ACCRA MUNICIPAL SOLID WASTE SECTOR REPORT

A Report by Resource Transformation Ghana Ltd for Pyro-degrade Energy

SUMMARY REPORT ON WASTE MANAGEMENT IN ACCRA, GHANA

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1. Introduction

The coastal city of Accra, the political and economic capital of Ghana, is in the Greater Accra Region. With a total area of 894 sq. km[1], the metropolis of Accra has a population of over 4.3 million inhabitants[2]. The city accounts for approximately half of the population of Greater Accra Region. According to 2010 census records, the city has a population density of 9,589/km^2 (or 24,836/sq. mi). Nonetheless, due to trends in migration from other parts of Ghana to Accra for economic opportunities, population growth is likely to continue for the foreseeable future.

Figure 1.1 Location of Accra[3]

Administratively, Accra encompasses eleven districts, including the Accra Metropolitan District, the central business district of the metropolis. The Accra Metropolitan District, administered by the Accra Metropolitan Assembly (AMA), comprises 10 sub-metropolitan district councils. Table 1.1 highlights both the districts of Accra and the sub-metro areas of the Accra Metropolitan District.

[1] https://www.graphic.com.gh/features/opinion/ills-of-accra.html
[2] http://www.citiesalliance.org/sites/citiesalliance.org/files/CB_Ghana_WEB.pdf
[3] https://cdn.ghanaweb.com/imagelib/pics/93668109.jpg

Table 1.1 Districts of Accra & the Sub-Metro Areas of the Accra Metropolitan District

Districts of Accra	Accra Metropolis District Sub-Metro Areas
Accra Metropolis District	Ablekuma Central
Ledzokuku-Krowor Municipal District	Ablekuma North
La Nkwantanang Madina Municipal District	Ablekuma South
Adenta Municipal District	Ashiedu Keteke
Ga East Municipal District	Ayawaso West
Ga West Municipal District	Ayawaso Central
Ga Central District	Ayawaso East
Ga South Municipal District	Okaikoi North
Kpone Katamanso District	Okaikoi South
La Dade Kotopon Municipal District	Osu Klottey
Ashaiman Municipal District	

Figure 1.2 Districts of Accra & the Sub-Metros of Accra Metropolitan District

Districts of Accra[4]

Sub-Metros of Accra Metropolitan District[5]

[4] https://en.wikipedia.org/wiki/File:Districts_of_the_Greater_Accra_Region_(2012).svg
[5] https://en.wikipedia.org/wiki/File:AMA_area_map.png

Largely due to the historical low priority given to sanitation by national and Accra authorities, municipal solid waste (MSW) service provision in Accra has been limited. With a few exceptions, Accra is, for the most part, a city that struggles with several sanitation issues, including MSW. For example, recent studies reveal that majority of the city's inhabitants still do not have access to a well-established waste collection service[6], whereas authorities have been slow to provide additional landfill sites to accommodate the waste generated in the city[7]. The sight of refuse in open drains is also another unfortunate fixture on the streets of Accra (Figure 1.3). Likewise, though organic waste represents a significant proportion of waste arisings in Accra, the execution of a concrete framework for the separate collection of organic waste for value extraction has been inadequate[8]. Due to these prevailing conditions, majority of Accra's inhabitants tend to be unsatisfied with the state of MSW service provision in the city. A survey carried out by the World Bank in 2010 revealed that 70% of residents in the Accra Metropolitan District considered the city to be either "dirty" or "very dirty"[9].

Figure 1.3 Garbage in an open drain in Accra

[6] https://www.globalcommunities.org/publications/2010-ghana-citizens-report-card.pdf
[7] https://www.graphic.com.gh/news/general-news/accra-compost-plant-to-become-waste-management-hub.html
[8] http://www.waste.ccacoalition.org/sites/default/files/files/city_fact_sheet/Accra_MSW_FactSheet_0.pdf
[9] https://www.globalcommunities.org/publications/2010-ghana-citizens-report-card.pdf

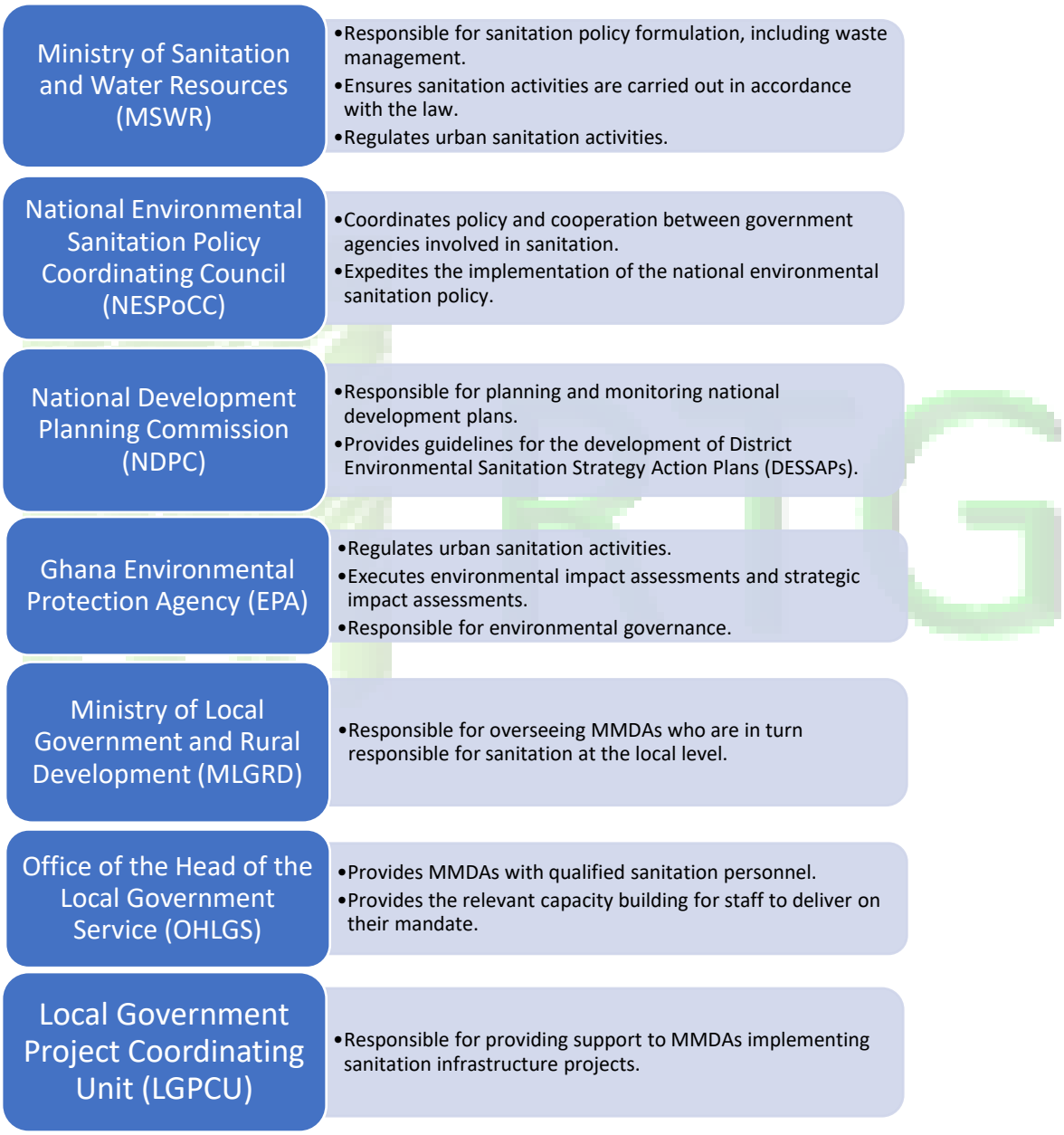
2. Accra Municipal Solid Waste Sector Stakeholders

Public Sector Stakeholders

National Level[10]

Figure 2.1 highlights the key national stakeholders in urban sanitation services and a summary of their respective functions.

Figure 2.1 National Sanitation Stakeholders

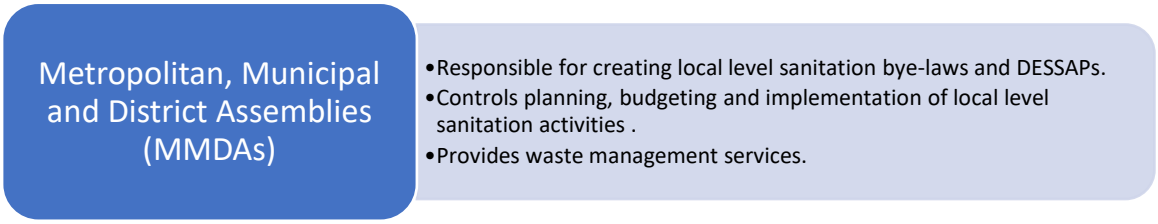


[10] The national government has indicated its intention to set up a new National Sanitation Authority to deal comprehensively with sanitation (Embassy of The Kingdom of The Netherlands, Accra 2018). The operations of the new body are to be financed through the introduction of a Sanitation Fund (http://citifmonline.com/2017/08/25/all-set-for-creation-of-national-sanitation-authority/).

Local Level

Figure 2.2 highlights the key local level stakeholder in urban sanitation services and their respective functions.

Figure 2.2 Local Sanitation Stakeholder



MMDAs are directly responsible for the provision of waste management services in Ghana for residential households and commercial establishments. These services are either provided by the MMDA or contracted to private sector operators. Usually, MMDAs consist of 5 entities that deal with waste management issues. These include the following:

- Waste Management Departments (WMDs)
  - Directly responsible for the execution and management of waste management services at the local level;
  - Monitors and evaluates the effectiveness of sanitation services; and
  - Sanctions private sector service providers that commit infractions against environmental standards according to service agreement provisions.
- Environmental Health & Management Department (EHMDs)
  - Provides Environmental Health Officers;
  - Monitors the environmental impact of MMDAs' waste management activities; and
  - Monitors and evaluates the effectiveness of sanitation services.
- District Works Department
  - Executes Works related to environmental sanitation facilities, in collaboration with EHMDs.
- Sub-metro, Zonal, Town and Area Councils
  - Provides sanitation education, cleansing, supervision of private sector service providers and fee collection at their respective levels.

The main sources of funding for MMDAs are the District Assembly Common Fund (DACF), the District Development Fund (DDF) and the Mineral Development Fund, all sourced from the central government, and the Internally Generated Funds (IGFs). DACF is the most importance funding source but its disbursement is often unpredictable and may undergo central government deductions. MMDAs are also partially funded through donor support.

Private Sector Stakeholders

The private sector waste management companies provide the provide bulk of environmental sanitation services in Accra. They are required to operate within the waste management policies, regulations and supervisory and licensing arrangements set up by the public sector; this is to facilitate efficiency and competition. The operations of private waste management companies must also be in accordance with the laws of Ghana and the Public Procurement Act.

Waste management companies in Accra are involved in franchise waste collection contracts. They engage in either door-to-door collections or communal collections. The respective MMDAs contracting the private operators are responsible for supervising and setting fees/tariffs. They are also responsible for the cleansing of designated areas and facilities (e.g. markets) and maintenance of drains, under the agreements covering solid waste collection. Private operators also provide waste treatment, recycling and disposal services, transfer stations and bulk waste transfer to disposal sites. These operations are carried out under either contract, franchise, concession, BOT, BOO, BOOT or other arrangements.

Informal Waste Sector Stakeholders

The informal waste sector stakeholders play a prominent role in Accra's waste management, largely due to the prevalence of low-income areas in the city. They provide a low-cost waste management option for many service users who cannot afford the formal waste collection services. Though a diverse sector, the informal waste sector largely consists of the following types of participants:

- Dumpsite waste pickers;
- Itinerant waste pickers;
- Scrap metal collectors;
- Informal Bottle collectors ("Korli Bas"); and
- Waste recycling enterprises.

Dumpsite waste pickers operate at private dumpsites, collecting waste materials of value, mainly metals and plastics. The extracted waste materials are sorted and sold to merchants who in turn sell to private metal and plastic manufacturing businesses in and around Accra. Recovered plastic bottles also sold for re-use.

Itinerant waste pickers, also known as "Borla taxis", provide waste collection services in mainly low-income areas at a cost of ($0.20) for daily collection. They operate using load carts and tricycles.

Scrap metal collectors are mostly based at Agbogbloshie, a slum located in central Accra. Using hand-drawn carts, they move around Accra looking for scrap metals and WEEE. The recovered metals are sorted and sold to local manufacturing businesses (e.g. metal refineries, jewellery manufacturers and cook-ware manufacturers) or exported. The scrap metal collectors also have a union - Greater Accra Scrap Dealers Association (GASDA).

Bottle collectors ("Korli Bas") are involved in the collection of plastic and glass bottles used for packaging beverages. They engage in door-to-door purchasing of bottles from households and small businesses. The recovered bottles are sorted, cleaned and sold or re-use by vendors of palm oil and other agricultural products.

Waste recycling enterprises engage in the reprocessing of recovered plastics and metals in Accra.

Community-Based Organisations & Non-Governmental Organisations

There are currently about 50 (small and large) NGOs working in Ghana's sanitation sector, as well as many CBOs. These organisations are usually involved in the provision of informal or semi-formal waste management services and facilitate community mobilisation. They also provide communities across the nation with much needed training on waste management solutions, as well as assist MMDAs in planning, funding and development of community sanitation infrastructure for safe disposal of waste.

3. Municipal Solid Waste in Accra – Waste Flow Overview

Figure 3.1 Process Flow Diagram for Municipal Solid Waste in Accra (2017)

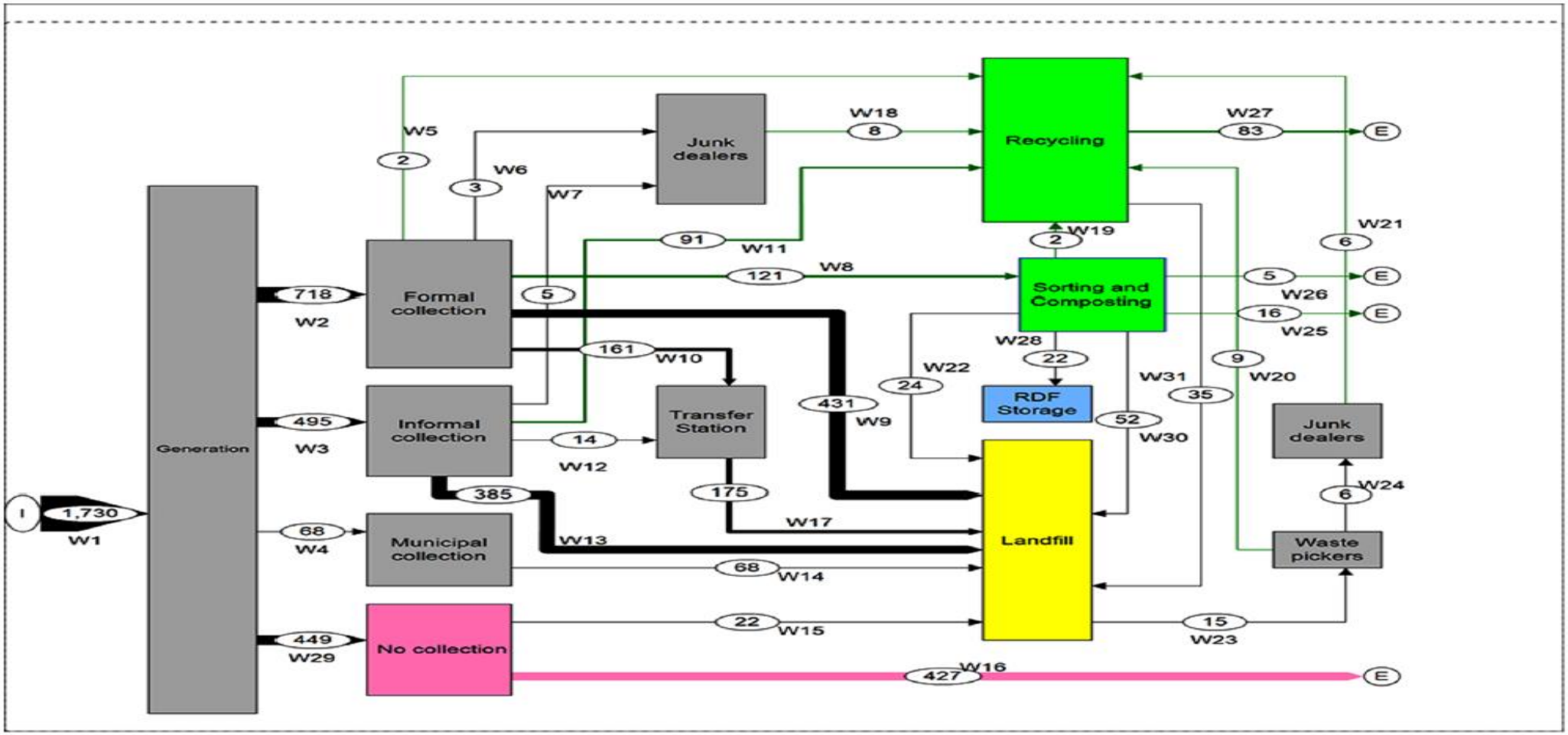


Figure 3.1[11] highlights a simplified overview of Accra's municipal waste system by Oduro-Appiah et al (2017). There are four main ways by which generated waste is managed in the city in relation to collection. These are:

- Formal collection
  This refers to waste collection services provided by the private sector through franchise collection contracts tendered by the MMDAs. Formal collection accounts for 41.5% of generated MSW.
- Informal collection
  This refers to the waste collection services by the informal waste sector, usually without the approval of the MMDAs. Informal collection captures approximately 28.6% of generated MSW.
- Municipal collection
  This refers to the waste collection services provided directly by the MMDAs. It accounts for 3.9% of generated MSW.
- No collection
  Approximately 26% of the MSW generated in Accra is not captured by either of the three collection avenues. According to Oduro-Appiah et al (2017), a tiny fraction of the non-collected MSW (which accounts for 1.3% of generated MSW) ends up in landfills. The rest (i.e. 24.7% of generated MSW) usually finds its way into the city's drainage systems, water bodies or illegal dumpsites, is burned or is managed through other illegal means.

Accra relies on four main waste treatment and disposal options for managing the 74% of MSW captured by formal, informal and municipal collections. These are landfill disposal, recycling, composting and energy recovery.

Landfill Disposal

Landfill disposal is the most dominant means of waste disposal for the city of Accra; according to Oduro-Appiah et al (2017), 68.9% of Accra's MSW is diverted to landfills. Of the total waste captured by the three main collection avenues, 91.3% is diverted towards landfill disposal.

Table 3.1 provides a percentile breakdown of the sources of landfill disposal inflow based on received tonnages.

[11] Oduro-Appiah et al. 2017. Assessment of the municipal solid waste management system in Accra, Ghana: A 'Wasteaware' benchmark indicator approach.

Table 3.1 Landfill disposal feedstock sources

Landfill Feedstock Sources	
Formal collection	49.7%
Informal collection	33.5%
Municipal collection	5.7%
"Non-collected" MSW	1.8%
Formally collected MSW rejected from recycling, composting or energy recovery after MRF treatment	9.3%

It must be noted that 1.2% of the MSW diverted to landfills are recovered by informal waste pickers for recycling.

Recycling

6.8% of the MSW generated in Accra ends up as feedstock for recycling. Of the total MSW collected by formal, informal and municipal means, only 8% is recycled.

Table 3.2 provides a percentile breakdown of the throughput sources for recycling based on received tonnages.

Table 3.2 Recycling feedstock sources

Recycling Feedstock Sources	
Formal collection	5.9%
Informal collection	81.4%
Recovered from Landfill	12.7%

Composting and Energy Recovery

According to Oduro-Appiah et al (2017), the throughput for composting and energy recovery is sourced solely from formally collected MSW. 2.9% and 3.1% of formally collected MSW is composted and used to produce refuse derived fuel (RDF) for energy recovery, respectively. Relative to the total amount of MSW generated in Accra, composting and energy recovery account for 1.2% and 1.3%, respectively.

4. Accra Municipal Solid Waste Sector Features & Infrastructure – Waste Generation

Accra - Demography

Key demographic information relating to waste generation in Accra include the following[12]:

- Accra has a population of over 4.5 million[13];
- The city is likely to have approximately 500,000 houses, as of 2018[14];
- These dwellings are likely to provide housing for around 1,200,000 households[15];
- There is a reasonable likelihood that the average number of households per house and the average household size are 2 and 4, respectively; and
- Accra's population is highly literate – estimate for 2018 is 91% of persons 11 years or older – mostly in English and/or one of the numerous local languages[16].

Municipal Solid Waste Arisings

Accra generates approximately near 7,000 tonnes of municipal solid waste a day. The tonnage of MSW generated in Accra has increased three-fold over the last two decades primarily due to population growth, increased urbanization and improved lifestyles[17].

Generation Rate[18]

A waste audit by Miezah et al. (2015) revealed that Accra had a per capita MSW generation rate of 0.74 kg/day. Table 4.1 highlights MSW generation rates across the different income areas of the city. There is a positive correlation between income levels in Accra and MSW generation rates.

Table 4.1 Accra's MSW Generation Rates Across the 3 Income Areas[19][20]

MSW Generation Rate (kg/person/day)		
High Income Area	Middle Income Area	Low Income Area
0.86	0.73	0.62

As different types of MMDAs make up the city of Accra, it is also important to ascertain the waste generation trends within the different types of local authorities. This is indicated in Table 4.2 which also provides a breakdown along the waste components. The higher waste generation rate values for metropolitan local authorities are largely due to the prevalence of greater economic activities and affluent lifestyles in comparison to municipal and district local authorities.

[12] The data provided should be considered rough estimates based on Accra's most recent census in 2010.
[13] Assuming an annual growth rate of 2.4%.
[14] Assuming an annual growth rate of 2.4%.
[15] Assuming an annual growth rate of 2.4%.
[16] Twi and Ga are likely to most common local languages in Accra. Also, literacy in English does not necessarily connote comprehension, especially in lower income areas.
[17] Kusi et al. 2016. Landfills: Investigating Its Operational Practices in Ghana
[18] **Details of waste generation rates in Ghana across different income levels by waste categories can be found in the main report (p.56).**
[19] Miezah et al. 2015. Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana.
[20] Very few areas in Accra can be classed as consisting of only one type of economic class. In many middle-income areas, for example, one may also find both high and low-income households.

Table 4.2 Generation Rates Across the Different MMDAs[21]

Waste Materials	Household MSW Generation Rate		
	Metropolitan	Municipal	District
Organic	0.376	0.249	0.172
Paper	0.036	0.019	0.011
Plastic	0.079	0.041	0.063
Metal	0.02	0.011	0.009
Glass	0.017	0.009	0.007
Leather and Rubber	0.007	0.004	0.002
Textile	0.012	0.005	0.002
Inert	0.048	0.027	0.004
Miscellaneous	0.033	0.028	0.007
Total - MSW Generation Rate	**0.628**	**0.393**	**0.277**

Composition[22]

According to Oduro-Appiah et al. (2017), the four main waste categories found in Accra's MSW arisings are organic waste, plastic waste, paper and cardboard waste and metals. Table 4.3 highlights the compositional representation of MSW materials generated in Accra. Organic waste accounts for the largest proportion of MSW in Accra, a feature common in many emerging economies. At a distant second place is plastic waste.

Table 4.3 Accra's Aggregate MSW Composition[23]

Waste Material	Household MSW Composition[24]
Organic	65.8%
Paper	5.3%
Plastic	10.4%
Metal	3.1%
Glass	2.8%
Leather and Rubber	2.1%
Textile	2.0%
Inert	5.2%
Miscellaneous	4.1%

[21] Miezah et al. 2015. Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana.

[22] **Details of MSW Composition in Ghana by Income Levels and waste categories can be found in the main report (p.59).**

[23] Miezah et al. 2015. Municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana.

[24] Weight-based

Chemical/Physical Characteristics

Important chemical and physical characteristics identified from Accra's MSW include:

- Calorific value ranging between $1.39 \times 10^4 – 2.99 \times 10^4$ kJ/kg;
- Moisture content ranging from as low as 25% to as high as 76%;
- Ash content ranging from 2.2% – 19%;
- A volatile solid range from 31% – 88%;
- An average bulk density of $5.3 \times 10^2 – 5.4 \times 10^2$ kg/m^3; and
- A carbon-nitrogen (C:N) ratio ranging from 37:1 – 100:1.

According to Miezah et al (2015), the relatively high levels of moisture in Accra's MSW makes it ideal for use as feedstock in biological conversions. However, this same feature also creates a barrier for energy recovery unless efforts are made towards increasing source segregation to isolate organic waste.

Profiles of Waste Materials

Biodegradable only

- Organic Waste
    - Examples: Food waste, yard/garden waste, wood and animal droppings/manure
    - Mostly consists of food waste (which accounts on average 79% of organic waste and 48% of MSW)
    - Yard/garden waste accounts for the second largest fraction of organic waste

Biodegradable and Recyclable

- Paper and Cardboard
    - Examples: Newspaper, office print, tissue paper, cardboard/packaging paper
    - Cardboards/packaging paper accounts for the highest fraction – 60% of paper/cardboard waste and 3% of MSW.

Non-biodegradable and Recyclable[25]

- Plastics
    - Examples: Plastic film/LDPE, PET, HDPE, PP Rigid, PS, PVC, Other plastics
    - Largest fraction of MSW in terms of volume
    - The most prevalent plastic waste types (in descending order) are plastic film/LDPE (4% of MSW), HDPE (3% of MSW), PET (3% of MSW) and PP (1.4% of MSW) [NB: weight-based]
    - Plastic film/LDPE is used mostly in food packaging; due to high levels of contamination from food waste, plastic film/LDPE has the highest fraction as per weight.
- Metals
    - Examples: Scrap metal, Can/tins
- Glass/Glass bottles

[25] There is limited information on the features in Accra's MSW for leather & rubber and textiles.

- Examples: Coloured, plain

Non-biodegradable only

- Miscellaneous Waste
  - Examples: Construction and demolishing waste, batteries, paints, etc.
  - Low-income areas tend to have the highest levels of miscellaneous waste.
- Other
  - Examples: Sand, fine organics, ash.
  - Low-income areas tend to have the highest levels of inerts.
  - A potential source of inerts is dredged storm drains in households.

Commercial Waste

Largely due to a lack of prioritisation by local authorities, there are no reliable statistics on commercial solid waste arisings in Accra. Additionally, the joint collection of commercial and household waste in Accra further complicates efforts to ascertain trends in commercial waste arisings from available MSW data. Hence, for the purposes of this paper, it is assumed that the household MSW trends above also apply to commercial MSW.

Industrial Waste

As local authorities are not mandated to provide waste collection services for industrial waste[26] and no efforts have been made to collate industrial solid waste data, there are no reliable statistics on industrial waste arisings in Accra.

[26] According to ESP 2010, "industrial houses shall undertake or arrange for the conveyance of their wastes to an approved disposal site."

5. Accra Municipal Solid Waste Sector Features & Infrastructure – Waste Collection

According to Oduro-Appiah et al (2017), Accra is well below some other lower middle-income cities regarding sustainable modernisation of solid waste services. As of 2017, the city's MSW collection coverage was 75%. There are three main types of MSW collection ongoing in Accra:

- Formal collection;
- Municipal collection; and
- Informal collection.

Formal Collection

Franchise Collection Contracts

As part of measures to improve MSW collection coverage in Accra, formal waste collection has been provided through 5-year franchise contracts allocated to waste management companies by local authorities in Accra under a fee- and performance-based strategy. Each franchise contract represents a specific collection zone. According to Oduro-Appiah (2017), waste collection services have been franchised to eight waste management companies in Accra.

This strategy, commencing in 2011, was introduced to improve primary collection coverage, as well as shift the responsibility for fee collection to the private sector. The local authorities, however, retain key control functions – setting user charges, improving legislation, regulation and enforcement, and monitoring and evaluation of collection services. Table 5.1 highlights the obligations that must be adhered to by the franchise contract holder and the municipal authority awarding the franchise contract.

Table 5.1 Franchise Contract Obligations

Franchise Contractor Obligations	Municipal Obligations
Register all service users	Inspect collection vehicles every two years
Supply 240L bins to service users for free	Promulgate and enforce byelaws to prevent unauthorised MSW collectors
Collect MSW two times a week	Enforce byelaws to make MSW of generators available to formal service providers
Educate service users on collection strategy	Educate public on MSW policies and collection strategy
Maintain clean sanitary sites	Assist providers to register and validate service users
Increase primary coverage and reduce secondary coverage to zero	Ensure service providers have access at all times to disposal sites
Collect approved fees from all waste generators/service users	Undertake monitoring to ensure maximum performance
Respond to complaints from service users within 24 hours	Sanction service providers who do not perform satisfactorily
Maintain at all times a functional office within the assigned area of work	

The franchise agreement allocations are based on the capacity of the waste collection companies in terms of equipment and personnel[27]. Once the allocations are agreed upon, waste collection companies are given monopoly over their areas of jurisdiction. Hence, no other registered operators can compete within the allocated area.

Types of Formal Franchise Collection Services

Typically, a franchise contract holder in Accra provides 2 types of MSW collection services: door-to-door collections only or a combination of door-to-door and communal (secondary) collections.

Door-to-Door Collection

Door-to-door collection services are generally found in high income and some middle-income areas in Accra.

Key features of door-to-door collection services in Accra include:

- Collection of MSW from households using refuse collection vehicles;
- Service users pay user charges directly to the waste management company on a weekly or monthly depending on the agreement with the latter;
- Service users are provided with waste containers and provided information on collection frequency; and
- Cross-subsidised per month user charges (2017) are set at $35, $20 and $50 for high and middle-income areas, and commercial users, respectively.

Formal door-to-door collection services are generally of higher quality in comparison to formal communal collection services. This is largely due to two key factors:

- Access to good road networks in these areas; and
- Dominance of housing arrangements that are convenience for door-to-door collections; and

Communal Collection

Communal collection in Accra involves the allocation of sites with large skip containers for the secondary collection of MSW. Residents in the locality where a communal collection site is located are expected to present their MSW in plastic sacks/bags or dustbins for direct disposal into the skip containers. The city's communal collection sites are predominant in low-income areas.

Some important features of communal collection services in Accra include:

- Communal collection sites are managed are local authorities;
- Skip containers are provided by the waste management companies;
- Local authorities are responsible for paying the waste management companies for communal collection services;
- Communal collections do not have a fixed collection frequency as skips are collected as and when they become full;
- Users of the communal collection service may be required to pay a disposal fee; and

[27] Raymond Acquah 2015. Towards a Zero Waste – Assessing Solid Waste Management in the Ledzokuku Krowor Municipal Assembly in the Greater Accra Region, Ghana.

- Some local authorities provide residents with waste bins to facilitate the transportation of MSW from households to the collection sites.

Communal collection services are generally of lower quality. This has been linked to a number of obstacles:

- Poor accessibility to collection sites for residents due to inappropriate siting;
- Insufficient supply of skip containers by waste management companies;
- In ability of local authorities to regularly meet their financial obligations to the waste management companies;
- Service user behavioural challenges pertaining to the appropriate use of waste bins and disposal of MSW at collection sites; and
- Infrequent collection of skips by waste management companies leading to odour nuisance and limited site collection capacity.

Waste Management Companies

Table 5.2 highlights a sample of the major waste management companies operating in Accra.

Table 5.2 Major Waste Management Companies in Accra

Waste Management Companies	Website
Zoomlion Ghana Ltd	http://www.zoomlionghana.com/
Jekora Ventures Ltd	http://jekoraventures.com/
J. Stanley Owusu & Company Ltd	http://www.jstanleyowusu.com/
Meskworld Ltd	N/A
Liberty Waste Ltd	N/A

Zoomlion Ghana Ltd, the largest waste management company in Ghana, tends to get a greater share of allocated operational zones in Accra due to its comparative advantage in relation to equipment and personnel.

Profile of Jekora Ventures Ltd

Jekora Ventures Ltd is a Ghanaian-owned waste management company with 30 refuse collection vehicles and over 195 employees[28]. The company currently has franchise monopoly over 3 operational zones in the following areas:

- Osu Klottey sub-metro (within the Accra Metropolitan Assembly);
- Adentan Municipal Assembly; and
- La Dade Kotopon Municipal Assembly.

These operational zones cover a total service area in Accra of approximately 15km^2.

The company's services comprise in Accra:

- Solid waste collection;
- Recycling;
- Green products (i.e. Compost production in 2 facilities);

[28] Jekora Ventures 2017. Waste Segregation at Source and Green Products – the Jekora Experience.

- Public toilet management;
- Equipment rental; and
- Education and sensitization.

Jekora Ventures Ltd actively engages in segregated waste collection; according to its records, this initiative leads to the source-segregation of 150m^3 per month of organic waste.

The company provides commercial waste collection services to businesses within its assigned operational zones. Its commercial waste service comprises the following features:

- Flexibility over collection frequency;
- Containers for temporary waste storage (Bins – 120L/240L/1100L; Skips – 7m^3 to 30m^3); and
- Commercial clientele consists of an array of businesses including restaurants, fast food joints and food markets.

Municipal Collection

Local authorities in Accra still engage in MSW collection, though their role has been significantly diminished due to the entry of the private sector. These waste collection services tend to target public spaces (e.g. traditional food markets), street cleansing and other areas neglected by the waste management companies. Hence, municipal collections are communal collections without any private sector participation.

Informal Collection

Accra, like many developing world cities, relies significantly on informal waste collection. Informal waste collectors in Accra usually comprise of persons that dropped-out of school during their primary or secondary education, as well as unemployed graduates. Informal collection is a major source of livelihood for residents in low-income areas. This service has contributed to recent improvements in MSW collection coverage in the city; according to Oduro-Appiah et al. (2017), the 25% increase in coverage witnessed between 2011 and 2016 was largely due to the informal waste collectors.

Informal collection has proven to be popular in Accra due to the following factors:

- Informal waste collectors set affordable user charges, relative to those set for formal collections, making their services particularly ideal for low-income areas.
- Due to lower operational costs and higher labour intensity, informal collectors can deliver more frequent collections. This is beneficial for residents with limited temporary storage capacity and residents faced with infrequent formal collections.
- Informal waste collectors provide personalised services, as many are usually anchored in the communities in which they operate.
- The low-tech implements used for informal collection enables easier access to low-income and some middle-income areas.
- Informal waste collection also provides job opportunities for residents in low-income areas.

Types of Informal Collection

The informal waste collection sector in Accra is diverse, providing different types of services:

- Informal Micro-collectors ("Kaya borla")

These are informal waste collectors that typically operate tricycle collection units for MSW collection of waste across the city. They provide their services, for a fee, to all income areas in Accra. Their patronage by some residents in high- and medium-income areas is driven by concerns over collection frequency by formal waste collection companies.

- Scrap Metal Collectors

They collect scrap metal and WEEE, for a fee[29], from shops and households all over the city using self-assembled, hand-drawn carts made of wooden boards and used car axles. The collected metals and WEEE are sorted, weighed and sold to metal refineries, jewellery manufacturers, and cook-wear manufacturers, sold to buyers from Asia. Many scrap metal collectors in Accra belong to a self-maintained union, GASDA.

- Informal Bottle Collectors ("Korli Bas")

They engage in the collection of glass and plastic bottles used for packaging beverages. These items are purchased from households and commercial establishments and are eventually deposited at collection points located in Accra's low-income areas. Here, the bottles are sorted, cleaned and sold for reuse by local bars, street food vendors and traditional vegetable oil processors.

- Landfill Waste Pickers

A special form of waste collection occurs at landfills whereby waste pickers metals, notably aluminium, copper, and zinc, and different types of plastic. The recovered materials are sorted, weighed and sold to merchants who sell the goods to private metal and plastic manufacturing businesses in and around Accra. The materials recovered from landfills are generally lower in value than waste retrieved at the source by collectors in the city due to higher levels of contamination.

Impact of Informal Collection on Franchise Contract Service Providers

The operations of informal waste collectors in Accra raise a number of concerns for waste management companies and city authorities. Firstly, the presence of informal micro-collectors in high and middle-income areas designated as franchise zones infringes upon the privileges of franchise contract holders. Additionally, by servicing clients in franchise zones, informal micro-collectors reduce the revenue generation for franchise contract holders. Local authorities also find the operations of informal waste collectors in Accra problematic because many do not pay taxes.

[29] Okolo 2013. E-waste management in Accra: Examining informal workers and informal-formal linkages for sustainable recycling.

6. Accra Municipal Solid Waste Sector Features & Infrastructure – Waste Treatment & Disposal

Landfill Disposal

Accra, like other cities in developing countries, relies heavily on landfills for MSW treatment and disposal. Currently, 62% of MSW from Accra ends up being landfilled. The city has neither any controlled nor sanitary landfills and relies on sites on its outskirts. There are two controlled landfill sites in Kpone and Abokobi. However, within the city, there are numerous informal dumpsites.

Relevant information pertaining to Accra's controlled landfill options include the following:

- The landfill sites accept MSW from both waste management companies and informal micro-collectors;
- Waste management companies charged US$6/t for waste disposal at the two controlled landfills[30];
- Informal micro-collectors are charged US$2 for waste disposal at the controlled landfills;
- Minimal material recovery occurs at the landfill sites, carried out by landfill waste pickers; and
- The siting, construction, operation and closure of controlled landfill sites in Ghana are governed by the guidelines set out in the EPA manual for landfills.

Kpone Landfill

The Kpone Landfill was constructed in 2013 as a sanitary landfill by Zoomlion Ghana Ltd but is currently functioning at the level of a controlled facility. The site is located at Kpone, a community 30 km from Accra metropolis. The Kpone Landfill has a design capacity of 500 tonnes per day; the site, however, receives more than 1000 tonnes of MSW daily. The facility operates two shifts – daytime and night-time[31]. To facilitate the recording of waste data, the Kpone Landfill operates a weighbridge that tracks the weights of MSW deposited by waste trucks; weight data on the waste presented by informal micro-collectors are however not captured by the weighbridge system. Due to the presence of gravelled primary and secondary access roads, thereby providing good traction to the waste trucks, the Kpone Landfill site is generally accessible all-year round.

Abokobi Landfill

The Abokobi Landfill receives 363 tonnes of MSW daily. The facility operates an 8-hour service from 8am-5pm. Unlike the controlled landfill in Kpone, the Abokobi Landfill does not have a weighbridge; the weights of loads are recorded manually by site supervisors before disposal. Access to the landfill is difficult during the rainy season.

[30] The charge represents 50% of their explicit operating costs, with the remaining amount subsidised by local authorities.
[31] 7am-5pm and 7pm-6am

Recycling

The city of Accra only recycles 5% of its MSW; recycling takes place in the private formal and informal sector, with captured recyclables ending up in commercial value chains. The main MSW materials captured for recycling include:

- Plastics;
- Non-ferrous metals (particularly aluminium cans);
- Ferrous metals;
- WEEE and
- Paper.

The main stakeholders involved in the supply of MSW materials for recycling are the informal and formal waste collectors. An umbrella organisation of plastic manufacturing companies based in the city also engage in plastic waste collection for reprocessing.

Sources of Recyclable Materials

Informal waste collectors capture recyclable materials directly from households and commercial establishments, as well as from landfill sites. They are by far the largest contributor towards Accra's recycling rate. They are particularly dominant in the collection and provision of ferrous metals for Accra's metal industry.

Formal waste management companies operating in Accra lag their informal counterparts in capturing recyclable materials for the local recycling industry; usually all the collected MSW ends up in landfills. Two companies, however, that engage in material recovery are Jekora Ventures and Zoomlion. Jekora Ventures contributes 2T of paper and plastics to the recycling industry through an innovative source separation programme within its franchise area. Zoomlion operates the Accra Composting and Recycling Plant (ACARP)[32], where mixed MSW collected by the company is segregated to isolate recyclable materials.

Not all the recyclable materials recovered by both the formal and informal collectors are sent directly to reprocessors. Some are sold to junk dealers and waste material merchants who in turn sell the recovered materials to reprocessors, after some degree of preliminary processing. For example, formal and informal collectors in Accra are responsible for selling approximately 8T of recovered plastics and aluminium cans to junk dealers for onward delivery to recycling industries. Though some of the junk dealers cooperate with waste brokers that sell their product on the world market, majority of their output ends up in the local reprocessing industry[33].

Stakeholders in the local recycling industry also engage in material recovery in Accra. An umbrella organisation of plastic manufacturing companies in Accra run a collection programme that captures recyclable plastics from strategic markets and shopping malls[34]. According to Oduro-Appiah, this

[32] The facility is located at Adjen Kotoku, about 40 km north of Accra, operates under public–private partnership (PPP) arrangement and receives a government subsidy, comparable with that received for disposal sites (http://acarpghana.com/)

[33] Laura Houber 2010

[34] In an informal conversation with Professor George Owusu (director for the Centre for Urban Management Studies at the University of Ghana), it was brought to my attention that some plastics manufacturers engage in the collection of damaged hard plastic products (e.g. recreational chairs) in exchange for new plastic products. The scale of this initiative was, however, unknown.

collection programme, combined with the collection of paper and plastics by the informal sector, contributes 91T per day of recovered recyclable material for reprocessing.

It must be noted, however, that the quality of the recyclable material recovered in Accra is relatively poor. Approximately 30% of all materials collected for recycling are rejected during processing and eventually disposed at landfills.

Reprocessing Industry[35]

Accra has a small but vibrant industrial sector. Both the neighbouring city of Tema, only 15 miles away, and Accra are the main centres for industrial production in Ghana. Hence, these cities are major end markets for recovered recyclable materials from Accra's MSW. The end users of recovered recyclables from Accra comprise of:

- Plastic manufacturers;
- Metal refineries, jewellery manufacturers, and cook-wear manufacturers; and
- Paper manufacturers.

Plastics Recycling in Accra

Accra's recycling sector is notably very small, with most stakeholders engaging in small-scale operations. It is largely unstructured and unregulated – there are no regulations that stipulate the way plastic recycling should be carried out nor established authorities that plastic recycling companies must report to. The plastic products usually recovered from MSW for recycling comprise of plastic films (e.g. polythene bags), plastic bottles and other plastic packaging products. The plastic film and other packaging products tend to be made from either HDPE, LDPE or PS; the plastics bottles are usually PET.

The recycling sector in Accra is split into two general niches – formal and informal. The formal section consists of privately-owned recycling companies with large capital investments in their facilities and are situated in the industrial areas of Accra. These companies typically reprocess recovered plastic products made from HDPE, LDPE and PS i.e. carrier bags, sachet water bags and other soft plastic packaging. According to Addei (2016), formal recycling companies in Accra receive approximately 1T per day of recovered plastic waste from their suppliers - informal waste collectors and formal waste companies. Recovered plastics obtained from these suppliers usually have relatively high levels of contamination, therefore requiring washing prior to reprocessing. Formal recycling companies also receive recovered plastic waste from industrial sources (i.e. automotive industries, construction firms and electrical industries). Industrially sourced recovered plastics are usually of relatively low contamination; they also provide higher feedstock volumes when compared with feedstock from informal waste collectors and formal waste companies.

The informal plastics recycling sector comprises numerous small businesses that do not have as much capital as compared to those in the formal sector. Due to limited access to capital most have small-scale operations. Informal plastics recycling businesses reprocess the same types of plastics as their formal counterparts. However, they also engage in preliminary processing of PET bottles[36].

[35] There are limited online resources providing information on the relationship between industry in Accra and Tema and recovered recyclables from Accra's MSW.
[36] PET bottles recycling is not currently pursued by the formal sector due to high technology costs.

Informal plastics recycling businesses typically obtain their feedstock from informal waste collectors, as well as industrial sources.

Formal reprocessing of recovered plastics by stakeholders in Accra consists of the following stages: sorting, washing, agglomeration (i.e. thermal treatment) and pelletizing. PET bottles are washed, crushed and bagged by informal plastics recycling businesses. A tonne of non-PET recovered plastic pellets sells for about GHS3000 ($789)[37]; whereas some stakeholders export the pellets to markets in Europe and Asia, others use them in-house to produce plastic products e.g. plastic films. Crushed PET bottles are exported to China for higher level reprocessing[38].

Ferrous Metal Recycling in Accra

Ferrous metal recycling in Accra is primarily led by the informal sector. Scrap metal collectors sell recovered ferrous metals to dealers who in turn sell the materials to either local steel mills based in Accra and Tema or metal waste exporters[39]. Ferrous metal scrap is recycled by the local steel mills into iron rods and other steel material (e.g. nails) for the Ghanaian construction sector. Due to limited reserves of iron ore in Ghana, there is a high local demand for recovered and recycled ferrous metals.

WEEE Recycling in Accra

The recycling of WEEE in Accra is solely carried out by informal dismantlers; they recover valuable components such as metals (e.g. aluminium, copper and iron), plastics and circuit boards using tools like hammers and chisels[40]. They also burn cables to extract the copper wires inside. Accra's informal dismantlers are mostly based in the Agbogbloshie scrap yard. They obtain their supply of recovered WEEE from informal scrap metal collectors who provide collection services to households and commercial businesses. The recovered metals are sold to dealers who trade in these materials and distribute them to various channels for sale to manufacturing companies or for shipment abroad[41]. The recovered circuit boards are sold to computer firms based in Nigeria for re-use in newly assembled computers[42]. Additionally, the recovered plastics are sold to local plastics recyclers.

Composting

Accra has a very small market of organic waste composting stakeholders. Currently, there are at least three operational composting facilities in Accra, run by entities such as Zoomlion Ghana Ltd and Jekora Ventures Ltd. Open windrow composting is the sole composting technology used in Accra based on its relatively lower cost and technical requirements in comparison with other composting technologies such as in vessel composting (IVC)[43].

[37] In 2016

[38] With the introduction of restrictions on the importation of recovered PET bottles by the Chinese government, there is a strong likelihood that the informal sector has been negatively affected, with the degree dependent on the availability of alternative international markets.

[39] CHF International 2010. Value chain analysis of solid waste management for youth engagement in service delivery (YES) program in Accra.

[40] Okolo 2013. E-waste management in Accra: Examining informal workers and informal-formal linkages for sustainable recycling.

[41] Non-ferrous metals are sold to cable manufacturing companies.

[42] CHF International 2010. Value chain analysis of solid waste management for youth engagement in service delivery (YES) program in Accra.

[43] Commander 2011

Composting of organic waste in Accra is particularly advantageous due to some prevailing factors:

- Compostable (or organic) waste tends to account for 55-65% of MSW generated in Accra[44];
- MSW tends to have a high moisture content, averaging 40-60% by weight;
- Very conducive climatic conditions due to the high temperatures in Accra that tend to vary between 21°C to 32°C and can reach as high as 38°C[45]; and
- Composting is preferred to dumping organic waste at either engineered landfills or unregulated dump sites – landfills generally require a larger footprint unlike composting plants thereby making it particularly more difficult to secure appropriate sites for their construction. Furthermore, depositing organic waste at landfills raises the environmental concerns over leachate, as well as odour and health concerns.

Nonetheless, the following factors have been responsible for the slow pace of growth in Accra's composting sector:

- Organic waste in Accra tends to have high values of carbon and nitrogen (C:N) ratios, usually falling between 27:1 and 100:1[46];
- Restrictive access to investment capital for composting infrastructure;
- Social acceptance and acknowledgement of the benefits of composting is limited;
- Weak regulations and enforcement of organic waste segregation leading to majority of organic waste ending up at landfills. This in turn leads to high volumes of leachate being generated at landfills especially during the rainy season[47]; and
- Limited skill level of composting personnel, as well as largely non-existent local expertise and experience in the production or operation of complex composting machinery[48].

Markets for Organic Compost in Greater Accra Region

Major demand end markets for organic compost sourced from food/organic waste include:

- Commercial cash crop farming;
- Urban and peri-urban agriculture in Accra; and
- Real estate and landscaping in Accra.

Currently, end market users of fertiliser in Accra, as in the rest of the country rely heavily on imported synthetic fertiliser[49]; Ghana produces no synthetic fertiliser. This type of fertiliser is much more expensive than organic compost, primarily due to the high international and domestic transportation costs[50]. Hence, this market feature creates a potential competitive advantage for organic compost sourced from MSW.

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[44] Fobil et al. 2010
[45] Ideal for catalysing biodegradation reactions to progress as required in composting processes.
[46] This may not necessarily apply to organic waste from hospitality, catering and food retail operators in Accra; further research on these sources will be required. Also, the ideal C:N ratio falls between 25:1 and 30:1 (https://www.researchgate.net/profile/J_Tarafdar/post/what_is_the_procedure_to_calculate_the_C_N_ratio_of_the_compost/attachment/5a828dbeb53d2f0bba518ab0/AS:593468841816064@1518505406867/download/NSC-52-Formated-checked.pdf)
[47] Commander 2011
[48] Zoomlion Ghana Ltd. 2011
[49] http://www.africafertilizer.org/wp-content/uploads/2017/05/Ghana-Fertilizer-Statistics-Overview-2015.pdf
[50] https://www.ifw-members.ifw-kiel.de/publications/organic-pineapple-farming-in-ghana-a-good-choice-for-smallholders/kwp-1671.pdf

Refuse Derived Fuel (RDF)

There is a dearth of analysis on the production of refuse derived fuel in Accra. This, presumably, is due to its extremely miniscule contribution towards MSW treatment. Only evidence identified for RDF production was provided by Oduro-Appiah et al. (2017) indicating that Zoomlion's ACARP facility generates a small amount of RDF from mixed MSW collected from its franchise areas.

7. Challenges/Problems Endemic in Accra's Waste Management System

Majority of Accra's residents consider its municipal solid waste management system to be in a poor state. Though efforts have been made in recent years to significantly improve waste management – such as expanding the private sector waste management operations – the city largely remains engulfed with waste. This conundrum is linked to specific endemic factors that will be addressed below.

Challenges Relating to Governance and Waste Legislation and Regulation

Regulatory Capacity of Waste-Related Authorities

Due to financial constraints, local governments in Accra have been largely unsuccessful in improving the quality of waste management services. MMDAs in Accra, like other municipalities in Ghana, are highly dependent on the central government for funding by way of the DACF. Rampant delays in the disbursement of central government funding have meant that MMDAs in Accra have been unable to appropriately fund their waste management services. This funding predicament is further worsened by the fact that local governments in Accra have been mostly inefficient at raising internally generated funds from local tariffs, such as property taxes. These hurdles create two significant problems: the inability to promptly pay private waste management companies with franchise contracts for services provided and the inability to finance the operations of waste management personnel. The former problem negatively impacts the financial viability of franchise collection operations, causing operators to cut back on their services. The latter problem is also directly linked to the poor state of enforcement of sanitation bye laws in Accra. Hence, the weakness of oversight has meant that the city lacks effective disincentive structures for improper waste disposal and treatment. Local authorities have also failed to meet both their non-financial contractual obligations to franchise waste collection service providers[51] and monitor the reciprocity of the collection service providers.

Uncertainty Over Waste Management Governance & Legislation

Though the creation of Ministry of Sanitation and Water Resources (MSWR) has been a welcomed development, it has yet to usher in a clear picture on the allocation of responsibilities for waste management in Accra. This is particularly highlighted in the clash between the MSWR and MMDAs over which entity is ultimately responsible for the provision of waste management infrastructure and the facilitation and execution of waste collection. There is also uncertainty over the division of responsibility for urban sanitation regulatory functions between MSWR, EPA and MMDAs.

The lack of leadership over waste management responsibility is further worsened by the lack of clarity over the long-term trajectory of waste management regulations. Though the MSWR announced that it would introduce a new Sanitation Policy to replace the existing ESP 2010[52], it is still unclear how this new policy will affect the NESSAP, DESSAP and SESSIP, as details about it have been sparse. Additionally, the announcement that the new Sanitation Policy would require the

[51] Such as preventing the operation of unauthorised third-party collection services in franchise zones.
[52] Embassy of The Kingdom of The Netherlands-Accra 2018. Business Opportunities for Water and Sanitation in Ghana.

creation of a National Sanitation Authority further compounds the uncertainty over the role to be played by local authorities. Furthermore, discussions with a local waste sector expert, Professor George Owusu[53], revealed that the central government is yet to provide a strong indication that the corruption and political interference prevalent in waste management governance, both at the local and national level, will be significantly addressed.

Challenges Relating to Waste Generation

Population Growth and Waste Generation

Accra's ever-increasing population is a key factor behind increasing levels of total municipal waste generation arisings. The increase in waste arisings has and will likely continue to outpace waste collection and treatment capacity, as city authorities have been slow in using their powers over urban planning to control rapid population expansion. Matters are also not aided by the absence of any serious government effort to promote waste prevention as a means of decoupling waste generation from both population and economic growth. The increase in the number of Accra's inhabitants, especially in low- and middle-income areas that usually receive the least amount of investment in waste management, has been critical to the growing incidence of indiscriminate waste disposal and limited treatment capacity and void landfill space.

Undesirable Waste Management Behaviours

Decades of feeble enforcement of sanitation bye laws and limited access to waste collection services, has contributed to the development of a culture of undesirable waste management behaviour amongst Accra's citizenry. As the incidence of indiscriminate waste disposal is highest in the city's lower income areas, this also suggests the strong link between income and waste disposal behaviour. With limited or, in many cases, no disposable income, residents in Accra's lower income areas are highly sensitive to the cost of waste management services, with many ultimately relying on improper waste disposal. As majority of Accra's inhabitants reside in lower income areas, this may likely explain why efforts to sensitize residents of the need for a cleaner environment have largely been futile. Even when low-income area residents appropriately dispose of waste at communal collection sites, there are still issues with the disposal of human excreta along with municipal solid waste[54]. Wealthier parts of the city also fall culprit to the trend of indiscriminate disposal, though to a lesser extent. The lack of street bins and the presence of open drains in wealthier areas create a conducive environment for improper waste disposal, especially involving organic and plastic waste. Some residents in higher income areas also solicit the services of third party (usually informal) waste collectors to the detriment of franchise waste collection companies. It should be acknowledged, however, that this trend may partly be driven by the lack of engagement of residents by the local authorities prior to the allocation of franchise contracts.

The indiscriminate disposal of MSW in Accra has been a major contributory factor to the incidence of communicable diseases such as malaria, typhoid fever and cholera. The most recent cholera outbreak in Accra which occurred in 2014 led to over 17,000 reported cases and the death of at least 150 people[55]. The annual occurrence of flooding in the city which if largely due to an ineffective

[53] The director for the Centre for Urban Management Studies at the University of Ghana.
[54] Access to personal and public lavatories is a major problem in Accra's low-income areas.
[55] https://www.myjoyonline.com/lifestyle/2017/July-18th/cholera-outbreak-imminent-health-service-told-to-be-on-high-alert.php

urban drainage system, is further worsened by the improper disposal of municipal solid waste, especially plastic waste.

Challenges Relating to Waste Collection and Treatment

Limited Waste Data

Though there have been attempts, usually by academic researchers, to gather waste sector data for Accra, there is no central/national database nor standardised system for the collation and monitoring of MSW data for Accra. As indicated in NESSAP, MMDAs are expected to annually track waste data and information. However, as the DESSAPs for the MMDAs in Accra are not readily available online, this cannot be verified[56]. Without this information, it is not possible to determine the specific data captured in the DESSAPs. Nonetheless, the Medium-Term Development Plans formulated by MMDAs do provide information on waste arisings, waste composition and collection costs. However, these plans are issued every four years, with only one of them currently available online i.e. MTDP for Adenta Municipal Assembly. Furthermore, the reliability and comparability of the data captured in DESSAPs and MTDPs is also questionable due to the absence of a standardised guidance for waste data management. An additional challenge relating to MSW data for Accra is the absence of regional/national classification catalogue for sub-categories of waste materials. Hence, all attempts by the local and national authorities and other stakeholders to track waste data for Accra only provide insight into high-level waste categories. Generally, these highlighted issues raise a number of concerns for waste sector stakeholders in Accra:

- They increase difficulty in developing reliable benchmarks for waste arisings or waste collection at the municipal-level and at smaller niche-levels e.g. franchise contract zones;
- They make the pursuit of monitoring waste performance in relation to collection and treatment arduous; and
- They increase the risk of waste sector investment in collection and treatment infrastructure due concerns over waste data reliability.

Inefficiencies Relating to Franchise Collection Companies

Though the introduction of franchise contracts for waste collection services had been expected to significantly improve waste management in Accra, it has failed to raise collection coverage. In contrast, informal waste collection has been responsible for the 25% increase in MSW collection coverage in Accra witnessed between 2011 and 2016, due to its robust growth[57].

The failure of formal waste management companies to significantly improve the state of waste management in Accra can be attributed to their inability to comply with the operational obligations set out in the franchise collection contracts. Table 7.1 highlights the challenges franchise collection service providers in Accra have faced in meeting eight of the nine contractual obligations.

[56] Attempts to secure hard copies directly from the MMDAs in Accra also proved unsuccessful. MSW data, like most other public-sector data in Ghana, is generally difficult to access. This is partly due to a history of public-sector officials being resistant to openness, as well as the low emphasis placed on the regular collation of high-quality data for directing public policy relating to social services. application of data analysis. A Right to Information Bill is currently under consideration by Ghana's Legislature; this bill and previous iterations have however been under consideration by Ghana's Parliament since 1999.

[57] Oduro-Appiah et al. 2017. Locally responsive intervention to improve municipal solid waste collection coverage in Accra, Ghana.

Table 7.1 Challenges faced by franchise collection service providers in meeting obligations

Franchise Contractor Obligations	**Performance**
Register all service users	On average half of service users are registered, with the remaining service users either relying on informal waste collectors or not covered at all
Supply 240L bins to service users for free	Most franchise companies have found this obligation financially unsustainable
Collect MSW two times a week	None of the franchise companies had met the collection frequency obligation; they had mostly opted for weekly collections
Educate service users on collection strategy	Franchise companies have failed at educating service users on waste collection arrangements as education campaigns have not been prioritised.
Maintain clean sanitary sites	Franchise companies have overseen a high incidence of littering at communal collection sites
Increase primary coverage and reduce to zero, secondary coverage	A combination of unaffordable service charges and poor roads and housing arrangements have restricted the operations of franchise companies.
Collect approved fees from all waste generators/service users	Cross-subsidised user charges are considered by service users as unaffordable.
Respond to complaints from service users within 24 hours	Most franchise companies do not have complaint desks and as such do not properly record, monitor or respond to service user complaints.

A major influencing factor behind these setbacks has been the lack of engagement with service users by either the MMDAs or waste management companies during deliberations over the operational obligations. As a result, the waste management companies have been unable to run collection services that are parallel with the needs of service users. Additionally, delays in payment by MMDAs for collection services have been a contributory factor.

Inefficiencies Relating to Informal Waste Collectors and Reprocessors

Informal waste collectors in Accra have proven to be more impactful in terms of increasing MSW collection coverage, especially for low- and middle-income areas, and have contributed most to the city's recycling rate. Nonetheless, they face challenges that have been a handicap to improvements in waste management in Accra.

Though some unions exist within the sector that govern service operations, a significant proportion of informal waste collectors usually do not follow any guidance in their operations. For example, due to the lack of guidance on the appropriate transportation of collected waste, informal waste collectors tend to inadvertently release some of the collected waste onto streets. Hence, they also contribute to the incidence of improper MSW disposal. Likewise, weak enforcement of child labour laws, coupled with economic need, has meant that the sight of children engaging in the informal waste sector is not uncommon. Akin to other informal sector businesses, informal waste collectors in Accra have limited access to investment capital from financial intermediaries. The lack of access to credit and grants prevents informal waste collection operators from investing in expensive but more efficient collection equipment, as well as buying land in the city to expand their operations. Additionally, informal waste collectors generally do not prioritise human health and safety in their operations. Though their operations are labour-intensive, MSW collectors, such as scrap metal collectors and landfill waste pickers, typically do not wear personal protective equipment (PPE)[58] when operating. Admittedly, the cost of most PPEs prices out informal waste operators. Nonetheless, the combined factors of economic need and limited access to health and safety training have contributed to this trend. This leaves informal waste collectors highly exposed to safety hazards such as traffic accidents.

Underdeveloped Waste Treatment & Disposal Sector

Accra is heavily dependent on landfills for waste disposal; landfills are the destination for approximately 70% of MSW generated. However, medium to long term dependence on landfills is unsustainable. Firstly, all indications from population and economic growth patterns suggests that the tonnage of MSW Accra generates will increase further. Operational landfills, such as the Kpone Landfill site, have already seen their lifespans decrease significantly because of the following factors:

- The delivery and disposal of MSW tonnages much greater than has been indicated in design specifications; and
- The glacial pace of new landfill developments.

Though the limited oversight of landfill sites enables landfill operators to flout rules on daily disposal tonnages, this trend as arguably been driven more by the limited number of controlled landfills in the Greater Accra Region. Hence, MMDAs in Accra end up sharing landfill sites with other local authorities in the region, thereby placing immense pressure on landfill void space. Due to the high cost of land and justifiable resistance from residents over health and environmental safety

[58] Examples of PPEs include hard hats, gloves, protective eyewear, hi-visibility clothing, safety footwear, masks, filter respirators, etc.

concerns[59], it is highly unlikely that Accra will see any investments in the development of new landfill sites, leaving only the option of relying on locations outside the city. Nonetheless, the outward expansion of the city has meant that potential landfill sites on the outskirts of Accra are constantly being encroached by new residential and commercial developments.

These challenges encountered in relation to landfills would seem to suggest the need for rapid investments in alternative waste treatment options such as recycling, composting and energy recovery. Though advocated for in waste legislation and championed verbally by local and central government representatives, there has been limited investment in alternative waste treatment options. This feature in Accra's waste treatment sector is driven by the following factors:

- Concerns over central government's commitment to facilitate the commercial viability of waste treatment infrastructural developments;
- Concerns over the reliable supply of MSW that meet the required treatment input specifications[60];
- Difficulties accessing financing for the development of capital-intensive waste treatment facilities; and
- Concerns over access to reliable demand markets for outputs from waste treatment facilities, especially electricity generated at energy from waste facilities[61].

Hurdles such as these explain why the informal waste operators in Accra are the primary stakeholders responsible for waste recovery efforts, overwhelmingly in recycling. However, the informal waste sector lacks the financial resources and technical expertise required to significantly improve value addition of recovered MSW. Furthermore, the rudimentary methods used by informal sector waste recyclers also exposes the general population and the local environment to serious hazards. For example, the burning of electronic waste for the extraction of valuable metals releases toxic fumes, as well as contaminates soil and water bodies. A recent study of internal exposure to heavy metals of e-waste reprocessors in Accra revealed that they had extremely high blood lead concentration levels[62].

[59] Poor management of uncontrolled landfills in residential areas in the city has made landfill development in Accra a highly politicised matter.
[60] Treatment options that are sensitive to contamination of supplied MSW are disadvantaged by the fact that majority of the MSW collected in Accra is not segregated, including those collected by formal waste management companies.
[61] Partly due to the non-payment of debt owed by the central government to the national electricity distributor, Electricity Company of Ghana (ECG), electricity producers in Ghana always have to grapple with the risk of ECG not meeting its financial obligation for electricity supplied.
[62] https://www.ncbi.nlm.nih.gov/pubmed/27858271