Solid Waste Management practices in Small towns: Implications for Urban sustainability in Ghana

Enoch Akwasi Kosoe

Department of Environment and Resource Studies, SDD University of Business and Integrated Development Studies, Wa, Ghana

Corresponding author: ekosoe@ubids.edu.gh

ABSTRACT

The lack of studies on waste management practices in small towns is a major gap given their fast-growing nature, especially in the global south. The study examines the peculiarities of waste management practices and behaviour choices in a small town and draws implications for urban sustainability trajectories different from the current pathways of megacities. Employing a cross-sectional design, data were collected from 200 households a household survey. The findings indicate that most households preferred to dispose off waste using communal container collection and house-to-house collection, while others preferred to burn and bury their solid waste materials. Only age ($p<0.03$) of household head was significant in influencing households' waste collection and disposal methods compared to education ($p<0.43$) and sex ($p<0.21$). The findings suggest that the gradual elimination of communal container collection and intensification of house-to-house collection with an appropriate fee policy can put small towns on the right trajectory for urban sustainability.

Keywords: Communal containers, House-to-house collection, fee policy, planned behaviour theory, Sustainable urbanisation

1.0 INTRODUCTION

As many small towns expand into cities, urbanisation becomes the new development challenge. One of the critical patterns of modern societies is the concentration of over 50% of the global population in urban areas (United Nations, 2018). Given the complexity of the interconnectedness of urbanisation with other critical economic, social, and environmental processes, urbanisation is seen as a significant process towards achieving sustainable development (Jeronen, 2013). Urbanisation can result in a development that balances economic, social, and environmental considerations in urban areas (Anarfi, Shiel & Hill, 2022). However, sustainable urban development has been a major challenge confronting the African region, especially regarding solid waste management. Like in many parts of Africa, the urban population of Ghana is growing rapidly. As the population grows at 2.2%,

Ghana's population is increasingly changing into an urban population at 3.3% per annum of the change (World Bank, 2020). Urbanization in Ghana has increased from 51% in 2010 is projected to over 57% in 2021. It is projected to rise to about 63% in 2030, and 67% and 70.5% in 2040 and 2050 respectively (Owusu & Yankson, 2017). The increase in the urban population of a country has implications for socio-cultural and economic conditions (Kayode & Omole, 2011). One of the key challenges facing Ghana is managing the growing volumes of solid waste in urban areas, which represent a source of environmental pollution and a hazard to human health. Metropolitan, Municipal and District Assemblies (MMDAs) continue to struggle to develop effective solid waste management systems for towns and cities in Ghana.

Historically, city authorities have overseen the provision of sanitation services to urbanites in Ghana. However, because of the cost of local government provision and the poor efficiency of the public sector in the provision of solid waste management services, there was a policy shift in solid waste management towards a private sector-led involvement in the 1990s (Owusu-Sekyere et al., 2015). The private sector was charged with overcoming the government's institutional failures in public direct service delivery (Cointreau-Levine, 1994; 2000; Post et al., 2003). With the privatization of waste management, companies were incorporated into the waste management system and were required to manage about 80% of municipal waste. Even though there are always fears that privatisation would increase the cost-of-service delivery for households, the government subsidises the service with households required to pay between 10 and 20% of the total cost (Owusu-Sekyere et al., 2015).

Available studies on solid waste management in Ghana have reported on the forms and waste generation types, quantity of waste generated as well as methods of collection (Owusu-Sekyere et al., 2015; Danso, 2011; Oteng-Ababio, 2014; Boadi & Kuitunen, 2003). The waste generated is indiscriminately dumped in open spaces and gutters, low-lying areas, and abandoned gravel pits, while lighter solid waste materials, especially plastic waste, are entrapped among bushes. The uncollected solid waste within the various residential areas finds its way into the unplanned solid waste dumping sites, aggravating the environmental sanitation situation caused by indiscriminate dumping by households without refuse receptacles (Kosoe, Akanbang & Ahmed, 2023). However, data on the factors (social, economic, and cultural) influencing the type of solid waste generated is rare. Such information is needed to bridge knowledge gaps and provide data necessary for policy formulation. Additionally, the assessment of the behaviour and perception of urban households towards solid waste generation and disposal behaviours is understudied. The lack of studies on waste management practices in small towns is a major gap given their rapidly growing nature, especially in the global south. The current study uses the theory of planned behaviour (Ajzen, 1980), to

to explore households' perceptions and attitudes toward solid waste management in small towns. It aims to understand how low-income households manage their solid waste, including the types, the amounts generated, and the disposal methods used. The study focuses on the peculiarities of waste management practices, and behavioural choices among residents in a small town; and how they can impact urban sustainability differently from larger cities.

This paper is divided into five sections with the introduction being section one. Section two reviews the literature on small towns and urban sustainability in the context of solid waste management. The section also delves into the theoretical framework within which results are discussed. Section three covers the study area and research methodology used to collect and analyse the data. While Section four presents the findings, Sections five and six contain the discussion of results and conclusions, respectively.

1.1 Small Towns and Urban Sustainability

Small towns are an insignificant part of the settlement system with very low innovative potential (Vaishar, Zapletalová & Nováková, 2016). In this technological era, small towns serve as places where the manufacturing industry could be partly saved as indicated by Krzysztofik, Kantor-Pietraga and Kłosowski (2019). Krzysztofik et al. (2019) assert that small towns also serve as transmissions between big cities and the small towns being part of the countryside than a part of the urban world. It is important to note that small towns denote development poles within the countryside. Small towns increased in connection with modern urbanization processes with technological changes which relate to the transformation from industrial to post-industrial society and increase the importance of personal security of individuals (Vaishar et al., 2016). The findings of Kobojek and Marshal (2014) reveal that the future of small towns in redefining their role in the regional, metropolitan, and municipal or district structure can be realized through finding new opportunities for growth and improvement of local communities' living conditions. It is argued that the sustainability of small towns is realized through the recognition of environmental, economic, social, and historical-architectural components that are important in the process of selecting projects for the small towns' valorization and recovery (Nesticò, Fiore & D'Andria, 2020). This considers the education, population, and employment status of individuals within the specific areas. According to Prasad and Bansal (2015), urban sustainability is the organization of a city without excessive reliance on the surrounding countryside with which the city can power itself with renewable sources of energy. In the writer's view, the main ideology of urban sustainability is to create the smallest possible ecological footprint and to produce the lowest quantity of pollution possible. The author has been of the view that urban sustainability is best seen when there is efficient use of land, converting waste to energy recycling waste, composting used materials

and contributing towards minimizing climate change. The writer argue that without this principle urban sustainability cannot be achieved in many places globally. In India, for example, towns and cities are formed principally by the transformation and growth of villages and towns due to the rapid growth of urbanization (Prasad & Bansal, 2015). Although there has been such rapid urbanization due to economic shifts in urban areas, cities still have little access to basic infrastructural services and other social amenities. This is attributable to a plethora of reasons which encompasses inappropriate administrative and service delivery mechanisms coupled with improper planning, investment, vision lifestyle and management.

Though urbanisation has many benefits, there are sustainability issues that arise in Africa because of uncontrolled urbanisation. This poses significant risks to the urban population, including rising levels of slums, increased water crises and associated environmental challenges. Globally, two-thirds of the population will live in urban areas by 2050 (UNDP, 2023). This makes the provision of essential services including sanitation, water, and transportation important to effectively manage growth. Much of the urban growth in Africa is forecasted to occur in small towns, making them a significant growth point in Africa's urbanisation trajectory. Although cities occupy only three per cent of the earth's surface, they are responsible for 70% of carbon emissions and 60-80% of global energy consumption (UNDP, 2023). Building sustainable societies and communities (Sustainable Development Goal - SDG 11) therefore comes with significant transformations and investment in improved sanitation, potable water provision, dynamic public transport, creating outdoor spaces, and improving participatory urban planning and management of cities. It includes building affordable and resilient systems which ensure that small towns can serve their populations without challenges. One critical area in the sustainable development drive in Ghana is the management of solid waste especially in small towns. The reason is that small towns have intertwined characteristics of both the rural and urban areas, making them unique in the human settlement landscape. Therefore, improvement in the management of solid waste in these towns will serve as a tipping point for large cities and the countryside in sustainable waste management approaches. More importantly, the dynamic nature of small towns makes them an ideal starting point in the implementation of waste management approaches in Africa. In this regard, the sustainability of urban areas can be achieved when urban areas use the available resources to meet current needs while ensuring that there are ample resources available for future generations' use (Mohanty, Choppali & Kougianos 2016). This implies that for public health to be improved and to ensure a better quality of life, individuals residing in urban areas should limit improper waste disposal, prevent pollution, develop local resources to revitalize the local economy, promote efficiency , and maximize conservation. It can be deduced from the analysis of empirical studies

that urban sustainability centres on three positive components namely: social, economic, and environmental. This implies that the social well-being of urban sustainability coexists with economic and environmental development. Technology is arguably a wheel for creating sustainability goals but works against urban sustainability when misused (James, 2014). Scholarship on urban sustainability shows that urban sustainability is workable based on the three pillars mentioned above (Purvis, Mao & Robinson, 2019). Realistically, the social component requires maintenance of the quality of life, the economic maintenance of a healthy market and environmental-preserving natural assets and prevents them from being consumed more quickly than they are replenished.

It must be emphasized that among the social, economic, and environmental pillars for both small towns and urban areas' sustainability, social sustainability has progressively infused the politics of metropolitan and district development than others due to the increasing number of populations, especially in the urban areas (Opp & Saunders, 2013). Rama, González-García, Andrade, Moreira, and Feijoo (2020) allude that in recent times, urban areas are recognized as places that host a larger portion of the world's population as compared to small towns due to a chunk number of human activities within urban boundaries. It is further argued that human activities that primarily revolve around consumption of natural resources, greenhouse gas emissions and waste generation are mostly concentrated in the urban areas.

1.2 The Theory of Planned Behaviour and Waste Generation and Disposal Practices

Assessing the various ways that people generate and manage solid waste requires an assessment of how individuals' or households' behavioural choices or actions are influenced by socio-cultural factors. Environmental attitudes (Tonglet et al., 2004), and income status (Egbu et al., 2015), have been identified, for instance, as determinants of a household's solid waste generation. Exploring these predictors as well as identifying other important predictors requires an efficient theoretical framework. Ajzen (1980) developed the Theory of Planned Behaviour (TPB) based on the *theory of reasoned action*, and this has been applied to a range of human enterprises (Egbu et al., 2015). The TPB explains human behaviour and how behaviour can be changed by others. The theory states that people are rational human beings and consider the implications of their actions on themselves or others (Tonglet et al., 2004). Like the theory of rational choice which postulates that human actions are based on "rational" actions and decisions, and they are informed by the possible consequences of those decisions (Akers, 1990), the TPB also posits that people have reasons for a given choice of behavioural action. Thus, "an individual's behavioural choice is the intention to perform or not to perform that behavioural action" (Egbu et., 2015:3). In furtherance, the theory states

In furtherance, the theory states that general attitude toward the behaviour, subjective norms, and perceived behavioural control together mould an individual's intentions and behaviours (Figure 1).

Accordingly, the theory of planned behaviour (see Ajzen, 1991; Tonglet et al., 2004; Egbu et al., 2015) contends that human behavioural intention or behaviour is guided by three considerations:

- Behavioural belief/Attitude toward the behaviour; individual's belief about the consequences of behavioural choice or the positive and/or negative assessment of performing the behavioural action (attitude).
- Normative belief/Subjective norm; this relates to the perception of individuals on social (normative) pressures or the beliefs of others that he or she should or should not perform the behavioural action (Amjad & Wood, 2009).
- Control belief/Perceived Behavioural Control; this is the individual's beliefs of the presence of factors that may enable or hinder the act of the behavioural action (Ajzen, 2001), or the individual's seeming easiness or difficulties of performing a certain behaviour (Ajzen, 1991).

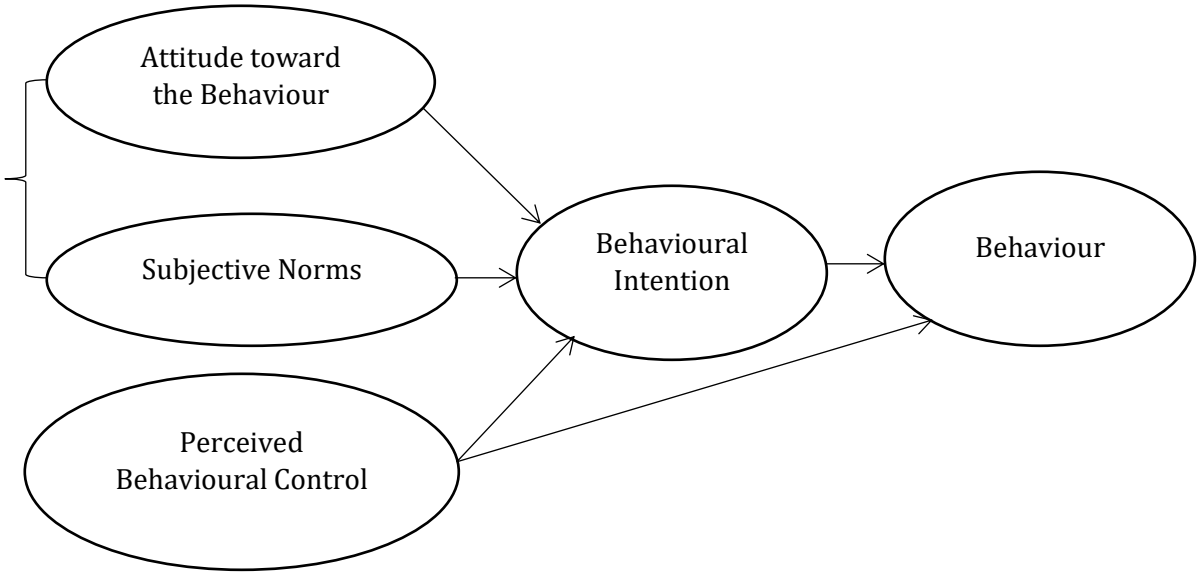

Figure 1: Theory of Planned Behaviour, adapted from Ajzen, 1991

These three considerations are the key determinants of an individual's intention to perform or not to perform a behavioural choice. The theory of planned behaviour applies to solid waste management since waste generation and disposal is a behaviour that needs thoughtful insight by households and individuals. Households make rational decisions to consume (informed by their income status) products that produce solid waste. Such behaviour implies that external costs are not considered OECD (2008) and Egbu et al., (2015). Since individual households do not consider the consequences of their behavioural choices (in terms of consumption), more solid waste is produced than may be optimal socially.

Individuals' or households' attitudes towards solid waste disposal behaviour (resulting in behavioural intention) may also be influenced by subjective norms (Figure 1). For instance, in most low-income communities where littering and indiscriminate disposal of solid waste are common, households may not be under any social (normative) pressure not to dispose of waste illegally. On the other hand, in middle and high-income communities where the subjective norm requires individuals and households to dispose of waste materials by the most appropriate means, households are pressured to perform accepted behavioural action in solid waste disposal, usually, because the presence of control beliefs (Figure 1) such as convenience, avoidance of cost, lack of knowledge on the appropriate disposal method, consciousness of environmental sanitation or health reasons, individuals choose to perform or not to perform a certain behavioural action.

The Theory of Planned Behavior (TPB) is used in this study to demonstrate how attitude, social pressures, and perceived control influence the waste management intentions and behaviours of households. The study aims to provide insights into waste management decision-making and identify areas where intervention can have the most significant impact on household solid waste management behaviour. Understanding which variables have the most significant effect on waste management behaviour can guide government initiatives towards implementing sustainable urban development policies.

2.0 RESEARCH METHODOLOGY

2.1 Study setting

This study was conducted in the Nadowli Township in the Nadowli-Kaleo District, Upper West Region. The Nadowli-Kaleo District is one of the 11 districts of the Upper West Region of Ghana with Nadowli as its District capital. The Nadowli-Kaleo District is centrally located in the Upper West region of Ghana. It lies between latitude 11' 30' and 10' 20' north and longitude 3' 10' and 2'10' west. It is bordered to the south by Wa Municipality, west by Burkina Faso, north by Jirapa and Lambussie-Karni Districts and to the east by the Daffiama-Bussie-Issa District. The Nadowli-Kaleo District, with a territorial size of

1,132.02 km^2 extends from the Billi Bridge (4 km from Wa) to the Dapuori Bridge (almost 12 km from Jirapa) on the main Wa-Jirapa-Hamile road. From west to east, it extends from the Black Volta to Daffiama. Figure 2 indicates the map of the Nadowli-Kaloe District showing Nadowli, the study area, in red. Nadowli was selected for this study due to its potential for producing large amounts of solid waste despite having a population of only 5,538 people (GSS, 2020). Nadowli is growing rapidly due to the increase of social services such as schools and health facilities, but solid waste management services are limited. The study identified five locations within the Nadowli where waster is collected: Mwayira-yiri, Newton, Ganga, Yipala and Sorikuong-yiri as shown in Figure 3. At each location, there is a communal container for solid waste collection.

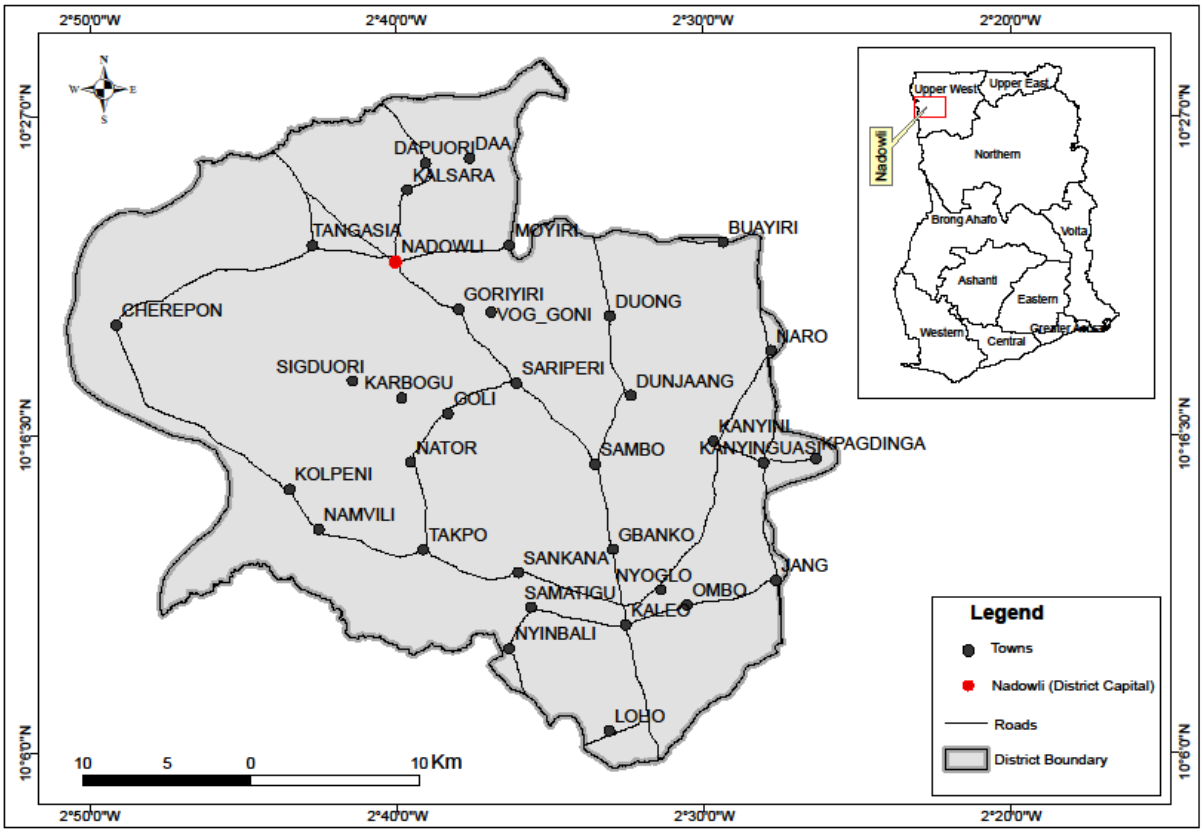

Figure 2: Map of Nadowli-Kaleo District indicating Nadowli

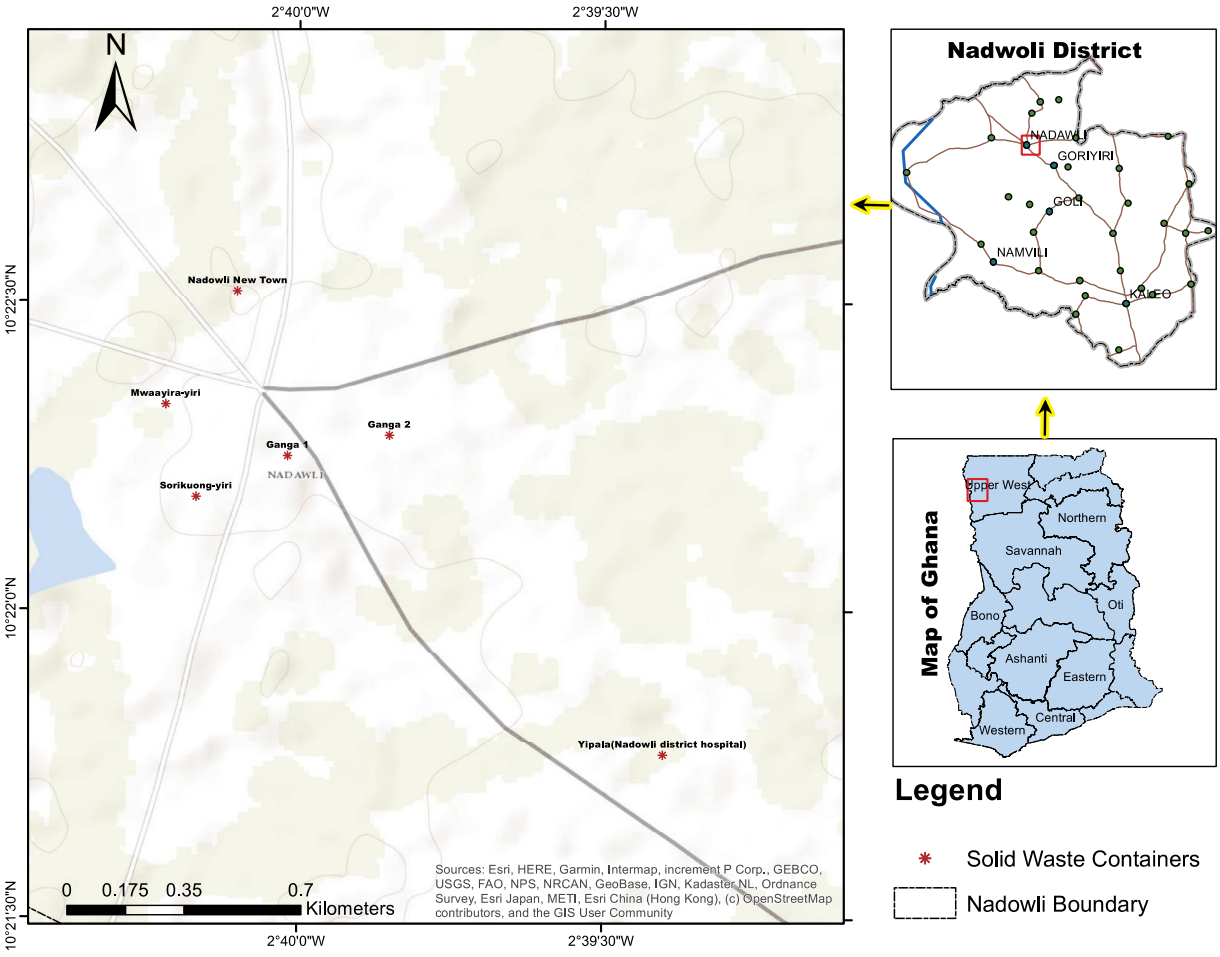

Figure 3: Spatial Distribution of Communal Container Collection (CCC)

2.2 Research Methods

The study is a descriptive cross-sectional survey patterned on household waste generation, disposal methods and overall management practices. The survey approach was necessary for determining the type of solid waste generated by households to be able to establish a strong relationship between behavioural decisions, characteristics of respondent households and solid waste generation and disposal practices. Data were collected using both primary and secondary sources. Primary data were collected from the five zones (Mwayireyire, Newtown, Ganga, Yipala and Sorikuong-yiri) demarcated by the District Environmental Sanitation Department, for solid waste collection in Nadowli. In each zone, 40 households were randomly selected for household questionnaire administration. In all, 200 household questionnaires were administered through face-to-face and one-one-one interviews using the local dialect, *Dagaare*, since most of the local people

cannot read and understand the English language. At the institutional level, official documents from Zoomlion Company Ltd and the Waste Management Department of the Nadowli-Kaleo District as well as other relevant literature were reviewed for the study. Semi-structured interviews were conducted with officials of the institutions. In all, officials from four institutions (Zoomlion Company Ltd, Nadowli-Kaleo District Assembly Environmental Health and Sanitation Unit, and Regional Environmental Health and Sanitation Department) were interviewed on waste management practices and the influence of socio-economic and cultural factors. Data collected using a questionnaire were analysed using SPSS software. The Pearson correlation coefficient was also established. The correlation analysis provided the study with the tool for measuring the linear relationship between two variables and producing statistics that describe the strength of the association between the variables (Kayode & Omole, 2011). Data collected from interviews were transcribed, analysed, and presented in the form of narrations using NVIVO 10 software.

3.0 RESULTS

This study delves into the characteristics of household solid waste, focusing on waste generation, collection practices, disposal methods, and the socio-economic determinants of the choice of disposal method. The insights gained from this study can inform policymakers and help communities develop more sustainable waste management practices.

3.1 Household Solid Waste Generation and Characteristics

Solid waste generated by households was put into three distinctive categories: organic, plastic, cans, and others. A multiple-response question on the type of solid waste generated by households revealed that organic waste is the largest waste generated by most households with 200 responses. The composition of organic waste generated includes remains of cooked food, vegetables and leaves, wood, raw or unprocessed staple food, peels of fruits and sometimes human excreta. Following organic waste are plastic and tin and others (such as scraps metals and paper boxes) representing 192 and 185 responses respectively (Table 1).

Table 1: Multiple Responses on the Type of Solid Waste Generated by Households

Household Solid Waste Generated	Responses
Organic	200
Plastic and Tin Cans	192
Others	185

Source: Field Survey, 2022.

Reasons given by household respondents for the rise in plastic (especially polythene bags) and tin cans waste generation by households include an increase in income levels, the desire to try something new, the addition of new food into the household diets, non-usage of traditional baskets for carrying market items, and the increasing usage of polythene bags to package market items. One household head reported that:

> 'It is not always that we get household consumables from the farm, sometimes we buy things like tomatoes (processed), milk, canned fish and the like. At the end of it all, everything is packaged in a polythene bag which is also sent home. Sometimes too when there is money, we must make the household happy by trying out new foods that we do not grow or usually eat. I remember my daughter once asked me to buy Neat Fufu because she had not eaten it before, and the entire household ended up eating it' (Yipala Zone, June 2022).

On the generators of the last category, 'other solid waste' which includes electronic waste, scraps metals and paper boxes, an official of Zoomlion Ghana Limited revealed shop owners and market women are some of the key generators of box papers to package items for their clients:

> 'Shop owners produce most of the paper box. When people go to shop, usually their items are packaged in paper boxes. However, instead of bringing these boxes to the market on their next visits, they leave them in the house and upon their return bring in new waste materials, the old ones are then discarded or burned' (Key Informant, Nadowli, June 2022).

3.2 Waste Storage, Collection and Disposal Practices

The National Building Regulation LI 1630, National Environmental Sanitation Policy and other regulatory frameworks on solid waste management require households to store their waste on the premises in a container of a type approved by the assembly before collection of the waste. Also, with the Local Governance Act of 2016 (Act 936), city authorities as legal entities have powers conferred on them to promulgate byelaws to govern and regulate solid waste management, sanitation, cleansing and abatement of nuisance in the city (Local Government Act 2016, Act 936). The study revealed that, out of the 200 household respondents, only 20.5%, 22%, 5.5% and 7% use metal, plastic, basket, and concrete containers respectively to store or collect their solid waste at source (Table 2). The study found the two main systems of solid waste collection methods operate in the area: communal container collection (CCC) and house-to-house (HtH) collection methods. The commonly used method is the Communal Container Collection. Of the eleven (11) communal containers spatially distributed for solid

waste collection in the district, five (5) are in Nadowli township. From the study results, much as 191 respondents (95.5%) use the CCC to discard their household solid waste because it is free of charge. Out of the 191 respondents who patronise the communal container collection mode, 67% usually dispose of their solid waste in communal dumping sites at various locations, 25.7% usually burn their household solid waste, and 7.3% usually bury the waste (Table 3).

Table 2: Type of Household Storage Container

Mode of Storage	Number of Households	Percentage (%)
No Containers	90	45
Metal Containers	41	20.5
Plastic Containers	44	22
Concrete Containers	11	5.5
Basket Containers	14	7
Total	200	100%

Source: Field Survey, 2022.

Table 3: Modes of Solid Waste Collection by Unsubscribed Households

Mode of Solid Waste Disposal	Number of Respondents	Percentage (%)
Burn in pits	49	25.7
Bury at backyards	14	7.3
Communal dumpsites	128	67
Total	191	100%

Source: Field Survey, 2022.

Reacting to the challenges of using the CCC, some users (63.7%) complained that the containers provided at the various centres are not enough since the town is expanding and there are only five containers. Another challenge is the long distance that people must cover to get to the container. As much as 63.7% of the respondents indicated that the containers are placed in locations far away from their homes. As a result, some respondents (25.7%) preferred to burn or dispose of their waste in open spaces, while 7.3% of respondents indicated they bury their waste at the back of their houses (Table 3).

The study showed that only 4.5% of household respondents have subscribed to the house-to-house (HtH) waste collection service. Information obtained from a Key informant in Nadowli revealed that 39 clients are patronising the services of Zoomlion Ghana Ltd. Of the 39 clients on the Zoomlion HtH services, 29 are households and 10 institutions. In total, there are 74 bins in circulation from Zoomlion Ghana Limited in Nadowli township. With the HtH waste collection, registered households are provided with dust bins which are to be collected by the service provider(s) (Zoomlion Ghana Limited) every week at a fee of GHc10 (US$ 1.73) a month. Though the system is a convenient way of collecting waste, it faces challenges. A major challenge as narrated by respondents is the fact that service providers do not empty the bins on the agreed time. The situation creates an unsightly view for them and their neighbours. A 65-year-old respondent revealed that:

> 'Sometimes it takes up to two weeks for the people (Service Providers) to come over to empty the bins. The site over this period is very disgusting, especially during the rainy season. When the rains fall on it (the full but uncollected bins) the smell of the entire place becomes offensive' (Household Interview, Nadowli, 2022).

Another major problem for subscribers was the cost of the service. The household survey found that initially the cost of the service was GHS 7 but had been increased to GHS 10. This increment has made some households unsubscribe from the service. These factors according to the respondents are the cause of the low patronage of the HtH services. This opinion was shared by an official of Zoomlion Ghana Ltd but added that the people traditionally are not used to this system, and they need to be educated more on the benefits of the HtH service provision.

3.3 Socio-economic Determinants of Choice of Household Solid Waste Disposal Method

The study found that age is significantly positively related to the probability of using an institutional waste disposal system (Table 4). Respondents indicated that as one gets older the more one's need to seek convenient and easy means of disposing waste becomes necessary. A 73-year-old retired educationist said:

Table 4: Correlation between Institutional Solid Waste Disposal Method and Socio-Economic Characteristics

Variable	Coefficient	Standard error	P – value	Marginal effect	Standard error
Age	2.13	.99	0.03	.45	.21
Sex	-0.59	.47	0.21	-.09	.08
Marital status	-.26	1.61	0.87	-.045	.28
education level	-.15	.19	0.43	-.03	.03
Income level	.01	.23	0.96	.002	.039
Number of observations	150				
Chi- square value	0.08				
Pseudo r-square	0.09				

Source: Field Survey, 2022.

> 'Now I have become weak and so is my wife, neither me nor her can go to the communal dumping site so what we do is to get registered with the home-to-home service provider to empty our bins for us' (Newtown Zone, June 2022).

Households with higher income levels can patronise the easy and convenient mode of waste collection and disposal. The study results show that pressures from society influence behavioural choice. The results show that depending on income earned or standard of living, society expects households to behave way. A 46-year-old civil servant living in a bungalow posited that:

> 'In this neighbourhood, you can't just act anyhow you want just because you feel so. As you can see, we live in a clean environment so it will be unwise and a shame for one to start dumping waste in the open' (Mwayireyire Zone, June 2022).

Other characteristics like sex, marital and educational status are negatively correlated with the methods used by households to collect and dispose of waste (Table 4). Education was not found to

Education was not found to influence a household's choice of disposal method because respondents indicated that choosing a waste disposal method is dependent on accessibility, reliability, and convenience but not just on the level of education:

> 'There are people in this town with high levels of formal education, yet there are no variations when it comes to solid waste disposal. We all depend on the communal container. We all burn and/or bury solid waste materials. One thing I know for sure is that we choose the most convenient means' (Household Interview, Nadowli, 2022)

4.0 DISCUSSION

4.1 Household Solid Waste Generation, Collection and Disposal

Organic solid waste ranging from food waste, green waste, food soiled paper to landscape and pruning waste constitutes most of the municipal waste in Ghana. The findings of the study correspond with the works of Adogu et al. (2015) in Nigeria, Ogola et al., (2011) in Johannesburg, South Africa and Amoah and Kosoe (2014) in Wa, Ghana. The domination of organic waste stems from the fact that Nadowli is predominantly a farming community where households use more organic foods in their diets. The unprocessed nature of organic foods (Tan et al., 2014; and Amoah & Kosoe, 2014) is another contributory factor for the dominance of organic waste. On the other hand, plastic and can waste generation is at par with domestic organic waste and this is like the findings of Modebe et al. (2011) in Nigeria where cellophane bags constituted the majority of solid waste generated by households.

The reasons for the increase in the generation of plastic and cans waste is attributed to the packaging of products (such packaging vegetables, salt, and fruits) for household consumption. Also, the traditional buckets used by households for shopping from the market have given way to plastic bags. This finding is in close association with findings by Egbu et al. (2015) in Nigeria, where the increased generation of plastic and can wastes was attributed to the consumption of cocoa and alcoholic beverages by households. The results of this study agree with the theory of planned behaviour that people as rational human beings make rational decisions, depending on their social and economic stands, and consider the implications of their actions either on themselves or on others or the environment.

The waste management stages by Tchobanoglous et al. (1993) demand that households store their waste at the source before collection. After collection is transport and treatment, before final disposal, however, this is not the case in Ghana. There is rather a link between household wastes which move straight from collection to final disposal. With 55% of respondents reporting storing their solid waste at

home for onward collection, the findings resonate with Adogu et al. (2015) and Kayode and Omole (2011) that households store domestic solid waste in one container or another with or without sorting.

There are two main types of solid waste collection in Ghanaian communities (Owusu-Sekyere et al., 2015; Amoah & Kosoe, 2014; Oteng-Ababio et al., 2013). These are the communal container collection (CCC) and house-to-house (HtH) collection systems. The study's findings agree with Amoah and Kosoe (2014) that the communal container collection system remains the commonest alternative for the disposal of domestic solid waste in low-income households. Owusu-Sekyere et al. (2015) reveal that the CCC mode is of two forms; *the pay-as-you dump*, and *free dumping*. The pay-as-you dump is most common in middle to high-income, populated and residential areas, while the free dumping systems are used for public places such as markets, educational institutions, and public hospitals among others. The communal containers are also provided by the Metropolitan, Municipal and District Assemblies (MMDAs) in collaboration with private providers such as Zoomlion Ghana Limited. Collection of these communal containers (especially the free dumping) is infrequent, leaving the urban areas filled with loads of uncollected solid waste materials especially in the lowly served suburbs, which creates unpleasant scenes.

The house-to-house (HtH) collection is common in higher and middle-income communities as well as some public institutions. High-class residential areas that utilize HtH services provided by private companies pay a monthly fee (Owusu-Sekyere et al. 2015; Amoah & Kosoe, 2014). The results of the study on the challenges of the HtH collection system add to earlier studies on the ill-timing of the collection of waste containers when they are full. This hampers the efficient and sustainable provision of service, acting as a major impairment for households that utilise the service. Another observed challenge is the excessive fees consumers pay that do not correspond with the services they receive.

4.2 Socio-economic Determinants of Choice of Household Solid Waste Disposal Method

The findings of the study are consistent with those of Kayode and Omole (2011) in Nigeria that age and income influence the residents of the Ibadan metropolis when choosing waste disposal methods. The level of income for instance is noted to determine the ability of a household to buy a waste bin and/or container that produces no odour and discourages breading of organisms that cause diseases. The study showed that when one gets old it becomes difficult for them for instance, to use the communal container collection system because of distance. They therefore tend to use either the HtH collection system or other alternatives such as burning and burying of waste.

On the other hand, the results of the study in part agree with the findings of Kayode and Omole (2011) that sex does not influence households' choice of waste disposal, but do not agree with the findings that educational status influences households' choice of waste collection and disposal methods (Kayode & Omole, 2011; Adogu et al., 2015). Kayode and Omole (2011) and Adogu et al. (2015) argue that the more educated the household, the more they become aware of the side effects of unmanaged solid waste and appreciate effective waste management. Therefore, they choose the best container that will keep it from breeding disease-carrying organisms. In the study area, choosing a solid waste disposal method by implication could be attributed to a behavioural pattern rather than educational status. Results from this study agree with the controlled belief or the perceived behavioural control (i.e., the individual's beliefs of the presence of factors that may enable or deter the performance of the social behavioural action) of the theory of planned behaviour. This is because households influence each other in choosing waste disposal means. A household is more likely to follow what the nearby household is doing. That is, an individual's perceived easiness or struggle of performing a certain behaviour kind is influenced by a similar behaviour being performed by others.

5.0 CONCLUSION

This study underscores the pressing need for sustainable waste management in small towns, exemplified by Nadowli, utilizing the theory of planned behaviour to illuminate the impact of community behavioural patterns. It advocates a transition towards organic waste composting and recycling, emphasizing the potential for creating healthier and safer urban environments. The findings underscore the importance of implementing comprehensive community sensitization programs to encourage waste repurposing, reduce food waste, and provide incentives for communities to actively participate in waste reduction. Essential for effective waste management is litter management strategies, including the provision of bins for low-income households and the endorsement of community self-help initiatives. Additionally, fostering widespread adoption of House-to-House waste collection could be achieved through the establishment of an inclusive fee policy by local government and stakeholders, contributing significantly to the overarching goal of urban sustainability in small towns.

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