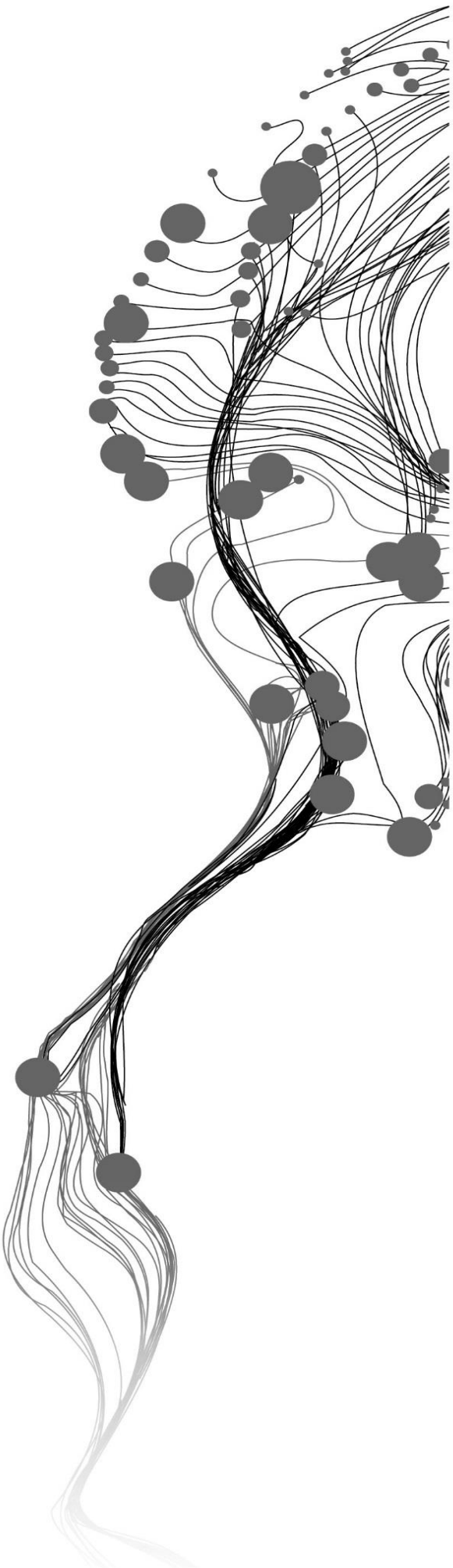


**ANALYSIS OF UNCOLLECTED
SOLID WASTE IN URBAN
AREAS: DIFFERENT EFFECTS
DIFFERENT CAUSE. CASE
STUDY OF WA MUNICIPALITY
GHANA.**

[BABUGU DIMAH FATAWU]
March 2015]

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DISCLAIMER

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ABSTRACT

Many African and developing countries are facing numerous challenges in waste management. Even with the privatisation and formalisation of waste collection, this privatisation has led to improved waste collection in urban high-income areas; similar cannot be said for poor neighbourhoods. Wa municipality like many growing urban cities face challenges of uncollected waste exceptionally in poor neighbourhoods. The level of sanitation infrastructure and the forms waste collection and disposal practices in a poor neighbourhood has an influence in the level of uncollected waste. Moreover, waste from non-residential activities play major roles in the levels of uncollected waste in poor neighbourhoods as compared to household solid waste. The study findings show waste disposal behaviour of poor neighbourhoods is partly influence by its location in an urban setting, and the number of other human activities surrounding the neighbourhood.

Since waste collection was practically formal without informal collections, the study focused on the factors that affect neighbourhood uncollected waste levels, differences of one poor neighbourhood from the other. It further evaluated how waste collection affected the levels of uncollected waste. Moreover, how communities perceived the possible effects of uncollected waste

The research design employed systematic sampling structure, the use of household food and shop owner questionnaires, semi-structured interviews with experts in waste management in both the private and public sector. Data was analysed using SPSS (crosstabs frequencies), textual analysis, and the use of ArcGIS for the visualisation. The findings show that locations of neighbourhoods and number of communal waste collection points have influence on the levels of uncollected waste. The findings further show different causes and different effects of uncollected waste in different neighbourhoods. However, the community leadership, certain basic initiatives, and the willingness of pay for waste to reduce the occurrence of uncollected waste differentiate neighbourhood from neighbourhood. The growing formalisation of waste collection without increasing logistics and inadequate integration of the informal sector in formal waste collection stream is a major contributor to increasing occurrence of uncollected waste in low-income areas

Key words

Waste management, Uncollected Waste, Wa Municipality Ghana, Low-income neighbourhoods

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List of Acronyms

EPA	Environmental Protection Agency
FGD	Focus Group Discussion
GPS	Global Position System
GSS	Ghana Statitscal services
MCE,	Municipal Chief Executive officer
MEO	Municipal Environment Officer
MPPO	Municipal physical planning officer
NSD	National Sanitation Day
PHO	Public Health Officer
UN	united Nations
WMA	WA Municipal Assembly
ZGL	Zoom Lion Ghana limited
MLGRD	Ministry of local Government and Rural Development
MDG	Millennium Development Goal
TCP	Town and Country Planning

1. INTRODUCTION AND BACKGROUND

1.1. INTRODUCTION

Human surroundings play a key role in quality of living, hence the constant need to assess the quality of it (Pacione,2003). The general liveability of the environment is dependent on the level of cleanliness of the surroundings. Van Kamp, Leidelmeijer, Marsman, and de Hollander (2003) related environmental cleanliness to the provision of sanitary facilities and the total collection of waste generated within such environments. The UW(uncollected waste) within such environments has been a major cause of worry to most developing urban areas, municipalities and the world at large (UN-Habitat, 2010).These UW consists of household (swept sand, food remains plastic packages),industrial, commercial and institutional Waste.

1.2. BACKGROUND

Rapid urbanization, population growth and changes in lifestyles in low- and middle-income countries contribute to increasing per capita domestic waste generation (Mosler,et al 2006). Domestic Waste is a major component of the waste uncollected in most poor neighbourhoods (Bernache-Perez, Sanchez-Colon, Garmendia, Davila-Villarreal, and Sanchez-Salazar, 2001). Uncollected Waste, pest infestation, access to Water and indoor air pollutions are unsanitary conditions that growing urban cities face (Osumanu, 2007; Oteng-Ababio, Melara Arguello, and Gabbay, 2013).The rates of Waste generation worldwide far exceed the rate at which it is collected. UN-Habitat(2010) estimated a collection rate ranging from a low 10% in pre-urban areas to a high of 90% or more in commercial city centres, this implies Waste generated in many urban areas is uncollected or do not reach the collection stream. According to estimates from the World Resources Institute(W.R.I) and United States Agency for International Development (USAID), many local authorities in developing countries spend over 30% of their budgets on refuse collection and disposal but can only collect at most 50–70% as cited in (Henry, Yongsheng, and Jun, 2006). Although data on Waste generation and collections are hardly available for most developing countries, Perinaz (2012) estimates collection rates range from as low of 41% in low-income countries to a high of 98% in high-income countries. It further explained that low-income countries, collection services make up the bulk of a municipality's solid Waste management budget (as high as 80 to 90% in many cases), yet collection rates tend to be much lower, leading to lower collection frequency and efficiency. In high-income countries, although collection cost represents less than 10% of a municipality's budget, collection rates are usually higher than 90% on average and collection methods tend to be mechanized, efficient, and frequent. This is mostly due to the inefficiency in Waste management system in most developing countries. These mismanagements have many side effects on the general development and liveability of urban areas with much impact on low-income areas. Which most often than not have little or no WC (Waste Collection).

1.3. JUSTIFICATION

The growing population and increasing urbanization have resulted in many disparities, in domestic Waste generations and collection. Several studies about household level Waste generations; Bach, Mild, Natter, and Weber, (2004); Keser, Duzgun, and Aksoy, 2012; Qdais, (1997) relate household size, composition and the location as some of the possible factors for differences in Waste generation Little (1997) suggests that Waste disposal behaviour vary from person to person, from household to household and from

neighbourhood to neighbourhood. While Songsore and McGranahan(1998) also concluded that female header household located in indigenous neighbourhoods worried more about UW surrounding the neighbourhoods and their possible effects than their male household heads. In contrast Tadesse, Ruijs, and Hagos, (2008) suggested that characteristics such as household size, sex and education have little impact on uncollected Waste. The above gives the different dimensions, Waste and its collections is studied. That notwithstanding Fobil, (2010); Little, (1997), and Sujauddin et al.,(2008) concluded in their studies that people from rich social economic backgrounds have good WC services and clean environments, as compared to poorer neighbourhood which generate less waste but have more of it uncollected. These are indications of the economic class difference with Waste generation and collection.

Numerous cities in Asia Africa and Latin America face serious hitches with managing their Wastes. The key causes have been the rare collections and inapt final disposal of Waste. Over a billion people worldwide living in low income neighbourhoods either lack appropriate WC systems or where they exist they are woeful inadequate mainly due to rapid population growth and urbanisations of those cities hence worsening the existing the Waste challenges of the residents (Medina, 2010). With this rapid growth, urbanisation, there is constant densification of indigenous neighbourhoods and slums; this put strains on scarce Waste infrastructure of municipalities which are not briskly replaced.

Solid WCs and its challenges in Ghana are often the features of low poor, and densified neighbourhoods and open streets in big cities of Accra and Kumasi In these cities neighbourhoods like the Zongos¹ and existing unplanned indigenous neighbourhoods like Teshie in Accra are such examples. Moreover neighbourhood residents close to the centre of the cities face most of these more of these challenges (Asomani-Boateng, 2007) These generalised statements make it difficult to study the difference in the settings of poor neighbourhoods. Henceforth, the often gentrification of the challenges of WC and the prescription of the same solutions to different Waste challenges.

WC has therefore has been formal in all municipalities in Ghana. The general privatisation of WC and the challenges that associate with it make it very difficult to understand the various factors that influence Waste disposal behaviour of residents of poor neighbourhoods. From the above, poor neighbourhoods do not necessarily generate large tons of Waste in urban areas but they suffer most from the little they generate due to the adequate collection systems.

This has called for the study of the settings and Waste disposal behaviour of residents to for tell the factors that cause the variations in WCs and the levels of UW in poor neighbourhoods

¹ Community of immigrants from different parts of the country. Majority often Muslims.

1.4. PROBLEM STATEMENT

WC and generation have many disparities; leading to different levels of uncollected Waste. Very limited studies have investigated the spatial differences in UW and factors behind the generation of uncollected Waste, including socioeconomic factors, household composition, and gender. Therefore, this study will be investigating the variations in uncollected waste, spatial, environment, and socio economic factors behind these variations. The study will further ascertain the hotspots of UW in low income, and to also to specify interventions being employed by different low income resident to dealing with the

1.5. CONCEPTUAL FRAMEWORK

The conceptual framework in Figure 1:1 elucidates the relationships that exist between neighbourhood solid Waste generation and collection. In addition, how these concepts influences the variations in UW within similar low-income neighbourhoods. Numerous studies and that of Mosler et al., 2006; Suthar & Singh, 2015; UN-Habitat, (2010) have shown that household characteristics determines the level and types of Waste that is been generated within a particular neighbourhood. Household solid Waste which is a major but not absolute component of neighbourhood Waste but there are samples of human and business activities that contribute to it Similar to Waste generation WC levels are influenced by the Waste and sanitation infrastructure in a particular neighbourhood. Complementing this, WC is further influence by the willingness and ability of residents to pay for WC. (Tadesse et al., 2008a). Therefore, low-income neighbourhood's Inabilities to pay for Waste stimulate the levels of Waste that is collected.

The general concepts adapted in this study include collection services, Waste generation, and WC. Based on the literature reviewed "household characteristics" is household composition that is gender, educational level among other factors. "Waste generations" are processes of household activities such as cooking, dumping of old, and unused products for which the generator has no further use. These can be Waste from residential daily household activities and of small-scale roadside business, activities of faith gatherings (mosque and Churches located in the neighbourhoods), and lorry stations among others that are within a particular neighbourhood. These generation activities exclude residuals for recycling and reuse. "Collection services" according to(Tadesse et al., 2008a) are the services been provided by WC agencies either private or public. WC can be formal and informal Formal collection include house-to-house collection and communal bins, curb side pick-up self-delivered and contracted or delegated collection (Daniel Hooornweg and Perinaz Bhada-Tata, 2012). While informal WC on the other hand is collection of specific types of Waste generated. The economic value influences its collection. The interplay of these concepts aids the understanding of Waste generation, collection and hence the levels of UW among neighbourhoods.

Additional, Waste can be generated and left uncollected depending on the generator's surroundings. (Location of the settlement and the WC point's availability) .Alternatively, when collection services are inadequate to meet the level of generation as illustrated in Figure 1:1. The level of collection has a direct effect on the levels of UW as much as Waste generated and left uncollected contribute to the levels of UW

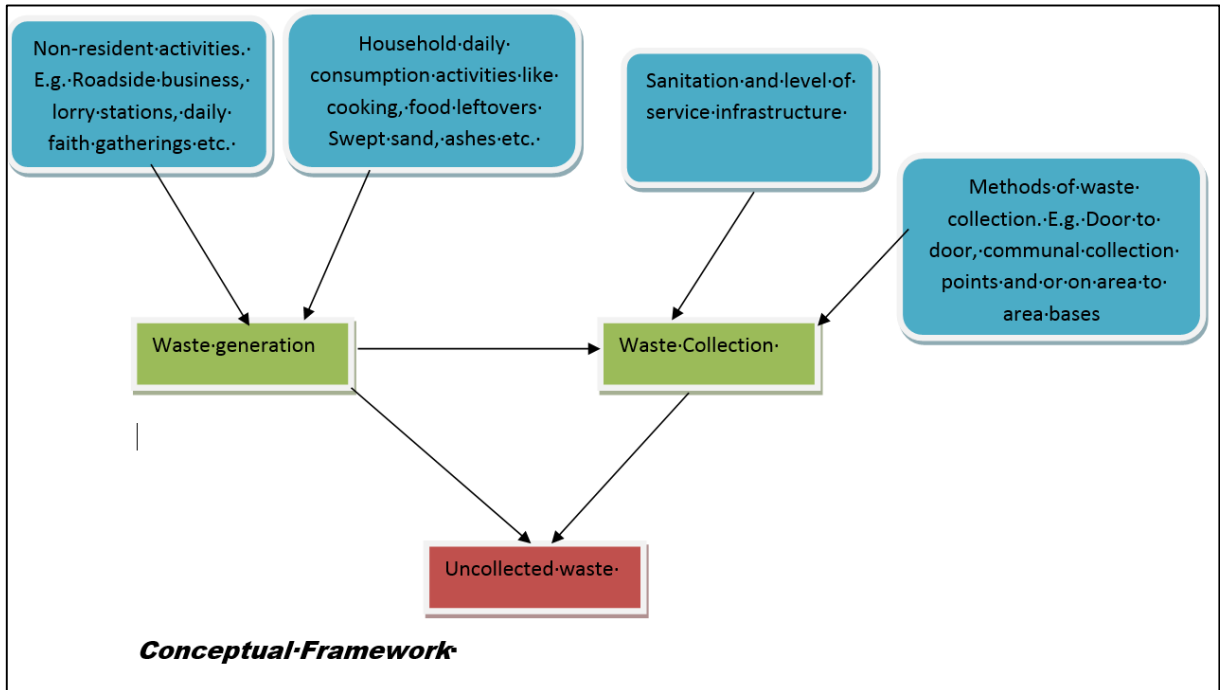


Figure 1:1 Conceptual Framework

1.6. RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

The focus of the study is identifying and analysing the underlying causes of the difference in UW within and among neighbourhoods

1.6.1. SPECIFIC OBJECTIVES

- To identify the nature and risk of UW in urban areas
- To identify the various sources of Waste generation
- To identify and describe the various forms of WC
- To analyse and explain the different causes of UW among neighbourhood

1.7. RESEARCH QUESTIONS

Table 1-1 Research Questions

Specific objective	Research questions
To identify the nature and risk of UW in urban areas	<ul style="list-style-type: none"> What constitutes uncollected Waste? What are the social, economic, and environmental risks associated with uncollected Waste? Where are the hot spots of uncollected Waste? What is the magnitude of the UW between neighbourhoods? At what types of locations are, UW found.

To identify the various sources of Waste generation	<ul style="list-style-type: none"> • What factors determine Waste generation? • What is a household Waste level contribution to uncollected Waste? • Where are the locations of uncollected Waste?
To identify and describe the various forms WC services	<ul style="list-style-type: none"> • What form of WC system is available? • What is the relationship between WC and generation? • What are the weakness and strengths of the collection systems available?
To analyse and explain the different causes of UW among the various neighbourhoods	<ul style="list-style-type: none"> • What factors account for difference in Waste uncollected? • How can the difference between UW among different neighbourhood be characterized

1.8. LOGICAL FRAMEWORK

This section gives a description of the various tools used to achieve the goal of the research as of difference in UWlevels in the low-income neighbourhoods. This is on the assumption that Waste is uncollected because of the levels of WC infrastructure and the Waste disposal methods employed by residents in low income areas. The focus is on exploring WC services and disposal methods, and how these influence UWlevels in low-income areas. Best practices in other low income areas were identified and reviewed for possible replication

Table 1-2 Logical Framework

Objectives	Methods	Assumptions	Expected Outcome
To identify the nature and risk of UW in urban areas	Household survey Food and shop owner survey Secondary Waste recodes Observations Focus group discussions	Resident reaction to UW is positive to Wards total collection	Quantification of neighbourhood level of uncollected Waste, it's associated risk and the locations of these UW
To identify the various sources of Waste generation	Household survey Food and shop surveys Observations	If household solid Waste is well managed less UW will accumulate in neighbourhoods If there exist combination of both formal and informal	Other possible factors responsible for the levels of UW apart from WC systems.

		WCs less Waste will accumulate	
To identify and describe the various forms WC services	Secondary data Informant interviews Literature review	Type of WC forms in low income neighbourhoods have an influence on the levels of UW accumulations	Assessment of WC practices in low income areas
To analyse and explain the different causes of UW among the various neighbourhoods	Household survey Focus group discussions Stakeholder interviews Observations	Although neighbourhoods are served with, only formal WCs there exist differences in WCs in this low income unplanned areas.	Factors accounting for the difference in UW will be unearthed Practices in each neighbourhood that differentiate it from the other, that account for the difference in UW

1.9. RESEARCH DESIGN

The research Was carried out in four main stages. First stage Was the pre-field work, which involved identifications of the research problem, setting objectives, proposing research questions to be answered by the study, and the exploring of literature and methods in achieving the set objectives of the research. This stage concludes with an execution plan on how the research and the preparation of questionnaires for field work.

This second stage involves the collection of both secondary and primary data. The secondary data were data solicited from literature, reports, WC records, and the review of municipal by laws on environment and sanitation. Primary data collection involved the direct administration of household, food vendors, and commercial shop owner questionnaires. It also involves interviews with key informants and stakeholders in the area of Waste management. Complementary primary data sources were focus group discussions and observations.

The third stage involved the analysis of the data collected, using descriptive statistics, textual, and content analysis. Through the transcribing and coding of recorded interviews, and identifying patterns of salient points in causes and possible solutions to uncollected Waste.

The fourth and final stage focus on the description and interpretation of results, draw conclusions, and make possible recommendations based on the compares of neighbourhoods and the identification of best practices in dealing with uncollected Waste.

1.9.1. RESEARCH OUTLINE

Chapter 1 *Introduction* This Chapter presents the introduction, background research problem, as well as the justification of the research

Chapter 2 *Literature review*. This chapter presents review of literature to clarify and understand the factors that interplay in Waste managements. Literature Was also regarding the forms of Waste management and factors influencing both Waste generation and WC.

Chapter 3 *Data Collections and Analysis*. This chapter gives a vivid description of tall the methods employed in both data collection and analysis

Chapter 4 *Study Area* This chapter gives an apt description of the municipality and the selected three case study areas

Chapter 5 *Discussion of results* this chapter presents and discusses results of the study

Chapter 6 *Conclusion and Recommendation* This chapter presents the conclusions and recommendations of the research

2. LITERATURE REVIEW

2.1. INTRODUCTION

Waste and its associated problems have accompanied man and his development since time immemorial. Developed nations have been able to manage, Waste and sanitation related problems, while most developing countries especially in Africa and Asian are still struggling to solve these basic problems. With the increasing urbanization and growing populations, Waste generation and collection (Waste management), is a major challenge that is dragging the attainment of Millennium Development Goal (MDG) 7 of having half the proportion of people without sustainable access to safe drinking Water and basic sanitation. Hence, this chapter reviews relevant literature regarding Waste management practices, policies, by laws, factors affecting Waste generation and collections. It also focuses on providing definitions to relevant concepts that aid in the understanding of UW in low-income areas, and how these affect the lives of the people.

2.2. DEFINITION OF SOLID WASTE AND SOLID UNCOLLECTED WASTE

Waste is a term that is used by different scholars, practitioners, and individuals to mean different things; the use of the term Waste varies from person to person and varies with circumstance time and place. Waste defers with people place and time. For the purposes of this study the adapted definition of Waste is according to UN-Habitat, "*Wastes generated by households, and Wastes of a similar nature generated by commercial and small-scale industrial premises, by institutions such as schools, health post, care homes and prisons, and from public spaces such as streets, markets, slaughter houses, public toilets, bus stops, parks, and gardens*". (UN-Habitat, 2010 p. 7). This definition takes into account the sources of Waste that is been generated at the neighbourhood level. UW the terminology used to refer to debris of solid Waste left uncollected within neighbourhoods. This UW in most cases is a result of the WCs and infrastructural services that are available in areas where this phenomenon is.

The study confine its definition of solid Waste to household solid which is Waste that is been generated as a result of the daily activities of families at their homes and also Waste coming from activities of small scale business and food vendors and passer-by in the municipality

2.3. WASTE GENERATIONS

Waste generation are the set of activities that result in, refuse that has no further use according to the generator. Waste generations are a by-product of the set of activities that the generator or the source of generation are engaged. This according to Riitta Pipatti, and Chhemendra Sharma, (2006) could be industrial, commercial, institutional, municipal or household level Waste. For the purposes of this study, the focus will be household solid Waste. Household solid Waste generation are the by-product of the household daily activities, which according to Li, Fu and Qu (2011) vary from place depending on the consumption activities of the households. Bernache-Perez et al, (2001). Waste generated from household activities is estimated in kg/cap/day, and dependent on household size and the income levels of the household. The works of Oteng-Ababio, et al., (2013), and Mazzanti, Montini et al , (2008) have both suggested that Waste generation vary with income level, hence the tonnage of Waste generated from middle to high income areas are far greater than Waste from low income areas but, but household sizes in low income areas are far larger than high income areas. The amount of Waste generated vary with the income levels and consumption patterns of populace in a particular residential location, the works of (Hooornweg and Bhada-Tata, 2012) estimates that Waste generation in Sub-Saharan African is at an average of 0.65kg/capita/day. Similarly, Kapepula, Colson, Sabri, & Thonart, (2007) in their multiple criteria analysis of household solid Waste estimated Waste generations vary from 2.9kg to 18kg/cap/day in structured high income areas to as low as 0.29kg to 0.72kg

in low unstructured low areas. Road, Village, & State, (2009) in their study of evaluations of Waste generations and categorization in developing countries using Nigeria as case study established, that Waste generation from low-income indigenous states generated an average of 0.46kg/cap/day while higher income residential areas generated an average of 0.71kg/cap/day.

In Ghana, Waste generational figures do not vary much from the above-mentioned examples for both low and high-income areas in urban cities of Accra and Kumasi. Agyemang et al.,(2013) in their studies estimated Waste generated in high-income residential areas in Accra to be 0.94kg/cap/day while high residential areas in Kumasi been 0.728kg/cap/day. They associated the variations to the differences in consumption pattern. Low income areas on the other hand Waste in both areas generated Waste ranging from 0.2kg/cap/day to 0.56kg/cap/day.

Lastly in the study of Monney et al.,(2013) of the municipal Waste components of three different residential areas; high, middle and low income of the WA municipality for a thirty(30) day period of five sampled households. Estimated Waste generated were high-income residential area 0.82kg/cap/day, middle income 0.72kg/cap/day and low unplanned income areas 0.49kg/cap/day. These differences in Waste generational quantities are a result of the consumption patterns and changing lifestyles.

2.4. HOUSEHOLD SOLID WASTE COMPOSITION

Household solid Waste components vary with household activities, the age groupings, and the consumption patterns of these groups of people. Ojeda-Benítez et al., (2008) see Waste of household as a factor of social economic stratum of the neighbourhood and affected by the change in weather conditions. Household solid Waste is a component of municipal solid Waste and a major contributor, in areas or neighbourhood and municipalities where little or no industrial or major commercial activities take place. Suthar & Singh, (2015) classify Waste into, kitchen food Waste, paper, plastics and polythene bags, glass and ceramic scraps and cardboards. This is similar to the categorization of (Monney et al., 2013) who also categorized Waste into biodegradable and non-biodegradable Waste. Hence these Waste categories do not necessarily differ from the Waste that is located in neighbourhoods that are left uncollected.

2.5. WCS

WC is a terminology to refer to Waste gathering and picking. This Waste picking can be formal or informal. Formal Waste picking are mostly responsibilities that is been undertaken by various local government authorities like district/provincial/municipal assemblies to pick up Waste, through the use of communal collection points in low income areas and also door to door services in middle to high income areas.(Oteng-Ababio and Arguello, 2013). Fobil, Armah, Hogarth, & Carboo, (2008) further emphasize and categorized WC into three different modes, which are kerbside collection, house-to-house collection and communal collection. Communal collection points are mostly low-income area based, containers are put in open spaces for community communal dumping of Waste. They further noted, kerbside and house-to-house collection are middle and high-income area preserves because of the willing and well layout of their building infrastructure. In the kerbside collection system, Waste is deposited at the kerbside on specific days within the week to be collected by collection crew while in house-to-house collection, the crew picks up the Waste from each property to be emptied and the bin returned after being emptied into collection vehicles. Apart from the formal Way of WC, informal WC especially in developing municipality of developing countries. These informal collections take several forms, but in Ghana, the popular know types are ones that specific kinds of Waste are collected for economic valorisation of the Waste and the second group of informal collectors who pick up Waste from households and shop to the main collection points or to a dumpsite for monetary returns. These practices are very common in the southern urban of Ghana. Informal Waste

pickers in WMA are relatively absent hence; collection is mainly formal. But the best practice to get low income off Waste is through a total integration of both formal and informal collection (Membele, 2014).

2.6. WASTE MANAGEMENT GHANA

Waste management Ghana is totally the responsibility of the Ministry of local Government and Rural Development (MLGRD), which has oversight responsibility of decentralized Metropolitan, Municipal and District Assemblies (MMDAs). The departments of Waste Management and Environmental Health in collaborative efforts with assemblies are responsible for the total collection and disposal of solid in their various jurisdictions. (MariWah, 2012) WC privatization in Ghana date back to the early 1980s in the cities of Accra and Kumasi. However, nationwide privatization started in 2006 where the government of Ghana sign a memorandum with ZGL to take charge of WC in Ghana. This WC and cleaning of surroundings is done in collaboration with the decentralised MMDAs, which pay monitoring roles.

2.7. INFORMAL WCS

In developing countries informal Waste pickers, play key roles in WCs. Most of these pickers work on daily bases at dumpsite, on the streets of urban areas, to pick up Waste of economic value. Their activities are mostly around Waste dumpsites and homes for particular kinds of Waste due to their economic value. According to the works (Wilson, Velis, & Cheeseman, 2006) these informal collectors often known as scavengers play key roles in Waste recycling and it collection due to the peculiarity of the interest in specific kinds of Waste. However, it is unfortunate that the works of these scavengers are hardly recognize in the Waste management stream in Ghana by MMDAs and their works aren't in any Way documented in their areas of operation (MariWah, 2012). WMA is one among few urban areas that you cannot find informal Waste collectors due to the highly indigenous nature of the settlers; people do not take pride in WC. Nonetheless (Eshun, 2002; Membele, 2014; MariWah, 2012) has established that the best Way to clear neighbourhoods off Waste is the proper integration of these informal pickers and the formal WC systems

2.8. EFFECTS OF UW

Most essential services like utilities and infrastructure such as transport, Water supply, energy, and housing receive more budgetary allocations than Waste and other sanitary. But the failure to manage properly the back end of the material cycle has direct impacts on the health, length of life and the human and natural environment (UN-Habitat, 2010). These end products if not well managed turns uncollected Waste, ending up in drains and cause floods and the sequent spread of diseases. The serious flood of Surat in India which resulted outbreak of plaque-like diseases affecting 1000 people and killing 56 (UN-Habitat, 2010), recent floods and cholera outbreaks in Accra Ghana which affected 356 households (Owusu, 2010). Confirming the stands of (Kapepula et al., 2007) of the increasing health impacts of uncollected Waste. Uncollected solid Waste can also obstruct storm Water runoff, resulting in the forming of stagnant Water bodies that become the breeding ground of disease (Oteng-Ababio, Ernesto and Arguello, 2013). Direct dumping of untreated Waste in rivers, seas, and lakes results in the accumulation of toxic substances in the food chain through the plants and animals that feed on it (Sujuddin, Huda, and Hoque, 2008) as expressed in Figure 2:1

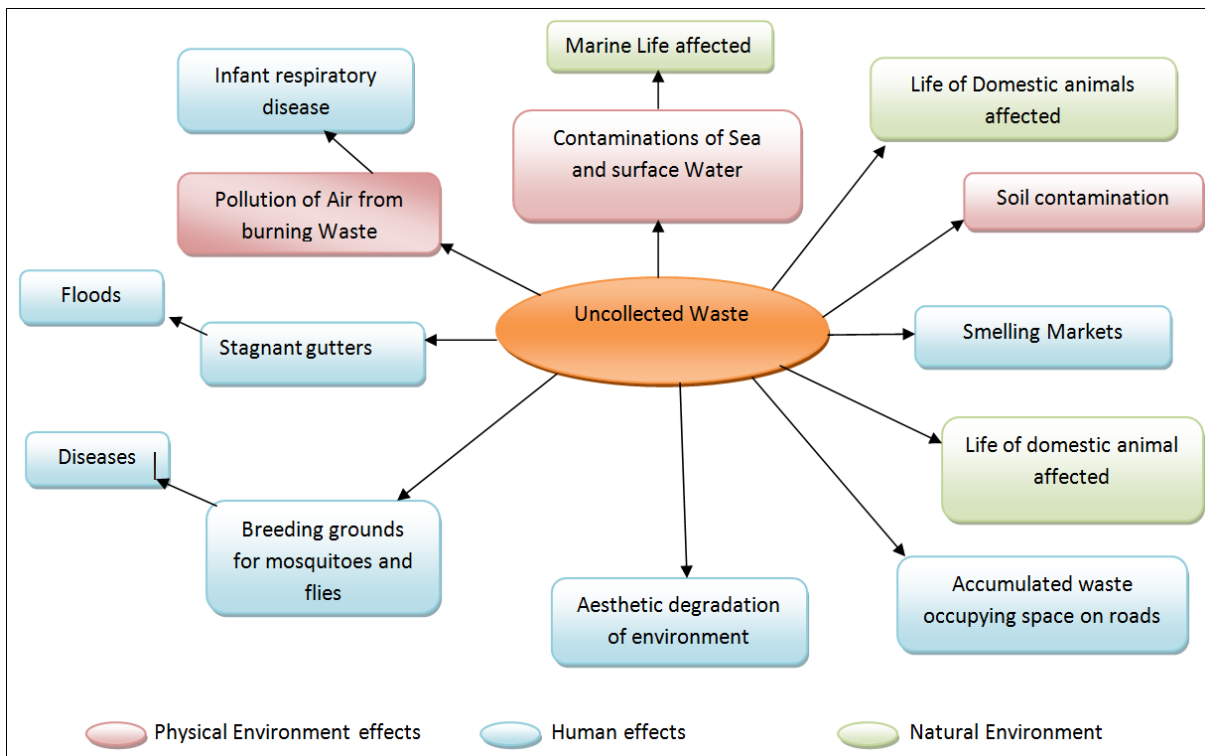


Figure 2:1 Effects of UW(Ababio, Ernesto and Arguello, 2013; Owusu, 2010; UN-Habitat, 2010).

2.9. CAUSES OF UNCOLLECTED WASTE

Waste generation is fast growing surpassing the rate at which Waste is collected. Several factors contribute to the phenomena of UW as shown in Figure 2:2 Although majority of municipalities in developing countries, spend 20-30% of their budgetary allocations in WCs and management(UN-Habitat, 2010). Some of these factors according to Kapepula et al.,(2007) are the several unstructured areas of cities with twisting and narrow roads, inadequate Waste educations, the perception of Waste as a public nuisance and the ignorance of the clever economic valorisation of Waste. It is also a noted and observed fact that poor people from unstructured areas pick up Waste from high-income areas, sort them, and dump the remains in their areas hence increasing the amount of UW in these areas. Moreover the demographic characteristics (education levels , income levels) of a community or neighbourhood also influence the level of Waste generation located within the area (Sujauddin, Huda, and Hoque,2008). This also have a relation with the level at which there is UW in the area since it has a direct relation with Waste generated

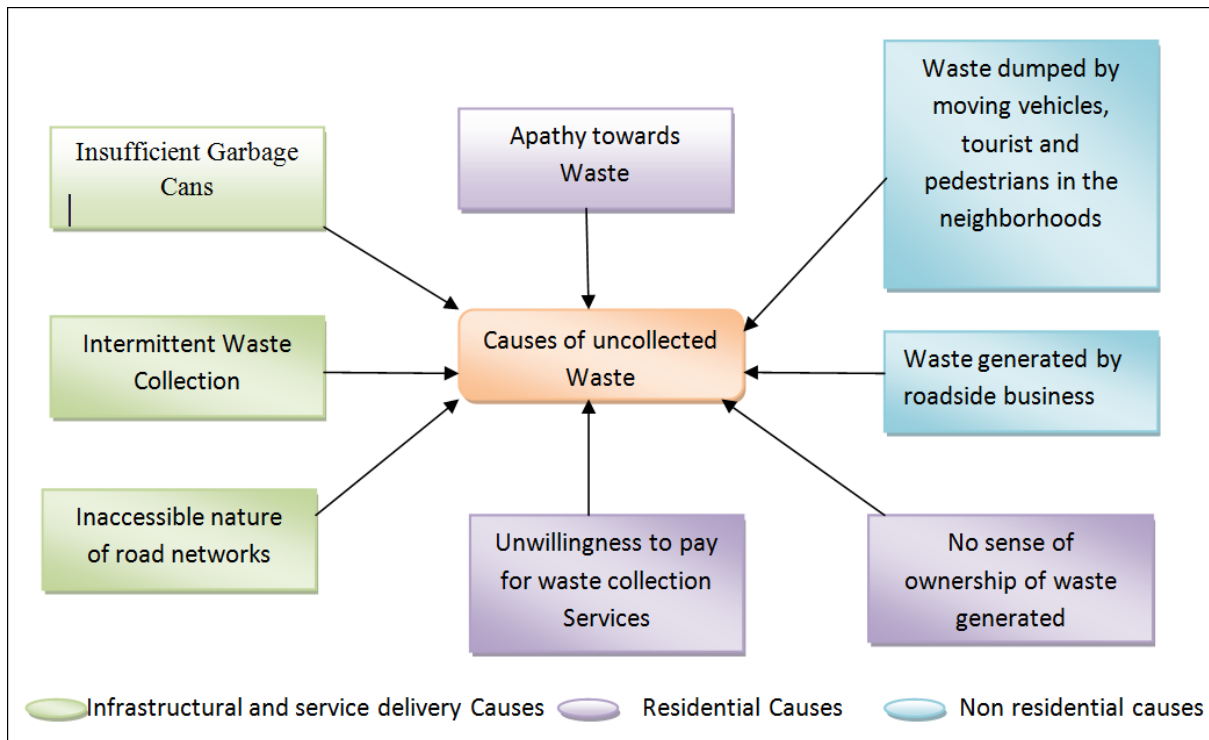


Figure 2:2 Causes of UW(Kapepula et al., 2007; Sujauddin et al., 2008; UN-Habitat, 2010)

The studies of Boadi and Kuitunen, (2003); Ababio, Ernesto and Arguello, (2013) express deficiencies in WC systems in Ghana, makes it difficult to have clean collection from Waste generations.. It is estimated WC in Kumasi and Accra ranges between 50-70% collection out of the 3000 tons per day solid Waste generated (KWasi Owusu Boadi and Markku Kuitunen, 2003)..

Similarly, Puopiel,(2010) as cited in (Monney et al., 2013) estimated WC in Tamale metropolis in the Northern part of Ghana to range between 27-40% out of the daily generation 810 tons.

Fast-forwarding, Wa municipality is no immune of this national problem. Monney, Tiimub, and Bagah, 2013; Yahaya and Ebenezer (2012) in separate studies of WA found out that 36% of the estimated daily 450 tons of waste generated are left uncollected daily, thus resulting in burning of heaped UW leading to regular pollution of the air in neighbourhoods.

The dumping of such Waste into stagnant gutters which serve as breeding grounds for mosquitoes and flies which leads to malaria and possible cholera outbreaks which is threatening the nation Ghana as a whole; Since waste separation is not practiced heaping of the amalgamated waste produce chokes of smells which deprive consumers of women selling in the central market of the municipality, hence their recent outburst of the traders and how this is affecting their business (GNA, 2012). This has also lead to the tagging of the once clean municipality as a flit engulfed community, which has a negative impact on attracting investment and residing in it.

3. RESEARCH METHODOLOGY

3.1. INTRODUCTION

This chapter describes essential methods and techniques used in the conduct of the research. It encapsulates the procedures and reasons for the selection of WA municipality as a case study area and the use of a multiply case study approach to selecting electoral areas (neighbourhoods) within it. Methods of data collection and analysis presented are towards achieving various set objectives of the research.

3.2. SELECTION OF STUDY AREA

Wa municipality the regional capital of the Upper West Region in Ghana is the study area. It is among the fastest growing urban towns in Ghana. With a population growing from 98,675 in 2000 to 107,214 in 2010, according to the population and housing census of 2010. GSS, (2013). The increasing population coupled with the influx of students in the areas has seen a considerable increase in waste generation from 12563 tons to 26100 tons from 2009 to 2013 (Amoah & Kosoe, 2014). Due to the difficult involved in estimating waste generation and WC different studies of the municipality estimates different collection rates, Amoah & Kosoe, (2014) estimates a daily generations 810 tons of waste with a 73% uncollected, while Aaniamenga, Anzagira, & Andrew, (2014) also suggest the rate of uncollected to be between 30-40%. From all the above studies, the study draws the conclusion that the problem of UW real, however both studies confirm high-income residential areas experience high WC rates due to their ability to pay for WCs. It can therefore been concluded that the problem of UW is largely faced in low to middles income neighbourhoods which are largely served with communal collection containers (CCC)

With the above problem established Wa municipality serves as a perfect study area to unravel the difference that exist between the levels of these UW among poor neighbourhoods This study builds on Baxter & Jack, (2008) in the use of multiple cases as this could help in the understanding of close related cases. The municipality like most developing urban areas in developing countries is mostly made of indigenous locally unplanned neighbourhoods, with middle-income neighbourhoods made up of government bungalows for public and civil servants and high class residential areas for the affluent normally located at the fringes of the municipal urban area. The middle to high-income residential areas pay for WC, thus have a maximum level of clean environment with little or no UW. This cataloguing of neighbourhoods done by the WMA is based on the nature, structure and perceived income levels of the residents

The municipality is subdivided into five (5) major zonal council area namely WA, Busa, Kperisi, Kpongung and Boli; apart from WA, the remaining four are rural in nature.

Urban WA is made of thirteen (13) electoral areas; electoral areas are the lowest unit in the decentralized local government system. These electoral areas are made of five (5) mid to high-income areas, which served with door-to-door WC services with little of UW in such areas. The remaining eight (8) are mainly unplanned indigenous areas and mainly served with communal collection points. The classifications of these areas are on the living standards, accessibility to basic social amenities such as portable Water, toilet facilities and the nature and structure of the buildings.

From these eight (8), three (3) of these are purposely sampled as shown these are Dondoli, Sopkayiri, and Dobile Wapaani.

Seawright and Gerring (2008) in their study of factors to consider in case study selection; they suggested numerous factors, but those that are relevant to this study included:

- a) Firstly the case selection should be reflective and representative of whole issue under study so as to enable scientific/statistical comprehension of the research results
- b) Case selection should also should also give good insights into achieving the research goals
- c) Methodology for the study should be applicable in the selected case areas and enhancement of easy compares

d) Lastly constrains in time, money, and accessibility to the case areas. Thus from the above population growth, WC characteristics, settlement pattern and the kind of information needed for the research three case areas; Dondoli, Dobile Wapaani and Sopkayiri were purposefully sampled to unravel the answers to the research questions as stated in Table 3-1

With the mentioned criteria, the three neighbourhoods all use similar communal collection points, but with different ratios of inhabitants to collection point variations. Dondoli selection was purposely because its location in a green vegetation zone, surrounded by wetlands and dugouts with Water, hence indiscriminate Waste dumps in such an area will adversely affect the Water bodies and the surrounding wet lands.

Secondly, considering the WC standard of 500 people to a communal collection point, Dobile Wapaani with three collection points and over 7000 inhabitants, and also close to the central business district(CBD) with a lot of booming commercial activities simply ignites the question of how residents compete with these commercial environment and manage their Waste

Lastly, Sopkayiri with relative linear built up surrounding. Where the neighbourhood is with relative linear housing layout and a minimum of ten feet between homes. Although there are few exceptional cases of congestion .This neighbourhood has three collection points and population of 3000 persons. Furthermore, it is also closer to the main lorry station in the municipality with many human activities that generate Waste on daily base. That notwithstanding it is one of the clean low-income areas in the municipality according to the rankings by the municipal Environment Office (MEO). This is on bases of no records of cholera cases, less records of malaria cases, and less complains of UWin the areas, for the past two years. Selected purposely to relate to the divergence, that makes it cleaner than the rest. Table 3-1 gives a summary of the reasons for selection of the case areas, further elaborations of the case areas is section

Table 3-1 Selected Neighbourhoods

ELECTORAL AREA NAME	POPULATION	NUMBER OF COLLECTION POINTS	REASONS FOR SELECTION
Dondoli	2,150	2	Surrounded by Water bodies and green areas and wetlands A lot of indiscriminate Waste dumping Records of 3 cholera cases in 2014 (W H O, 2014) report on Cholera areas of Ghana
Dobile Wapaani	7,634	3	Population is far exceeds the WC points Periodic Waste dumping behind homes Lack of space to increase WC points Land locked between neighbourhoods with little or no room for Waste infrastructure expansion
Sopkayiri	3,866	3	Unplanned area with less problems WC

			Selected based on recommendation and for comparison purposes Surrounded by shops and food vendors and closer to the central lorry station and market
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Figures 1-3 gives the various locations of Dondoli, Dobile Wapaani, Sopkayiri, their WC points, and spots of uncollected Waste. Thus, given the time period and the ready accessibility of these neighbourhoods provided both the qualitative and quantitative data that is needed for a comprehensive understanding of the problem of uncollected Waste.

3.2.1. BASE MAPPING AND SECONDARY DATA

Maps of the study areas were digitized from Google earth and open street maps. The boundaries were demarcated using major road networks dividing the neighbourhoods, the authors' local knowledge of the neighbourhoods by names and with support of assembly members showing ends of the political jurisdictions. This was because of the non-existence boundary maps of the various neighbourhoods. These demarcations were to ensure spatial identification of study areas and the locations of WC points and points of UW as shown in figure 3:1

Secondly, the coordinates of communal collection and UW sites were picked using a Global Position System (GPS). This was done by standing at each collection site or UW sites and the coordinates noted.

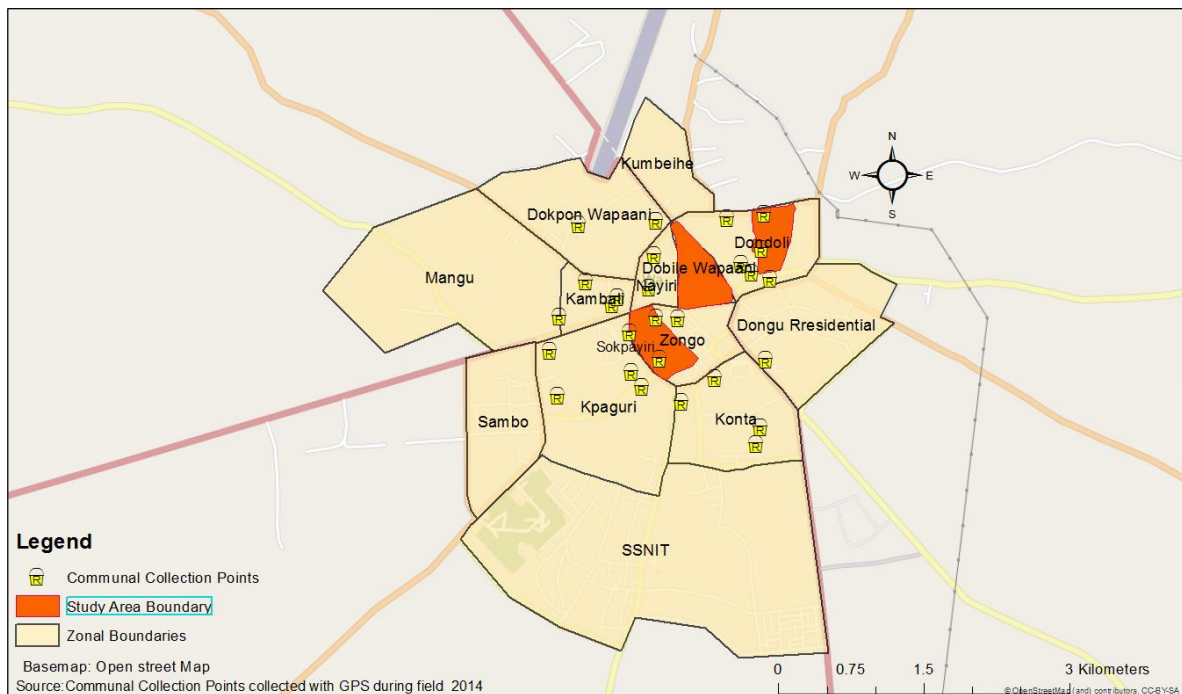


Figure 3:1 Study Area

3.3. PRIMARY DATA COLLECTION

Primary data sources were crucial, therefore qualitative and quantitative data were gathered through the use of household surveys(3.3.2), food vendor and shop owners' surveys (3.3.3), focus group discussions (3.3.4), key informant and stakeholder interviews (3.3.5) Finally observations in the three case study area were made

among others through transect Walks. These sources of information functioned as both complementary and validation of data collected through triangulation. The various types of primary data sources presented in the subsequent sections.

3.3.1. FIELD ASSISTANCE

The wide spread nature of study areas and the need for people who understood the neighbourhoods compiled, the employment of (3) field assistants with local knowledge of the three study areas, to help in the administering of questionnaire. They assisted in the translation into the local language and back into the English language with specific terminologies to ensure consistency

3.3.2. HOUSEHOLD SURVEY

Household questionnaires (Appendix 2) administered, were to determine waste disposal behaviour and how this affected the levels of uncollected waste. These questionnaires were self-administered, during the early mornings, and early evenings. The reason was to meet the target group who were mostly women, who were engaged in several activities during the day. Women were the target since they were considered as sole managers of household activities that generated Waste and disposal were their sole responsibility (Awunyo, Ishak, & Jasaw, 2013). Conscious efforts were made to interview males that were present during the survey period to prevent lopsided view of the uncollected Waste.

Household survey was carried out on the assumption that household waste is a major component of neighbourhood uncollected Waste

3.3.2.1. SAMPLING

A total two hundred and forty (240) household questionnaires were administered in all the three neighbourhoods. A systematic sampling strategy was employed in all the three study areas. The sampling was in accordance with the number of communal collection points that were in each neighbourhood. Dondoli, which has two WC sites 40 questionnaires administered at each. At each container site, ten (10) questionnaires were administered in each of the four cardinal direction with a systematic order of every second compound house.

Table 3-2 Questionnaire Distribution

Neighbourhood	Number of site	Questionnaires
Dondoli	2	40 40
Dobile Wapaani	3	30 30 20
Sopkayiri,	3	30 30 20

As in Table 3-2, Dobile Wapaani which has three (3) CCC with two (2) located to the road and boundary end. The questionnaires administering were to the south, east, and west direction, with ten in each direction. The remaining twenty (20) were administered ten (10) in each cardinal directions in a systematic order of every second compound house

Lastly, in Sopkayiri, sampling was similar to Dobile Wapaani; it has three (3) WC points. With two (2) closer to main the roads east and west of the area boundary. Thirty, (30) household questionnaires were administered at collection points by the roadside and twenty at the third located in the middle of the neighbourhood. This is because the road serves as boundary to the neighbourhood and further ensures even distribution of questionnaires. This enhances good statistical analysis and compares of observed cases. Figure 3:2 shows the sampled households in the three selected case study areas.

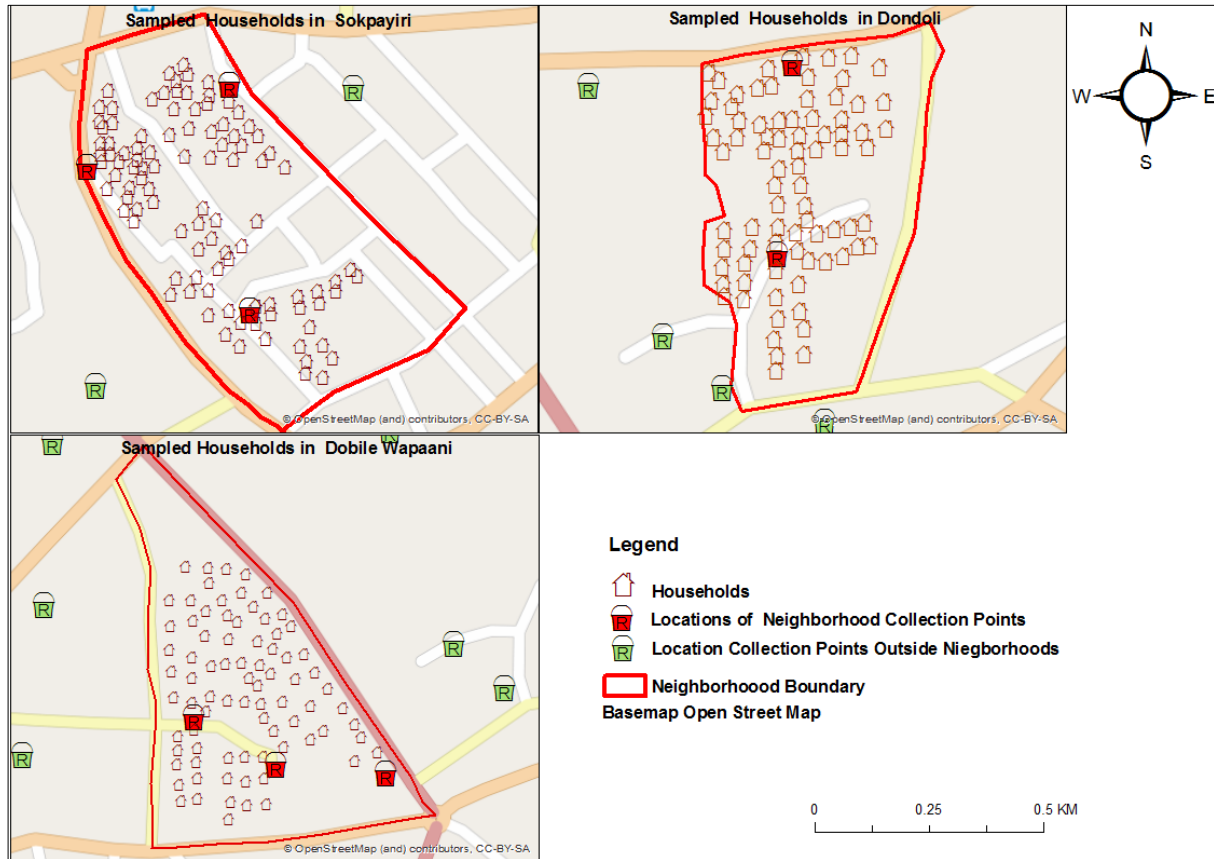


Figure 3:2 Sampled Households

3.3.2.2. QUESTIONNAIRES

Semi structured questionnaire approaches, with questions open and closed -ended. The questionnaire covered a wide range of issues from demographic characteristics, causes of uncollected Waste, its nature, and risk and household assessment of WC types available. The questionnaire further ascertained the kind of waste household generated, household rating of the performance of municipal WC, and their willingness to pay WC to deal with this problem. (Appendix 2) Table 3:2 gives a summary of the major issues the questionnaires and focus group discussions addressed

Table 3-3 Major open ended questions

Household Questionnaire	Focus Group Discussions
Locations of UW	UW composition
Compositions of UW	Sources of UW accumulations
Effects of UW on Household	Factors accounting for the levels of UW
Suggestions of dealing with UW	Health implications of UW
Household solid Waste composition	How does the neighbourhood deal with the menace of UW
Household Waste disposal methods	Are the community members willing to pay to deal with the menace of UW
Willingness of households to pay for improve WC	Responsibility of dealing with the problem

3.3.3. SHOP OWNERS AND FOOD VENDORS SURVEY

Shopkeepers and food vendor questionnaire administration were done similar to household questionnaires this was to determine where they disposed of Waste and how UW in the neighbourhoods had effects on their daily activities. The questionnaires further asked for the possible remedies to the problem of uncollected Waste. (Appendix 3). Figure 3:3 shows the various locations of food and shop owners interviewed.

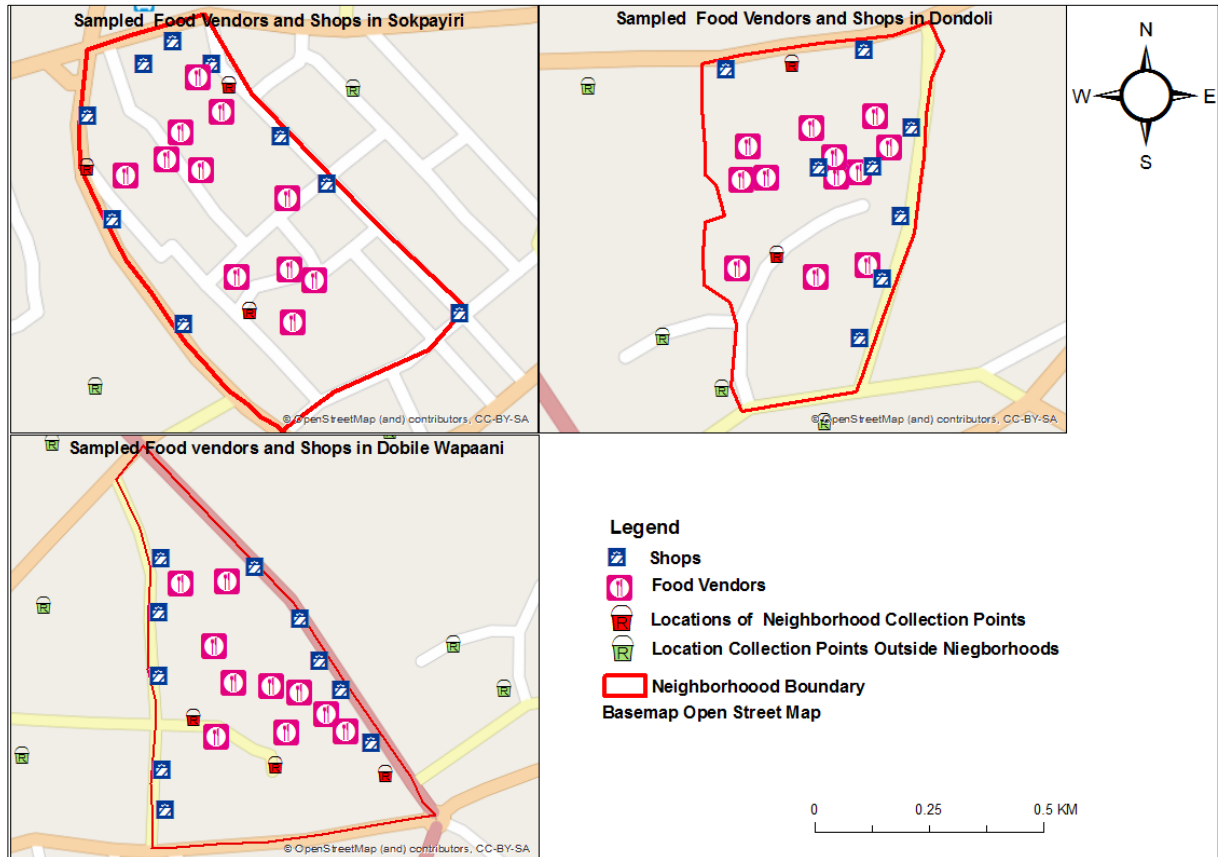


Figure 3:3 Sampled Food and Shop Owners

3.3.3.1. SAMPLING

Accidentally sampled in all the three neighbourhoods are thirty-one (31) food vendors and twenty- one (21) shop owners.

shows the distributions of sampled shop owners and food vendors interviewed. Twenty (20) were sampled in all the three (3) the neighbourhoods to enhance good compare of cases. Transect Walks through the various neighbourhoods as shown in Figure 3:4 aided in identifying these food vendors and shop owners. An accidental sampling technique Was used because of convenience and willing of the identified respondents to participate in the study as some were not willing to do so (Kumar, 2005)

Table 3-4 Sampled Food Vendors and Shop Owners

Neighbourhoods	Shop keepers	Food Vendors	Total sampled
Dondoli	8	12	20
Dobile Wapaani	10	10	20
Sopkayiri	11	9	20
Total	29	31	60

3.3.4. FOCUS GROUP DISCUSSIONS (FGD)

Complementing questionnaires administered were focus group discussions (FGD). These FGD further explored the causes, effects, and reasons why these neighbourhoods in particular faced those problems. Wong, (2008) states that focus group discussion give unbiased opinions and insights to matters under discussion. These groups gave more clarifications to reasons why some communal collection points are worst off regarding WC. It also gave understanding to some of the measures members of the various neighbourhoods are doing to curb the problem.

In each of the focus groups, discussants were mainly market women groupings of in the neighbourhood. This is due to the aforementioned reason of tagging of household Waste management as a famine domain. These discussions lasted an average of an hour, with discussants freely airing their views to questions asked by the author. Table 3-5 gives composition of the focus group discussions, age groups, and occupations. Plate 3:1 show a sample of the discussion with discussants in Dondoli women's group. Discussants were aware they were being recorded and these recordings were later transcribed.

Table 3-5. Composition of Focus Group Discussants

Neighbourhood	Number of Discussants	Occupations	Ages	Time Hours and Minutes
Dondoli	10	Five (5)Market women, 2 grain traders, 2 market queens 1 house wife	Age range Was from 27 – 60	An hour
Dobile Wapaani	10	2 unit committee members	Age range Was 21- 55 years	An hour and 15 minutes

		5 market women 2 house wives 1 Assembly member		
Sopkayiri	10	1 male unit committee member 4 market women 2 Hair dressers 1 dressmaker 1 housewife	20 -60 years	An hour 05 minutes



Plate 3:1 Dondoli Focus Group Discussion

3.3.5. KEY INFORMANTS AND STAKEHOLDER INTERVIEWS

The diverse nature of Waste and its collection in the municipality has aboard different players and stakeholders. Some of these key players include the Municipal Environment Officer (MEO) who also serves as the chairperson of the environment and sanitation subcommittee of the assembly. Secondly the Municipal physical planning officer (MPPO) who is in charge of the physical layout of the municipality. These were purposely sampled for the oversight roles in Waste management and environmental sanitation and where therefore in the best positions to providing useful information regarding uncollected Waste.

The other key stakeholders included sampled and interviewed the branch manager and field operations officer of ZGL. This Was on grounds of major roles they play in municipal WC in the municipality. Hence, they provided more insights of the kind of services and challenges in providing those services.

Lastly, some selected opinion leaders from the three study areas interviewed included the three assembly members of the three neighborhoods. Their opinions were on the situation analysis of UW in their various

jurisdictions. Supplementary, these interviews aided in the identification of challenges these leaders face and how they are able to overcome these challenges

All the interviews were conducted with the consent of the interviewees that they were being recorded for academic purposes. Institutional and neighbourhood factors contributing to UW levels within the neighbourhoods were deduced from the transcribed recordings of the interviews. Table 3-6 gives a summary of the list of key informants, stakeholders and the issues discussed.

Table 3-6 Interviewed Informants

Key Informant	Number	Issues discussed
Assembly Member	3	Waste management challenges in the neighbourhoods
Municipal Sanitation Officer	1	Total sanitary conditions of the municipality
Municipal Environmental Officer	1	Areas of challenges of WCs
Workers of ZGL	5	Interactions WCs in congested areas in the municipality and how these are
Municipal planning officer	1	Planning challenges of developed areas and Waste management
Manager of ZGL	1	overcome Word Document of WCs per neighbourhood in the municipality

The Municipal Chief Executive officer (MCE), the Public Health Officer (PHO) of the ministry of health and the Field Operations Officer (FOO) of the Environmental Protection Agency (EPA) scheduled for interviewing for further clarifications and cross validations of information gathered. These personalities were readily not available during the time of the research.

3.3.6. OBSERVATIONS

Observation played a key role in locating places of uncollected Waste. These observational points validated the questionnaires and interview description of some of the areas of uncollected Waste. Locations of UW were identified with the use of a motor bike to accessible areas with an aid of a lead person in the community who knew such places.

Secondly, footpaths of behind houses were also used to identify areas that complains were made about regular indiscriminate dumping by other residents, this Was done with the aid of some volunteer residents who saw the research as an opportunity stop and report the menace

3.3.6.1. TRANSECT WALK

The combination of transect Walks and observations; through traversing from the north to the south, east to west parts of the various neighbourhoods to identifying the various WC points as seen in Figure 3:4. These points were identified using the walk paths in the various neighbourhoods with the local knowledge of the study areas and the names of the collection point given by ZGL.

Households in the various neighbourhoods make use of waste containers close or across their neighbourhoods so as neighbourhoods across also make use of communal collection points next to their neighbourhoods' .As shown Figure 3:4 showing collection points in and out of the various neighbourhoods

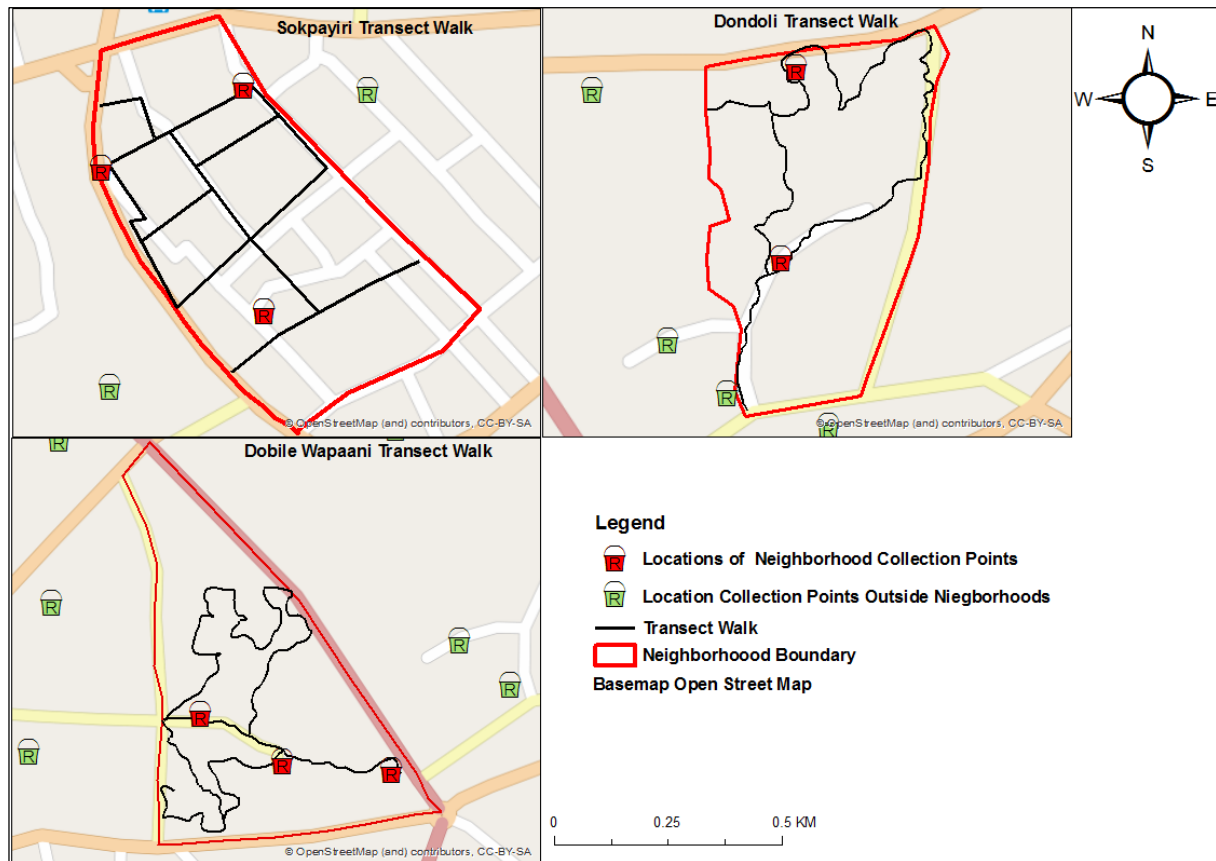


Figure 3:4 Transect Walk Paths in Neighbourhoods

3.4. SECONDARY DATA

Secondary data solicited from the Municipal environmental Health Unit of the municipal assembly regarding the municipal by laws on Waste and sanitations. This aid appraisal of the Waste management system and the identification of areas where the problem of UW was severe in the municipality. Secondly WCs records of all the communal collection points operated by Zoomlion Ghana Limited (ZGL) were also collected, which served as a source of estimating the amounts of metric tonnage of waste that was collected from each area. These juxtaposed against the estimated amounts of Waste generated to determine the magnitude of UW in the various neighbourhoods. That notwithstanding there was a constant review of news articles and journals on factors leading to UW and policies regarding Waste management improvements in general.

3.5. DATA PREPARATION AND ANALYSIS

3.5.1. DATA PREPARATION

Given the range of data sources of both primary and secondary, these were subjected to preliminary investigation in order to have a good analysis. Data preparation mainly consisted of entry of household survey, entry of daily Waste pickings into excel format, transcribing of interviews and coding these transcripts into various themes. Data preparations also involved digitizing boundary maps of the neighbourhoods studied. This was all carried out to ensure good analysis of the collected data and presentation.

3.5.2. DATA ANALYSIS

As detailed in Table 3-7 data Was analysed using both IBM SPSS for descriptive statistics and also the qualitative part Was done through textual analysis by coding in accordance to the guidelines by (Bryman, 2012). The next sub sections gives the various methods used in analysis the data to achieving the set objectives of nature and risk of uncollected Waste, identification of Waste sources , description of WC and finally the analysis and explaining the difference in UW among these selected case areas

Table 3-7 Methods used for Data Analysis

Research Questions	Data Needed	Source of Data	Method of Analysis	Expected Results
What is the magnitude of this UW	Estimated Waste generations WCs Population data	Population Data of various neighbourhoods Monthly WC records of the various collection points in the municipality Reviewed Literature on Waste generations	$TNWC = CS * N * NWC$ Where: TNWC: total neighbourhood Waste collected per month CS: Size of Communal collection Container N: Number of container pickings per Month NWC: number of Waste containers in a neighbourhood	Estimated amounts of UW (T.G – TC=EUC) TG = estimated waste generated per month in a neighbourhood TC= total tonnage of waste collected EUC =estimated differences between waste collected and generated
What are the social economic and environmental risk associated with UW		Focus group discussions Household survey Food Vendor /shop keeper survey Observations	Textual analysis Content Analysis Literature reviews Descriptive statistics	Description of UW risk to environment, society and their economic activities
Locations of UW	GPS points of UW	Observations	Plates Showing UW forms	Locations of UW and its Compositions
Composition of UW	Household solid Waste types	Observations Household survey Focused Group discussions	Textual analysis Photographs showing UW	Major components of UW
Determinants of Waste generations	Factors influencing household solid Waste	Household survey Shop and food vendor survey	Textual analysis into themes of institutional and neighbourhood	Established determinants of uncollected Waste.

	Household Daily Activities	Focus group discussions Key informant interviews Literature Review	factors contributing to UW	And a description how each factor contributes to uncollected Waste
What levels of household Waste contribute to UW	Locations of household Waste dumping	Household survey	crosstab analysis of socio demographic characteristic and Waste household management practices Buffer analysis of coverage of Waste points and areas	Difference in household Waste and other kinds of Waste at dump site
WC forms assessment	Household assessment of Waste Work of Waste management agencies Waste management in WA	Household Surveys Stakeholder interviews (ZGL manger) Documentary reviews Literature on Waste management	Content analysis Textual analysis	Performance assessment of Waste management agency
Relationships between WCs and generations	WC data Waste generation activities Data on WCs	Household survey Shop and food vendor survey	Crosstabs and Chi square	Development a positive relation with Waste generation and collection
Weakness of WCs	Performance assessment of Waste management in the Municipality Staffing level Tools and equipment	Interview with informants Interview with stake holders Observations Reviews of Waste management by-laws and literature on Waste management WA and Ghana at large	Content analysis (categorization into themes weakness of the Waste management system	Analysis of the strengths and weakness of formal Waste management in WA and how it aids levels of UW
Factors accounting for Differences	Practices that differentiate each neighbourhood from the other Communal collection points	Household survey Focus Group discussions Informant interviews	Textual analysis of Household and neighbourhood demographic characteristics and institutional factors	The differential factors are ascertained and the possible innovative community

	distance to Household		500 meter buffer analysis of well served areas and UW	solutions are studied and recommended.
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3.5.3. WEAKNESS OF DATA COLLECTION AND METHODS OF DATA ANALYSIS

Data collection faced challenges of unwillingness of households to participate in the research for fear of victimisation. This is due enforcement of the municipal by laws on sanitation. The bye –law enforcement became more active because of the establishment of the National Sanitation Day (NSD) policy initiative; this led to the arrest and prosecution of offenders of the law. Moreover, there were no immediate population data available for the various census transect used for census. This would have aided to calculate the Waste densities of the various study areas. This could have also aided in estimating the actual Waste generations of the various neighbourhoods. Lastly, because Waste disposal is a behaviour related it needs a longer time to study phenomena The neighbourhoods did not shown enough variations in the uncollected,

3.6. CONCLUDING REMARKS

Employed were different techniques and methods in exploring the difference in UW in low-income residential areas with multiple case study approach in Dondoli, Dobile Wapaani, and Sopkayiri all in the WA municipality. Household, shop owner, and food vendor questionnaires, semi-structured interviews with key informants and stalk holders, and through direct observations were the major sources of primary data .The analysis of data was done using three different techniques, statistical analysis using IBM SPSS, data visualisation using ArcGIS 10.3 and textual analysis. The statistical analysis mainly involved descriptive statistics, crosstabs, and chi square Lastly, ArcGIS was instrumental in visualising the difference in WCs and generations from the various neighbourhoods .Lastly textual analysis was using in extracting the themes of institutional and neighbourhood factors that account for uncollected Waste.

4. STUDY AREA

4.1. INTRODUCTION

This chapter gives a detailed description of Dondoli Dobile Wapaani and Sopkayiri the three case study areas. It further gives the location, administrative, economic, and social characteristics of the Wa municipality as a whole. The environment, sanitation, and Waste management and Waste infrastructure WA municipality at large and the three case areas specifically are emphasised.

4.2. LOCATIONS OF STUDY AREA

Located in the Upper West Region of Ghana, Wa doubles as both the regional capital and the capital of the only Municipal Assembly in the region; Geographically, Wa is located on latitude $10^{\circ}4'N$ and longitude $2^{\circ}30'W$ (Figure 4:1) and covers a land area of 234.74 square (kilo) meters which is about 6.4% of the region. The municipality shares boundaries with Nadowli district to the North, WA East to the east and south, with WA West district to the west.

4.2.1. POLITICAL ADMINISTRATION OF WA MUNICIPALITY

In the quest for decentralization and effective community, participation the WMA has been subdivided five zonal councils, made of Wa, which is urban, and the remaining four Busa, Kperisi, Kpongungu and Boli, are rural in nature. It is made of 73 unit committees and 27 electoral areas. They are currently 44 assembly members made up of 40 men and four (4) women. These members work in five different sub committees namely the education, planning, environment and sanitation, finance and administration and justice subcommittee. This committee aid in the day-to-day running of the municipality through expert advice on the various committee they serve.

The planning subcommittee has an oversight responsibility for all the sub governmental departments and institutions that are responsible for both the spatial and development planning of the municipality. While the environment and sanitation sub-committees are responsible for issues of environmental protection and Waste management. The municipality according to the Ghana Statistical Service,(2013) analytical report, is among the fastest growing urban centres in the Ghana with major educational institutions like the sub campus of the University for Development Studies, Polytechnic, nursing and teacher training institutions, there is a constant influx of students and hence a major demand for housing and service infrastructure.

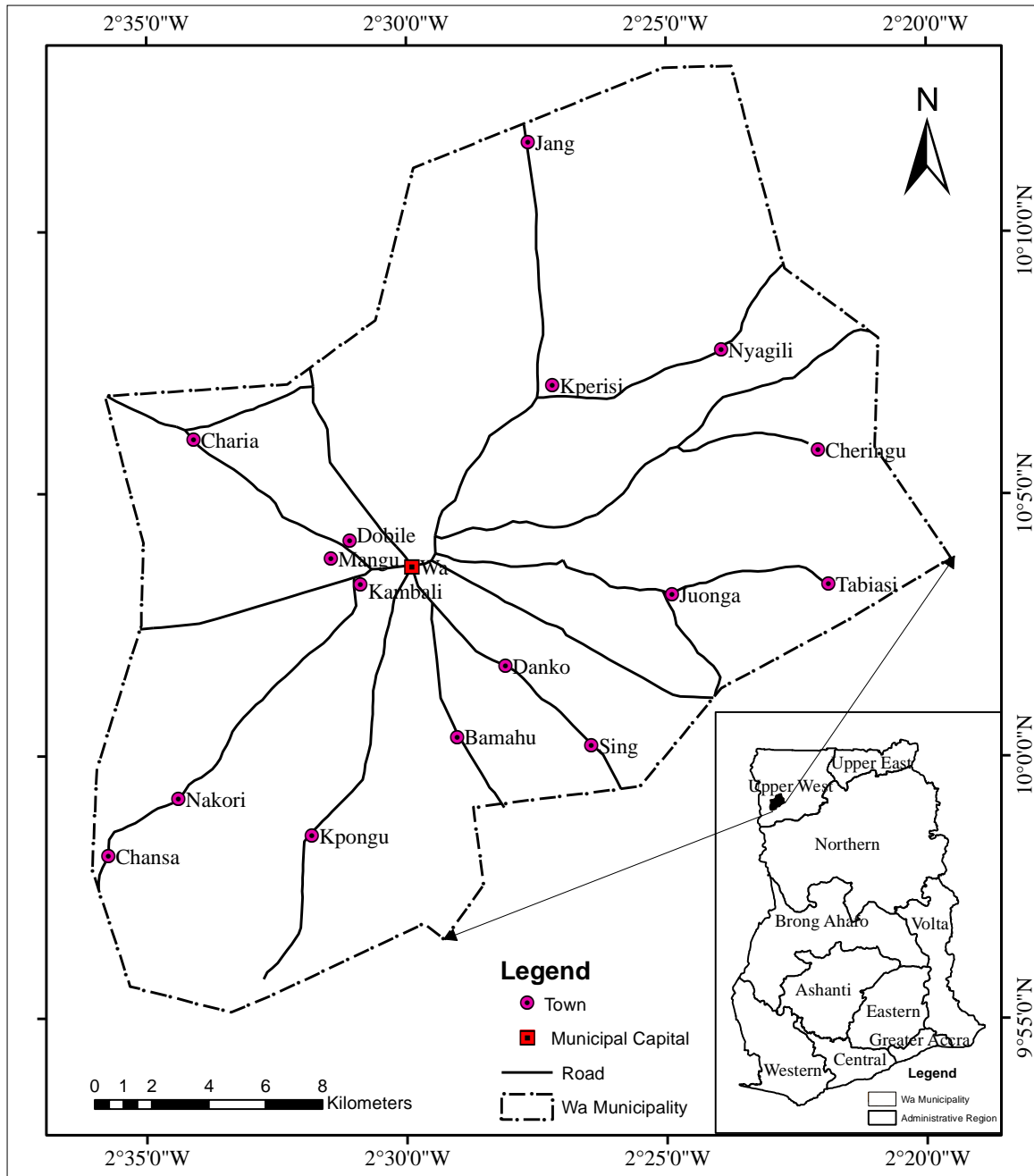


Figure 4:1 Boundary Map of Wa Municipality

4.3. CASE STUDY AREAS

As stated in section 3.2), the research carefully and purposefully sampled three case areas. The social, economic, and environmental, characteristics of these sampled areas reflect the menace of UWin these areas and the municipality at large. Detailed descriptions are in the succeeding sections.

4.3.1. DONDOLI NEIGHBOURHOOD

Dondoli is one the early indigenous settled areas in the WA municipality. It is located in the eastern most part of the municipality adjoined to the south by the middle-income class of junior staff quarters of the ministry of Health and Agriculture. To the north is Dondoli Kumbeihe east by West by Limanyiri and Sandemuni zonal areas respectively as shown in figure 4:2.

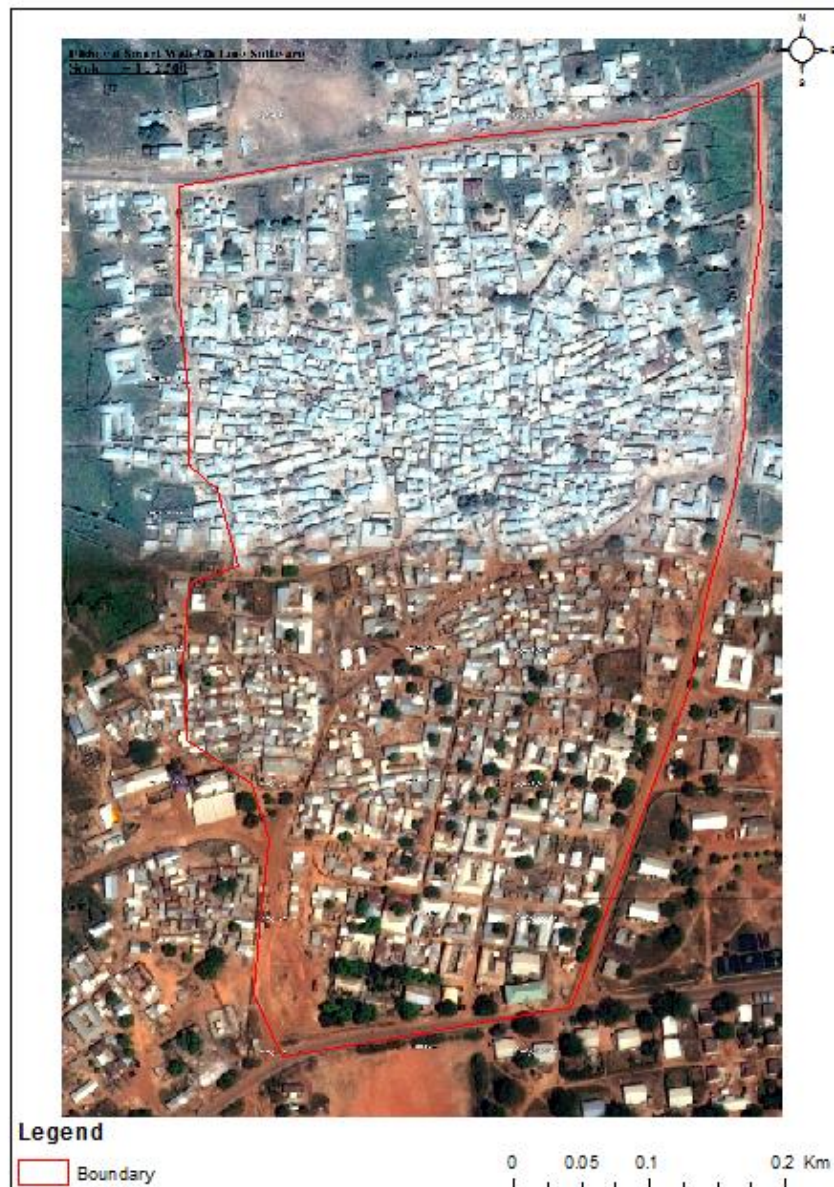


Figure 4:2 Google Image of Dondoli

It covers a land area of about two (2) square km. A growing community surrounded by wetlands, dugouts, and natural grooves. It has a population of about 2150 people (Ghana Statistical Service,2013). There are two (2) WC points with each serving an estimation 1,075 persons. However, residents often use surrounding

communal collection points as shown in Figure 3:4 . The community's source of drinking water is from boreholes and numerous standpipes in and around the area. . It has one (1) twelve (12) seat public toilet facility, which serves the whole community, a possible reason for many children openly defecation in around communal waste dumpsites. This therefore makes it unattractive for landlords to give out their land for communal WC commonly known NIMBY²

The major economic activities engaged in by women in the community are petty retail and seed (maize beans millet and rice) marketing. The men are mostly farmers and middle-income class workers.

The recent nationwide cholera outbreak in 2014, the community recorded four (4) cases with one death. (Interview with the MEO on October 10, 2014.)

More so, the assembly member also complaint, during an interview about the congested nature of the compound housing structure of the area made it very difficult to providing Waste services.

4.3.2. DOBILE WAPAANI NEIGHBOURHOOD

This neighbourhood is located adjacent the market and in the closer to the centre of town as shown in Figure 4:3. The inner peripheral is mostly made of old mud compound houses. While the outer surrounding is made of increasing block, cement housing with shops at the opening to the major streets that enclose the neighbourhood.

² Not In my Backyard

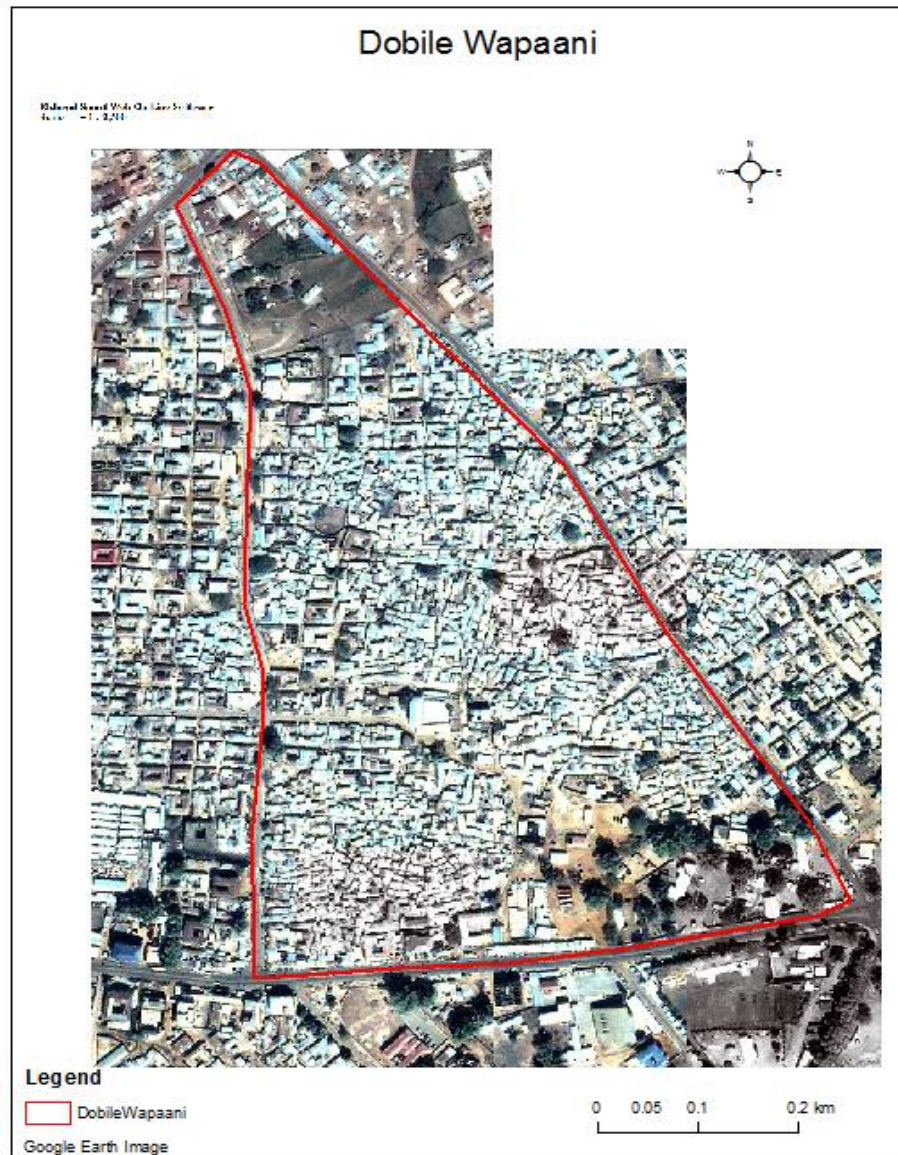


Figure 4:3 Google Image of Dobile Wapaani

With a population of about, 7,634 people and boarded to the east by the central market and to the west by the central administration of the municipality. The neighbourhood has four (4) twelve (12) seat toilet facilities, its access to portable Water relatively difficult as compared to Dondoli because it has more congestion and no space for further expansion and provision of basic services. Strategically the area is well positioned for business activities due to its closeness to the central market, therefore, most residents are into buying and selling, with a lot of retail provision shops found in the area. This area served with three (3) communal collection points compared to a population of over 7000 people. The area suffers from a major complains of malaria records in the municipality according to the Municipal Sanitation and environment report in 2013 with a record of five hundred (500) child malaria cases per quarter. The area also demonstrate a problem of behind houses waste dumping, which is a major sanitation challenge facing residents. Moreover, due to this the area is been rank based by a popular community radio program “te gae maalu” as dirties in the rankings of September 2013 based on the perception of the listeners. (Radio Programs)

With a population of 7,634 channelling out daily waste, and land it is interesting to study such an area. Since communal collection standards according to (branch manager of ZGL, during an interview conducted on

the 15 October 2015), he stated communal points are supposed to serve 500 people at maximum and to be picked on daily bases. In the Dobile Wapaani on average 2,544 people are served per WC point, far exceeding this standard the population far exceeding the collection points.

4.3.3. SOPKAYIRI NEIGHBOURHOOD

This is the third study area, is relatively looks planned as compared to the other two (2) neighbourhoods as figure 4:3 depicts as figure 4:3 depicts.



Figure 4:4 Google Image of Sopkayiri

Compound houses in the area has a miniature of a linear layout and with a relative 50-meter distance between houses, this ensure good ventilation in some parts of the neighbourhood.

The majority of residents in the areas are mostly landlords also known as “*Tindana*”³. With population of 3866, people and an estimated average of 1,288 people per three communal collection points available.. These waste point are well distributed relative to the other two neighbourhoods were they are concentrated at one site There are three different public toilets facilities available to residents and according to the assemble man and field observations residents are digging soak away to drain their liquid waste so as to keep the surrounding dry and clean.

The built up is relatively linear in nature and accessibility in these areas is relatively easier a compared with the two mentioned above. One of the reasons given for its linear and spacious nature is related the fact that they were they were among the early settlers, and therefore own large parcels of land in and around the neighbourhood .According to the senior landlord Tindan Issahaque of the area. More so the area was selected due to closeness to the main market and central lorry station of the municipality, has four different collection points and was perceived to be relatively clean as to the two mentioned above. Therefore, selected and investigated.

³ Landowners

4.4. BUILT ENVIRONMENT

The developed environment fundamentally delineate the towns from the villages with the substantial conglomeration of people, served with different land-use purposes such as residential educational, civic and cultural, commercial, infrastructural and other socio-economic or socio political facilities. The application of town and country planning principles are the main the main tools used to drive home the appropriate land use planning and zoning for safety of health safety and other human needs. Over the years, the WMA has collaborated with planning authorities to prepare layouts for to guide land use in the municipality. The built environment has moved a well-structured middle to high-class residential areas to a clumped of settlement in low income. Areas such as the government residential areas, Dogu Residential and Dondoli, Zongo, Kanbaye and Sopkayiri area respectively (MTCP, 2014) show these planned differences. These simply unplanned houses and collocated compound hardly have space or routes in between them making it sometimes practically impossible to provide services such as pipe Water, Waste skips among other social services. The nature of such areas gives possible rise to communicable diseases and poor environmental quality due to inadequate spacing amount housing units and poor ventilation.

4.5. SANITATION

Solid and liquid Waste is unavoidable by-products of daily human activities. It is unavoidable by-product of human activities which people of WA are no exception .This Waste material inflow has impose both economic and environmental cost on the municipality with regards it collection and treatment. The quantity, nature, and amount of solid Waste generated have impacts on the environment and health of the people. The increasing recording of cholera deaths and malaria cases within 2013-2014 suggest how risky this UW is (MSO, 2014). There still exist substantial amounts of generated Waste left uncollected although the collection of Waste is 80% privatized in WA (G.N.A, 2012). Studies of (Monney et al., 2013) shows Waste generation rate of the WA municipality (WMA) is about 48,246 metric tons per year (Yahaya and Ebenezer, 2012) also estimated from their study that about 36% of Waste generated is left uncollected. Some of the possible reasons suggested by the above studies in the municipality include; the deplorable nature of most of these poor neighbourhoods, the unwillingness to pay for services of WCs, the unavailability of sanitary facilities, low levels of educations and the general disregard with issues of Waste.

The inadequacy of data of Waste generated makes it relatively difficult if not impossible to give accurate accounts of Waste generations in the municipality. The increasing population has a direct impact on the increasing amounts of Waste generated, which does not commensurate with Waste infrastructure development. These compositions however of such Waste inadvertently vary with the growing variation in household consumption patterns.

4.6. ECONOMIC STRUCTURE

The economy of the Municipality has a dominant agrarian sector of about 70% followed by commerce and industry representing 9% and 3% respectively. The remaining 18% is composed transport, tourism communication among others. Comparatively the economy isn't very diverse but limited and is the second poorest in Ghana with 8 out every 10 people considered poor.(Ghana Statistical Service, 2013)

5. RESULTS

5.1. INTRODUCTION

The results of the study are presented in four (4) broad sections. The section presents the nature and risk of UW (5.3), the waste generational sources (**Error! Reference source not found.**), an assessment of waste anagement in Wa municipality (5.5). The last sections digest the factors that account for the variations in UW in the three selected study areas (5.6). Preceding the above section is a section that gives general characteristics of the sampled surveys (5.2).

5.2. SAMPLE CHARACTERISTICS

5.2.1. HOUSEHOLDS

As explained in section 3.3.2.1, 240 household questionnaires were administered to participants in the three sampled neighbourhoods. An equal sample of 80 participants in each neighbourhood. Table 5-1 summaries the general characteristics according to the gender, occupations, level of education, and the number of years each participant has stayed in his/her neighbourhood.

In all 25% of the respondents were male with a 75% female, this supports the claim of Koolwal & Walle, (2013) that women in developing countries have a total responsibility of keeping the household clean and keep it off solid waste is no exception. Similarly Awunyo-Vitor et al., (2013) suggest in their study that, responsivity of household solid waste is the repository of women. They are therefore responsible for cleaning to dumping and payments related to HW

More so, 62.3% of the household survey were engaged in informal activities these include petty trading, farming, dressing making, hairdressing, seed marketing and the remaining 37.3% were formally engaged in the government sector, mainly teachers nurses, students, cleaners and massagers of decentralized departments. The remaining 1.3% was either not engaged in any economic venture or was just home as homemakers.

With regards the number of year's respondents stayed in their various neighbourhoods 44.5% participants had stayed in their neighbourhoods for 10 years and above, an indication that they were either indigenous people or had stayed in the neighbourhood for long and understood the Waste management system in their neighbourhood. The 7.9% of the participants had either relocated from one urban neighbourhood to the other or moved from the rural areas of the municipality to the urban centre, , this echoes the assertion of earlier studies of Oteng-Ababio et al., (2013), Amoah & Kosoe, (2014). These movements of residents put pressure on the existing waste infrastructure in the neighbourhood. While waste infrastructure provision does not grow at the rate, at which population grows

Table 5-1 Neighbourhood Characteristics

Participant Characteristic by Neighbourhoods	Dondoli		Dobile Wapaani		Sokpayiri		Total
Gender							
Male	20	25.0%	20	25.0%	20	25.0%	60
Female	60	75.0%	60	75.0%	60	75.0%	180
Occupation							
Formal	49	61.3%	2	2.5%	36	45.0%	87
Informal	30	37.5%	78	97.5%	42	52.5%	150
Others	1	1.3%	0	0.0%	2	2.5%	3
Level of Education							
Primary	11	13.8%	28	35.0%	45	56.3%	84
Secondary	24	30.0%	14	32.5%	13	16.3%	51
Tertiary	23	28.8%	26	17.5%	2	2.5%	51
Others	22	27.5%	12	15.0%	20	2.5%	54
Year of stay							
1-2	0	0.0	9	11.3%	10	12.5%	19
3-5	7	8.8%	46	57.5%	30	37.5%	83
5-7	1	1.3%	19	23.8%	12	15.0%	32
10 Above	72	90.0%	6	7.5%	28	35.0%	104

5.2.2. FOOD VENDOR AND SHOP OWNERS

For the purposes of waste social and economic effects of UW in neighbourhood, thirty one (31) food vendors and twenty nine (29) shop owners. Equal samples of twenty (20) participant questionnaires were administered in each of the three neighbourhood. The sampled characteristics are presented in Table 5-3 according to their gender, years of operations, and their educational levels. Majority representing 61.7% of respondents are females and 38.3% male. This is because of the easy entry and the limited opportunities available for women in most developing countries especially in Sub Sahara Africa (Nichter & Goldmark, 2009).

This 43.3% of the business activities have been in operation for the past 10 years while 41.7%. At a significance level of 0.024 < 0.05 shows there is a significant relationship between the number of years of operations and how the options waste disposal alternatives by business owners (See Table 5-2, Appendix 4)

Table 5-2 Chi Square Length of Business Operations and Disposal Methods

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.097 ^a	9	.024
Likelihood Ratio	22.261	9	.008
Linear-by-Linear Association	.453	1	.501
N of Valid Cases	60		

The numerous challenges of attaining higher education in most developing turns to make the informal sector centre becomes alternative panacea in most developing counties. Since less formal education is required for the operation of such business (Nichter & Goldmark, 2009), this is among numerous reasons why a majority (51.7%) of the respondents had their education up to primary education, 31.7% to the secondary and less school tertiary (13.3%) in business.

Table 5-3 Food Vendors or Shop Keepers

Participant Characteristic	Dondoli	Sokpayiri	Dobile Wapaani	Percentage (total)
Type Of Activity				
Food Vendor				
Shop keeper	12	10	9	(31)51.7%
	8	10	11	(29)48.3%
Gender				
Male	15	2	6	(23)38.3%
Female	5	18	14	(37)61.7%
Years operation				
1-2	0	1	2	(3)5.0%
3-5	0	10	15	(25)41.7%
5-7	0	5	1	(6)10.0%
10 and Above	20	4	2	(26)43.3%
Education Status				
Primary	9	10	12	(31)51.7%
Secondary	8	8	3	(19)31.7%
Tertiary	1	2	5	(8)13.3%
Others	2	0	0	(2)3.3%

Furthermore, all the food vendors and shop owners in Dondoli have both been in operations for over 10 years and above. While 54.5% of food vendors in Dobile Wapaani have been in operation for 3-5 years their counterparts of 30% and 40% of vendors in Sakpayiri have been in operations for between 3- 7 years.

5.3. NATURE AND RISK OF UW

This section discusses the magnitude of the UW in the urban areas of the municipality, its nature, composition and location. Emphasis is on the three selected study areas.

5.3.1. NATURE OF UW

Household (HW) is an important part of neighborhoods waste generated, which is a major component of uncollected waste. UW is a heterogeneous type of stuff, which contains a variety of waste of different chemical and biological nature. Uncollected waste; is categorized as either biodegradable or non-degradable according to this study. Summarized in Table 5-4 are the forms that these biodegradable and non-degradable waste take. Sampled shown in Plate 5:1 are the categorized UW from the general observation of the urban surroundings of the municipality and interactions with during F.G.

The trends of HW waste and other daily human activities in like lorry stations, food vendor's shops, faith gatherings and the waste disposal behavior of residents determines UW components. Plastic waste, a major component of uncollected waste, mainly because of it serving as a major packaging component in all the daily dealings of households and business activities. These plastic wastes, which is mostly non-degradable, come in the form of 'pure water'⁴ sachets plastics bags for shopping, plastic containers (plate, bowls cups etc.)

Secondly, food waste is another biodegradable form of uncollected waste, these food waste mainly come from kitchen remains of HW. Examples of such include Tuo Zaafi (TZ)⁵, kapala⁶. Vegetable remains (green, pumpkin leaves, tomatoes, okra) were also easily visible at the dumpsites. Children pampers (made from both plastic and cotton) which takes a lot of time to decompose when not collected. Also found in the components of these UW were non-biodegradable like empty bottles, metals scraps of old machines (cars and motorbikes)

Thirdly, the use of fuel wood and charcoal an affront to afforestation as a major source of household energy for cooking generate ashes. Ashes hitherto were used in soap production in the traditional setting with indigenous technology. This is absent in recent times therefore dispose of hot in waste containers which burn waste containers.

Table 5-4 Nature of uncollected Waste

Biodegradable	Non Degradable
Food Waste: food remains, (TZ, Kapala rice), vegetable remains (green pumpkin leaves tomatoes okra), Market waste (spoilt food products: vegetables tubers, cereals)	Plastic: sachet water bags, plastic bottle, food wrappers, sandals,
Paper: box packing, old newspapers pampers	Empty bottled broken plates.
Kitchen remains: Ashes swept sand and charcoal remains	Metals : metallic waste (mechanic shops) etc.

Uncollected of the various neighborhoods are similar due to the similarities in the consumption of these neighborhoods. Since, consumption pattern of HW has a relation with the type of waste produced, as sections (5.2.1, 5.2.2) shows households dispose waste at communal collection points, which is a major source of uncollected waste. However, UW in these neighborhoods vary depending on the different kind of social or economic activity present in the neighborhood. For example, the presence of major lorry station and the central mosque of a Muslim faith where there are gatherings on daily bases, these gatherings produce pure water sachet waste which are different from HW, which also litter Dobile Wapaani. These UW

⁴ 150 ml water bags

⁵ Meal from corn flour

⁶ Mashed yam, or mashed cassava or plantain

sometimes come in the form of non-biodegradable materials is empty can containers, bottles, and plastic food packaging. There were also samples of food remains from the restaurants, roadside food vendors, and shops in the area.

In Dondoli, UW was mainly made of food waste, kitchen remains, like charcoal, and ashes less business activities are in and around this area as compared to Dobile Wapaani, there is less observed plastics littered on the grounds of the neighborhood, however many open defecations of children are found around collections points. Household ashes, charcoal and food waste were very common UW in all, that of Sakpayiri was no different but also featured similar UW like Dobile Wapaani due to its closeness to the central market



Plate 5:1 Sampled Uncollected Waste

with a lot business acuties that produce plastics and bottles which are left uncollected and are non-degradable

5.3.1.1. MAGNITUDE OF UW

As stated in Table 3-7 the estimated levels of UW in the municipality, estimated based on the number of communal collection points (Table 8-1) in each of the urban neighborhoods. The estimated waste generated based on the populations of each neighborhood (Table 8-2). The difference between estimated waste generated and WCs gives indications of the estimated uncollected waste. As shown in Figure 5:1 communal waste container pickings in the municipality in general was estimated to be between zero to twelve (0-12) pickings per neighborhood depending on the number of containers the neighborhood had. Table 8-1 indicates; Nayiri had the highest WC per week with four (4) waste and average of thrice picking of each container per week. This is mainly because the neighborhood is within the center of town and in the central market with majority of its daily waste generated from market activities. Adversely, Sambo experiences the less collections per week with sometimes zero collection due to the absence of this communal point for a period.

In between the two extremes lies Dobile Wapaani with three (3) waste points average weekly pickings of each container picked twice within the week, similarly Sakpayiri also with three (3) waste points have an average weekly picking of about twice per week per container. Contrary to this two Dondoli has the lowest picking of an average of neighbourhoods of less than once (0.5 times per week) per waste container

As per the estimations of waste generated per neighbourhoods per shown in Figure 5:1 Dondoli generates between 110-198 tons of waste per week but with an average tonnage picking of 34.5tons per week. An indication of waste no attended to within a week, which might either constitute UW or influence indiscriminate dumping.

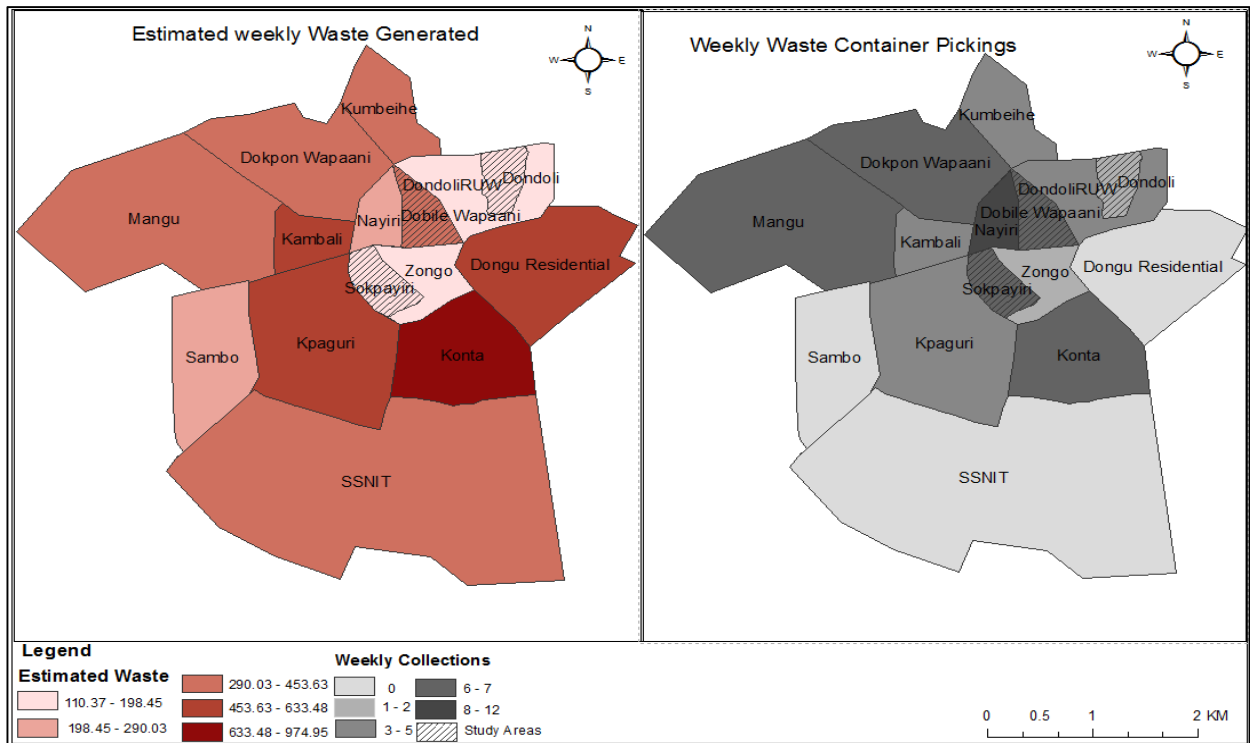


Figure 5:1 Estimated Waste Generated and Collections per Week

Figure 5:2 illustrates the estimated difference between the estimated HW and collections per each neighborhood depending on the number of collection per week. It shows more neighborhoods with less UW showing figures less than zero. This is an illustration that more waste is picked than generated, however this is not true since HW is just a fraction of waste generated in these areas. These areas mostly closer to the market. Since data on quantity of market waste is not readily available, it can only be assumed that this negative difference can be attributed to market and other human activities depending on the location of the neighborhood.

However, Dondoli, which express fewer collections as, compared to Dobile Wapaani and Sakpayiri shows significant difference WC. Indicating that more wastes is generated than it is collected an indication of possibilities of uncollected waste. This is mostly due to the delays in the waste container pickings.

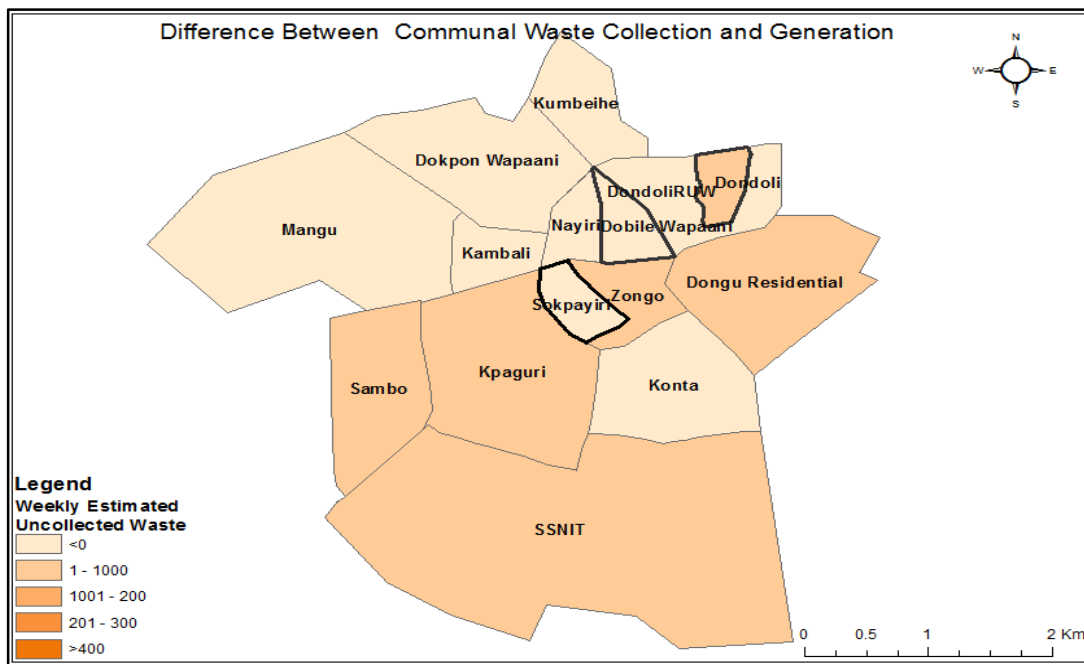


Figure 5:2 Estimated Weekly Difference in Waste Generated and Collected per Neighbourhood

5.3.2. RISK OF UNCOLLECTED WASTE

As mentioned earlier in section 2.8 UW has several effects on human surroundings. Majority of the 240 households 91.7% established uncollected wastes had diverse effects on their lives. While 8.3% stated that UW had no immediate effects although they agreed that it affected those in the immediate surroundings. These 8.7% households hold these believe because their homes were far away, about 500 to 1000 meters from places of UW. Similarly, 82.8% shop owners and 93.5% of food vendors think UW had effects on their daily activities while 17.5% and 6.5% of shop and food vendors think UW had no immediate effects. Some of the general reasons given by households, food, and shop owners of how UW affected them include:

“There served as breeding grounds for both mosquitos and others insects that which caused diseases”

“It also made our neighbourhoods look very bad, because people consider us as filthy people which we not and we stigmatized”

“These stereotyping affect the physiological upbringing of children who grow in such filthy environs”

These potential risks of UW are been categorized into health, economic, social, and environmental:

5.3.2.1. HEALTH

The communal collection points were a major source of UW in all the three neighbourhoods due to delays in picking. Contrary to the standards of TCP,(2010) of public toilets locations been 60 meters away from houses, it was observed that all the public toilets in all the neighbourhoods which also served as host to communal collection points where mostly less than the 60 metre standard. This post a big risk to homes that are immediately close to these containers especially in days that they are delays or no collections over a week or two without picking.

As these containers per the frequencies of their picking see (Figure 5:1) with average weekly picking of less than once (0.7) pickings in Dondoli with two (2) waste containers. While that of Dobile Wapaani and Sokpayiri experience daily pickings on average bases. From these figures, the likelihood of spillovers is common in Dondoli as compared to the other two (2) neighbourhoods. This is because with three Waste sites in Dobile Wapaani and Sokpayiri a waste container skipped out waste on daily bases while Dondoli gets this at least once in a week or sometimes not at all

These spillovers as in **Error! Reference source not found.** serve as breeding grounds for mosquitoes, through the accumulation of rainwater and other discharged liquids in cans, bottles, and other containers. These mosquitoes are a major source of adult and child malaria which causes death in developing countries, so spill-overs or continues delays in picking Waste containers do not just cause mosquitoes but but mostly breed death

Similarly, with children openly defecating at these spillovers sites, there is the probability of the contact of cholera, and other possible diseases for these children. Open defecations is a common practice in all communal collection points except in Sopkayiri where mothers are suppose are either compiled to provide their children with chamber pots or polythene bags to ease, which is latter their parents drop it into the Waste containers or the public toilets. This is not common in Dondoli and Dobile Wapaani as discussant in focused group put it:

“Because the public toilets in Dondoli are not meant for children, parents just allow their children to openly defecate at these dump sites”

“The absence of caretakers at sanitary sites gives room for people and children to ease at by these containers during day and night adults”



Plate 5:2 Spillovers of Waste

Secondly, since most shops and food, vendors are located along roadsides, and these waste containers located by roadside and left unpicked for several days even if there are no spillovers, but flies from these waste containers pose threat to consumers these food sold if these are well covered. . Moreover, the stench smell from these accumulated Waste pose a great threat to fresh air, and affects the breathing. These are very common in Dobile Wapaani and Sakpayiri all of these containers are located by the roadsides; see (Plate 5:3 and Plate 5:4)



Plate 5:3 Waste Container along Roadside of Dobile Wapaani



Plate 5:4 Waste Container along the Road of Sokpayiri

5.3.2.2. ENVIRONMENTAL RISK

WC variations and inconsistencies has been a major source of worry. This has influence the indiscriminate nature of Waste disposal in most of the neighbourhoods. When communal collection points are full and they are not picked residents are compiled to dispose of Waste to alternative places as a respondent in Dondoli put “*When the container is full do you Want us to keep the Waste in our rooms defiantly not, so we dispose them in the nearby bushes and the Water bodies around*”. This is not surprising during the observations in Dondoli to see Waste dumped in dams, which were pervious used for dry season gardening. These wetlands in the area are also been affected. This will in the near future take over the rice farms see. (Plate 5:5) of Dondoli. Secondly, Dobile Wapaani with burning of spillovers and the constant dumping of charcoal and ashes from homes has resulted in harden and darken of the surface soil. These discussants during focus group had divergent views, 40% were of the view that dumping on the ground was good source of manure for crop cultivations if they are located in areas of farming, like the Dondoli dam area while the remaining 60% think the ashes in HW were rather detrimental to plant growth. These findings are consistent with that Deenik et al., (2011) which suggest ashes from charcoal could either be helpful or detrimental to plant growth. The bare dark grounds with patches of UW destroy the atheistic beauty of the surroundings and make the areas look bad at sight. The effects of these dumping are on the environment is not immediately but gradually affect might affect the value of the land after it is cleared of the UW see (Plate 5:6), of these effects include the decrease the value of land in neighbourhoods with these spots of uncollected Waste. “*A female discussant mentioned if even there are lands available but the nature of land no body is willing to invest in our neighbourhood [Female discussant Dondoli]. Emphasis given that due to loss of value of land “because of the turning of these container sites into dump sites, residents are not willing to give out their lands for sanitary purposes even if government is willing to pay compensation” [Dobile Wapaani key informant]*”



Plate 5:5 Uncollected on wetland

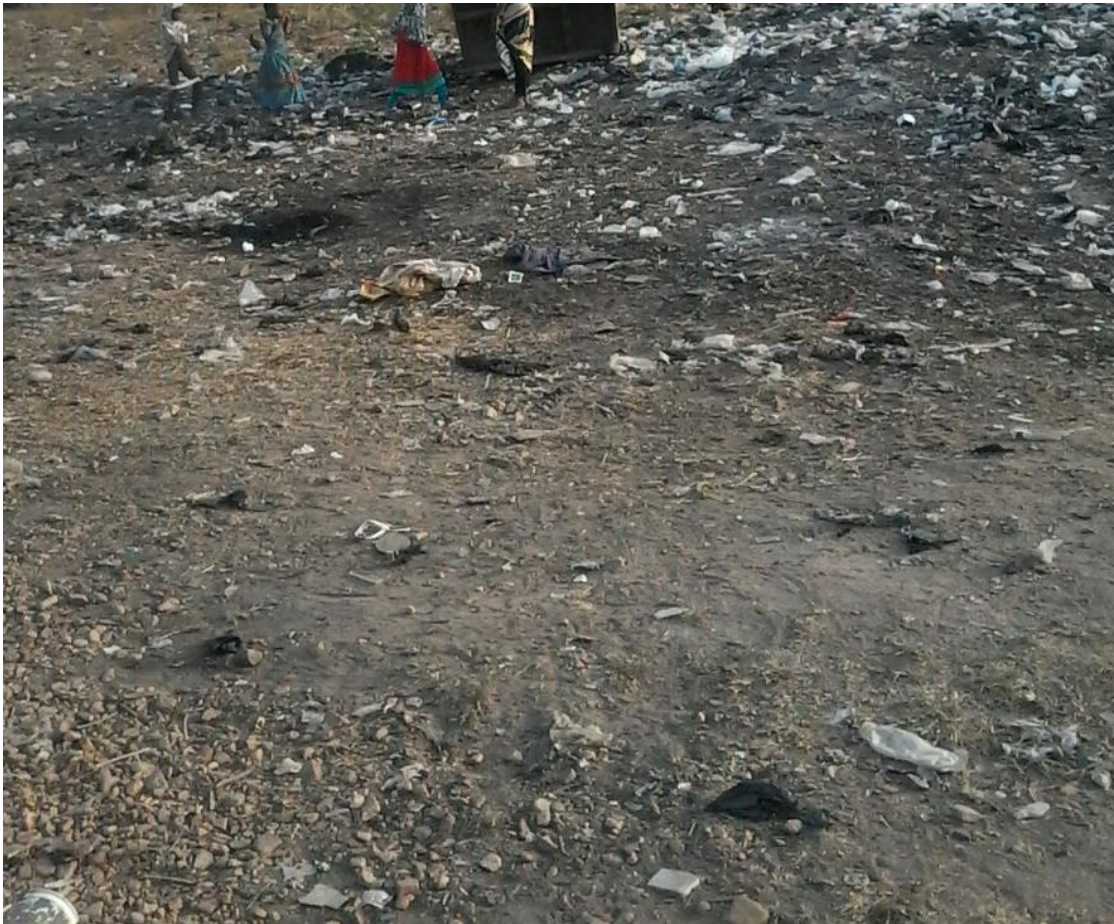


Plate 5:6 Area Cleared of UW in Dondoli

5.3.2.3. SOCIAL AND ECONOMIC RISK OF UW

The perceived risk associated with UW according to the three F G conducted in all the three neighborhoods and interviews with opinion leaders. They expressed the stigmatization, destruction of the aesthetic beautiful environs, and denial of other social services as some social risk, while the economic risk perceived included sales of food, loss of value of lands and the less renting of rooms in stigmatized neighborhoods see (Table 5-5)

Table 5-5 Perceived Social and Economic Risk of uncollected waste

Social Effects	Economic effects
Aesthetic surrounding destroyed and distorted with indiscriminate dumping	Affects sales of food
Destruction of social cohesion. (peaceful co-existence	Unwillingness of people to rent rooms in such neighborhoods due to the negative stigmatization
Denial of other basic social infrastructure	
Negative indoctrination of children behavior towards waste	Lost in value of lands that are surrounded with UW
Stigmatization of neighborhoods with UW	

A high quality environment allows both children and adults in a neighbourhood to live longer lives, but with a polluted environment of uncollected waste, it affects both the social cohesion of adults and children.

'It therefore influences children growing up to believe indiscriminate dumping of waste is normal' [female discussant.] This she further explain that as children grow up in such dirty they suffer the challenges of keeping clean environments in their marriage life especially for females who marry outside these neighbourhoods.

Poor indigenous neighbourhoods are known for their social cohesion, which is a source of strength and social growth but these problem of UW and indiscriminate disposal has a big potential of destroying such bonds when people drop waste indiscriminately or by waste container sides that are full or during spillovers. A discussant expressed her confrontations with a neighbourhood as:

I quarrelled with my neighbourhood because she still drop waste on the ground right behind my home because my container was full, which I asked her to pick and she refused asking me where she should dump it'.

'Another had quarrels with the mother of a child who sent her child to drop off waste, which she asked her to send it back to her mum because the container was full and the mum brought the waste with child and drop it on the floor'

These constant quarrels destroys the social bond and cohesion, and destroying the togetherness of poor neighbourhoods

More over the combination of UW and liquid waste, according to discussants and key informants, in these areas continuously stigmatizes them. These sometimes end up delaying or denying certain development project. According to the assembly member of Dobile Wapaani, the neighbourhood was denied public toilet facility just because of the perceived indiscriminate defecation and waste dumping around the existing once. The fear been should if constructed, without a serious educations and sensitization there might be serious repercussions if there is an outbreak of communicable diseases.

As stated in section (5.3.2) majority of food vendors, and shop owners believe UW affects their daily activities. Since uncollected Waste, contribute to a pool of sanitation problems that poor neighbourhoods face. It affects food sales as a vendor puts it "no matter how you package or prepare your food because of the cholera case recorded in our neighbourhoods people prefer not to buy from our food again. And from these our sales that we cater for our children in school" a food vendor in Dobile lamented.

Because of the constant stigmatization of Dondoli, Sopkayiri, and Dobile Wapaani has affected the rent of houses as a most room rents in these areas are devalued and people are not willing to stay in such in such areas. These discussants in focus groups all agreed that students rent seekers, do not want rooms in our areas

5.4. SOURCES OF UW

This section discusses the locations, hotspots of UW and also the other sources of waste that contribute to UW apart from waste from HW The estimated waste generated by the household is

5.4.1. HOUSEHOLD WASTE

Waste generation per section 2.3 are dependent on the household size, household activities like consumption patterns. This implies that if the consumption and life style pattern of the populace change the amount of Waste that is generated also changes. Hence waste generation vary with lifestyle and household size for neighbourhood Waste. Since life style and consumption pattern takes time to determine this research sort to use the average household size estimates from field work of October 2014 and average household size per the analytical report of the GSS, (2013), the average household size for high middle and low unplanned residential areas are three (3), four (4) and six (6) respectively .

Using the study of Monney et al., (2013).Table 8-2 gives the estimated waste generated per neighbourhood calculated based on the neighbourhood population. Figure 5:3 displays the propositional estimates of generated waste per neighbourhoods. Assessing the urban neighbourhoods in general it can realised that Dokpon Wapaani and Konta generate between 90.50 to 139.28 tons of waste on daily bases while areas such as Dondoli and its surroundings neighbourhoods generate less waste of between 15.77 to 28.38 daily

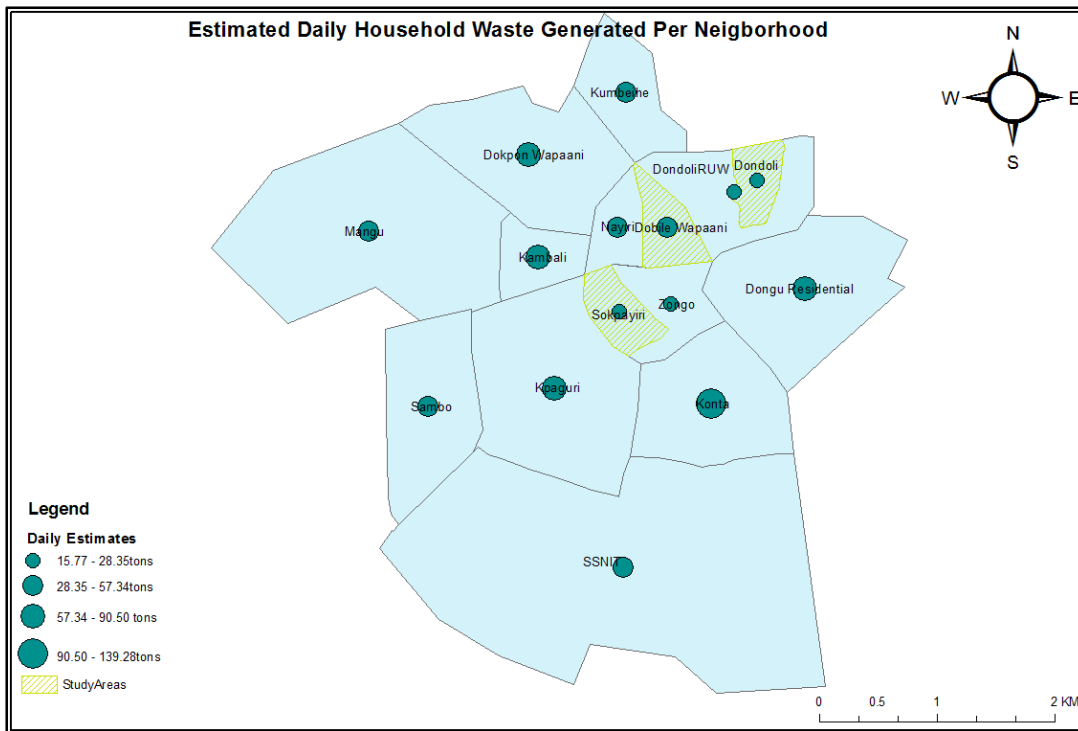


Figure 5:3 Daily Waste Generations

Apart from waste from households, waste from other social activities in the various neighborhoods; contribute significantly to the levels of waste that is generated per neighborhoods. As stated in section (5.3.1.1). The rate of collections exceeds the rates of generations but observations show there is still significant tons of waste left uncollected in the neighborhoods of Sakpayiri and Dobile Wapaani. This shows the influence of waste from social gatherings like faith based activities like weekly Friday prayer gatherings of Muslims at the central mosque located in Dobile Wapaani. Moreover, the presence of the main stations of both the main public transport station (Metro Mass transport) and the other private stations in this area also contribute to these waste that is generated in these area. However, the placing of these waste containers do not take into consideration these activities, according to the standard a communal collection point are purposely for solid waste of a population of 500. Similarly, Sakpayiri surrounded by numerous businesses and shops have waste containers for only household solid waste with no business activity registered for commercial collection according to the records of ZGL. Moreover, the market waste dominant these waste due to the closeness to the central market.

This implies the HW might just be a fraction of UW with limited attention given to the other sources of waste and curtailing these waste generation side poor neighborhoods will continue to experience high levels of UW with HW not necessarily been a major contributor.

5.4.2. LOCATIONS OF UW

General observations of the urban areas of the municipality revealed, UW took several forms, mainly because of the Waste disposal behaviour of residents. There is waste dumped by WC sides see (Plate 5:1), this is mostly very common in low-income neighbourhoods, where communal collections are the major accepted waste disposal alternative available. Although this kind of UW is sometimes, consider temporary, but its frequency eventually turn these collection points to permit open dumpsites. In times of absence, of the container people find it more convenient dumping by the container dumpsite as compared to sending waste back home and dumping it later.

The second most dominant form of UW observed were waste dumped in the fringes of urban Wa. Mostly dumped in the green surroundings and bushy areas open spaces where there is no immediate land use designation as **Error! Reference source not found.** shows.



Plate 5:7 UW in the Green vegetation Areas

Thirdly were UW from Waste dumped in open drains and waterways. These mostly found in areas without storm drains. Residents in such areas do not consider these as major problems because they believe their Waste dumping fill these drains to prevent further erosion and widen of the gullies.

As a discussant during the focus group mentioned, “*We dump Waste there to fill the drains so the gullies do not widen further*” It Was further identified as a Way of protecting their backyards from been eroded away see (Plate 5:8)



Plate 5:8 Waste in Water Ways

Similar to waste dumped in gullies are waste dump in open constructed gutters and Water bodies as see Plate 5:9 and Plate 5:10. This is very common in Dondoli as it located with surrounding Water bodies. That of open gutter dumping is also very common in market and transport stations where there are many human activities, which generates Waste with very few WC points at located vantage points hence providing the convenience of people dumping in these gutters.



Plate 5:9 Uncollected Waste in open Gutters



Plate 5:10 Waste Dumped In Water Bodies

The last and most common are Waste dumped behind homes. This takes different forms, it either the household dumps in a dugout see (Plate 5:11) or it is dump behind or inside uncompleted buildings. However, in congested neighbourhoods such as Dobile Wapaani this dumped directly behind homes, which most residents acknowledge as irresponsible adult behaviour or the neglect of duty by parents who give waste to their children to dump.



Plate 5:11 Uncollected in Dugout behind Homes

Among the aforementioned locations of UW, Mr. Moomin the Manager of ZGL, during an interview, ranked Waste dumped by Waste container sites as the major problem faced in the municipality.

This was also evident during observations and recognised as a major source of uncollected by discussants during all the three focus group discussants in all the three cases areas

He further stated that Waste in drains in market areas is also a major source of UW that distracts municipal WC. The market women he said were solely responsible, because of the groundnut hush they grind and drop in the storm drains with intentions of them been carried away by running rain Water..

At the various neighbourhood levels, household and food vendors categorized the various locations of UW that were predominant and more severe as summarized in table. Waste dump at communal collection points were a major source of UW in all the three neighbourhoods, this is evident as 86.3%, 80.0% and 71.3% of household respondents in Dobile Wapaani, Dondoli and Sopkayiri respectively all asserted that Waste dumped around WC points Was a major source of uncollected Waste. Waste dumped in drains were less of a concern to residents in Dobile Wapaani and Dondoli as compared to Sopkayiri where 10% thought otherwise and consider Waste dump in drains as a challenge in their neighbourhood. This they attributed to locations of Waste containers, as the roadside and closer to constructed open drains located two of the three Waste containers in the neighbourhood.

A minority of respondents 1.7% and 6.7% identified waste dumped behind homes and on the streets as a major source of UW in Dobile Wapaani although majority in identified contrary Waste types. Waste dumped behind homes happened intermittently and were not regular in areas where there are no open drains. Nonetheless, it is wealth mentioning that waste in plastic bags were were very common behind homes congested dwellings of which Dobile Wapaani is no exception

Similarly, food vendors and shop owners also see the problem of waste dumped by WC points as a major source of UW in their neighbourhood. As all twenty respondents in both Dondoli and Sopkayiri as, (Figure 5:4) asserts waste dumped at container sides as a major source of uncollected waste. This concurs with household assessment of the major source of uncollected Waste.

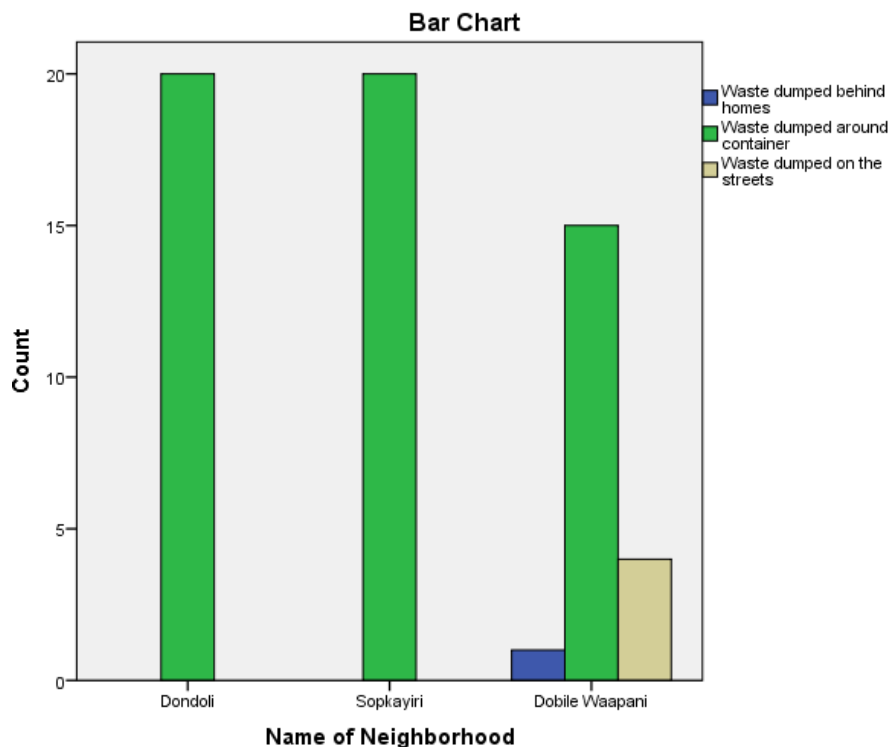


Figure 5:4 Food and Shops owners Categorization of Location of uncollected waste

5.4.3. HOTSPOTS OF UW

Transecting the urban surroundings during field, the seventeen (17) major points of UW were identified with assistance of residents of such areas. These uncollected Wastes were mostly in areas that are currently or previous hosted communal containers. Supplementary, areas that had natural green vegetation during the rainy seasons and also dry and bare during the dry season were also spots one could easily locate uncollected Waste.

Furthermore, uncompleted buildings, and abandoned structures were points of these uncollected waste. Unfilled dugouts, wells that were no longer in uses were all filled with waste. Figure 5:5 show the various points of uncollected waste, communal collection points in the urban settlements of the municipality. UW spots observed in both low and high-class residential areas. Although in high-income areas there are mostly located outside and far from the residents while in low-income areas they were either by the container side, behind homes, in open drains or in gutters.

These Wastes mostly dumped during the nights or during the day when most people were out engaged in their daily activities. This according to residents makes it difficult to apprehend those involved. In low-income neighbourhoods, Waste dumped behind homes and other unapproved places mostly occur when Waste containers are full or when children dump Waste.

Putting the three neighbourhoods in perspectives observations in three areas show a major source of UW are the communal collection points. Nevertheless, what distinguishes the hotspots of Dondoli from the other two is that UW is mostly in Water bodies as shown in **Error! Reference source not found..** It was urther observed that UW was more are found in bushy areas and wetlands that are located with 50 -1000 metres outside the neighbourhood.

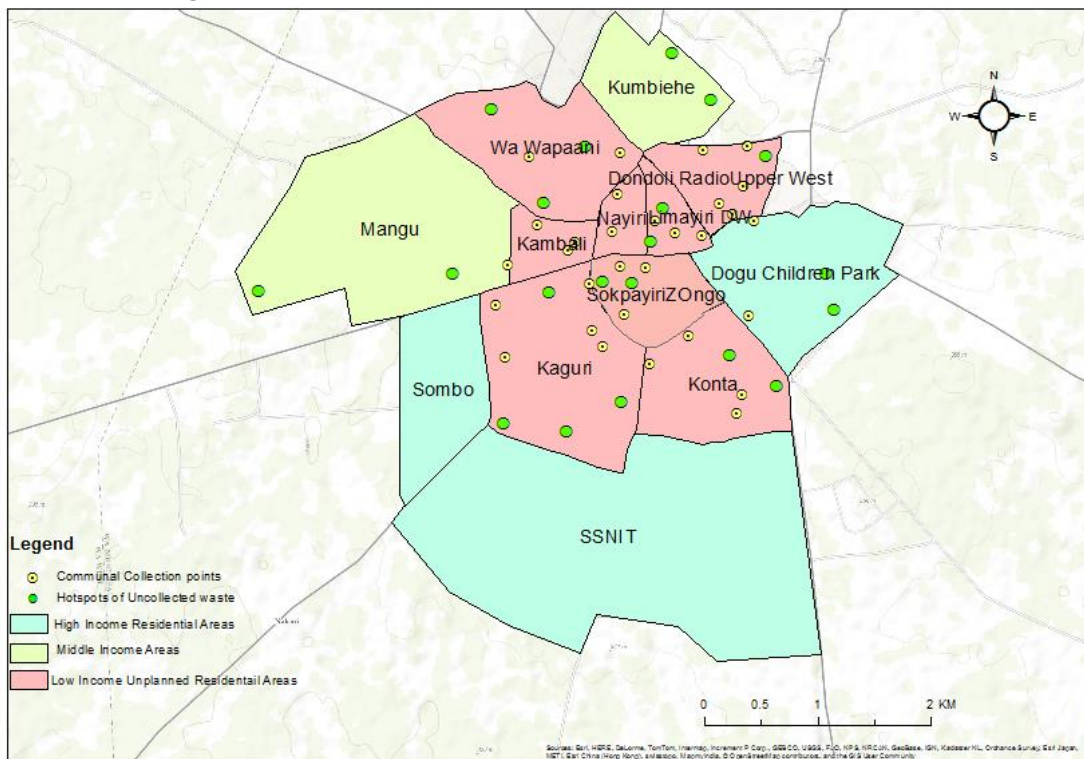


Figure 5:5 Hotspots of Uncollected Waste

Obstinately, Sakpayiri and Dobile Wapaani both located closer to the centre of the city, experience more Waste droppings behind homes which accumulate periodically This often is the norm in times that the Waste containers are full or during times that the communal containers skipped. These according to residents are most often nocturnal. In addition, passer byers in these neighbourhoods do these dropping of Wastes. However, residents turn to clean them up ones in a while.

Complementing the above observations, responses to both household, food and shop owner's survey ranked on a scale of severity of the UW locations, Waste uncollected in container sites, UW by communal collection sites pose more challenge. As as much as 86.3%, 80 and 71.3% of residents in Dobile Wapaani , Sakpayiri and Dondoli agree to it as a major challenge, and more severe. As shown in Appendix 4

			How do you despose off waste				Total
			Burning	Bury	Deposit at Communal point	Dump in Open Space	
Lenght of operations	1-2 years	Count	1	0	2	0	3
		Expected	.5	.5	1.8	.4	3.0
	3-5years	Count	3	0	20	2	25
		Expected	3.8	3.8	14.6	2.9	25.0
	5-7years	Count	2	0	3	1	6
		Expected	.9	.9	3.5	.7	6.0
	10 years and above	Count	3	9	10	4	26
		Expected	3.9	3.9	15.2	3.0	26.0
	Total	Count	9	9	35	7	60
		Expected	9.0	9.0	35.0	7.0	60.0
		Count					

Table 8-3 in the appendix. Conclusively hotspots in low-income areas are often designated areas for communal collections; this is mostly in cases where formal collection is the only dominant form of collection with little or no informal WC activity.

5.5. WASTE MANAGEMENT AND CHALLENGES IN WA MUNICIPALITY

The chapter assess the waste management practices in the municipality and appraise the performance of the WC, in municipality and low income areas in particular

5.5.1. WASTE MANAGEMENT PRACTICES AND FORMS

Waste management in the past was the sole responsibility WMA. The services were mostly in the cleaning and maintenance of open space dumping sites, local collection points, public incinerators, and solid Waste burning. The neighbourhoods were kept clean with regular field inspections that were undertaken by “samasama”⁷ who paid regular visits to neighbourhoods to ensure their cleanliness and ensured the cleaning and burning of Waste at accepted dumpsites. Mr. Ata (Municipal Environmental Officer). Waste from communal dumpsites were picked on regular intervals of two to three times a week. These activities monitored based on standards set by the Environmental Protection Agency (EPA).

Privatization of WC were delayed in the municipality up until 2006, because the municipality was performing relatively well in the management of its’ Waste. However, the growing population coupled with non-advancement in technology to dealing with Waste lead to the privatization. Other urban areas like Accra and Kumasi had WC privatized in 1990 as part of a package of the Bretton Wood policies to help structure African economics development. (MariWah, 2012)

The government of Ghana in 2006 entered into a public private partnership with Zoom lion Ghana limited (ZGL) to provide WC and other important sanitary related services to all MMDAs in Ghana. WMA Was no exception, therefore solid and liquid WC, transportation, and disposal became the responsibility of ZGL while, WMA on the other hand played monitoring role in the services provided Two different service levels are rendered by ZGL to the residents of the municipality: that is House-to-House WC and Communal collection System. (ZGL, 2014)

The communal collection is a system in which WC containers is placed at vantage points in neighbourhood for residents to dispose of Waste in and are picked at regular intervals. These are mostly operational in unplanned and low-income areas. Also part of the communal collection ZGL is responsible for the cleaning of dumpsites, spillovers of Waste containers. Thirty- five (35) operational points were active during the period of the study. (October 2014). Other seven (7) collection points were closed down because of accessibility and logistics problem experienced by the organization.

Additionally ZGL operated the House-to-House collections, which has five hundred and eighty (580) registered households, restaurants, Hotels and other commercial organizations. Participates in “houses to house” had their Waste collected at a fee Gh¢.10 (\$3.00) and GH¢.7.00 (\$2.18) for 240 and 120 kg containers respectively per month. These Waste bins freely given to households that are willing to pay for the monthly fee.

Recent monthly clean-up campaign instituted by government also complemented the existing Waste management activities in the municipality. Government in the Month of August in 2014 instituted National Sanitation Day (NSD); it is a practice of the dedication of the first Saturday of every month set aside for the general cleaning of drains, general surroundings of neighbourhoods and cleaning of the streets off d is set aside to Wards cleaning communities off Waste. Inhabitants of the communities with assistance from Waste management agencies are to aid execute this task. It is instituted to curb the growing cholera cases that are recorded in the country and to keep the country surroundings off Waste. (WHO, 2014)

5.5.1.1. WASTE COLLECTION

The municipality in collaboration with ZGL operate thirty -five (35) communal collection points, located in all the low, middle, some parts of high-income neighbourhoods and in the market and main lorry stations. The CCC is of two types, 60-ton, and the 70-ton containers. According to section six (6) WMA, (2006) by law on sanitation. It is also a punishable offence to hump waste and burn at unapproved sites, and a

⁷ Local sanitary inspectors

punishable office to dump waste indiscriminately. This therefore makes CCC the only legal alternative available for residents.

These notwithstanding 16.7 % of responses dispose of waste by burning, while 38.7% bury waste and the majority (44.6%) dump by CCC. Within the minority who dump waste by burning 57.5% had education up to the primary level while 42.5% to the secondary level. On the other hand, majority (43%) of those who dispose waste at CCC had education while a minority of 15.9% -28% ha secondary school or less education. This resonances the stands (Road et al., 2009; Tadesse, Ruijs, & Hagos, 2008b) who both suggest education status has an influence on the waste disposal behaviour of residents.

However, it is surprising to note that none of the respondents in all the three neighbourhoods indicates they dump waste in open places this was yet, glaring in the open space dumping during observations. In addition, non-claims responsibilities for these actions for the fear of been reprimanded by the law.

5.5.1.2. WASTE MANAGEMENT ASSESSMENT

Majority of households (54.2% representing 130) expressed dissatisfaction with the services that where provided by ZGL while 28.7 were undecided and the remaining 17.03 where satisfied with the services. Some of the general reasons given for the dissatisfaction expressed by households included:

“The delays in picking of Waste containers” “The inadequate Waste containers in the neighbourhoods” and “Not covering of Waste during collections” While those who express indifference in the services were of the view that the performance of the ZGL fluctuate and so it is very difficult to state whether you satisfy or otherwise. The

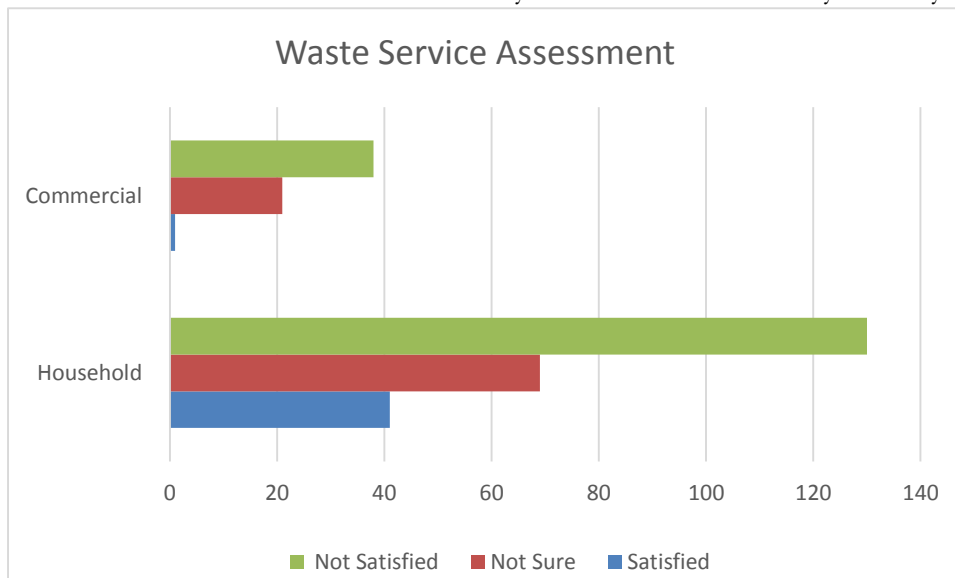


Figure 5:6 residents' perception ZGL services

satisfied minority suggested the regular cleaning and clearing of piles of UW and spillovers are commendable efforts. Similar to households, majority of shop owners and food vendors (commercial) express dissatisfactions in the service rendered by ZGL, they express similar sentiments of the delays in Waste picking and inadequacy of collection points relative to the populations of the various neighbourhoods

In Dondoli, more households (61.5%) were more dissatisfied with services provided as compared to 38.5% in Dobile Wapaani. Contrarily majority of household in Sakpayiri were total indifferent to the services that they enjoyed from ZGL, and more household were satisfied with the services rendered in Dobile Wapaani while in Dondoli no resident were satisfy with services they receive.

Further supporting this fact are discussants in Dondoli totally putting the cause of communal collection point UW on the service provision of ZGL. Contrary to assessments of discussants of Dondoli, Dobile Wapaani and Sakpayiri discussants think the ZGL is performing considerable well when, but blamed

squarely the poor services on residents indiscriminate disposal behaviour. However, were also quick to acknowledge the regular delays in Waste container skipping and resident non- payment for WCs. This implies indifference as to the satisfaction residents perceived about the works of the Waste management agency. The regularity of Waste skipping in their areas influenced their perception.

5.5.2. CHALLENGES OF WASTE MANAGEMENT URBAN WA AND IT WEAKNESS

Since waste, management in the municipality is formal, while communal collections are the common form of WCs in the urban unplanned settlement. In an interview with Mr. Issahaque the Municipal manager of ZGL, indicated that as a private organization collaborating with government in ensuring clean environment, they face many logistics, financial and skilled personal inadequacies that affects their performance.

About logistics he mentioned currently the agency owned seven (7) skip loader tracks with five operating on daily bases, he also mentioned they currently operating thirty-five communal collection points while in factual sense they supposed to operate up to 60 collection points so to coup with the increasing population and Waste generations. However, there is the challenge of Waste container burning due to the consistent dumping of household hot kitchen ashes. This He mentioned affects all 35 operational containers, but more Sokpayiri, Dobile Wapaani and the central market, therefore shorten the life span of these containers. The cost of replacing a container is GhC 9000 (\$2802.85). This consistent burning and other associated factors has led to the reduction of communal containers from 42 to 35 and increasing the maintenance cost.

Secondly, he started the regular delays in government subventions known as common fund to the WA municipal assembly of which five (5%) for Waste management. Payments of these subventions are quarterly in nature and sometimes arrive very late or end up in the preceding year. This therefore makes it difficult to keep pace with increasing Waste generations contrary to the fact, that local populace of low-income areas do not pay for Waste disposal.

Nonetheless, an additional challenge face was the calibre of unskilled labour. Most of the workers with the company are not skilled, due to the nature and manner of their recruitment. Employment, based on government national youth employment program (NYEP), as part of the memorandum of understanding between the government and the Waste agency hence government pay workers hence have a big influence in their employment.

Furthermore, most indigenious local areas served with communal Waste points, are without well laid out roads networks making it very difficult if not impossible to place communal containers or even pick them when they are full. For instance, the Waste skips during the rainy season in Dondoli hardly excavated, due to the bad nature of roads in the neighbourhood. These roads are not motorable. Making it difficult to excavate the accumulated Waste. More so Dobile Wapaani congested nature, makes excavating Waste almost impossible without regular payment of damages to house roofing, during and after Waste is been skipped from the neighbourhood. However, it was more convenient to containers from roadsides. The more reason for the frequency in Waste skipping in Central market area (Fadama), Limanyiri Vuori, and Sopkayiri as shown in Table 8-1.

Lastly, He mentioned that Waste education in the municipality in very crucial in achieving a clean and polluted free environment. This he said lacks in most of the neighbourhoods hence the attitude of indiscriminate dumping on the streets, dumping around and away from communal collection points.

5.6. FACTORS DETERMINING UW IN DONDOLI, SAKPAYIRI AND DOBILE WAPAANI

Several factors account for UW in different neighbourhoods. For this study, these factors are categorised into, institutional and neighbourhood factors. .. Some of neighbourhood factors responsible for UW included

- Location of Neighbourhoods
- Land and Waste Container Availability
- Distance to Within and Outside CCC

- Delays in Waste picking
- Cultural factors
- Willingness to pay for waste
- Community leadership and Waste management

I. Location of in Neighborhood Urban Areas

The location of a low- income in the municipality has a big influence in the nature and manner in which they dispose of Waste. Residents of neighbourhoods located in the outskirts of the municipality most often than not find it more convenient to dispose waste in the grass and natural surroundings nearby than to walk to communal containers. Most of these residents do not store waste but dispose them as and when generated. Due to the nature of the surrounding, residents do not see it to have any effects since they believe is been blown away or mix with natural environment. In Dondoli (Figure 4:2) waste is often, dispose of bushy surroundings, wetland areas, and uncompleted buildings. This echoes the studies of (Little & Songsore, 1997) who states that low income areas are often located at unsuitable areas sometimes due to the environmental conditions of the surroundings which in this case encourage indiscriminate waste dumping. Boadi & Kuitunen, (2002) also argue that residents located along the lagoon in Accra dispose of water into these waterways as an easier way of getting rid of the waste.

Dissimilarly, residents of neighbourhoods in or around the centre of the city with overcrowded and congested with buildings. The closeness to the city centre and abundance of commercial activities in surroundings makes Waste dumped at communal collection points more rampant, and the clandestine attitude of residents dumping waste behind homes. Residents of Dobile Wapaani (Figure 4:3) mostly faced with this challenge since waste containers are relatively distance. A female discussant during a focus group discussion mentioned, *“You find a lot children pampers dumped behind our homes almost every day, but you can hardly identify who is or the people responsible”*

This therefore results in waste uncollected found in and around surroundings of the neighbourhood contributing to unclean nature of the environments. Additionally, because these areas are closer to the commercial centre they often experience many commuters in and out of the neighbourhoods these people drop waste in such neighbourhoods as the pass. It is therefore should be noted that waste found in such areas does not necessarily come from households or commercial activities in the neighbourhoods but also from pedestrians in these neighbourhoods.

Conclusively the location of a neighbourhood influences the Waste disposal behaviour of the residents. As the studies of Owusu and Owusu,(2010) slums and poor neighbourhoods may exhibit similarities but they locations in big cities has a total influence in the way and manner in which they dump their waste. They stated poor neighbourhoods with little or no ability to buy for waste in big cities find it convenient to dump in open drains or behind their homes packaged in plastic bags.

II. Land and Waste Container Availability

Land accessibility is the single most vital factor when it matters of communal waste container siting emanates. Tenure rights, available of a suitable location and the willingness of municipalities to pay compensation are factors to consider when it comes to the placement of waste containers in poor neighbourhoods, since the syndrome of NIMBY comes to mind(Tadesse, Ruijs, & Hagos, 2008c; UN-Habitat, 2010). For social and economic reasons no residents is willing to give out his or her land to be used as a communal dump sites. These notwithstanding, in events that people are prepared to release their lands for such purposes, payment of compensation is often delayed, even in cases that payment is to be done who to pay to is another challenge due to ownership or succession related problems. In Dondoli for example there are many land litigation problems making it practically impossible to site a third container to ease pressure on the existing once ('Conflict Man Hurt', 2014 December 28). However in Sokpayiri, where the line of succession and land ownership are clearly defined, mostly because they are the landlords(Tendamba) in Wa, land acquisition for sanitation and related developmental projects is easier and compensation payment do not face face ownership challenges. The more reason why there is land acquired and available

for the four waste container in the neighbourhood to ease waste collection (According to the Assemble man). In Dobile Wapaani (Figure 4:3) overly congested nature and location at the centre of the centre land is scare and relatively very competitive usage in economic viable returns than for waste dumpsites with little or no economic returns.

Moreover, the cost involved in providing waste containers as in section (5.5.2) has made it practically impossible to provide containers at even distribution to ease pressure on existing once. This owes to the inconsistent government subventions to ZGL that affects their logistics therefore circuitously increasing the chances of waste uncollected in poor neighbourhoods

III. Distance To Within and Outside CCC

As seen (Figure 5:7), waste containers in all the three (3) neighbourhoods are readily accessible in terms of distance within 500 meters

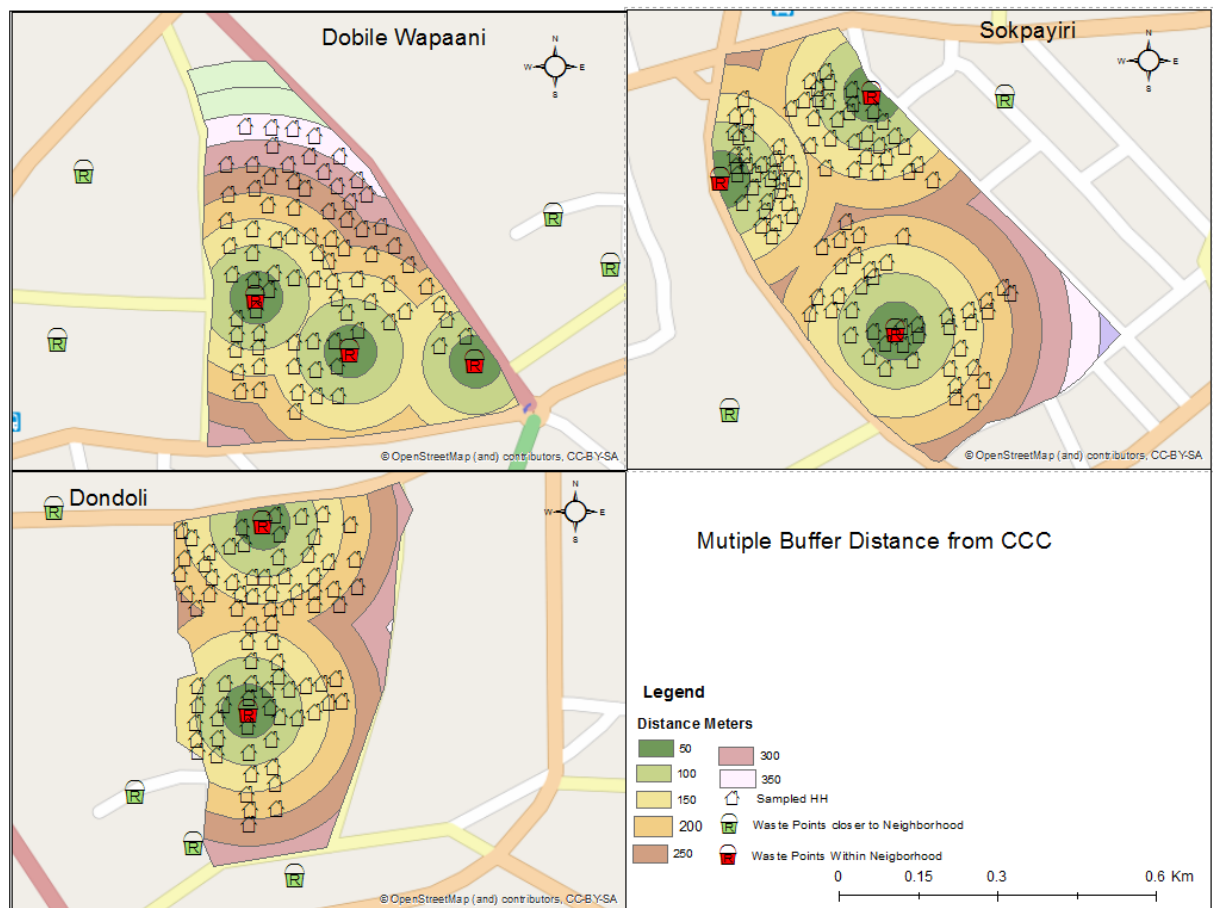


Figure 5:7 Multiple Buffers from Containers

Distance decay factor is not applicable in the distribution accessibility of waste containers within all the three neighbourhoods, this is because all the waste containers with are accessible to all households within 350 meter. Although some residents still see these waste containers as a bit distance away from their homes therefore prefer to burn their waste. The timely of waste disposals in all the three neighbourhoods play crucial roles in residents accessing other neighbouring waste containers. All the three neighbourhoods are Muslim dominated, consequently the timing of sweeping. Not attempting to trivialise the issue but the timing of disposal has a significant impact in the waste disposal, which accumulates to uncollected waste especially in Dondoli residents.

As a discussant asserts that *'if I should wake up around four (4) am to the CCC to dispose waste wouldn't I be called a witch, since they is no lighting in the area, so I will prefer to just dump a few meters in the bush around'*

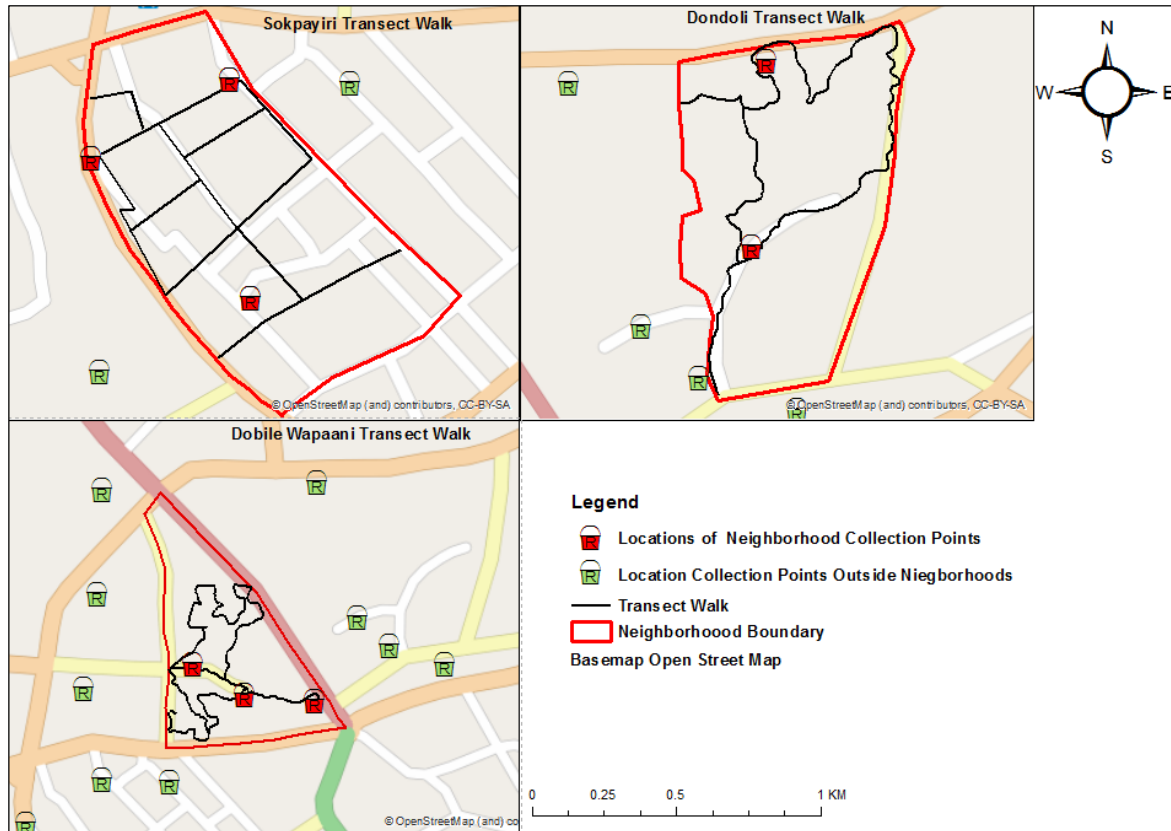


Figure 5:8 Closer Waste Containers outside Neighbourhoods

Akin to waste containers within is the distance and availability of waste containers in closer or surrounding neighbourhoods. (see Figure 5:8) Sakpayiri residents have two (2) further options of waste disposal apart from those three (3) located within their neighbourhoods as compared to Dobile Wapaani, which has more options of six (6) additional waste points to dispose of waste. Dondoli on the other one has four options available for waste disposal but three of these waste points are located in the southernmost part of the neighbourhood

Similar to location of neighbourhood are the location of waste containers in a neighbourhood. In Wa, municipality in general communal waste points are mostly located closer to public toilets/sanitary sites.

These sanitary sites according to the planning standards and zoning regulations T C P, (2010) are to 100-metre sq. away from all building. However, waste containers in Dobile Wapaani are less than five (5) to ten (10) meters away from homes. While those in Sakpayiri relatively, meet such standards due to land availability. .Moreno all waste containers in Sakpayiri are located by public toilets with caretakers of these toilets, who regular how to dispose of waste and prevent waste dumped by the container side.

On the hand, waste containers in waste containers in Dondoli are not located by public toilets and do not have caretakers to look over the waste disposal tendencies of residents. These isolated Waste containers generate a lot of UW and do not even get promote picking responses from the agency. This because they have no caretakers. (See Plate 5:12)

In neighbourhoods like Dobile Wapaani, where waste containers are kept by these public toilets where there exist caretakers but residents still disregard them as a discussant put it

“People say the care takers are responsible for the toilets and not the Waste containers hence the caretakers play adamant to these spilling over of Waste containers leading to accumulations of Waste.”

That notwithstanding neighbourhoods that are easily accessible in terms of their road infrastructure where waste containers are closer to the main roads boundary it, Waste is easily. Areas as Sakpayiri with all its Waste containers by road sides this facilitate the regularity of WC from the communal collection points.



Plate 5:12 Container away from a public Toilet and Without Caretaker

IV. Delays in Waste picking

The fourth factor affecting waste management in the municipality and contributing to the high levels of indiscriminate waste disposal behaviour is the availability of waste containers. According to the waste container to population standard set by ZGL every 500 population within a community are entitled to a waste container. Although these waste containers are inadequate to meet the increasing waste generated due to population growth, the problem is worsened as a result of the regular delays in waste picking (see Magnitude of UW5.3.1.1). These delays in some cases last for more than two to three weeks without these containers being picked therefore making the situation worse. Among the three (3) Dondoli expresses the most delays although it generates the least of waste

V. Willingness to pay for Waste in Poor Neighbourhoods

The sole major execution challenge of Waste management implementation is the creating of adequate capacity for environmentally sound management, this includes making appropriate recovery plans. This is practically difficult because the principle of polluter pay principle has not yet matured well in developing countries. Awunyo-Vitor et al., (2013) particularly with poor neighbourhood where practically waste picking is free and the cost of picking is borne by the municipalities.

Generally, women were willing to pay deal with the problem of uncollected waste at the household level men willing to pay for waste dumping at a rate of one (1) out of every twenty one (21) respondents and 21

out of 23 for females. Contrastingly, women shop keepers and food venders were unwilling to pay for waste as compared to men (See Table 5-6).

As seen (Table 5-7), 50%, 78.75%, and 87.50% of the 174 respondents who are willing to pay to improve the waste collections in Dondoli, Dobile Wapaani, and Sokpayiri respectively. They were prepared to pay rates ranging from (50 pesewas to two (2) cedi) (0.13\$ to 0.52\$) to help improve the picking of CCC this is to reduce the incidence of uncollected waste.

Majority (50%) of respondents in Dondoli who were unwilling to pay for improve upon the waste collection were all located with 100 – 200 meters from CCC. and those who were will to pay were located within rages of 300-400 meters away from CCC. This is counter intuitive most of the reasoning given for the unwillingness to pay for waste collection,

Waste picking is the general responsibility of the municipal assembly, why should I pay tax to the assembly and still pay to dump waste [female discussant in Dondoli]

Another also asked *'the current state of the economic and business activities will not support me pay for waste; there are constant increases in water and electricity tariffs and common waste you want us to pay for again'* [male discussant in Dondoli]

Table 5-6 Willingness to pay for Waste by Food and Shop Venders

			Will you pay for Waste		Total
			Yes	No	
Gender	Male	Count	13	10	23
		% within Gender	56.5%	43.5%	100.0%
		% of Total	21.7%	16.7%	38.3%
	Female	Count	15	22	37
		% within Gender	40.5%	59.5%	100.0%
		% of Total	25.0%	36.7%	61.7%
Total	Count	28	32	60	
	% within Gender	46.7%	53.3%	100.0%	
	% of Total	46.7%	53.3%	100.0%	

Table

5-7

Amount willing to Pay

Amount willing to pay			Do you pay for services		Total
			Yes	No	
0.5-1 Gh¢	Name of Neighbourhood	Dondoli	39		39
		Sokpayiri	64		64
		Dobile Wapaani	45		45
	Total		148		148
1-2 Gh¢	Name of Neighbourhood	Dondoli	1	0	1
		Sokpayiri	1	0	1
		Dobile Wapaani	12	0	13
	Total		14	0	15
others	Name of Neighbourhood	Sokpayiri	5		5

		Dobile Wapaani	6		6
	Total		11		11
Total	Name of Neighbourhood	Dondoli	40	0	40
		Sokpayiri	70	0	70
		Dobile Wapaani	63	0	63
	Total		173	0	173

From the above the desires and willingness expressed shows poor neighbourhoods to zeal to deal with this menace, nonetheless among the three Sokpayiri is taking practical steps to see the possible implication of the pay as you dump policy in the neighbourhood, by erecting sheds around all the waste dumpsites to help

VI. Cultural factors

As part of the training of the female children, women sweep and collect the waste and give it to the children to take it to communal container. However, many children are not able to reach the height of the container, so instead of dumping the waste inside the container, they rather dump it on the ground. But these challenge has practically be overcome by residents of Sakpayiri who has provided wooden steer cases for children to stand on and dispose of waste. This also assist vertically challenged adults who cannot reach the heights of the container. The community members provide the wooden staircases that facilitate waste dumping by both children and adults (See

Paradoxically majority of households in Dobile Wapaani and Dondoli representing 80 % and 73.4% respectively had children dump off Waste on daily bases while the remaining 26.6 %(21) and 20% (16) had their Waste dumped by adults and it done twice daily. However, these two neighbourhoods lack these wooden staircases that assist children and adults to climb and dispose of their Waste in the communal containers. This therefore account for the levels of UW by the container sides. While in Sokpayiri, a minority of 43.75% (representing 35 respondents) had they Waste dumped by their children, with the remaining 56.25 %(45) had adults dumping off Waste therefore contributing minimal tons of Waste deposited by Waste dumpsites and behind home. Based on the assumptions and focus group discussants agreeing that children going to dispose of waste contribute to waste accumulation at container sides.

Concluding from above it is realised that the constant interference and politicisation community activities has the tendencies of killing community initiatives that have good intentions for the community. Moreover, there should be constant education of residents on the cleanness and emphasis placed on educating residents on their Waste disposal behaviours and the effects of their actions. Furthermore, it is realised that the residents of Sakpayiri distinguish itself from other neighbourhoods by their exhibition of volunteering spirit under their leadership; they also understand the consequences of UW, leadership are working towards achieving a clean surroundings

6. Conclusion and Recommendations

Exploring the various factors behind waste generations and collections, and examining formal waste management practices in the absence of informal collection, separation and economic valorization of waste the following conclusions are drawn.

6.1. CONCLUSIONS

The nature and risk of UW waste vary depending on the location of the poor neighborhoods, thus neighborhoods located at the fringes of cities with green surroundings face the risk of losing the natural green surroundings while those at the center of the city get more risk of being infected during outbreaks. Secondly HW which mostly the target of formal collection points in poor neighborhoods is a necessary factor that contribute to UW but sufficient considerations should be given to business, and social gatherings, and other major activities that are located with or around poor neighborhoods. The cases of Dobile Wapaani and Sokpayiri are clear examples where the waste picking records of these areas far exceed the amount of estimated HW, however observations during the period of study shows patterns of UW waste

Thirdly, formal WC should not be an ultimate solution to waste management challenges in all poor areas. There should be motivation for the separation of waste exceptional non-degradable water sachet bag. The producers of pure water in the municipality can reuse these

The efficiency of private waste management agencies is to make sufficient turn overs so to keep the company operational. However, since WC in poor neighborhoods is total paid for by the WMA, which experiences constant delays from central governments, therefore affects the performance regards WC and therefore increase the chances of waste uncollected in poor neighborhoods since they do not pay for WC directly.

Lastly, the degeneration of the communal spirit amount residents of poor neighborhoods is eroding faster the spirit of volunteerism in dealing with the challenges. The strong sense of belongingness is declining therefore participation in communal projects which collective waste disposal behavior is no exception. The move from a community leadership to the election of leaders has thrown the spirit of togetherness to that of partisan politics making it difficult to have a common forum to express challenges of communities.

6.2. RECOMMENDATION

The following recommendation are based on the findings of the research:

- Waste management agencies should encourage the separation of waste, both at the household level and at the communal dumping level. Special waste containers should be placed should be given to activities in and around poor neighborhoods that generate waste and
- Piloting pay as you dump in the poor neighborhoods is another way of dealing with uncollected waste. The price for dumping should be subsidized. This will encourage neighborhoods to take charge of the waste pickings in the neighborhoods
- There is be constant research into the alternatives of WC in poor neighborhoods apart from using only the formal communal collection points.
- The municipal assemblies should encourage, enhance more community sensitization, and reassure more community participation in waste management activities. Waste management should not just be about waste picking but also education on the side effects and possible risk associated with indiscriminate dumping and UW

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8. Appendix

APPENDIX 2

Dear, Participant

I am a student of the Faculty of Geo-information Science and Earth Observation of the University of Twente. Who is conducting a research on variation in UW in low-income areas? In WA Municipality I, kindly request you through the filing of these questions to aid me understand and analyse these variation. The Information you will provide will be treated as confidential.

UW is Waste accumulation in open spaces, streets and dumped in unauthorized areas. These uncollected Wastes can be from several sources such as household solid Waste, Waste from commercial and industrial activities.

Demographic Information

1. Gender Male Female

2. Occupation

3. Name of neighbourhood

4. Educational level

Primary Secondary Tertiary others Specify

5. How long have you been living in this neighbourhood?

1-2 years 3-5 years 5-7 years 7-10 10 years and about

Nature and Risk of Uncollected Waste

6. What is the composition of this uncollected Waste?

.....
.....
.....
.....
.....

7. Which category does the UW in your neighbourhood belong?

i Uncollected and closer to houses ii) uncollected but at container collection point iii. Uncollected and on the streets iv. Uncollected in the drains

--



i



ii



iii



iv

8. On a scale of 1-3 which of the categories above is the severest in your neighbourhood? 1. Very polluted
2. Moderately polluted 3. Less polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted

9. What is the level of severity of UW in your neighbourhood?

- Large, wet, and smelly piles of UW
- Small but dry smelly piles of UW
- Large dry and odourless uncollected Waste
- Small, wet, and odourless UW
- Small dry and odourless UW

10. Where are these UW normally located in your neighbourhood

X... and Y.... Coordinates

11. Do you think the UW has an effect on your surroundings?

Yes No

12. If yes, what are some of the possible effects?

.....
.....
.....
.....
.....

13. If No, why do you think it is not a problem?

.....
.....
.....

14. Are you aware of other neighbourhoods in the municipality that this situation of uncollected Waste?

.....
.....

15. Comparing your neighbourhood to the others, which are worse off regarding uncollected Waste.

.....
.....
.....

16. Who is responsible for the UW accumulated in your neighbourhood?

.....
.....
.....

17. How do you suggest this problem of UW be solved?

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

SOURCES OF WASTE GENERATED

18. What is the composition of Waste that is generated from your daily activities?

Plastics Food Waste Paper Textiles Swept Sand Ashes others Specify

.....

19. How do you dispose of your Waste?

- Burning
 Bury Waste underground
 Deposit at WC points
 Dump in open Space
 If others specify

20. Where do you dispose of your Waste?

21. How regularly do you dispose Waste?

Daily twice-daily

22. Who disposes of the Waste?

.....

Waste Disposal Services available

23. What Waste disposal services are available in your neighbourhood?

.....
.....
.....

24 How will you rate the services provided by the WC agency in your neighbourhood?

Very Bad Bad Good Very Good Excellent

26. How satisfied are you with the services of the WC agency?

Very Dissatisfied Not Satisfied Not Sure Satisfied Very Satisfied

26. Will you pay Waste services to keep your neighbourhood clean of Waste?

Yes No

27. If yes How much are you willing to pay

If No Why

28. What is the distance between your house and where you dump your Waste?

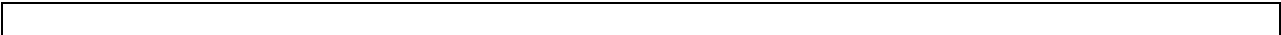
100 -200 300-400 500-700 800-900 1000 and Above

29. Does the distance affect you in deciding where to dispose of your Waste?

If Yes How.....

If No why

Thank you



APPENDIX 3

INTERVIEW GUIDE FOR SHOP OWNERS/STREET VENDORS.

Dear Participant

Dear Participant

I am a student of the Faculty of Geo-information Science and Earth Observation of the University of Twente. Who is conducting a research on variation in UW in low income areas. In Wa Municipality I kindly request you through the filing of these questions to aid me understand and analyse these variation. The Information you will provide will be treated as confidential.

UW is Waste accumulation in open spaces, streets and dumped in unauthorized areas. These uncollected Wastes can be from several sources such as household solid Waste, Waste from commercial and industrial activities.

- 1) Are you the owner of the shop
- 2) Gender Male Female
- 3) Are you a resident of the neighborhood
Yes No
- 4) If No, where do you stay
- 5) For how long have been operating the shop in the neighborhood
 1- 2 years 3- 5years 5- 7 years 7-10 10 years and about

Nature and Risk of Uncollected Waste

- 6) Are you aware of any UW in this neighbourhood?
 Yes No
- 7) If yes, where are these located?
Locations on Maps X..... Y..... coordinates
- 8) What are the compositions of the UW that is located within these areas?
.....
.....
.....
.....

9) Which category does the UW is applicable in your neighbourhood?



1



2



3



4

10 On a scale of 1-3 which of the categories above is the severest in your neighbourhood? 1. Very polluted 2. Moderately polluted 3. Less polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted



- 1 Very polluted
- 2 Moderated polluted
- 3 Less Polluted

11. What is the level of severity of UW in your neighbourhood?

- Large, wet, and smelly piles of UW
- Small but dry smelly piles of UW
- Large dry and odourless uncollected Waste.
- Small, wet, and odourless UW
- Small dry and odourless UW

12. Where are these uncollected Wastes located in your neighbourhood?

.....

.....

.....

13. Are you aware of other neighbourhoods in the municipality that this situation of uncollected Waste?

.....

.....

14. Comparing your neighbourhood to the others, which is worse off regarding uncollected Waste.

.....

.....

.....

--

15 Does this UW have any effect on your business?

Yes

No

16. If Yes How

.....
.....
.....
.....

17. Does the UW have effects on the environment in general?

.....
.....
.....

18. Who is responsible for the UW accumulated in your neighbourhood?

.....
.....
.....

19. How do you suggest this problem of UW be resolved?

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Waste Generation

20. What is the composition of the Waste you generate from your daily activities?

Paper Boxes Plastics Swept Sand Empty Cans Others Specify

21. How do you dispose of the waste generated?

Burning Bury underground Deposit at WC points Dump in open Space

Others

specify.....
.....

22. Where do you dispose of your Waste?

.....
.....
.....
.....

23. How regularly do you dispose Waste?

A. Daily B twice daily

24. Who disposes of the Waste?

.....
.....
.....
.....

Waste Disposal Services available

25. What Waste disposal services are available in your neighbourhood?

.....
.....
.....

26. What is the form of service they provide?

A. Communal collection points B. Door to Door Collection C. Sweeping off the streets

Others Specify

27. How satisfied are you with the services of the WC agency?

Very Dissatisfied Not Satisfied Not Sure Satisfied Very Satisfied

28. Are you registered member of Zoom lion Ghana Door to door services?

Yes No

--

29 Are you willing to pay waste to keep your environment off Waste

.....
 If Yes How much

If No why

Thank you

Table 8-1 Collections per Neighbourhood

Name of CCC	13 - Aug	13 - Sep	13 - Oct	13-Nov	13 - Dec	14 - Jan	14 - Feb	14 - Mar	14 - Apr	14 - May	14 - Jun	14 - Jul	Total CC	CCC Weight	Number of CCC	Total Tons
Kambili	24	22	17	19	16	17	24	24	16	28	29	13	249	60	3	44820
Konta	29	29	29	29	29	29	29	29	29	29	29	29	348	60	3	62640
Dokpon Wapaa ni	44	37	30	30	24	22	34	22	25	29	34	31	362	60	3	65160
Dobile Wapaa ni	13	22	41	45	41	39	39	31	24	33	18	29	375	60	3	67500
Dogu Residential	1	1	1	1	1	1	1	1	1	1	1	1	12	60	2	1440
Dondoli	6	1	3	5	0	2	1	3	3	0	5	1	30	60	2	8640
Kpaguri	12	12	12	12	12	12	12	12	12	12	12	12	144	60	2	17280
Kumbihei	14	12	15	15	14	15	11	5	16	14	17	3	151	60	2	18120
SSNIT	3	3	5	12	0	0	1	0	0	0	0	0	24	60	1	1440
Mangu	47	33	20	32	29	16	32	24	29	25	25	18	330	70	3	69300
Nayiri	57	60	48	64	66	41	58	41	65	40	43	35	618	60	4	148320
Zongo	14	13	17	13	8	3	16	12	6	10	10	7	129	60	1	7740
Sambo	0	0	0	0	0	0	0	0	0	0	0	0	0	60	0	0
Sokpayiri	44	32	31	34	25	12	48	32	16	31	34	17	356	60	3	64080

Notes

Dondoli RUW	15	19	22	17	16	10	15	25	16	15	18	12	200	60	3	3600 0
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Table 8-2 Waste Generations per neighbourhoods based on Monney et al., (2013)

Name of Neighbourhoods	Total Populations	Average HH size	Number of HH	Average Waste Cap Generated	Daily (tons)	Weekly (tons)	Monthly (tons)	Est (tons)
KAMBALI	4396	4	1099.00	0.071	77.81	544.66	2178.66	4046.08
KONTA A	11770	6	1961.67	0.071	138.89	972.20	3888.808	7222.07
WA-WAPANI	8837	6	1472.83	0.044	64.80	453.63	1814.53	3369.84
DOBILE WP LIMANYIRI	7819	6	1303.17	0.044	57.34	401.38	1605.50	2981.65
DOGU CHILDREN'S PARK	6755	4	1688.75	0.044	74.31	520.14	2080.54	3863.86
DONDOLI/RADIO UPPER WEST	4382	6	730.33	0.044	32.13	224.94	899.77	1671.00
KPAGURI	3271	3	1090.33	0.083	90.06	630.43	2521.72	4683.20
KUMBIEHE	1785	3	595.00	0.083	49.15	344.03	1376.12	2555.64
SSNIT	3477	3	1159.00	0.044	51.00	356.97	1427.89	2651.79
MANGU	3461	6	576.83	0.083	47.65	333.53	1334.10	2477.61
NAA YIRI	4886	6	814.33	0.044	35.83	250.81	1003.26	1863.19
SOKPAYIRI/ZO NGO	3487	6	581.17	0.044	25.57	179.00	716.00	1329.71
SOMBO	5650	6	941.67	0.044	41.43	290.03	1160.133	2154.53
TOTAL	69976				785.97	5501.76	22007.02	36824.11

APPENDIX 4

			How do you despose off waste				Total
			Burning	Bury	Deposit at Communal point	Dump in Open Space	
Lenght of operations	1-2 years	Count	1	0	2	0	3
		Expected					
		Count	.5	.5	1.8	.4	3.0
	3-5years	Count	3	0	20	2	25
		Expected					
		Count	3.8	3.8	14.6	2.9	25.0
	5-7years	Count	2	0	3	1	6
		Expected					
		Count	.9	.9	3.5	.7	6.0
	10 years and above	Count	3	9	10	4	26
		Expected					
		Count	3.9	3.9	15.2	3.0	26.0
Total	Count	9	9	35	7	60	
	Expected						
	Count	9.0	9.0	35.0	7.0	60.0	

Table 8-3 Crosstab of Severity of Locations of Uncollected Waste

				Which category do the UW in neighborhood belong to				Total
				Waste dumped behind homes	Waste dumped around the container	Waste dumped on the streets	Waste in Gutters	
On a scale of 1-3 which category and level of severity in your neighbourhood								
Very Polluted	Neighbourhood.	Dondoli	Count	6	52	3	6	67

Notes

				9.0%	77.6%	4.5%	9.0%	100.0%
		Sopkayiri	Count	11	39	4	6	60
				18.3%	65.0%	6.7%	10.0%	100.0%
		Dobile	Count	7	43	1	0	51
		Wapaani		13.7%	84.3%	2.0%	0.0%	100.0%
		Total	Count	24	134	8	12	178
				13.5%	75.3%	4.5%	6.7%	100.0%
Moderately polluted	Neighbourhood.	Dondoli	Count	1	12		0	13
				7.7%	92.3%		0.0%	100.0%
		Sopkayiri	Count	0	18		2	20
				0.0%	90.0%		10.0%	100.0%
				0.0%	54.5%		6.1%	60.6%
		Total	Count	1	30		2	33
				3.0%	90.9%		6.1%	100.0%
Less Polluted	Neighbourhood.	Dobile	Count	2	26	1		29
				6.9%	89.7%	3.4%		100.0%
			Total	Count	2	26	1	
				6.9%	89.7%	3.4%		100.0%
Total	Neighbourhood.	Dondoli	Count	7	64	3	6	80
				8.8%	80.0%	3.8%	7.5%	100.0%
		Sopkayiri	Count	11	57	4	8	80
				13.8%	71.3%	5.0%	10.0%	100.0%
		Dobile	Count	9	69	2	0	80
	Wapaani		11.3%	86.3%	2.5%	0.0%	100.0%	
		Total	Count	27	190	9	14	240
				11.3%	79.2%	3.8%	5.8%	100.0%



Figure 8:1 Waste Container with Stand



Figure 8:2 Waste Container without Stand

