Disposal (pocketing litter)	20	2.0
Disposal (Correct and Incorrect)	1180	98.0
Total	**1200**	**100.0**

Disposal Behaviour Outcome	**Frequency**	**Valid (%)**
Correct Disposal, i.e., Put litter in a bin	461	39.0
Littering	719	61.0
Total	**1180**	**100**

Littering Strategy Observed	**Frequency**	**Valid (%)**
Drop-intent	620	86.2
Drop-no intent	3	0.4
Wedged	17	2.4
Flick or fling	30	4.2

Inching/ Inch away	6	0.8
Foul shooting/ shoot and miss	16	2.2
Kicking	9	1.3
The 90%	2	0.3
Herd behaviour	12	1.7
Sweep	3	0.4
Others	1	0.1
Total	**719**	**100.0**

4.2.1.3 Demographic characteristics of participants and frequency of littering.

Figure 1 indicates that 61% of individuals observed littering were males. This result may be due to the greater proportion, i.e., 63% of male participants sampled against 37% of females (Table 4.1). Also, individuals between 21 and 30 years were the most observed littering (44.1%). Individuals between 21 and 40 years accounted for 70.7% of littering, while the least 4.3% were above 50 years. This observation could be associated with the fact that most individuals sampled, 44.0%, and 67.2%, were between the ages of 21 and 30, and 21 and 40, respectively, thus, increasing the probability of observing individuals within that age group. Similarly, the least observed (3.4%) were individuals above 50 years.

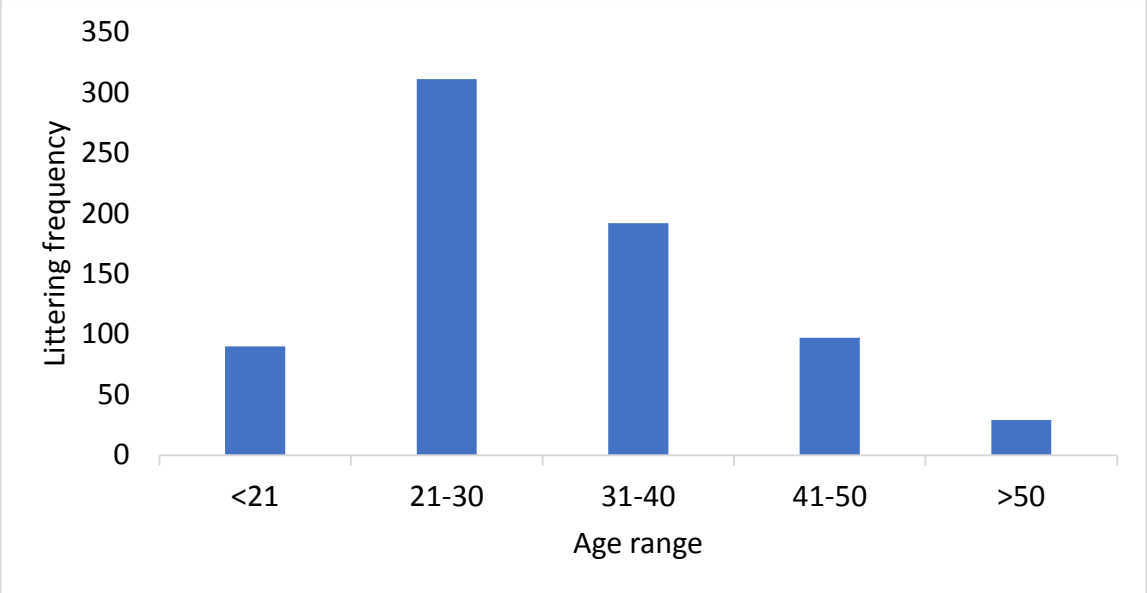


Figure 4.1: Participant age and littering frequency

4.2.1.4 Participants' social setting and littering frequency

There was an almost equal frequency of littering (366) as there was correct disposal (357) among individuals who were alone (Figure 4.2). However, there was a difference when individuals were in a group. Littering (353) within the social context far exceeded correct disposal (124), i.e., a 74% littering rate.

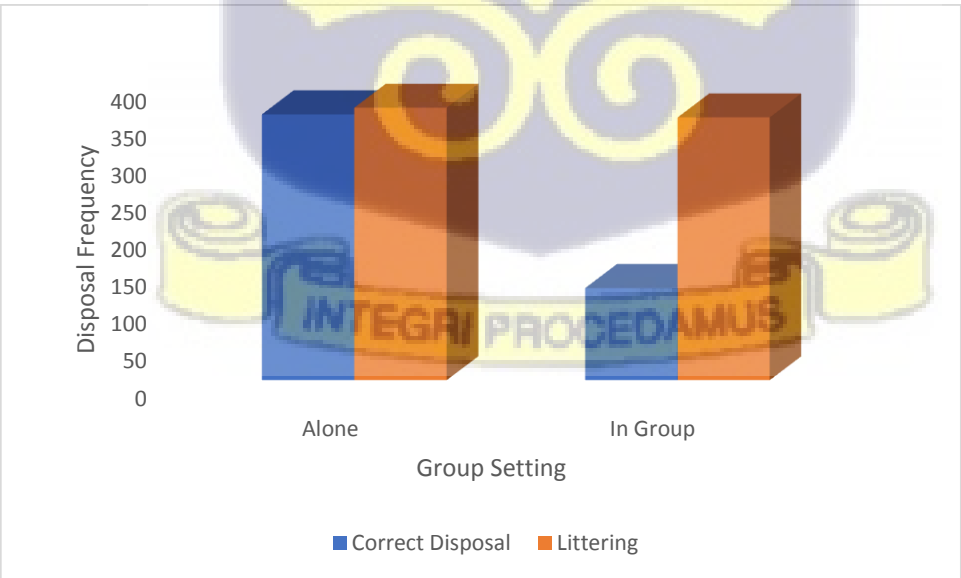


Figure 4.2: Social Setting and Litter Disposal Outcome

4.2.1.5 Group age composition and litter disposal behaviour

Figure 4.2 indicates that littering and correct disposal occurred more when individuals were with their peers (figure 4.3). It is important to note that the majority of individuals with the peer group were of the same sex (*f* = 284), which explains the similarity in their behaviour outcomes (Figure 4.2). Correct disposal exceeded littering when they were in the company of younger people, but when with older people, they littered more.

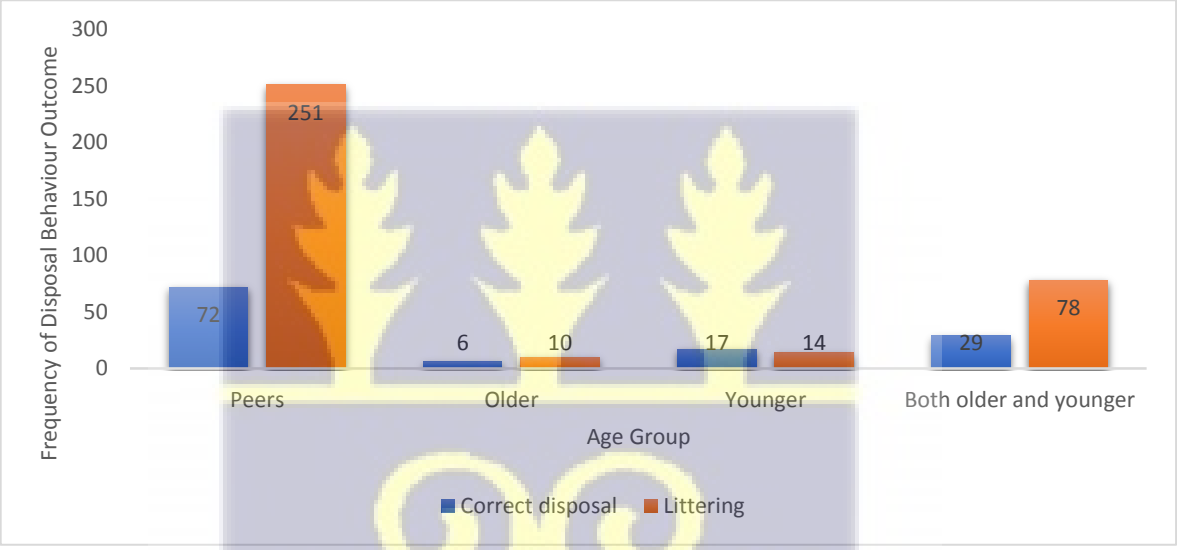


Figure 4.3: Group Age Composition and Litter Disposal Behaviour Outcome

4.2.1.6 Group Gender Composition and Litter Disposal Outcome

Group gender composition is an important determinant of individual litter disposal behaviour outcome. Figure 4.3 depicts that individual behaves pro-socially when they are in a mixed-sex group. Individuals' correct disposal (44) exceeded littering (23) by 21. Surprisingly, however, the opposite is true when individuals are with the opposite sex and same-sex. The littering rate was 82% when individuals were in the company of the opposite sex and 65% when individuals were of the same-sex groups.

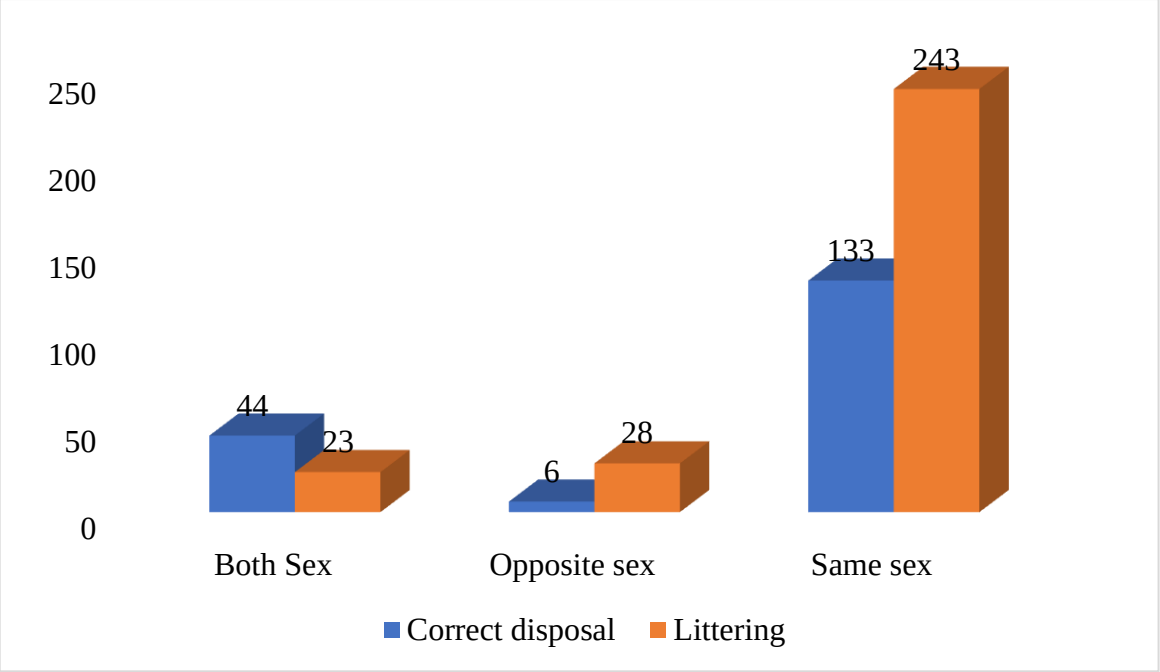


Figure 4.2: Bar chart of gender composition of group members relative to the participant

4.2.1.7 Group Size and Littering Frequency

With respect to group size and disposal outcome, individuals in a smaller group below 5 people littered less than those in larger groups of more than 5. Thus, group size is positively related to littering behaviour (Table 4.5).

Table 4.5: Group size and disposal outcome

Group size	Correct disposal (%)	Littering rate (%)	Total percentage (%)
<5	30.3%	69.7%	100
5 to 10	19.6%	80.4%	100
>10	12.5%	87.5%	100

4.3.1.8 Litter Items Disposed

It was observed that most of the litter items disposed of, both correct disposal and littering, were water and beverage-related packaging items, which constituted more than half (69.6%) of all items disposed (Figure 4.4). Food-related packaging items and food remains followed this, making up 16.8%. General packaging, mostly plastic films-'takeaway' bags accounting for about 9.6%. Paper/ paper towel and other litter items like metal, glass, e-waste, etcetera was the least among the items disposed, making up 2.6%

and 1.4%, respectively. Littering frequency exceeded correct disposals for all the litter items except the others (mixed waste). Overall, the water and beverage and food-related litter items were most disposed, either correct disposal or littering, constituting 86.4%.

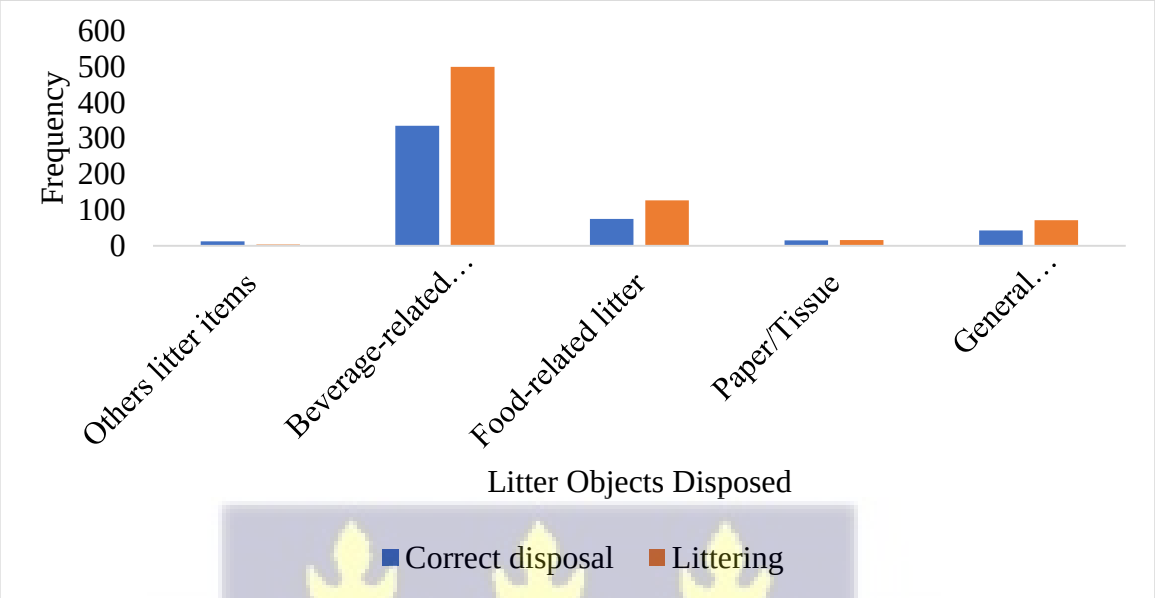


Figure 4.3: Bar chart depicting the frequency of littered items disposed

4.2.1.9 Type of Public spaces and associated littering frequencies

With reference to Figure 4.5, except for the educational institution, the frequency of littering at all the public spaces exceeded the frequency of correct disposal. About 93% of disposals in the market resulted in littering, with 78% and 53.3% littering rates at the lorry station and health facility, respectively. However, the littering rate was 15.3%at the educational institution.

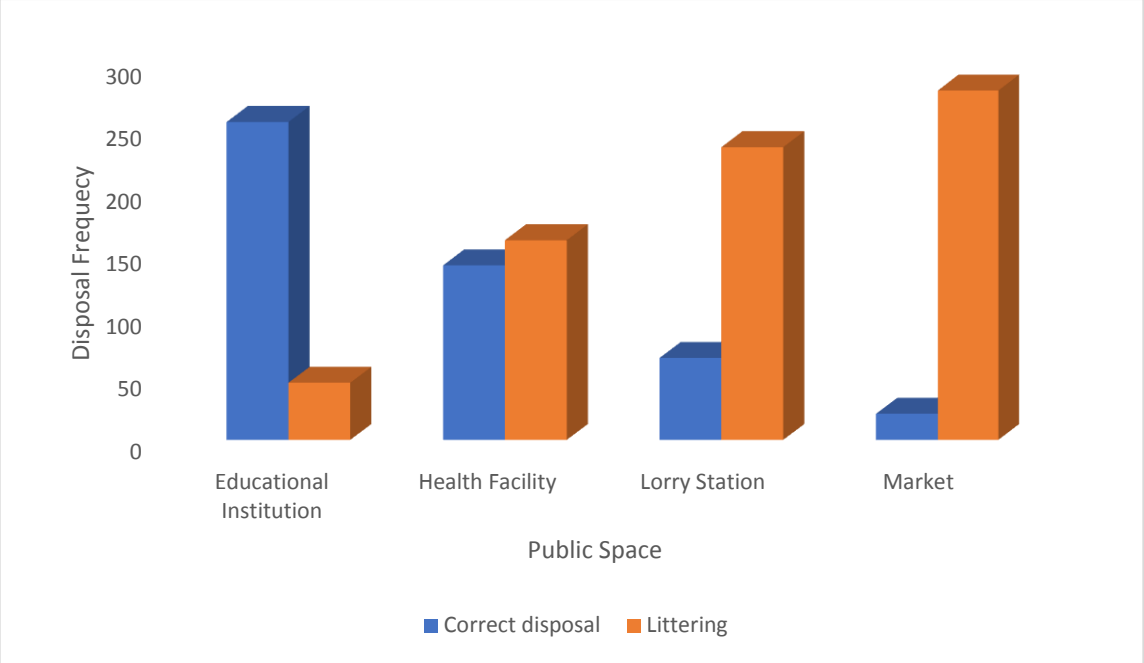


Figure 4.4: Graphical representation of public space type and litter disposal behaviour

4.2.1.10. The distance to the nearest waste bin and disposal behaviour outcome

About 84% of observations were made within 5 metres and below, while the highest observation among the distance categories was within 1-5 metres. *Distance* here refers to the distance of the participant from the nearest waste bin at the point of disposal. Figure 4.6 shows a reverse relation between littering and correct disposal within 5metres and below. Within less than a metre, correct disposal is higher than littering but starts to fall while littering frequency rises at a distance approaching 5 metres. Beyond 6 metres, both behaviour outcomes decreased but with littering slightly higher than correct disposal.

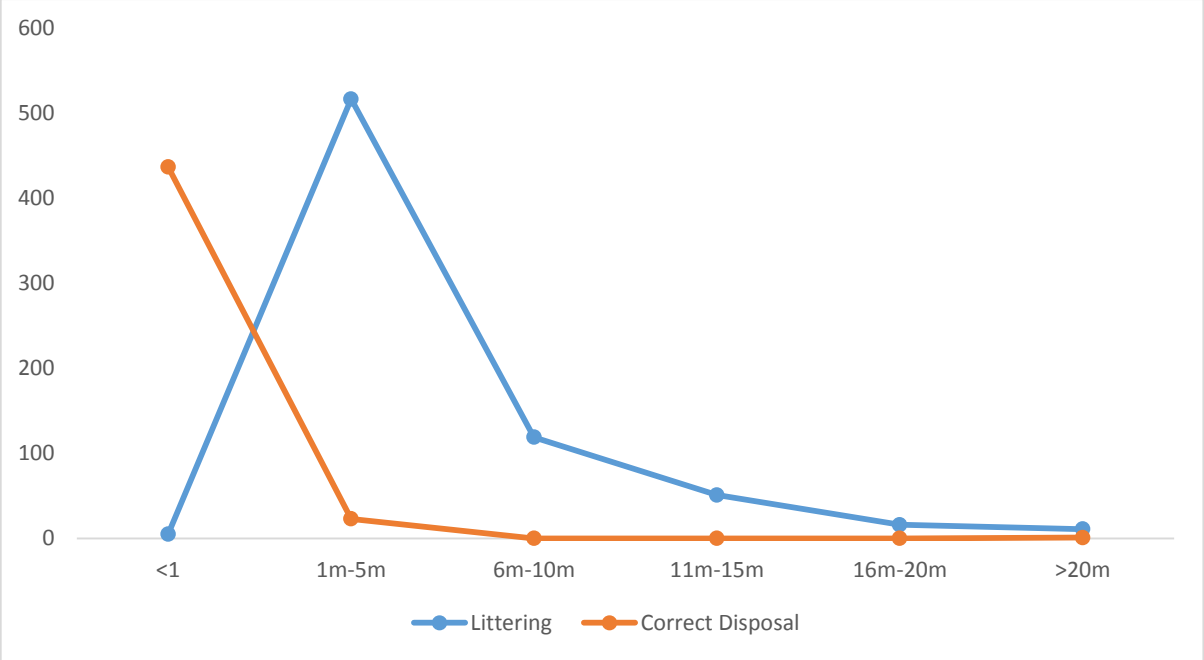


Figure 4.5: The Distance to the Nearest Waste Bin and Litter Disposal Behaviour Outcome

4.2.2 Inferential Statistics

4.2.2.1 Univariate Analysis for Categorical Variables: The Test of Goodness of Fit

A chi-squared test of goodness of fit was performed for all categorical explanatory variables to determine if the variables measured mirrored the distribution of the full population under study.

The results in Table 4.6 indicates that three variables showed no difference between the observed and expected frequencies, namely, *site type, existing litter*, and *level of economic activity*. The observed and expected frequencies were equal for all the public spaces. This was, however, expected as the sample size for each site was decided prior to data collection. The analysis showed some variations between the observed and expected frequencies for, *existing litter* and *level of economic activities*, but the difference was not statistically significant. The Chi-Square Goodness of Fit Test shows no statistical significance for the three variables at: $\chi^2(3) = 0.000^a$, p = 1.00, $\chi^2(1) = 0.000^a$, p = 1.00, and $\chi^2(1) = 0.000^a$, p = 1.00 for *site type, existing litter*, and *level of economic activities*, respectively.

However, the test showed statistical significance for all the other variables at p=0.001 at a 95% confidence level, as Table 4.6 depicts. For instance, in the case of gender, the test revealed 154 more males were observed over the expected frequency (expected=600 and observed=754) while females observed fell short of the same number (expected=600 and observed=446) at $\chi^2(3) = 79.053^a$, p > 0.001. Further, individuals littered more (719) than they disposed correctly (418) and exceeded the expected littering frequency by 119: $\chi^2(1) = 47.203^b$, p = 0.001.

Table 4.6: Chi-Square Goodness of Fit Test for categorical variables

S/N	Variable	Chi-Square Value (χ^2)	df	P-value	Conclusion
1	Type of public space	0.000	3	1.000	Not Significant
2	Existing litter	0.000	1	1.000	Not Significant
3	Economic activities	0.00	1	1.000	Not Significant
4	Gender	79.053	3	0.001	Significant
5.	Disposal outcome	47.203	1	0.001	Significant
6.	Group setting	453.395	2	0.001	Significant
7.	Group age composition	1466.158	4	0.001	Significant
8.	Gender composition of group	1032.500	3	0.001	Significant
9	Crowd	150.000	2	0.001	Significant
10	Accessibility	150.000	2	0.001	Significant
11	Object Disposed	1935.433	4	0.001	Significant
12	Activities engaged in at location	921.793	6	0.001	Significant
13	Time	350.000	2	0.001	Significant

4.2.2.2 Univariate analysis for Continuous Variables: The test of normality

From the test, all three variables showed significant deviation from a normal distribution with p-values below 0.05 as follows; $W(1200)=0.953, p<0.001$, $W(1200)=0.589, p<0.001$, and $W(477)=0.670, p<0.001$ for participant age, distance from litter bin, and group size respectively.

Table 4.7: Summary statistics and test of normality

Variable	Mean	S.D.	Min.	Max	Skewness	Shapiro-Wilk Test		
						W	df	P-value
Age	29.74	10.140	6.00	68.00	0.730	0.953	1200	0.000
Number in Group	4.61	2.745	2.00	30	4.205	0.670	477	0.000
Distance from bin	3.43	4.638	1.00	40.00	3.017	0.589	1200	0.000

With reference to Table 4.7, the average age of participants was 29 years. The age distribution indicated that only a third of the participants were above age 35. Thus, individuals who frequent the public spaces are youthful. In this study, about half of the participants are between 28 years and below.

4.2.3 Bivariate Analysis

4.2.3.1 Test of association

Table 4.8 show results from the Chi-square test of association analysis. It shows significant associations between the dependent variable, "*littering occurrence* " and factors such as *group setting* [χ^2 (1200)= 66.141, p=0.001], *group age* [χ^2 (477)= 77.759, p=0.001], *group gender* [χ^2 (477)= 83.782, p=0.001], *participant activity* [χ^2 (1200)= 184.444, p=0.001], *litter item* [χ^2 (1200)= 11.344, p=0.023], *crowdedness* [χ^2 (1200)=417.215, p=0.001], *accessibility* [χ^2 (1200)= 341.080, p=0.001], *existing litter* [χ^2 (1200)= 327.027, p=0.001], *economic activity* [χ^2 (1200)=8.7 , p=0.001], and *site type* [χ^2 (1200)= 431.268, p=0.001].

However, two variables, *participant's gender* and *time of day* were not significantly associated with individual littering occurrence with p-values greater than .05 as shown in the test result, [χ^2 (1200) =2.059, p=0.151], and time [χ^2 (1200) = 0.870, p=0.467]

respectively. These two non-significant variables were, therefore, omitted from further analysis.

Table 4.8: Bivariate Analysis between the Categorical Predictors and the Outcome Variable

S/N	Variable	Chi-Square Value (χ^2)	df	P-value	Conclusion
1	Gender	2.059	1	0.151	Not Significant
2	Time	0.870	2	0.467	Not Significant
3	Type of public space	431.268	3	0.001	Significant
4	Group Setting	66.141	2	0.001	Significant
5.	Group Age Composition	77.759	4	0.001	Significant
6.	Gender Composition of group members	83.782	3	0.001	Significant
7.	Crowdedness	417.215	2	0.001	Significant
8.	Accessibility	341.080	2	0.001	Significant
9	Existing Litter	327.027	1	0.001	Significant
10	Economic Activities	327.027	1	0.001	Significant
11	Object Disposed	11.344	4	0.023	Significant
12	Activities engaged in at location	184.444	6	0.001	Significant

Further, Table 4.9 shows results of the test of association between the continuous explanatory variables, namely, *age*, *group size*, and *distance* and the dependent variable, *disposal outcome*. The Spearman's correlation depicted a significant correlation as follows: *age* (rs(1200)= 0.272, p< .001), *group size* (rs(477)= 0.171, p< .001), and *distance* (rs(1200)= 0.647, p< .001) which is statistically significant at 95% and 99%

confidence level. The sample size was 1200 except for some group variables, including *group age* and *gender composition*. The sample size for those variables was 477 since 723 participants were alone.

Table 4.9: Bivariate correlation (Spearman's correlation, two tailed) between the numerical independent variables and the dependent variable

Variables	Test Statistic(rs)	df (Sample size)	P-value	Significance
Participant Age & Disposal Outcome	0.272**	1200	0.000	Significant
number of people in the group & Disposal Outcome	0.171**	477	0.000	Significant
Distance to bin & Disposal Outcome	.647**	1200	0.000	Significant

4.2.3.2 Test for collinearity between explanatory variables

Table 4.10 indicates that many of the explanatory variables were significantly correlated. However, the correlations were not high, thus, satisfying the assumption for multiple regression analysis.

Table 4.10: Correlation analysis for collinearity between explanatory variables

Variable	Participant age	Group size	Distance	Group gender	Activity	Litter item	Existing littered	Crowdedness
Participant age	1.000							
Group size	.176**	1.000						
Distance	.164**	.255**	1.000					
Group gender	.048	-.063*	-.074*	1.000				
Activity	.307**	.223**	.195**	.064*	1.000			
Litter item	-.051	-.058*	.104**	.011	-.112**	1.000		
Existing littered	-.374**	-.206**	-.619**	.024	-.399**	-.061*	1.000	
Crowdedness	-.114**	-.364**	-.328**	.237**	.007	.012	.192**	1.000

4.2.4 Multivariate Analysis: Interpreting the Odds Ratios

4.3.4.1 Individual-level Factors Influencing Individual Littering Behaviour

A logistic regression analysis to investigate if an individual's age contributed to individuals' likelihood of littering was performed. The explanatory variable, *age* in the logistic regression, was found to contribute significantly to the outcome variable, *littering behaviour*, [B= (1.338), S.E= .058, Wald = 24.872, p <.001]. It also indicated that *age* is positively related to an individual's littering behaviour, as suggested by the positive regression slope (the B value). Expressed in odds ratios, the results shows that,

for every unit increase in age, an individual is 1.338 times more likely to litter than a younger individual at a 95% confidence level.

4.2.4.2 Interpersonal-level factors influencing littering behaviour

Group size, *group gender*, and *participant activity* were also statistically significant at alpha less than 0.05. Table 4.11 indicates that an individual's likelihood of littering is shown to increase with the number of people in a group: [B= (1.214), S.E. = .048, Wald = 16.489, p < .001]. Thus, the odds of an individual littering increase by 1.178 times more for every additional person to the group.

The logistic regression analysis indicates that group gender composition does have an overall statistically significant influence on littering behaviour (p=.011). Individuals who were in a mixed-sex group were less likely to litter [B= (.322), S.E= .417, Wald = 7.400, p- value = .007] than those in same-sex group. There was more likelihood of individuals littering while in a group with the opposite sex [B= (2.380), S.E= .735, Wald = 1.391, p = .238].

Table 4.11 shows a positive relationship between individuals who work in the public space, [B= (1.458), S.E= .272, Wald = 4.912, p = .134], and people who were waiting to pick a car, [B= (2.265), S.E= 495, Wald = 2.733, p= .098] were more likely to litter than those who were walking through the space. There was less likelihood of those were observed eating/drinking, selling, shopping, and standing at one point to litter than those who were walking through the site. However, aside the overall significance of this variable (*participant activity*) and the varied effects of each of the categories on littering behaviour, only those eating/drinking (p-value =.004) and shopping (p-value =.012) were significant in influencing littering behaviour.

Table 4.11: Binary Logistic Regression model of individual and interpersonal level factors influencing littering behaviour

Parameter	B	S.E.	Wald	Df	Sig.	Exp(B)

Individual level:						
Participant age	.291	.058	24.872	1	.000	1.338
Interpersonal level:						
Group size	.194	.048	16.489	1	.000	1.214
Group gender: Same sex- ref			10.240	3	.017	
Opposite sex	.867	.735	1.391	1	.238	2.380
Mixed sex	-1.134	.417	7.400	1	.007	.322
Activity, Walking through- ref			24.131	6	.000	
Eating/drinking	-1.377	.475	8.393	1	.004	.252
Selling	-.670	.449	2.223	1	.136	.512
Shopping	-2.280	.904	6.353	1	.012	.102
standing	-.308	.390	.624	1	.429	.735
Waiting to pick a car	.818	.495	2.733	1	.098	2.265
Working	.377	.252	2.240	1	.134	1.458

4.2.4.3 The organisational-level factor influencing littering behaviour

The only organisational-level factor included in the study was litter item (Table 4.12). Overall, the variable proved to be a highly significant contributor to littering behaviour (p<.001). The logistic regression analysis indicated that all litter items had less likelihood of being littered than water and beverage bottles and cans. This can be seen in the beta value (regression slope) with their accompanying standard error, Wald statistic, and p-values as follows; mixed waste [B= (0.017), S.E= 01.109, Wald = 13.691, p <.001], paper/paper towel [B= (0.004), S.E= 1.713, Wald = 10.527, p=.001] , plastic film [B= (0.290), S.E= 0.238, Wald = 37.069, p <.001] , food-related items, [B= (0.448), S.E= .361, Wald = 4.943, p=.026] , food/fruit remains [B= (.305), S.E= .405, Wald = 8.594, p = .003]. With reference to the odds ratios, mixed waste and paper/paper towel, plastic films, food-related items, and food/fruit remains are 0.017, 0.004, 0.290, 0.448, and 0.305 times respectively, less likely to be littered than water and beverage bottles & cans.

4.2.4.4 Environmental-level factors influencing littering behaviour

The fourth analytical category retained three factors, namely, crowdedness, existing litter, and distance, in the final logistic regression model representing the statistically significant influential factors in the community/ environmental level (Table 4.12). Regarding crowdedness, the odds of those in the medium crowd to litter was .841 times

less likely than those in the small crowd. Those in the larger crowd were rather 3.456 times more likely to litter than those in the small crowd. The logistic regression analysis also indicated that less littering is likely to occur where an area is slightly littered by .549 times compared with a heavily littered environment.

The last statistically significant environmental level factor (*distance*) showed to be an immense influential factor in determining littering behaviour. The regression analysis indicated that distance contributed positively to individual littering behaviour. This the odds of individuals littering for any metre increase in distance from a litter bin was 15.139(OR).

Table 4.12: Binary Logistic Regression model of organisational and environmental level factors influencing littering behaviour

Parameter	B	S.E.	Wald	df	Sig.	Exp(B)
Organisational level:						
Litter item: Water and beverage bottles & cans- ref			42.616	5	.000	
Mixed waste	-4.102	1.109	13.693	1	.000	.017
Food-related items	-.804	.361	4.943	1	.026	.448
Food/fruit remains	-1.188	.405	8.594	1	.003	.305
Paper &paper towel	-5.559	1.713	10.527	1	.001	.004
Plastic film bags	-1.237	.238	27.069	1	.000	.290
Environmental level:						
Crowdedness: small crowd- ref			39.415	2	.000	
Medium crowd	-.173	.251	.477	1	.490	.841
Large crowd	1.240	.253	23.972	1	.000	3.456
Slightly littered	-.599	.247	5.856	1	.016	.549
Distance	2.717	.376	52.220	1	.000	15.139

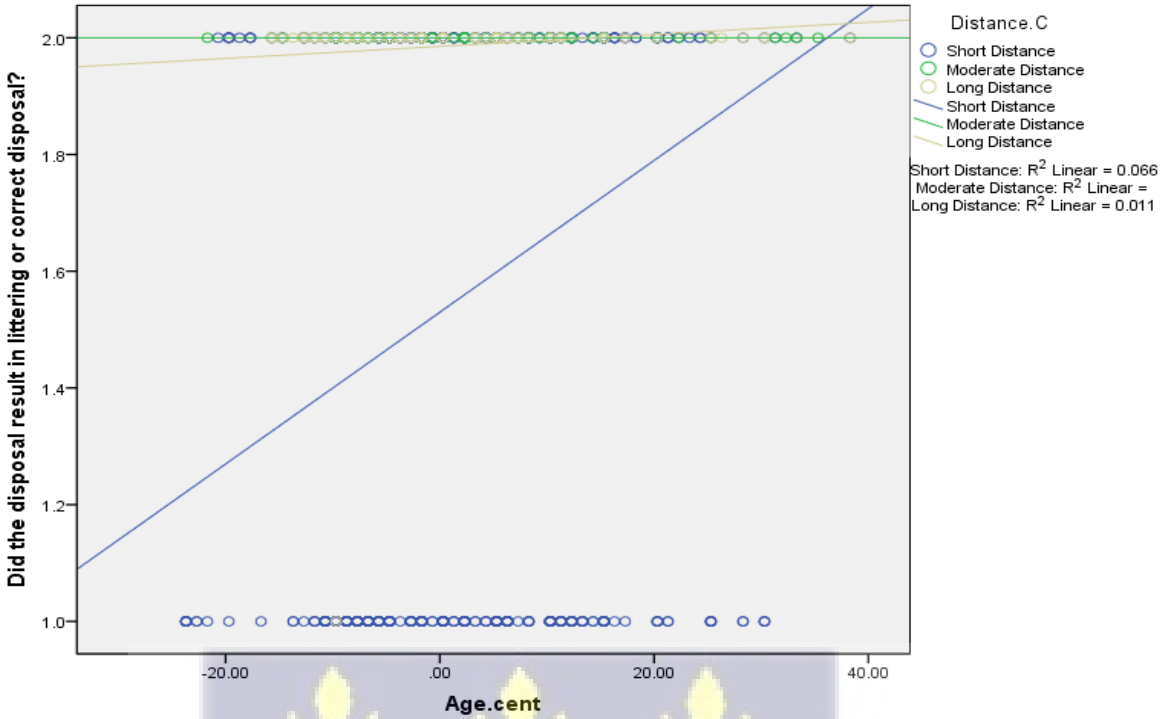
4.2.4.5 Cross-level interaction effects on littering behaviour

An interaction effect (*age* by *distance*) was identified during the model fitting process, as mentioned in the earlier paragraphs. The interaction term was statistically significant at a p-value <.001, as shown in Table 4.13. The interaction plot, as shown in Figure 4.8, shows that the relationship between age and individual littering behaviour differ at different distance categories. Based on the R^2 Linear value, the correlation between age and littering behaviour for those within 0 – 5 metres was 0.268 and reduced to 0.118 for those above 10 metres. The plot indicates that the relationship between age and littering behaviour remains positive even when considering the effect of distance.

Table 4.13: Cross-level Interactions and their influence on littering behaviour

Parameter	B	S.E.	Wald	df	Sig.	Exp(B)
Cross-level interaction:						
Age*Distance	.114	.024	22.413	1	.000	1.121
Constant	-10.838	2.079	27.185	1	.000	.000

Figure 4.6: A graphical representation of the interaction effect of distance on age and littering behaviour



This objective sought to determine factors influencing littering behaviour in public spaces in the Greater Accra Metropolitan Area, using non-experimental correlational methods, specifically binary logistic regression. The analysis showed several influential factors including *participant's age, group size, group gender composition, participant activity, litter item, existing litter, crowd,* and *distance*. *Age* and *distance*, corresponding to individual and the environmental level, were found to have a reciprocal moderation effect on each other, and combined, significantly influenced littering behaviour. The analysis showed support for the assumptions of the Social Ecological Model that multiple factors across different levels influence behaviour and that factors can interact to influence behaviour.

4.3. Litter Composition and Brands Dominating Public Space Litter Stream in GAMA

4.3.1. Litter Characterisation

4.3.1.1. Litter Composition

Littering in public spaces results from the disposal of post-consumption packaging materials. This study assessed the type of packaging materials that end up as litter in public spaces and the major brands that contributes to the littering problem. The survey evaluated 37,280 pieces of litter over the study period. The next section presents the results of the litter characterisation and, subsequently, the branded litter audit.

Plastic made up about 79%, followed by paper (14%) and organic was only 2%, while the remaining 5% comprised of textile, glass, metal, e-waste, medical waste, and others. The organic component was mainly banana and plantain leaves, i.e., *Musa x paradisiaca*, miracle berry leave, *i.e., thaumatococcus daniellii*, (U.S. Dept, Agr., Agr. Res. Serv., 2013), and corn husk, i.e., *Zea mays* used to wrap food, i.e., Ghanaian cuisines like *waakye*, and *kenkey*. Refer to Figures E and F in the appendix for images of the banana, miracle berry, and corn husk. Food remains were very negligible (even when weighed) and therefore was excluded.

Table 4.14: Litter Items by Material type

Recorded Litter by Material Type	Frequency	Valid (%)
Plastic	29145	78.17
Paper	5250	14.08
Organic	910	2.44
Textile	660	1.77
Metal	190	0.51
Others	915	2.45
E-waste	125	0.34
Glass	35	0.10

Cotton	25	0.07
foam	25	0.07
Total	**37280**	**100**

4.3.1.2 Plastic Litter Composition

The dominant fractions of plastic litter observed were Low-Density Polyethylene (LDPE), i.e., plastic film bags including black and transparent polyethylene bags and empty water sachets; Polyethylene Terephthalate (PETE), including plastic water and beverage bottles and face shields; Polystyrene (PS) composed of disposable food packs and containers, disposable spoons, straws, and disposable cups; High-Density Polyethylene (HDPE) mainly, bottle caps and bottles; and others including disposable nose masks, nylon, foam, among others.

Plastic film bags were mainly black and transparent polyethylene bags commonly called "takeaway rubber" in Ghana, and plastic sachets accounted for 11,565 and 7,805 pieces, respectively. Combined, plastic film bags made up about 66% of the plastic litter counted (Figure 4.8). Aside, plastic films, other plastics like broken bowls, cups, and containers used in the pharmaceutical and cosmetic industries accounted for about 9.2%. Also, about 9% of plastic litter were bottles, mainly water and beverage packaging like mineral water and drinks. These four components amounted to about 84.2% of plastic litter. The proportion of the remaining, namely, disposable food packs, bottle caps, disposable spoons, straws, disposable cups and containers, and face shields, were about one-sixth of plastic litter.

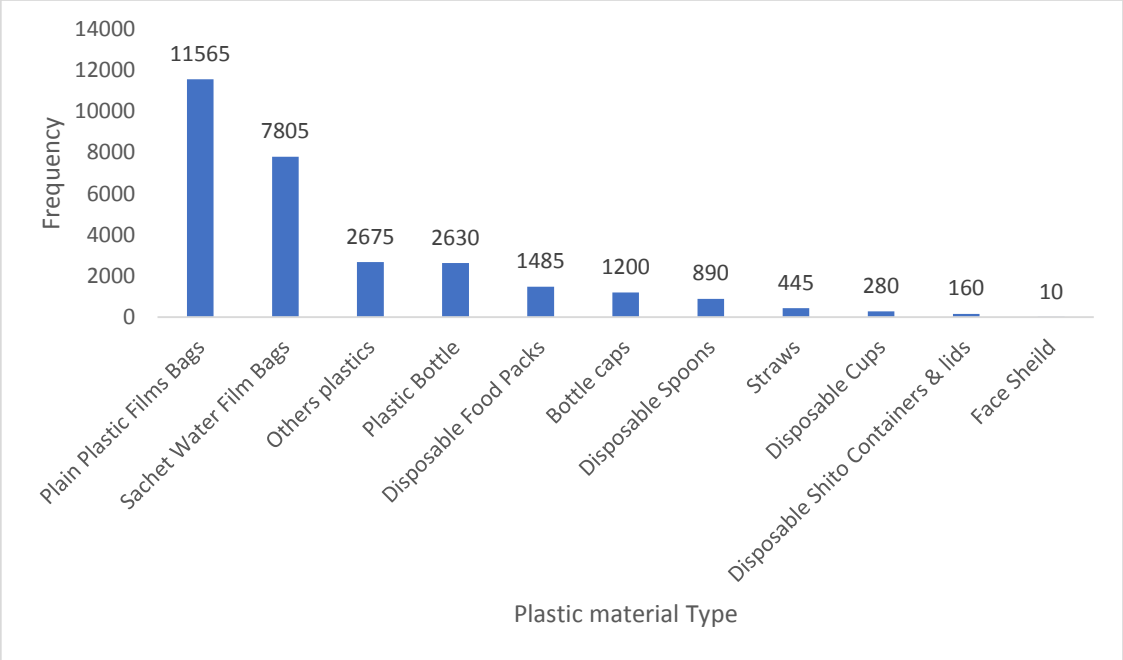


Figure 4.7: Plastic Litter Composition

4.3.1.3 Paper Litter Composition

Overall, 5250 paper litter was counted. With reference to Figure 4.9, there was an almost equal proportion of white office paper and newspapers, 39% and paper towels, 38%, while other paper materials, namely, cardboard, egg crate, magazine, juice box, and others, were 23%.

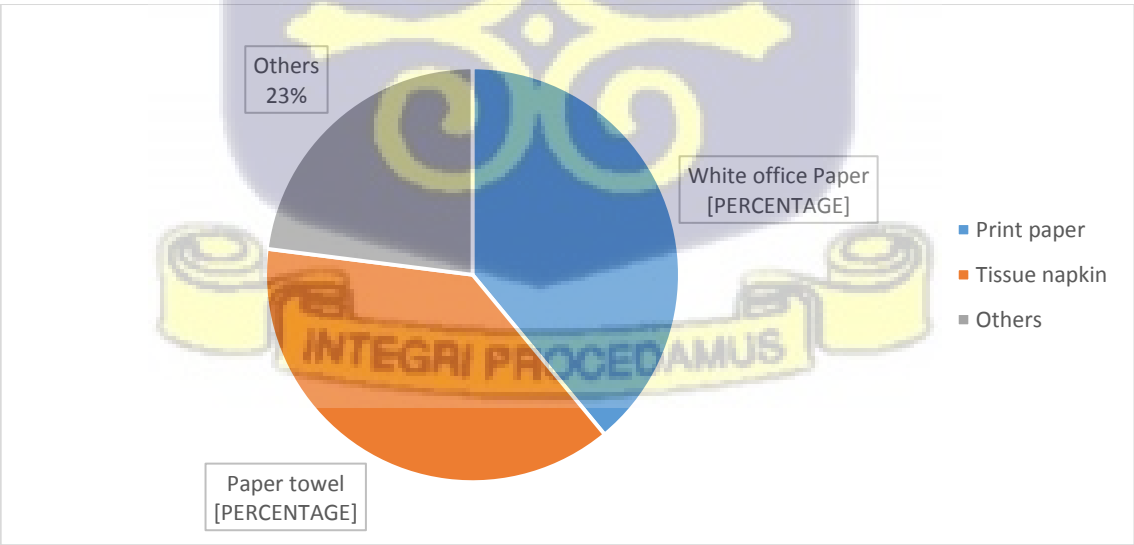


Figure 4.8: A Pie chart showing the composition of paper litter by type

4.3.2 Branded Litter Audit

Out of 37,280 pieces of litter counted, 44%, 32%, and 24% were unbranded, branded, and unidentified materials, respectively, as shown in Table 4.15. The litter items classified as branded were those that had brand names on them, while the unidentified litter included those litter items that either had the brand name cleaned off or where the research was unable to associate the item to a brand.

Table 4.15: Litter Categories and Frequencies

Variable	**Total = 37280**	
Litter Category	**Frequency**	**Valid (%)**
Branded	11910	32
Unidentified	8940	24
Unbranded	16430	44
Total	**37280**	**100**

4.3.2.1 Industries contributing to public space litter

The water and beverage industry topped the list with 13,785 pieces of litter, followed by general packaging (11565) and the food (5880) industry (Figure 4.10). These three industries contributed about 78% of all recorded litter items (Table 4.10). The water and beverage industry litter items comprised of bottles & sachets (86%), bottle cups (9%), straws (3%), and disposable cups (2%). The majority (95%) of bottle & Sachet litter belonged to the water and non-alcoholic beverage category, mainly mineral water and soft drinks. The general packaging were mostly unbranded, including plain and black plastic film bags that are often used once by retailers to package general consumer items and, therefore, could not classified under a particular industry. Tissue paper (34%), food wrappers-leaves (16%), disposable food packs (15%), disposable spoons (15%), and other food-related litter items (19%) made up the food industry litter items.

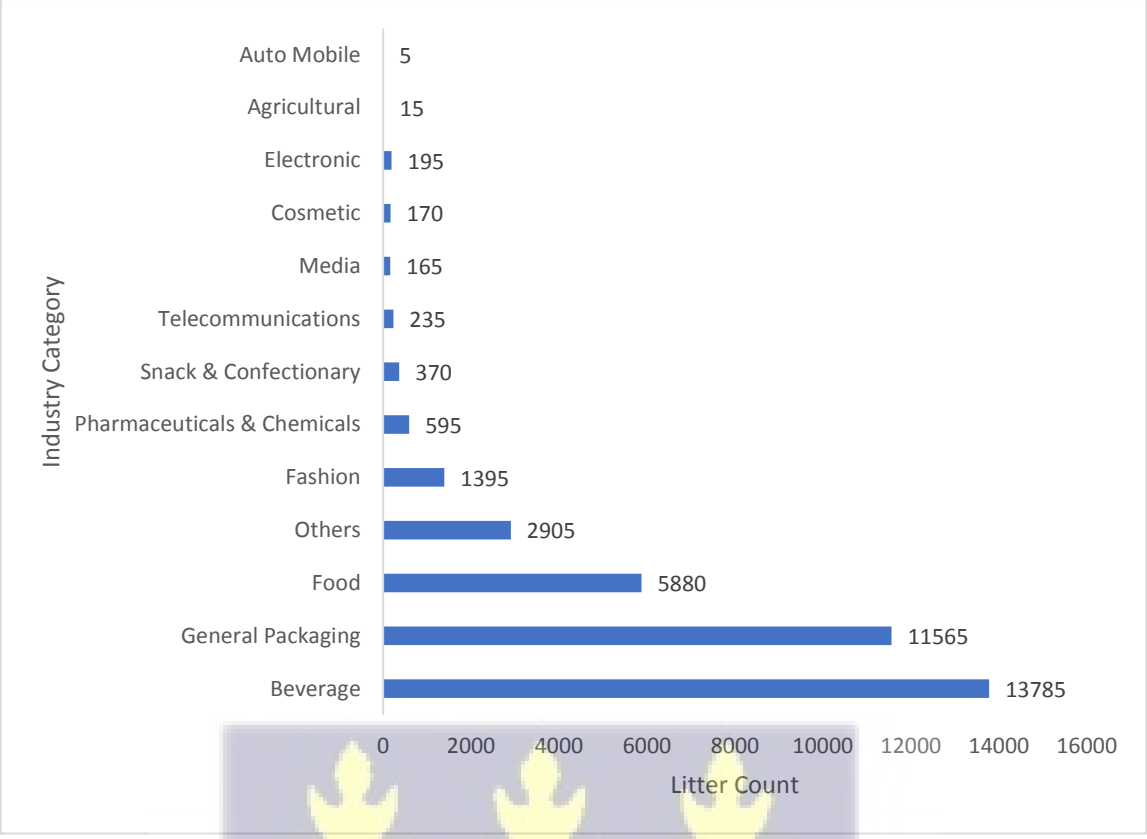


Figure 4.9*: Recorded Litter by Industry Category*

4.3.2.2 Top brands contributing to the water and beverage industry litter

The study recorded three subcategories of the water and beverage-related litter, namely, alcoholic, water and non-alcoholic, and energy/sport drinks. Litter from the top 5 brands in each of the three water and beverage industry subcategories amounted to 8235 pieces, accounting for 59.7% of water and beverage-industry litter. Brands within the soft drink category were the largest contributors to branded litter in the water and beverage category, making up to 94%. The Table 4.16 presents the top 5 brands from each subcategory. Multi Pac Limited and Special Ice Company Limited topped the alcoholic, energy drink, and the water and non-alcoholic beverage subcategories with 35, 220, and 3510 recorded litter cases, respectively (Table 4.16). Notably, Kasapreko Company Limited featured among the top 5 brands in two of the three water and beverage subcategories.

Table 4.16: Top 5 brands in the three water and beverage industry subcategories

Alcoholic	Count	Energy Drinks	Count	Non-Alcoholic	Count
Kasapreko Company Limited	35	Multi Pac Limited	220	Special Ice Company Limited	3510
1Africa Industries Limited	25	Twellium Industries Company Limited	95	Baron Water House	1595
Radico Khaitan Limited	10	Kasapreko Company Limited	45	Brooks Water Limited	1245
Oheneba Kasempa Enterprise	10	Royal Forest Factory	15	Standard Drinking Water	770
Gihoc Distillery Company Limited	10	General Trading Co. Limited	15	Fan Milk Ghana Limited	635
Total	**90**		**390**		**7755**

4.3.2.3 Brands dominating sachet water and plastic bottle litter

Four brands accounted for about 90% of sachet water litter items, namely, Special Ice Company Limited, Baron Water House, Brooks Water Limited, and Standard Drinking Water, representing 44.33%, 20.44%, 15.95% and 9.87%, respectively. Likewise, the majority, 775 pieces of the plastic bottle litter, was accounted for by Kasapreko Company Limited (240), Twellium Industries Company Limited (220), Multi Pac Limited (215), and Voltic Ghana Limited (100).

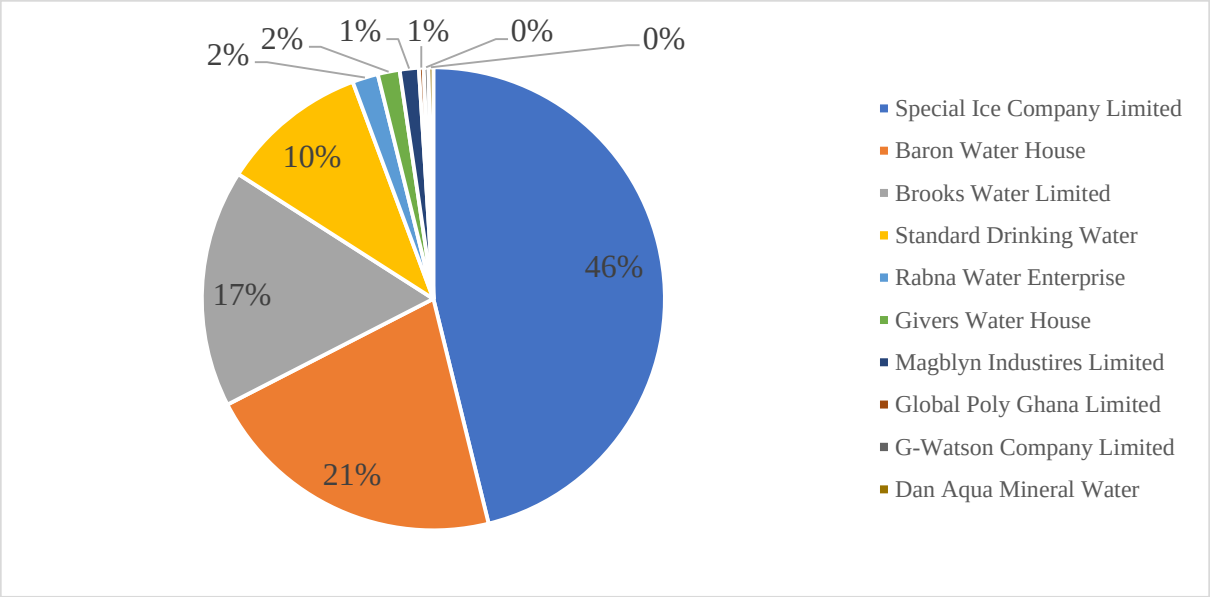


Figure 4.10: Top 10 Brands Contributing to Water Sachet Litter

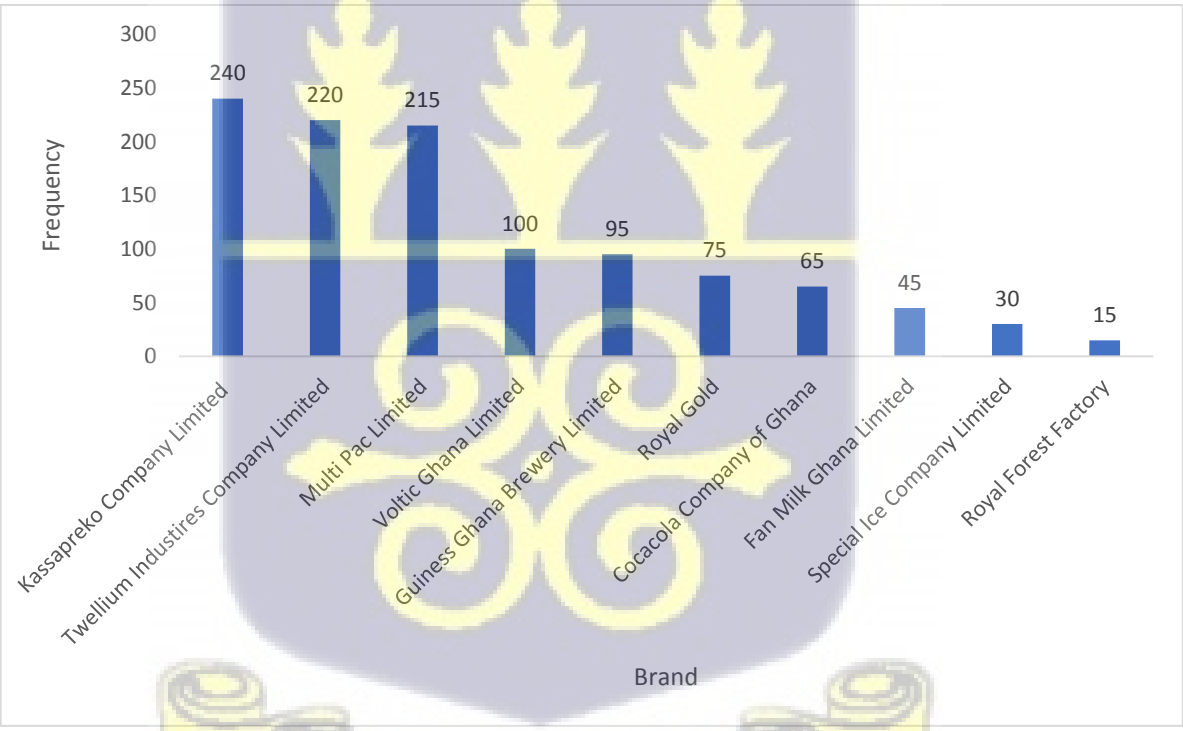


Figure 4.11: Top 10 Brands Contributing to Plastic Bottle Litter

4.3.2.4 Food industry litter

The food industry litter numbered 5880 pieces. The largest proportion, 86% of litter items could not be linked to any brand because about 61% were unidentified, and 25%

were unbranded. The remaining 14% were branded. Paper towels, food wrappers, disposable food packs, and plastic spoons accounted for 81% of the food-related unbranded and unidentified litter items. The top 5 brands in the food industry were Nestle Promasidor Ghana Limited, Blow Plast Industries Limited, Delta Paper Mill, and Lexta Ghana Limited, accounting for only 16.8% of the branded litter (832 pieces).

Table 4.17: Top 5 Brands by Recorded Litter in the Food Industry

Brands Name	Frequency	Valid (%)
Nestle	50	0.96
Promasidor Ghana Limited	40	0.77
Blow Plast Industries Limited	20	0.38
Delta Paper Mill	15	0.29
Lexta Ghana Limited	15	0.29
Total	140	100.00

4.3.2.5 Corona virus-related litter items recorded

COVID-19 related items were expected in the waste stream, given that wearing nose masks and face shields in public spaces were made mandatory by law. Consequently, the study recorded 215 pieces of COVID-19-related litter items, comprising 205 nose masks and 10 face shields.

4.3.2.6 Hygiene Related Litter Items Recorded

The study recorded cases of flying toilets, i.e., faeces tied in black polyethylene bags and two cases of urine in plastic water bottles at two of the public spaces- the market and lorry stations. Other unusual litter items found littered in the public spaces were used sanitary pads and baby diapers. Plates 4.1 and 4.4 show the hygiene-related litter items. **Thus, *viewers discretion is advised since some of the images below may disturb some viewers*.**

Source: Student's Fieldwork

Plate 4.1: Urine in a plastic bottle

Source: Student's Fieldwork

Plate 4.2: Faeces wrapped in a black polyethylene bag

Source: Student's Fieldwork

Plate 4.3: Used baby diapers

Source: Student's Fieldwork

Plate 4.4: Used Sanitary Pad

The section discussed the results from the litter characterisation and branded litter audit in four public spaces, with the aim of determining the litter composition and industry and manufacturers dominating the public space litter stream. The exercise recorded 37280

pieces of litter, with plastic dominating the litter fractions. The water and beverage, general packaging, and the food industry contributed the most to the public spaces litter stream. Among the branded litter items, Kasapreko Company Limited, Multi Pac Limited, and Special Ice Company Limited topped in the water and beverage industry. At the same time, Nestle, Promasidor Ghana Limited, and Blow Plast Industries Limited scored highest in the branded food-related litter items.

4.4 Challenges of Littering Policy Implementation and Law Enforcement

This present the findings on policy implementation challenges in Ghana. In-depth interviews were held with five key informants representing key players in sanitation governance in Ghana to satisfy the issue of the research objective. Thematic analyses of their responses identified four main themes. The interaction revealed that policy implementation challenges in Ghana are bedevilled by three main issues or themes, namely, governance and leadership challenge, incompatibility between cultural norms and policy, and educational gaps. The Table 4.18 summarises the three main themes and seven sub-themes that emerged from the interviews.

Table 4.18: Summary of Themes and Subthemes Generated from Interviews with Key Informants

Main Theme		Sub-theme	
1	Governance and leadership challenges	1.	Lack of commitment, monitoring, and enforcement of policy implementation and environmental laws
		2.	High incidence of political interference and corruption
		3.	Financial challenges
2	Incompatibility between cultural norms and policy	1.	Cultural upbringing and the principle of decentralisation
		2.	Effect of cultural practices on current sanitation practices
		3.	Influence on language on waste and sanitation practices
3	Educational gaps	1.	High level of abstraction in education training

4.4.1 Governance and Leadership Challenges

The interaction revealed that sound environmental policies and laws on environmental sanitation and litter abatement abound in Ghana, but the problem is with implementation resulting from bad governance and leadership. This theme emerged from key informants' assessment of the major challenges facing effective policy implementation and law enforcement in GAMA and the country at large. Subsequently, three subthemes emerged including, lack of political commitment, monitoring and enforcement of policy implementation and environmental laws, high incidence of political interference and corruption, and financing challenges. Table 4.9 provides the subthemes.

4.4.1.1 Lack of Political Commitment, Monitoring and Enforcement of Policy Implementation and Environmental Laws

The subtheme "lack of political commitment, monitoring and enforcement" emerged from respondents' narrations of the challenges of policy implementation and littering abatement. The participants stated that there was no commitment to the completion of policy implementation. They also indicated that there is usually and hasty discontinuity of policies as soon as Authorities conceive of another intervention. This is said to be one reason why not much progress is made with regard to achieving policy objectives. The ensuing excerpt portrays this opinion.

> *"In all the policies we have rolled out, we have never had a normal curve. When we take one policy, we carry it to the peak and then decline. However, we have never taken anything and concluded with it da. We get stuck in the middle and forget about it? Look, was it not Rawlings' era that we started vision 2020? Now in 2021, what have we achieved from it? We dropped it when we kicked him out. We started this Ghana Shared Growth and Development Agenda, A lot of them. We do all these things, and we just throw them away" (KI-2).*

Further, participants stated that lip services are often paid to policy implementation and, in other cases, a deviation from core policy objectives as captured in the quote below.

> *"Look, let me tell you something, Ghana as part of the sanitation policy, we said no more public communal toilets. You can only do that attached to an institution, like lorry park, market, playgrounds, and others because we have bought into one new policy. That is the community-led total sanitation. Not knowing we have paid lip service to those things. Where today we have the government of Ghana using our money to still build public toilets" (KI-1).*

The masses' inability to hold the government accountable for their obligations further aggravates the lack of commitment to policy implementation. Interviewees perceive that many people, though they have formal education, they lack the understanding of the basic tenets of democracy. Thus, the failure to recognise the supremacy that democracy wilds to the citizen over governance of the country.

> *"It is the lack of education. When we say education, it is not about having a formal education. But having attained that education, do you appreciate democracy? The design of democracy is that the minority rules the wish of the majority. But do you understand what your government is supposed to do for you? You see. Our power is in our thumb. If we had understood that our thumb is our power that is what we would have used to control the leaders and force them to work. But they come, we vote for them, and they go and will not fulfil their commitments. (KI-5)*

Furthermore, participants affirmed a system to monitor MMDAs policy implementation. However, mechanisms to sanction any MMDA that fail on policy implementation were absent.

> *"There is a solid waste management unit at the Ministry. They go to monitor whether they are being used, the collection and all that. Within Accra, where they have access, they even go round to take pictures on the bins and alert the MMDAs responsible. But, the ministries cannot sanction MMDAs if they fail to implement policies. However, the MLGRD has direct oversight responsibility for the MMDAs. So, if you have any grievance on any issue, you have to pass it to the*

MLGRD. You write a letter to them and complain about the issue and pray that they work on it. Otherwise, there is nothing you can do"(KI-1)

They further added that enforcement was lacking.

"*For the laws, we have them in abundance. The problem is the implementation. We don't enforce them. When it comes to speaking to the issues, drafting policies, Ghanaians are number one, but implementing them, is a no, no."* (KI-3)

The interactions also provided a strong view on the lack of monitoring and laxed law enforcement, a reason why littering is widespread and has become an everyday practice. They indicated that, while it is unlawful to litter, people did it without fear of being penalised for their behaviour. Many of them stated that this is one major complication in successfully implementing litter abatement programmes and sustainable management of solid waste in the country. This is best echoed in the words of a key informant at the local assembly level:

"People drunk water and just dropped it. There, in front of the office. And they did that with that kind of alacrity. Eeii is like they don't have any itchy skin to watch their back. They just squeeze the water out of it, and then the next is to drop it. While you think officials are there, they behave this way".

4.4.1.2 Political interference and corruption

From participants' perspective, institutions and governance structures put in place to ensure people abide by the laws and to facilitate policy implementation are rendered redundant because of the constant interference from politicians or influential classes in the communities. This phenomenon renders the integrity of public institutions questionable, as in the view of KI-3 below.

"[…] oh, they say handle them, chastise them, but when it touches one of their main people. You know it cuts across a section of the society, namely, politicians, the religious, chieftaincy and then a particular income class. If it is a church member and he knows the pastor, he will only call the pastor, and the pastor will plead for him. Once another person sees that, then the cycle goes on. If it also

happens that it is a family member, family friend, then. So, the setup, the setup is not helping" (KI-4)

Additionally, participants suggested the laws are not enforced because those are responsible for enforcing the laws are apprehensive about performing their duty. Other accounts show that enforcement officers will instead turn a blind eye to offenders of the law for fear of the wrath of community members or getting betrayed by their superiors. This means that while Ghana is making strides in enacting laws and regulations to govern the behaviour of the citizens, their enforcement remains an illusion sustained by interference from influential forces in society. This perception is captivated by the quote below.

"Let me digress a bit. When I went to Tamale in 2016, they had arrested some people who illegally tapped electricity and was using it for free. So, they arrested them and sent them to the police station and put them behind bars. And within some split of time, they had organised, and the report went up. And they arrested the security officers who made the arrest and put them behind bars and let those people who illegally tapped the electricity go" (KI-3)

"So, I have a police officer friend, and they were into the visibility team. He said, look, if you see these boys crashing into anything, within that time, just get out of post. Just go away so that they will take their troubles away before you come back there. Because if you are not careful and you arrest somebody, either they can team up and beat you, or your job will be on the line".(KI-5).

Participants also alluded that corruption is key, not only to weakening institutions but a challenge to addressing environmental problems like littering. Environmental problems are not just seen as a challenge but also presents a means to reduce Ghana's unemployment and revenue challenges. A participant stated that, but for corruption and greed, the government could have reduced the unemployment situation by engaging

people to monitor environment-related transgressions as well as generate income for the country's developmental programmes by fining such offenders.

> *"You see, we have so much. We don't lack resources. The problem is actually greed. And greed yields corruption. So, the money they will use to employ people to monitor the littering behaviour of the citizenry, they will not do that. The environment-related issues alone can employ a lot of people. So, corruption and greed, are why these people do what they do. […] And you know, if some politician wakes up today and he doesn't feel like collecting taxes but just collecting fines on sanitation infringement alone, we can get a lot of money. Even Accra alone, if we do that in Accra, common fund, what is the common fund? The money we will make in a day, in a month, in a year, we have no idea"* (KI-3).

Further, informants suggested a bidirectional relationship between corruption and weak institutions. They linked the weak institutions to the deep-seated corruption that has engulfed many public institutions, including the law enforcement agencies. At the same time, they suggested that such weak institutions present a fertile ground for corruption to thrive.

> *"It is because of the corruption that the institutions are not working, because those who would have enforced the laws are they corrupt. […] The other day we were going to Accra and talking about corruption. And I said the setup we have actually exonerate corruption" (KI-4).*

4.4.1.3 Financing

Lack of financing was identified as a key challenge for policy implementation in MMDAs. However, the opposite was said for some MMDAs like Accra and Kumasi Metropolitan Assemblies, who were said to be advantaged with regard to generation of internal funds. The study garnered this from excerpts of representatives of policy formulators and the local assemblies.

> *"You see (laughter). When it comes to implementation, the biggest factor for successful implementation is financing. But the thing is that Assemblies are mostly financed. When they send their budget to the Ministry of Finance, assuming they are asking for GHc100.00, they end up getting GHc40.00. They are expected to complement whatever they get from their IGF. However, the thing is that in most of*

these Assemblies, the IGF (Internally Generated Fund) is simply not there. The big ones like KMA, AMA, and the rest can generate, but with the others, 80% don't generate any proper IGF. So, they are not able to implement any of their action plans". (KI-4)

Key informant at the local assembly level also confirmed that funds do not pose much of a problem.

"So, these three things. We, for instance, should not be talking about funds because we have ways of getting them. If it is about technology, it is there. What we are left with is the political will, the building of the court systems, setting surveillance where if you do the least thing, you are paying huge sums of money. Then we will get there". (KI-2)

4.4.2 Inconsistency between Cultural Norms and Policy

This study found a consensus in the second main theme regarding the inconsistency between local cultural norms and contemporary policy direction and development trends. Three subthemes were identified, namely, cultural upbringing, and the principle of decentralisation, the effect of cultural practices on current sanitation practices, and the influence of language on waste and sanitation practices, littering inclusive. The next few paragraphs present these subthemes.

4.4.2.1 Cultural Upbringing and the Principle of Decentralisation

Participants' opinions suggest that the failed implementation of many interventions, including litter abatement, hinge on the fact that the policies adopted are inconsistent with the cultural practices of the Ghanaian people. Using the analogy of decentralisation, an interviewee emphasised that real decentralisation would remain a dream in Ghana because of the incompatibility between the principles of decentralisation and the cultural upbringing of the people. Unlike the European countries, Ghanaians are not trained to be independent by their cultural upbringing.

"For me, our failure as a country is about the culture, and that leads to the attitude. That somebody introduced this decentralisation thing to us, and it is now crashing with the fundamentals that we were taught. The whites can do it because

> *they start training you to live an independent life when you are growing up. When you are 18 years, you are on your own. So, this training is to psych you up. But Madam, are you not married? With your husband and children? Do you know that your parents still control you? So, where is the decentralisation? So, when your mother or your father becomes the head of a government office, will you say she/he should leave you totally to do your work? No"* (KI-1).

He further explained that,

> *"We are brought up to be dependent all our lives. Do you know that if you give birth in some families, your parents will name the child, and you and your husband have no say in it? If you joke, they will say don't step to my funeral grounds when I die. That alone kills us. If you argue, they will say eerr, today you think you are on your own, you are married, you will see. You will have to run to go and meet your church elders and your family elder to go and plead"* (KI-1).

Another interviewee stressed that the difficulty in achieving proper decentralisation is associated with a lack of understanding of the concept on the part of people at the helm of governance and policy formulation.

> *"These ministers say they have the experience, but they don't know a lot of things happening. They don't get the decentralisation concept. I think it is because their appointment is politically influenced. So, they are kept into ministries they have very little knowledge of how the system works. So even from the top, the decentralisation is not understood very well except those who work within the local government sector" (KI-4)*

4.4.2.2 Influence on cultural practices on current sanitation practices

Interviewees' perception showed a consensus in the way individuals were brought up is instrumental in the way they behave. A participant gave a narrative that the reason why Throwing away waste always has and is still widely practised in Ghana, which is why Ghanaians are slow to adopt the new sustainable solid waste management approaches, i.e., source separation, recycling, and others,

> "*While we were growing up, we have always been thought that waste is either thrown, buried or burnt outside the house. That is what our mothers did, and that is what we were thought to do. This is still practised in many homes as we speak. And now you are expecting people to change with one-day sensitisation. So, we need to look at the culture. How were they trained? And how can we stop them?"* (KI-2).

Similarly, from the interviews, it also emerged that the development pattern, regarding urbanization, housing structures, and land scarcity has become incompatible with traditional waste disposal methods such as burning, burying and open dumping, littering inclusive. Traditionally, waste is thrown outside the house. This behaviour is transferred to public spaces in urban centres where land scarcity has made it challenging to dispose of at home.

> *"My department, through the Sanitation Ministry, procured 400 litter bins, educated the people, and told them that we will be placing bins along the streets so that when they are out on the streets, and they buy things, eat, and want to dispose of, they can put it the bins, before we placed the bins along various streets. But do you know what happened? People carry waste from their houses in sacks and put them there. Along the street ooh. Some even brought waste containing hot ashes into the street bin. Not even a communal container, the street bin"* (KI-3).

4.4.2.3 Influence of language on waste and sanitation practices

Likewise, another interviewee explained that the language and the words used to express issues about waste and sanitation affect the perceptions of them, hence the behaviour towards them. He emphasised that the words used transforms into attitudes and values.

> *"Look when you hear 'bayan gidan', 'bayan gidan' is a Hausa word which means behind the house. So, if it is behind the house, what do you do? Defecate and throw it behind the house. The psyching comes from that. So, how do we treat our toilet? How do we treat our waste? Behind the house. And those days, maybe behind the house was a vacant land, a bush or farm. If you like, look at*

some of the houses, they clean their houses and just throw it behind the house" (KI-5).

4.4.3 Educational Gaps

A gap in Ghana's educational system was identified as a major challenge for effective policy implementation. It came out that there was a high level of abstraction in the educational system in Ghana, which becomes a problem when policy implementers and public officials face real-life challenges concerning solving societal problems like littering and sanitation issues. The subtheme under this main theme was therefore based on this allusion.

4.4.3.1 High Level of Abstraction in the Educational System

From informants' narrative, participants attribute the challenges in policy implementation to the high level of abstraction in Ghana's educational system. More so, their accounts point to the fact that because the educational system models people based on abstract theories rather than practical and problem-solving approaches, it becomes difficult to implement programmes when they face the challenge. Responses from the interviews also indicated resultant prevalent falsification of documents. This excerpt below portrays this view:

> *"Look, I am telling you on authority. Unless you have not worked in any of the government institutions, most of the reports we write are cooked. Do you know why? When you go to school, and you are asked to write an essay, do you write essays that are personal to you, or do you write imaginary things? We are taught how to do imaginary things. Now you have graduated and started working. What do you do? You do imaginary things. That is why you go to the ministries, and we can speak to the issues, but when you say implement them, then they are unable to perform. They can't do it. [….] But if you get to the western world, they are teaching the children how to practicalise things. Even the letter 'a' has a history, how things came about. They will tell you how it is. So that you can understand it and how it is applied"* (KI-2).

Another confirmed this statement by sharing his experience about the high incidence of report falsification that has become a major challenge for effective planning and implementation.

> *"Even in my Ministry, when they are doing their planning, they come to me looking for data. I give them the correct data. But before I realise they change everything. If I give them 1000 communities, they will go and multiply it to 5000 communities that have been declared open defecation free. So, this is one of the problems I am facing in my Ministry. They cook figures and expect that I stand on any platform and defend that"*

Interestingly, another revealed that many graduates in Ghana acquire practical skills only when they have been employed in such fields because the training received in education does not equip people with practical problem-solving skills.

> *"If you ask most of the graduates, they will tell you that they come back and start work, they will learn the profession on the job. Because while you were going through the training, you were not exposed to those practical issues. The training children receive in Ghana does not equip them to handle practical things" (KI-3).*

This section revealed several challenges of policy implementation, including poor governance, culture-policy inconsistencies, and gaps in the educational system that contributed to the litter and littering situation in public spaces.

In summary, this chapter presented the findings of the study, which revealed that several factors ranging from individuals' perceptions, social, environmental and policy factors are important in understanding littering behaviour in public spaces in the Greater Accra Metropolitan Area.

CHAPTER FIVE

DISCUSSION

This chapter discusses the study's findings relative to the existing body of knowledge and theory. Thus, it discusses individuals' perception about littering behaviour, the factors influencing littering behaviour, the litter composition and brands contributing to the litter stream in the study area and policy implementation and litter abatement challenges.

5.1 Individuals' Perception about Littering in Public Spaces in GAMA

The current study builds on prior studies, including Amankwah-Poku (2020) and Ocansey (2006), exploring why people litter in Ghana. However, this study reports on the general population in four public spaces in the Greater Accra Metropolitan Area. Essentially, the current study is in response to the request of these studies to research a general population to have a broader perspective why individuals litter. Therefore, this section discusses the results of the thematic analysis of the individual and collective construction of littering that reveals the prevailing perceptions about behaviour in public spaces. These perceptions can guide behaviour change communication and other intervention designs to reduce littering in public spaces.

5.1.1 Demographic Characteristics

All the study participants for this objective were adults, i.e., above seventeen years. It could be suggested that they have gained an appreciable level of environmental awareness and knowledge (Norrgren & Swahnberg, 2016). However, it does not necessarily mean it will translate to good litter disposal behaviour (Taylor et al., 2010). Besides, the educational level of the majority of participants was between basic and high school level, suggesting a lower environmental knowledge. This is because people's educational level has been shown to correlate positively with awareness and knowledge of environmental issues and negatively with littering behaviour (Eastman et al., 2013; Moqbel et al., 2019; Nkwocha & Okeoma, 2009), However, other studies, including Campbell et al. (2014) and Oguntayo et al. (2019), found no significant relationship in

that regard. For instance, most of participants in Campbell et al. (2014) had a university education. Yet it did not lead to lower littering behaviour.

However, in the current study, littering rates were lower, i.e., 15.3% among participants with a higher educational level at the educational institution. In contrast, the littering rate was higher, i.e., 93% and 78% at the market and lorry station, respectively, which has been associated with lower educational levels (Kotei et al., 2020). Also, consistent with Quartey-Ankrah (2011), the public spaces where most individuals had higher educational status, like the educational institution, and some parts of the market were less littered. Interestingly, the first floor of the Kaneshie market that housed corporate institutions like financial institutions, the market administration offices, the clinic, and others had very minimal litter on the ground compared to the other floors. This could suggest that aside from the quality of cleaning services which may differ at the different public spaces, the findings indicate that education could significantly impact individuals' littering behaviour.

5.1.2 Cognitive Ideation about Littering

Responses from participants' individual and collective conception of how littering occurred in the public spaces suggest that littering is a normal live occurrence. Individuals reported on their littering behaviour without hesitation or remorse. This posture seems prominent in many developing countries where people are quick to point to the government's failure to provide good waste management services but not individuals' littering behaviour. For instance, a study in Nigeria reported that people littered to express of their frustration towards the government for the lack of basic urban sanitation infrastructure and services (Nkwocha & Okeoma, 2009).

The relative efficient waste management in developed countries may confirm the lower littering rates recorded by studies in that part of the world (Freije et al., 2019; 'Keep New Zealand Beautiful', 2018; Schultz et al., 2013). This is indicative that waste management service quality, like other basic amenities, has a significant influence on individuals'

litter and waste handling behaviour. It also reveals some complexity in littering behaviour, such that attempts to address the issue transcends just provision of waste services but include other basic services that can enhance citizen satisfaction.

Others have suggested that people tend to litter more or are more likely to admit to their littering behaviour without much reservation because of the prevailing descriptive norm (Bergquist et al., 2021; Moqbel et al., 2019; Poškus, 2016; Scheibehenne et al., 2016). Consistently, many studies have found that less littering occurs in a clean environment (Cialdini et al., 1990; Schultz et al., 2013; Weaver, 2015). However, the findings of this study showed that cleaning the environment does not guarantee less littering. This will suggest that because many cities of developing countries are persistently littered, and people observe the masses littering, they may be more comfortable littering and speaking of the act. This contrasts with cultures where they perceive littering as shameful, and consider keeping a clean environment as honourary (Jia & Tao, 2019; Ong & Sovacool, 2012). Consistently, studies in such cultures find very minimal self-reports of littering behaviour (Shimazu, 2018a), thus pointing to the possible littering is context-driven, which must be taken into consideration when planning littering abatement interventions.

According to Ghana's constitution, keeping a clean environment is the state's responsibility and civic duty. This recognises the critical role of state agencies and citizens in preserving the environment. However, it was found that many people are inoperative concerning their civic duty. It is noteworthy that aside from blaming their littering behaviour on the inefficiencies in the waste management system, as discussed earlier, many participants in this study did take personal and collective responsibility for littering the environment, but not for keeping it clean. Taking personal responsibility for keeping the environment clean, even if it means keeping the litter or sending it home, is a norm supported in Japan (Mulyadi, 2020). However, for this study's participants, keeping

litter on oneself until a litter bin is found is not a conscious option. This implies the need for intensive sensitisation and constant reminders of individuals' civic responsibility for environmental protection and cleanliness in public spaces.

5.1.3 Norms Influencing Littering Behaviour

The state of waste management, including an adequate supply of litter bins and effective collection services, is a key determinant of littering behaviour according to this study findings. Many studies, including Foxall et al. (2006), Ong and Sovacool (2012), and Muñoz-Cadena et al. (2012), supports this view. Participants recognised the lack of and irregular servicing of litter bins, absence of prompts cautioning littering, presence but ineffective informal social control, and weak law enforcement as critical norms influencing littering behaviour.

Interestingly, the current study presents mixed findings regarding the effect of waste management quality, especially in relation to the availability of litter bins on littering behaviour. While some participants confirmed that the absence of litter bins influences littering, others emphasised that littering is persistent even when litter bins were present. Observation from the field confirmed the availability of litter bins in the public spaces. Thus, this study is of the view that individuals seem to have a preconceived mind about the state and or inadequacy of litter bins in the public spaces and so easily attribute their littering behaviour to the absence of litter bins. It could also be because the presence of litter bins has minimal effect on people's disposal behaviour, as found by Patel et al. (2013) and Wilson et al. (2014). Conversely, it may not be necessarily the absence of litter bins, but the accessibility and the distance one will have to travel to dispose of litter that is producing such perceptions.

Though equivocal, studies have found accessibility and distance from a litter bin to influence littering rates (Bator et al., 2011; Curnow and Spehr, 2001; Keep New Zealand Beautiful, 2018; Meeker, 1997; Ong & Sovacool, 2012; Schultz & Stein, 2009; Tettey, 2015). This suggests that interventions relating to adequate waste bin provision and effective use must consider the availability, accessibility, and distance from one bin to the other.

Further, the absence of messaging or written prompts prohibiting littering was identified as a norm influencing littering. This study's result might suggest that individuals conceive that where anti-littering prompts are not posted, then littering is allowed in such public spaces. It goes to echo the importance of prompts in influencing behavioural outcomes (Cialdini et al., 1990; Bateson et al., 2013; Hansmann & Steimer, 2016; Shukor et al., 2012). In this way, written prompts may serve two purposes in influencing behaviour, i.e., by focusing people's attention on the behaviour expectations or providing them with normative information about desired litter disposal behaviour.

Notwithstanding the effectiveness of prompts in influencing behaviour, it was found that verbal prompts were ineffective in this study. Participants acknowledged that they cautioned people when they littered and, in some cases, sanctioned them to pick up the litter. However, the study showed that these prompts were not being adhered to by many people. This could be because the environment might already be littered, thus signalling an opposing cue to the verbal prompts concluded by Keizer et al. (2011). The non-adherence to the verbal prompts could also result from the tone or content of the message. For instance, Durdan et al. (1985) demonstrated prompts with positive words to elicit better behaviour than prompts with negative words. Similarly, Hansmann & Steimer (2016) confirmed in an experiment that humorous and environmentally oriented posters were 33% and 39%, respectively, more effective than authoritarian posters.

While some individuals seek to control littering through verbal prompts, This study emphasises that educating them on the most effective communication approaches can be instrumental in nudging people to adhere to such prompts and possibly reduce littering.

Further, though the current study suggests that verbal prompts were ineffective in controlling littering behaviour in some instances, it did point to an important fact that informal social controls exist and hence a potential source of social support for collective effort in litter reduction. Strengthening this form of measure could signal that there is surveillance, that littering is socially disapproved. Thus, people will be discouraged from engaging in the act (Cingolani et al., 2016). Consequently, litter control interventions in this regard could take advantage of the informal social control to encourage and motivate citizens to participate in monitoring littering behaviour.

Moreover, non-enforcement of the law was another justification for many participants' littering behaviour. It was discovered also, that people littered without fear of being caught or prosecuted, therefore the intensity of their littering behaviour. This is a common finding in many local and international surveys (Freije et al., 2019; Lewis et al., 2009; Lyndhurst, 2012). Furthermore, individuals are oblivious of the laws about littering in Ghana (Amankwah-Poku, 2020) and may not think of littering as a serious offence. To further aggravate the situation, studies have found that law enforcement agencies in Ghana place less importance on environmental issues and often sideline such cases when brought before the law court (Sarfo-Mensah et al., 2019). Non-enforcement of the law also pertains to general environmental regulations in Ghana (Korley & Richmond, 2017; Oteng-Ababio et al., 2013) and many developing countries (Mcallister, 2015). Thus, contributing to the widespread violation of environmental laws, including those against littering.

5.1.4 Perceived Littering Prevention Measures

The findings of this study revealed a three-tier intervention approach for effective littering abatement in public spaces in the Greater Accra Metropolitan Area, namely, supply of litter bins, intensifying public education, and strict law enforcement as reported in the results. These approaches are consistent with many studies' reports that a combination of these will significantly reduce littering behaviour (Sarfo-Mensah et al., 2019). Moqbel et al. (2019) suggested that ensuring the availability and convenient placement of litter bins coupled with extensive public education will ensure proper waste disposal to a large extent. Consistently, many countries have been successful in their littering reduction approaches through these approaches, including Rwanda, Singapore, Japan, and others (Hakuzimana, 2021; Ong & Sovacool, 2012; Straughan et al., 2011). However, in the case of Ghana, due to implementation and enforcement challenges (Anaman & Nyadzi, 2015; Oteng-Ababio et al., 2013), successful litter reduction is yet to be achieved. This, therefore, points to the crucial role of law enforcement in litter reduction in Ghana.

Besides, the success story of Singapore, as with other countries in littering control, was not until the Authorities enforced littering laws (Straughan et al., 2011). In this study also, participants were more emphatic about the deployment of the military services in littering reduction efforts, suggesting the need for strict law enforcement. Notably, though, none of the participants referred to the Police Service as agents of law enforcement. These expressions could indicate that people have low confidence in the efficacy of the Police Service to instil discipline, by extension, preventing littering. Moreover, individuals may perceive the Police to be ineffective in enforcing the law (Sherrington et al., 2013) because littering is widespread in the public space and prosecution for littering is rare. Thus, while law enforcement is important in reducing

littering, it is essential to publicise littering-related prosecutions through public education and communication programmes to deter littering and build confidence in the Police Service as the community law enforcement agency.

Providing adequate bins for littering reduction, particularly in public spaces, cannot be overemphasised. Numerous studies have concluded this locally (Amankwah-Poku, 2020) and internationally (Kolodko et al., 2016; Leijdekkers et al., 2015). Nevertheless, there is no guarantee that people will use the bins as they should. For instance, studies have reported littering incidences with litter bins present (Tettey, 2015), as was observed in this study. Besides, this study found that people rather stack the public spaces litter bins with household waste, which defies the purpose of providing them, i.e., disposal of litter generated in the public spaces. In other words, waste management at the household level impacts the effective management of public space litter and thus, requiring a holistic management approach.

5.2. Factors Influencing Individuals' Littering Behaviour in Public Spaces in GAMA

This study sought to determine the factors influencing individual littering behaviour in public spaces in the Greater Accra Metropolitan Area. It was found that the binary logistic regression model supported the claims of the Social Ecological Model (Mcleroy et al., 1988), showing that multiple factors across levels independently as well as interacted to influenced littering behaviour.

5.2.1 Individual-level Factors Influencing Littering Behaviour

The analysis shows that only *participants' age* was an important factor among the three variables tested at the individual level. While participants' *gender* is found to influence littering behaviour (Freije et al., 2019; Tettey, 2015), The analysis found *gender* to be a

non-significant factor thus, comparing favourably with Al-Mosa et al. (2017a), Bator et al. (2011), and Schultz et al. (2013). Based on gender differences in environmental behaviour, including littering, scholars have argued that women are more concerned for the environment because of their traditional role in environmental cleanliness (Opayemi et al., 2020; Torgler et al., 2008). This argument may hold at the private domain, i.e., the household level. However, because of changing gender roles, i.e., the increasing involvement of men in waste management within the public domain (Kadfak, 2011) the gender gap is beginning to diminish. For example, many men have increasingly been engaged in public spaces cleaning through the Sanitation Module of Ghana's Youth Employment Agency, waste picking, and others. Thus, the possible reason why gender showed to non-significant in explaining littering behaviour in this study.

Also, individuals' littering behaviour was not affected by the time of day. Thus, consistent with Schultz et al. (2013) and Malomo et al. (2021), the littering rate did not vary with the time of day. Following the argument that littering will reduce if the environment is clean (Bergquist et al., 2021), it is conceivable that because of the cleaning schedule in the mornings at the public spaces, there would be less littering as compared to the afternoons and evenings when litter would have accumulated on the ground. This is, however, not the case, signalling that approaches based on cleaning the environment alone will not lead to any significant reduction in littering.

The study found that individuals are likely to litter more as they grow older. The positive relationship found between participant age, and littering behaviour presents a divergent finding from many littering behaviour studies that have found that individuals' likelihood of littering reduces as they advance in age (Al-Mosa et al., 2017a; Campbell et al., 2014; Schultz et al., 2013; Norrgren & Swahnberg, 2016; Tettey, 2015). Based on studies such as Campbell et al. (2014), Moqbel et al. (2019), and Norrgren & Swahnberg, (2016),

some authors have argued that less littering is expected with older individuals because they possess higher environmental awareness and knowledge associated with age. Further, Hu et al. (2018) found people to litter less with higher environmental knowledge. Nonetheless, Taylor et al. (2010) found older people to be less knowledgeable and concerned about environmental issues than younger individuals.

Another argument put forward is that the effect of social pressure is higher on older individuals due to higher social standing and the aversion for social disapproval, thus, their lower antisocial behaviour, including littering (Tittle, 1980). This study, however, argues that higher environmental awareness and knowledge seem to have minimal effect on older participants in this study as they were more likely to litter than the younger ones. This argument stems from the fact that littering is perceived by many as a norm in Ghana, as was elicited from individuals' perceptions about littering in the first objective of the study.

Besides, recent surveys in Ghana showed that people littered despite their level of concern about the adverse effects of indiscriminate solid waste disposal (Sarfo-Mensah et al., 2019). More to the point, Amankwah-Poku (2020), who studied a population with higher education, i.e., university students, many participants, alluded to the fact that littering is a norm and so their littering behaviour. Moreover, environmental knowledge and awareness do not automatically translate to an environmental concern or pro-environmental behaviour.

Furthermore, based on the findings of this study, environmental factors, including the distance to the nearest litter bin, was important when discussing the effect of age on littering behaviour. It was found that the relationship between participant age and their likelihood of littering increased but at a reducing rate for every unit increase in distance

from a litter bin. This is indicative that the effect of age cannot be interpreted without considering the effect of distance to the nearest litter bin.

5.2.2 Interpersonal Factors Influencing Littering Behaviour

Group size, defined by the number of people in a group at the point of disposal, positively influenced littering behaviour. The result on the effect of group size on littering behaviour is corroborated in several studies (Curnow & Spehr, 2001; Meeker, 1997; Wever et al., 2006) where it was found that littering was higher with more people in the group. This is also corroborated by the first objective of this study as well as Amankwah-Poku (2020) and Sarfo-Mensah, et al. (2019) that littering is perceived as a norm in public spaces. Thus, individuals are more likely to conform to such littering behaviour of the group (Bond, 2005), a trend also reported in international studies (Bateson et al., 2015; Ernest-Jones et al., 2011; Moqbel et al., 2019). This means that littering in public spaces is influenced strongly by the prevailing norm, both injunctive, i.e., littering is accepted, and descriptive norm, where everyone is littering. This is suggestive of lax social disapproval of littering in public spaces, and people are more inclined to littering.

Consistent with the notion of social influence on individuals behaviour in a group situation, Meeker (1997) found that individuals, specifically males tend to behave pro-socially when in a mixed-sex group or in social settings where both sexes are presented. It was reported from this study that individuals were less likely to litter in a mixed-sex group situation than in a same-sex group. It further reported that more males, 70.5% and 59.6%, were observed in the mixed-sex group and same-sex groups, respectively. In contrast, an equal proportion in groups with the opposite sex was observed. The current study, therefore, supports the idea of Babinski et al. (2014) where males exhibited

prosocial behaviour in the mixed-sex group than same-sex group among adolescents with Attention Deficit Hyperactivity Disorder (ADHD).

The present study is generally supported by Meeker (1997), when comparing male littering behaviour in mixed-sex groups versus same-sex groups. However, this study does not entirely agree with Meeker's findings that males have a lower littering rate in the presence of even one female and that this effect has less influence on females littering behaviour. Even though more males were observed compared with females in the groups with the opposite sex, the logistic regression model showed more likelihood of individuals to litter when in a group with the opposite sex than in a same-sex group. Nonetheless, building on Meeker's (1997) argument and the fact that in mixed-sex situations, males are more domineering and assertive than females, designing interventions targeting nudging males' behaviour in public spaces is likely to be more effective. In this way, while more males exhibit correct behaviour (not littering), the norm is more likely to influence many people to conform to the prevailing norm.

5.2.3 Organisational-level Factor Influencing Littering Behaviour

The current investigation established that litter items differ significantly in their likelihood of being littered. For example, all other litter items were less likely to be littered than water and beverage-related items, including bottles, caps, and cans. Despite the little research on the litter item (Sadeleer et al., 2021), the findings compare favourably with some authors who found that some litter items have a higher littering rate than others (NSW Office of Environment and Heritage, 2013; Williams et al., 1997). Despite this finding, the descriptive analysis showed the highest littering rate (71.4%) for food-related litter followed by the water and beverage-related items (67.4%) and general packaging, i.e., plastic film bags (58.8%) compared to their correct disposal. Compared with the type of litter items disposed, plastic film bags were most observed to be littered

(63.6%), followed by plastic bottles i.e., water and beverage-related items (15.6%), and food-related items (11.1%) in the public spaces. Accordingly, all the litter items disposed of, except paper & paper towels and mixed waste, resulted in littering than correct disposal. Overall, it was observed that all the litter items were single-use materials, which explains the high frequency of disposal and consequent littering in public spaces. This highlights the role of the industry with regards to being innovative in packaging product design that will encourage re-usability recovery.

5.2.4 Environmental Factors Influencing Littering Behaviour

Environmental or community-level factors included in the final regression model were the level of crowd, existing litter, and distance to the nearest litter bin. All these environmental factors were significant in influencing littering behaviour.

Overall, the level of crowd present at the public space contributed significantly to individuals' likelihood of littering or otherwise. It was observed that littering rates increased with the level of crowd. That is, people littered more in a larger crowd (85%) than the medium (53%) and small crowd (15%) setting compared to their correct disposal. This is a clear indication that public spaces that attract large crowds are potential litter hotspots. Likewise, littering was more prevalent at the market (93%) and lorry station (78%), where there was a consistently large crowd present as compared to the educational institution (15%) and health facility (53%) where there was a medium and small crowd respectively. Further, from the regression analysis, individuals were more likely to litter in a large crowd setting than in a small crowd setting. However, the medium crowd condition showed a different pattern where individuals were less likely to litter than in a small crowd condition. The medium crowd condition was observed in the educational institution where correct disposal far exceeded littering.

Besides, this may be attributed to the low littering rate at the educational institution, the litter bin availability and accessibility, the presence of cleaning regulations, social norms supporting correct disposal, and the high level of knowledge of the students. It could also be because while a similar mix of activities transpired at the market and lorry station alongside high human and vehicular traffic, there was comparatively low human activity and crowd at the educational and health institutions. The results support the argument that though crowdedness has been considered as a contextual factor, social influence is important in explaining the effect of crowd on behaviour (Kolodko et al., 2016; Lorenz et al., 2011). This social influence manifests through mechanisms like conformity (Keizer et al., 2008; Wever, 2010; Wilson & Kelling, 1982). Comparably, a study in Ghana revealed that people consistently used an overflowing bin when there was an empty bin nearby (Tettey, 2015). People tended to conform to disposing of litter in the bin in which they perceived many people to be using, signifying that people will most likely just conform to the perceived behaviour of the crowd.

Moreover, it was found that the amount of litter in the environment increases the likelihood of individuals littering. Specifically, individuals were less likely to litter when the environment was slightly littered as compared to a heavily littered one. Previous studies have consistently found similar results (Al-Mosa et al., 2017a; Van Dyck et al., 2016; Rangoni & Jager, 2017; Schultz et al., 2013; Tehan et al., 2017). On the one hand, this study result could mean that interventions that aim at regularly cleaning the public space to avoid litter accumulation could effectively reduce littering. On the other hand, this strategy could be associated with more littering because people often use the provision of cleaning services to justify their littering behaviour. Based on this, the current researcher argues that public education should focus on educating people on their

civic responsibility of keeping the environment clean with participatory interventions to help build environmental efficacy in the populace.

Additionally, the investigation revealed that the distance to the nearest litter bin from in reference to the point of litter disposal is positively related to littering behaviour. This implies that people will litter less when litter bins are located near them. Nonetheless, the mean distance to a bin at the point of disposal was 3.43 metres. Correct disposals were observed when litter bins were within a metre from the participant. Thus, a greater proportion of the disposal within a metre resulted in correct disposal. Beyond that, most disposals resulted in littering, which suggests that many people are unwilling to walk beyond a minimum distance of one metre to dispose of litter correctly. Consequently, litter bin supply strategies need to consider the strong effect of distance while placing the bins in public spaces.

Similarly, some prior studies have found reduced littering rate when litter bins are closely located (Bator et al., 2011; Lyndhurst, 2012; Schultz et al., 2013; Schultz & Stein, 2009). However, other studies have questioned this finding, arguing that littering occurs even as close as between 3 and 5 metres (Curnow & Spehr, 2001; Keep New Zealand Beautiful, 2018). Consistently, a study in Ghana found that the littering rate was still high even when the bin was 5 metres away (Tettey, 2015). The differences in the effect of distance on littering behaviour across studies could result from other factors at play such as age, location, the prevailing norm, and others.

Following from the preceding paragraph, the distance to the nearest bin is likely to have a minimal effect on littering behaviour, especially in a cultural setting like Japan, where civic responsibility in environmental cleanliness is prioritised through participatory environmental education and management approaches (Mulyadi, 2020). The same can be

said for Singapore, where littering offenses attract substantial fines (Ong & Sovacool, 2012). Furthermore, the logistic regression in this study showed that the effect of distance on littering behaviour is dependent on the participant's age. Therefore, the interpretation of the main effect of *age* and *distance* must be done with caution because of the moderating effect of the participant's age on the relationship between distance and littering behaviour and vice versa. That means that the strength of the effect of distance on littering behaviour is influenced by participants' age. The scatter plot in Figure 4.8 shows that the effect of distance on littering reduces as individuals advance in age, which means that as people advance in age, they are more willing to walk an extra metre to dispose of correctly. Thus, the current researcher argues that intervention plans that target individuals as a unit must incorporate environmental factors like litter bin provision and positioning such that individuals do not need to walk over long distances to dispose of litter. In fact, the mean distance within which littering occurred was 3.43 metres, while the majority of correct disposal only occurred when litter bins were just a metre or less away from the participant. Thus, indicating that ideally, litter bins must be placed 1 metre apart to achieve a significantly reduced littering rate.

5.3 Litter Composition and Brands Dominating the Public Space Litter Stream in the Greater Accra Metropolitan Area

5.3.1 Litter Composition

The dominance of plastic litter items from the litter characterisation exercise confirms the findings of the observation study in objective two of the current research, where plastic litter formed the most observed items disposed. Following the increasing application of plastics in consumer-good packaging (Nguyen et al., 2020), like this study reveals, plastic makes up the larger proportion of waste in many studies internationally though some higher than others. Thus, not only is the proportion of plastics in household

waste increasing (Boateng et al., 2016), it also dominates marine and coastal environment waste streams (Tettey, 2015; Van Dyck et al., 2016) and other public space litter stream, especially in developing countries. To reaffirm the higher proportions of plastic in the waste stream in this study, respondents have widely reported its use in many studies (Adane, & Muleta, 2011; Ahsan et al., 2020; Awusi & Kyei, 2017). Also, a study by Kotei et al. (2020) affirmed the higher proportion of plastic waste in the litter stream, particularly at some lorry stations in the Ga West Municipal Assembly of Ghana.

The relatively higher plastic waste proportion in developing countries coupled with ineffective waste management indicates an increased propensity for terrestrial and marine environmental pollution (Lebreton & Andrady, 2019). Thus, the argument that developing countries are the worst culprits in ocean pollution (Schmidt et al., 2017). This, therefore, calls for more litter reduction and waste management efforts to be redirected to plastic waste management in Ghana.

A substantial amount of household waste often tied in sacks and black polyethylene bags were encountered while collecting the litter samples, thus, confirming the findings from the two qualitative aspects of this studies. Both individual perceptions and key informant interviews revealed a spillover of household waste to public spaces, thus contributing to the ineffectiveness of public space waste management and failure of the MMDAs' "street litter bins project" to serve its intended purpose. This results suggest that public spaces litter management efforts must incorporate strategies to deal with the household waste that leak into the public spaces.

Additionally, some litter associated with the Covid-19 pandemic, including nose masks and face shields were found. Because of the laws imposed on citizens in many countries regarding the wearing of nose masks in public spaces or in gatherings to reduce the

spread of the disease, it has increased the generation of such waste, hence their disposal and subsequent littering. This signals a changing composition of the litter streams globally and continuously adding to the already burdened waste management systems (Khan et al., 2021; Sharma et al., 2020), particularly, in many developing countries. Like this study, there is increasing reports of the Covid-19 pandemic-related litter in many litter streams, including marine litter, medical waste and municipal waste in general (Fadare & Okoffo, 2020; Hiemstra et al., 2021). This implies an increasing complexity of waste management not only because of negative environmental impact but also the risk of spread of the virus through the littered or improperly disposed masks. This thus, require city authorities to improve the investment in solid waste management and a restructuring of waste management system to handle the rising volumes of such hazardous waste in municipal solid waste.

5.3.2 Branded Litter Audit

The dominant litter items from the branded litter audit, i.e., water and beverage, food, and general packaging portray that litter generated in public spaces results largely from the consumption of food, water and beverages and associated packaging materials such as plastic films, which were mostly used for packaging food, water and beverages, and other consumer-goods. This means that the food, the water and beverage industry, and general packaging, i.e., plastic films, contribute more to the littering problem. Further, littered items seem to vary spatially. For instance, like the present study, Muñoz-Cadena et al. (2012) reported that beverage-related and food-related items made up about 63.3% of litter items disposed in the street in Mexico City. However, a survey by Arafat et al. (2007) found that participants reported littering glass bottles more than other items. In Australia, also, while most observed items disposed was "takeaway" packaging/

wrappers, cigarettes and accessories were most littered ('Keep New Zealand Beautiful', 2018; NSW Office of Environment and Heritage, 2013).

It can be observed from the previous paragraph that litter items likely to be disposed of in public spaces could be related to the geographic context and associated culture and consumption patterns. For instance, cigarette-related litter items are commonly recorded in some countries than others. In Japan, Shimazu (2018) found 54% of items littered to be cigarette butts. Also, a national visible litter survey in the United States reported tobacco products as the highest proportion followed by paper and plastics ('Keep America Beautiful,' 2009b). In New Zealand, the top three most littered items reported by participants included "takeaway" packaging/food wrappers, followed by cigarettes and accessories, and drink bottles ('Keep New Zealand Beautiful,' 2018). However, in Ghana, cigarette-related litter are rather reported in beach and lagoon-based studies, including Van Dyck et al. (2016), Tettey (2015), and Tsagbey et al. (2009), with no record of such items in household waste composition studies (Miezah et al., 2015), indicating that smoking is more prevalent in the beach than at home. Also, organic materials make up the greater proportion of household waste (Miezah et al., 2015) while plastics dominate in public spaces litter streams as reported in the current study and studies in the marine and coastal areas (Van Dyck et al., 2016; Tettey, 2015). Thus, confirming spatial variation in litter types generated.

This spatial variation denotes a difference in the consumption patterns in different locations, hence the sources and types of litter generated, suggesting that intervention strategies regarding litter management must be tailored to suit the litter type generated in specific locations. For instance, composting is an ideal strategy for household waste management in Ghana and many developing countries because of the greater proportions of organic materials in the waste streams but less suitable for public space and coastal

area litter management. The findings from the litter characterisation indicates that plastic recovery, upcycling, and recycling is much suited for public spaces litter management. Also, macro-level litter abatement interventions for public space as those included in this study should target the food, water and beverage, and plastic film manufacturing industries.

Furthermore, the majority of these brands that were identified are associated with the water and beverage and food industry, while the general packaging industry recorded non because of the absence of brand or names of the manufacturer. Overall, the dominant brands were water producers, particularly sachet waster. This also explains why LDPE and PET were dominant plastic materials, demonstrating the critical role of the beverage producers and sachet water producers in public spaces litter generation and its management. However, industry participation in addressing externalities of their products such as litter and littering is not bound by law but entirely based on volition (Amponsah-Tawiah & Dartey-Baah, 2016) through Corporate Social Responsibilities and other voluntary activities.

Unfortunately, most of these manufacturing companies will rather engage in education, health and technology-related activities as their Corporate Social Responsibility (Amponsah-Tawiah & Dartey-Baah, 2016). For instance, Kasapreko, a popular alcoholic and non-alcoholic beverage producer in Ghana, direct their corporate social responsibility towards health and relief services. Similarly, the Corporate Social Responsibility of Unilever Ghana Limited, one of the pioneers of GRIPE, is focused on health education, empowerment and community development (Ansah, 2013). Also, the effort of leading manufacturers in Ghana through GRIPE in addressing the litter problem is directed to public education and awareness creation, research, multi-stakeholder engagement and others. This means very minimal attention is paid to post-consumer

litter management of their products despite the fact that branded litter has been found to affect brand image (Roper & Parker, 2013), which might be overlooked by brand owners. The current researcher, therefore, agrees with Maier's (2019) argument that producers must be encouraged to assume some responsibility in managing the litter in public spaces.

The present study results are essential for macro-level, upstream litter control intervention planning because it is evident that any decisions made by stakeholders in the industries could have a significant influence on people's consumption and litter disposal behaviour. It is also evident that the dominant litter items are single-use which translate into high disposal requirement and subsequent littering as soon as they have fulfilled their intended use. Thus, it is suggestive that any intervention by local authorities for public spaces litter management strategies must target the plastic component to reduce littering in public spaces significantly. This also indicates that while composting and others have been widely accepted as sustainable management methods for municipal solid waste, particularly in developing countries, these strategies are not fit for public space litter management. This study highlights the important role of businesses in litter reduction through such interventions as public education on post-consumer waste management, redesigning packaging to encourage reuse and investing in the recovery of post-consumer waste materials.

5.4. Challenges of Littering and Environmental Policy Implementation in Ghana?

Policy implementation has been argued to be the major contributor to the stalled development and associated problems in many developing countries (Ajulor, 2018). This study aimed to assess the policy implementation challenges specific to littering sanitation environmental problems. The thematic analyses of key informants' responses identified three main themes revealing that policy implementation challenges in Ghana are

bedevilled by leadership challenges, inconsistency between local cultural norms and policies, and educational gaps.

5.4.1 Leadership Challenges

Good policies and adequate laws are not a panacea for successful policy implementation and achievement of policy goals (National Plastics Management Policy, 2020). It was found that good environmental policies and laws abound in Ghana, but the problem is with implementation. Key informants are of the view that lack of monitoring and weak enforcement of the policies and laws is a critical bottleneck, which is congruent with a report by Attafuah-Wadee (2018) that poor waste disposal behaviour is a result of continuous weak enforcement of environmental laws.

The problem of weak enforcement cuts across sectors in the country and many developing countries (Al-Khatib et al., 2015). The study argues that the widespread littering in public spaces stems from the lack of political will and commitment to implement policies and enforce laws, a notion supported by Al-Khatib et al. (2015); Ogawa (2005); and Sarfo-Mensah et al. (2019). An alternative explanation is that because several agencies are involved in the environmental and sanitation policy value chain (Lissah et al., 2021), due to the decentralisation policy reforms, there tends to be a lack of strong inter-agency coordination both vertically and horizontally to ensure successful implementation of policies. Consistently, a study by Mbuligwe (2013) argued that any disconnect will result in a break in communication and monitoring, hence enforcement would be problematic. This disconnect could result from the divergent interests of the different agencies involved in policy governance, which calls for purposeful collaborative action in achieving policy goals.

It could also be argued that the lack of commitment to policy implementation may be because, in some instances, politicians designed policies as vote-seeking strategies or to gain popularity. This view is consistent with Obu-cann et al. (2014) regarding the use of resources for political gains. Consequently, such policies lose relevance and are abandoned once the purpose for which the policy was rolled out is over, or the proponents lose power. If the former occurs, the policy is either abandoned all together or modified by the succeeding government, which assumes ownership. Thus, policy implementation or its continuity become a political game or tool to gain popularity. This vote-seeking behaviour of politicians also accounts for the minimal interest in enforcing policies and environmental laws, which can also stem from the fear of losing the support of the loyal party members.

Further, the findings revealed that the constant political interference and corruption aggravates the policy implementation challenges, thereby weakening institutions which are corroborated by Sarfo-Mensah (2019) and Zhu et al. (2008). Also, the interviewees' responses, supported Attafuah-Wadee (2018) and Huober (2010) acknowledging the persistence of corruption in environmental and sanitation governance, thus impeding effective waste policy implementation and law enforcement.

Furthermore, while scholars have linked the failed policy implementation to financial challenges of local authorities (Arthur, 2016; Troschinetz & Mihelcic, 2009), this study revealed otherwise for some MMDAs in the Greater Accra Metropolitan Area. It was agreed, though, that many MMDAs, particularly those who rely heavily on central government transfers, face financial challenges for the implementation of development projects and policies. This investigation revealed however that the main challenge in this regard is related to the bureaucracies and inefficient processes involved in the central government fund transfer to the MMDAs, which often result in a delay of and significant

reduction in the amount transferred compared with the amount budgeted by the MMDAs. However, this study's findings revealed that for many MMDAs in Greater Accra Metropolitan Area are more advantageous, especially regarding the mobilisation of Internally Generated Funds (IGF). Thus, confirming that financial challenges are not the main problem responsible for policy failures by the MMDAs in the study area and reaffirming the lack of commitment and leadership challenges for effective policy implementation.

5.4.2 Inconsistency between Cultural Norms and Policy

The successful and complete decentralisation is yet to be realized in many developing countries, including Ghana, which is linked to the central government's inability to achieve complete fiscal decentralisation (Amoako-Asiedu & Domfeh, 2016). In addition to the institutional challenges, this study shows that decentralisation as experienced in Ghana, reflects the cultural practices in relation to how individuals are brought up. As revealed by this investigation, cultural upbringing in Ghana is one of dependence and continuous allegiance to family and elders. Complete autonomy of individuals is not practiced. Thus, the values and beliefs that emanate from such cultural practices are not supportive of the very principles of decentralisation, i.e., self-governance. This is because culture models human attitude and behaviour (Opoku et al., 2015), thus, translating into organisational and institutional culture and practices.

In line with the effect of culture on individuals' behaviour and institutional norms, Isife (2012) suggested the need for development policies to be aligned to the culture and home-grown to ensure consistency with local traditional values and culture. The importance of cultural considerations and integration into national development, including environmental and sanitation policy planning, has been further emphasised by (Jeannotte & Andrew, 2012). Consistently, Kola-Lawal et al. (2014) stressed the key

influential role culture plays in the adoption and implementation of specific national environmental management systems, while Heitfeld (2017) argued that cultural differences might affect resultant environmental behaviour intentions. Therefore, it can be argued that cultural-policy considerations are crucial in determining individuals' waste disposal behaviour at the micro-level and the macro-level of policy implementation.

This research further associate the current indiscriminate waste disposal behaviour, including littering in public spaces, with the long-standing waste disposal practices such as burning, burying and open dumping. Besides, the traditional waste disposal practices of throwing waste outside the house have been transferred to public spaces in urban centres, which is corroborated by the quantitative study. This confirms the findings of (Oyegunle, 2016) that the poor waste management problem is rooted in the traditional waste management practices, which have become problematic because of the increasing use and disposal of non-biodegradable materials.

In addition, it was found that language and expressions regarding waste handling and treatment influence the way people conceive of and manage waste. the finding agrees with the argument that language influence people's perception of issues that borders on the attitude and behaviour they cultivate in that regard (Boroditsky, 2001; Heitfeld, 2017). The effect of language on behaviour is an emerging field and have been tested on varied behaviour, including economic behaviour, savings, and health behaviour (Chen, 2013; Chen et al., 2019). In this light, inherent in the most cited definitions of waste suggests that substances that are considered as waste are unwanted and suited for disposal or, in simple terms, to be thrown away. For instance, article 3 of the European Directive of 2008 defines *waste* as "any substance or object which the holder discards or intends or is required to discard". This definition aligns with Kadfak's (2011) findings that respondents perceive waste as unwanted materials, thus the higher likelihood of

waste being disposed of compared with other management methods such as recycling, composting, and others.

5.4.3 Educational Gaps

The high level of abstraction in Ghana's educational system contribute to the ineffective human resource quality, impacting negatively on policy implementation. More importantly, their accounts point to the fact that because the educational system models people based on abstract theories rather than practical, problem-solving approaches, it becomes difficult to implement programmes when faced with the challenge. Some authors emphasise that while theory-based education broadens people's understanding of concepts, its application in a real-life situation is achievable through integrating practice-based education and learning (Roberts, 2018). Besides, technical and vocational skills have been identified as critical in national development and effective policy implementation (Akanbi, 2017). This approach has gained much recognition in many fields of study, including medical, marketing, and the workspace (Abdelkarim et al., 2018). The findings of the present study and that of related scholars cited here, highlights the need to restructure the educational curriculum to make experiential learning feature prominently across all levels and in all educational institutions. That will improve the quality of graduates produced for the world of work and institutional management.

The chapter discussed the study's findings according to the specific objectives to broaden our understanding of littering behaviour in public spaces. It was then concluded that individual and contextual factors explain individuals' littering behaviour, with the manufacturing industry playing a critical role in the frequency of the behaviour occurrence.

5.5 Contribution to Knowledge

The current study contributes to the empirical literature on the factors that influence littering behavior and litter abatement practices by testing the significant factors influencing littering behavior across the multiple levels of influence as proposed by the Social Ecological Model according to McLeroy *et al.* (1988). Local authorities and other stakeholders can reflect on the significant determinants to guide litter abatement intervention design. Thus, in addition to confirming some existing knowledge, the study results have made some original contributions to the body of knowledge and identified a number of directions for future studies. The study's contributions include the following:

The study's findings revealed that aside littering being perceived as a normal daily practice, the act is perceived positively in the sense that it presents an opportunity for income generation for the public spaces waste management crew and waste pickers. Further, it applied the Social Ecological Model to expand knowledge on littering behavior and potential abatement interventions (Brennan et al., 2015). In doing so, the current study extended knowledge of the complex relationship of individual, social, organizational, environmental, and policy factors influencing littering behavior that enabled the assessment of factors beyond existing studies that have attempted to apply broader perspectives in responds to recommendations by recent scholars including (Al-Mosa et al., 2017a; Chaudhary et al., 2021). This can enable the identification of effective and context-relevant behavioral change approaches.

Additionally, the study is one of the first in identifying a cross-level interaction effect between an individual's age and the distance to a litter bin relative to the point of litter disposal on littering behavior thereby one of the first studies to confirming the proposition of the Social Ecological Model in littering behavior studies. Moreover, by employing a mixed method research approach, combining observational methods and

self-reported measures, the study expands knowledge on the methodological application answering the call to employ measures that do not rely on self-reports (Kubacki & Rundle-Thiele, 2017).

Besides, the current study adds to existing literature on littering behavior by extending understanding of the multiple factors influencing littering behavior in public spaces in Ghana and the developing countries context which has received minimal scholarly attention as oppose to the developed countries (Chaudhary et al., 2021; Moqbel et al., 2019; Oluyinka, 2011). Finally, the study contributes to knowledge on the physical material composition of litter and the dominant brands contributing to litter accumulation particularly in the public spaces surveyed

CHAPTER SIX

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

6.1. Summary

1. This study aimed to understand individuals' littering behaviour in four public spaces in the Greater Accra Metropolitan Area.
2. A cross-sectional convergent parallel mixed-method research approach was employed. A qualitative method was utilized to assess individuals' perceptions about littering and the challenges of policy implementation and litter abatement in Ghana. Additionally, a quantitative method was employed to examine the factors influencing littering behaviour and the composition and brands dominating the litter stream in the study area.
3. The in-depth interviews and focus group discussions to investigate individuals' perceptions about littering in public spaces revealed that littering was a norm, a result of collective action, an act of ignorance, a way to minimise private cost and a source of livelihood for waste pickers.
4. The study found that weak law enforcement, lack of litter bin, presence but ineffective informal social controls, and absence of written prompts prohibiting littering accounted for the persistent littering behaviour of participants.
5. Participants perceived that any effective litter reductions must incorporate three approaches, namely, adequate supply of litter bins, intensive public education, and strict enforcement of the law.
6. The binary logistic regression analysis revealed that multiple factors across different levels of the social ecological model influenced individuals' littering behaviour, including participant age, group size, group gender composition,

participant activity, litter item, level of the crowd present, existing litter, and distance to the nearest litter bin.

7. It was found that the relationship between age and littering behaviour depended on the distance to the nearest litter bin. Thus, the main effects of age and distance cannot be interpreted independently because the relationship between each covariate and littering behaviour is interacted by the other covariate.
8. The litter characterisation and branded litter audit recorded 37280 pieces of litter with plastic (79%) ranking first among the litter material types. Also, some 205 pieces of nose masks and 10 face shields were recorded relating to the COVID 19 pandemic. Further, some hygiene related litter were recorded including faeces (*flying toilet*), urine in bottles, and used sanitary pads and baby diapers.
9. The water and beverage industry was the most significant contributor to the litter stream, followed by the general packing and food industry.
10. Kasapreko Company Limited, Multi Pac Limited, and Special Ice Company Limited topped the branded water and beverage industry litter.
11. Nestle, Promasidor Ghana Limited, and Blow Plast Industries Limited dominated the branded food-related litter.
12. The study revealed that policy implementation and law enforcement are bedeviled with poor governance, local cultural norms and policy inconsistencies, and educational gaps.

6.1.2 Conclusion

Based on the key findings of this study, the following conclusions were made:

1. The study concludes that the persistent littering behavioural of individuals stem from people's perception that the act is a normal practice by the masses in the public spaces.

2. Littering behaviour may be sustained because, in some cases, it is perceived positively, i.e., providing source livelihood for public space cleaners and informal waste pickers, and the perception of the slightest possibility of being prosecuted for littering.
3. In many cases, the absence of litter bins as a justification for littering is perceived rather than objective.
4. The absence of prohibiting messages in public spaces could account for the perception that littering is not a grievous offence.
5. Several factors across four levels of the Social Ecological Model influenced individual littering behaviour. Both individual-level and contextual factors are important in explaining littering behaviour.
6. Plastic materials present a significant problem relating to littering than other litter items, corroborated in this study's qualitative and quantitative phases.
7. The water and beverage, food, and general packaging industries contribute significantly to Ghana's public space litter stream.
8. Food and the packaged water and beverage product manufacturers are significant contributors to branded litter.
9. COVID-19-related litter is increasing the volumes and complexity of solid waste management.
10. Governance quality, cultural values, and educational gaps affect the effective implementation of environmental and litter-specific policies.
11. Combining qualitative and quantitative approaches guided by theory provided a holistic understanding of individuals' littering behaviour in public spaces in the Greater Accra Metropolitan Area.

6.2. Recommendation

This study recommends that Government agencies in the waste and sanitation sector must collaborate in litter abatement strategies including the following:

1. The National Communication for Civic Education (NCCA), in collaboration with the Public Health Department and the Sanitation Department of the various MMDAs must endeavour to integrate the promotion of civic responsibilities when designing public educational programmes.
2. MMDAs can leverage on the informal social controls to encourage and motivate citizens to participate in monitoring littering behaviour as part of their public space litter control strategies. This measure could send a cue that there is surveillance, and that littering is socially disapproved, hence discouraging from engaging in the act as suggested by (Cingolani et al., 2016).
3. The Physical Planning Department in collaboration with the Waste Management Department of the various MMDAs must provide anti-littering messaging in all public spaces to provide normative information regarding the desired litter disposal behaviour to the users of the public space.
4. The Ministry of Sanitation and Water Resources and allied agencies' public spaces litter bin infrastructural planning must consider the availability, accessibility, and the distance of the bins in reference to the intended users.
5. The law enforcement agencies, specifically the Police and Judicial Services, must prioritise and publicise the prosecution of littering and environmental offences to serve as a deterrent to the public.
6. The manufacturing industry and brand owners must endeavour to channel corporate social responsibility efforts towards post-consumer packaging litter management as an industry contribution to litter abatement.

7. Industry must embark on redesigning packaging and introducing more reusable items to reduce the disposal rate of items after first use.
8. Any intervention by the MMDAs for public spaces litter management strategies must prioritise and target the plastic component and COVID-19-related litter to significantly reduce littering and health risk of individuals in public spaces.
9. Policy makers including all the Ministries and allied agencies must ensure that future policies are cultured and homegrown to suit local culture and traditional values.
10. The Ghana Education Services and its allied agencies must ensure that more practical training approaches are integrated into the educational curriculum in Ghana.
11. The Ministry of Sanitation and Water Resources and allied agencies must constitute a robust coordinating body to oversee sanitation sector policies and activities.

6.3. Suggested Areas for Further Studies

Based on the study findings, the following directions for future research were recommended:

1. Littering behaviour has not been extensively explored in the Ghanaian setting to exhaustively determine the factors influencing littering behaviour. Specifically, future studies can explore the factors influencing littering behaviour on a national scale to enable an inter-regional comparison of the problem.
2. Furthermore, the extent to which language affects individuals littering and waste disposal practices should be explored further.
3. Experimental research is required to confirm the relationship between individuals age and littering behaviour in public spaces and the moderating effect of distance

on the relationship and vice versa to guide future littering abatement strategies in public spaces.

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APPENDICES

Appendix 1: Semi-structured Interview questions to assess individuals' perception about littering behaviour in public spaces

Interview Questions:

1. Please tell me a little about yourself (e.g., demographics: age, ethnicity, gender).
   1. How often do you come here?
   2. For what purpose do you come here?

   ***Objective: To establish social-demographic profile of participants*]**

2. What is your view on the current state of solid waste management in public spaces in Ghana?

[*Objective: Identify the current state of SWM in Ghana*]

3. How do you perceive littering in public spaces in AMA?

   a. How do you feel about it?

   b. Why do you think people litter?

   c. Have there been instances where you have littered in a public space? And why?

[*Objective: To ascertain the general perceptions about littering in public spaces in AMA, and the causes and of littering*]

1. In your opinion what can be done about littering in public spaces?

[*Objective: To identify management efforts and recommendations for litter management*]

Appendix 2: Litter composition data form

Waste Composition data form					
Day/Date:		**Traffic/crowd condition:**			
Site ID &Location:		**City:**			
Visual rating of site (cleanliness):		**GPS Coordinates:**			
Weather:		**Recorded by:**			
Public space (e.g., Lorry station):					
Start time:		**End time:**			
		Weight in kg			
Component	**Sub- Component**	**Count**	**Brand/Manufacturer**	**Industry**	**Count**
E.g., Paper					
	E.g., Cardboard				
	Paper towel				
	Newsprint				
TOTALS					

Appendix 3: **Behaviour Observation Data Form**

		Participant ID (e.g. F1, F2….., , etc.)									
S/N	**ITEM DESCRIPTION/QUESTION**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
	SITE BACKGROUND DATA										
	Please provide the background information as appropriate										
	Name of Observer …… Day & Date…….…….										
	City……..										
	Start time…… End time……										
	PLEASE TICK, RATE OR STATE WHERE APPROPRIATE										
	Record the time that the observation for every subject was sampled (e.g. 1:28pm)										
	OBJECT DISPODED										
1	**What litter item was disposed (littered or disposed correctly)?**										
	Water and beverage Bottle: Plastic										
	Sachet water bag										
	Disposable utensils (spoon, cup takeaway pack)										
	Plastic film bag										
	Food/fruit Remnants										
	Food Wrapper										
	Beverage Bottle: Glass										
	Beverage Can										
	Beverage Cup										
	textile										
	Paper										
	Napkin/Tissue										
	Combo/Mixed Trash										
	Cotton bud										
	Other:_____										
	PARTICIPANT DEMOGRAPHICS (PLEASE TICK)										
2	**Gender:**										
	Male										
	Female										
3	**Estimated age (guess the age of participant (e.g. 24, 36, etc.)**										

4	**From your perspective what is activity involved in at the location**										
	Waiting to pick a car										
	Going to the office										
	Walking through										
	Working at the location (staff)										
	Selling										
	Shopping										
	Standing at one spot										
	GROUP SETTING (PLEASE TICK)										
5	**In what group setting was the subject at the point of disposal?**										
	Alone										
	In a group (a member of a group)										
6	**If the individual is either part of a group or within 10 feet of a group, record the number of people in that group.**										
7	**Group Composition:**										
	Peers										
	Older than subject										
	Younger than subject										
	Both older and younger										
8	**Gender composition of group**										
	same-sex as subject										
	Opposite sex as subject										
	Mixed Sex										
	OBSERVED BEHAVIOUR (PLEASE TICK)										
9	**What behaviour was observed?**										
	Left Site with no Visible Object										
	Left Site with an Object										
	Disposer										
10	**Disposal method/ Behaviour exhibited:**										
	Dropping litter in a bin										
	Littering- dropping litter on the ground										
	putting litter in a bag or pocket										
	On or around the bin										

	threw litter in the bushes, shrubbery, or planters										
	Other: Disposed of in a manner not specified above. Please specify what happened to the object in this situation										
	If no littering occurred skip to *13*, If littering, continue from * 11 *.										
11	**What type of littering behaviour is exhibited?**										
	Intentional										
	Unintentional										
12	**What form did littering behaviour take?**										
	Drop-Intent (The object was simply dropped (not thrown) and the drop appeared to be intentional).										
	Drop-No Intent: The object was simply dropped (not thrown) and the drop appeared to the observer to be unintentional										
	Wedging (Litter was stuffed into a gap in a wall, in-between seats, sidewalk, light fixture)										
	Flagrant flinging/ Flick or Fling (The litter was thrown into the air without intent to reach a receptacle)										
	Inching/ Inch away (subject littered and gradually moved away from it)										
	Foul shooting/ Shoot and miss (litter is thrown towards a bin, but ignored if it misses the bin)										
	Kicking (the item was kicked into the air without intent to reach a bin)										
	90% (Most litter items are put in a bin, but some is left behind)										
	Herd behaviour (the tendency to follow the littering habits of others in the group)										
	Sweep: The individual sweeps others' waste onto the ground before settling at a location.										
	Bury (The litter was buried in dirt or leaves)										
	Other: The individual used some other strategy for littering that was not specified above. Please detail the strategy used.										
	DISTANCE (e.g., 2metres)										
	Record the approximate distance (in metres) from the observed individual to the nearest waste bin. (Note: If no waste bin exists, record N/A and Use a "0" only if the person is less than one foot from the waste bin										
13a	How far was the subject from the nearest waste bin at the point the subject was sampled, and observation began. Please state the distance										
13b	How far was the subject from the nearest waste bin when the litter item was disposed? Please state the distance										
	ACTIVITY BEFORE AND AFTER DISPOSAL										
14	**Record the activity that the individual was engaged in prior to disposing of the object (e.g., Selling, shooing, walking, etc.). Please specify**										

15	**Record the activity that the subject was engaged in immediately following disposal (e.g., Selling, shooing, walking, etc.). Please specify**										
	ANTI-LITTERING MEASURES										
16	**Was there any anti-littering messages or public sensitization messages displayed**										
	Yes										
	No										
17	**Was any anti-littering regulation enforced on subject when littering occurred?**										
	Yes										
	No										
18	**If yes, specify the type of enforcement (eg, subject was made to pick up litter, arrested, approached by staff etc)**										
17	Record which randomization procedure was used to sample participants, e.g., 1's 2's 3's. etc.										
18	Notes: Provide a description if anything unusual that happened in the situation or if there was anything you were uncertain about. This may not need to be completed for every observation.										

Appendix 4: Semi-structured Interview questions to assess policy implementation challenges specific to littering and waste management in public spaces

Interview Questions:

1. Please tell me a little about yourself (demographics: age, ethnicity, observed gender).
1. How long have you worked in this organization and where did you work previously?
2. What position do you hold and how long have you worked in this position?

[*Objective: To establish social-demographic and employment profile of participants*]

3. How do you perceive littering in public spaces in Ghana?

[*Objective: To ascertain the general perceptions, attitude and behaviour about littering in public spaces in Ghana, the causes and how to control it*]

3. What are the policies and institutional arrangements regarding litter and littering management in Ghana? how comprehensive are the policies?

4. How do you perceive the laws pertaining to littering?

a. Are they being adequately enforced?

b. What actions does the law prescribe concerning littering culprits?

c. Are they effective? What more can be done?

[*Objective: identify perspectives on policies and institutional arrangements specific to litter management in Ghana*]

4. What are some of the challenges in policy implementation regarding littering?

5. What can be done to facilitate policy implementation?

[*Objective: To identify implementation challenges and recommendations for litter management*]

Appendix 5: Correlation Analysis testing for Collinearity

	Public space	Existing litter	Economic activities	Group setting	Group age	Group gender	Crowd edness	Accessibility	Litter item	Participant activity
Public space	1.000	**-.894****	.288**	-.131**	.014	-.007	-.175**	-.330**	.046	.298**
Existing litter		1.000	-.297**	.080**	.001	.024	.192**	.326**	-.061*	-.399**
Economic activities			1.000	-.030	-.179**	-.211**	**-.943****	**-.943****	.000	.065*
Group setting				1.000	.011	.016	.033	.008	-.012	-.088**
Group age					1.000	.936**	.200**	.208**	.000	.078**
Group gender						1.000	.237**	.235**	.011	.064*
Crowdedness							1.000	**.889****	.012	.007
Accessibility								1.000	.000	-.070*
Litter item									1.000	-.112**
Participant activity										1.000

Appendix 6: Full logistic regression model without interaction term

Parameter	B	S.E.	Wald	df	Sig.	Exp(B)
Participant age	.026	.011	5.637	1	.018	1.027
Group size	.186	.046	16.189	1	.000	1.205
Group gender: Same sex-ref			11.193	3	.011	
Opposite sex	.393	.207	3.587	1	.058	1.481
Mixed sex	1.140	.729	2.444	1	.118	3.126
Activity, Walking through- ref			21.370	6	.002	
Eating/drinking	-.341	.247	1.912	1	.167	.711
Selling	-1.742	.537	10.522	1	.001	.175
Shopping	-.714	.391	3.329	1	.068	.490
standing	-2.148	.784	7.505	1	.006	.117
Waiting to pick a car	-.756	.436	3.010	1	.083	.470
Working	.497	.479	1.078	1	.299	1.644
Litter item: ref-Water and beverage bottles & cans			46.556	5	.000	
Mixed waste	-4.193	1.098	14.598	1	.000	.015
Food-related items	-.889	.360	6.102	1	.014	.411
Food/fruit remains	-1.169	.405	8.341	1	.004	.311
Paper &paper towel	-3.970	.932	18.144	1	.000	.019
Plastic film bags	-1.242	.238	27.278	1	.000	.289
Crowdedness: ref- small crowd			42.044	2	.000	
Medium crowd	-.101	.251	.162	1	.687	.904
Large crowd	1.320	.253	27.321	1	.000	3.743
Slightly littered	-.530	.245	4.664	1	.031	.589
Distance	2.079	.261	63.377	1	.000	7.994
Constant	-2.412	.629	14.686	1	.000	.090

Appendix 7: Images of leaved used to wrap food in Ghana

Banana and plantain leaves, i.e., *Musa x paradisiaca* ***Source: Student's Fieldwork***

Corn husk, i.e., *Zea mays* ***Source: Student's Fieldwork***

Miracle berry leave, *i.e.*, *thaumatococcus daniellii* ***Source: Student's Fieldwork***

Appendix 8: Litter characterisation and brand audit

Source: **Student's Fieldwork**

Source: Student's Fieldwork

Appendix 9: Informal Waste Picking at Odawna Lorry Station

Source: Student's Fieldwork

Appendix 10: Mid-day Cleaning Activity at Odawna Lorry Station

Source: Student's Fieldwork

Appendix 11: Trading Actitivities in Kaneshie Market

Source: Student's Fieldwork

Appendix 12: State of Kaneshie Market Prior to Trading Activities

Source: Student's Fieldwork