

The Cycle of Solid Waste:
A Case Study on the Informal Plastic
and Metal Recovery System in Accra

Beamlak Tesfaye Gugssa

Examensarbete i Hållbar Utveckling 97

The Cycle of Solid Waste:
A Case Study on the Informal Plastic
and Metal Recovery System in Accra

Beamlak Tesfaye Gugssa

Examensarbete i Hållbar Utveckling 97

The Cycle of Solid Waste: A Case Study on the Informal Plastic and Metal Recovery System in Accra

Beamlak Tesfaye Gugssa

Supervisor Dr. Cecilia Sundberg
Evaluator Dr. Gloria Gallardo

Lists of Abbreviation

AMA	Accra Metropolitan Assembly
AMA GSGDA	AMA Ghana Shared Growth Development Agenda
AMA ISWMS	AMA Integrated Solid Waste Management Strategy
CBOs	Community Based Organizations
CCWL	City and Country Waste Limited
FPB	Fee and Performance Based
GHC	Ghanian Cedi
ILO	International Labor Organization
IWWA	Integrated Waste Management in West Africa
GWMA	Ga West Municipal Assembly
GSMA	Ga South Municipal Assembly
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assembly
MSEs	Micro and Small Enterprises
NDC	National Democratic Congress
NPP	New Patriotic Party
NGOs	Non Governmental Organizations
NIMBY	Not In My Back Yard
PPP	Public Private Partnerships
SWM	Solid Waste Management
UNDP	The United Nations Development Program
UNEP	The United Nations Environmental Program
WCED	World Commission on Environment and Development
WMD	Waste Management Department

List of Figures

Figure 1. Waste Management hierarchy	4
Figure 2. Informal recycling system in Bangkok in 1987.....	6
Figure 3. Hierarchy of informal sector	7
Figure 4. AMA Administrative Area	14
Figure 5. Estimated Population distribution By Sub Metro (2010).....	15
Figure 6. Organizational structure of AMA	17
Figure 7: Current Organizational structure of WMD	18
Figure 8: Organizational structure of WMD at Sub Metro level	18
Figure 9: Average fraction of solid waste generation in Accra	19
Figure 10: Usage of polyethylene bags with in the waste bin at primary storage	21
Figure 11: Households carrying waste bins from the street after waste collection	22
Figure 12: Waste bins left on the streets after waste collection	22
Figure 13: Waste accumulated due to collection backlog	23
Figure 14: Zoomion Ghana Limited waste collection crew during door-to-door waste collection	24
Figure 15: Partial view of Sabah Landfill	24
Figure 16: Fire at Abokobi Landfill site	25
Figure 17: Metals sorted and collected form streets and ditches by street sweepers	29
Figure 18: Plastic bottles re-used in the domestic market for oil and local drinks retail	29
Figure 19: Collection of broken plastic chairs and kitchen utensils at one of the MSEs	30
Figure 20: Schematic diagram of waste recovery system in Accra.....	32
Figure 21: Trade hierarchy and value addition in the informal metal and plastic recovery system	33
Figure 22: Organizational Structure of the Scavengers' Association / network	34
Figure 23: Scavenging at Sabah landfill site	34
Figure 24: Percentage of Age composition of scavengers	35
Figure 25: Years of Education of Scavengers	35
Figure 26: Years of Experience of Scavengers	36
Figure 27: Partial view of plastics collected from Sabah Landfill by a network member	37
Figure 28: Partial view of metals collected from Sabah Landfill by a network member	37
Figure 29: Organizational structure of Asontaba Waste collectors	38
Figure 30: Network members helping each other to collect waste from households in Ablekuma Central...	39
Figure 31: Years of experience of members.....	40
Figure 32: Start Up capital of Informal waste collectors	40
Figure 33: Network members hanging sorted metals and plastics around the truck for waste collection.....	41
Figure 34: Scavengers assisting network members in an exchange for plastic waste	42
Figure 35: Organizational Structure of Scrap dealers Association	43
Figure 36: Group members sorting waste materials such as fans and water for metal extraction.....	44
Figure 37: Boys roaming around looking for metals and / or used electric metals for metal extraction	45
Figure 38: A shade and seats where group members rest	46

Figure 39: Years of Education of Metal dealer boys and masters	46
Figure 40: Years of Experience of Metal dealer boys and masters	47
Figure 41: Working hours of Metal dealer boys and masters	47
Figure 42: One of the group masters sorting metals at the yard	48
Figure 43: Age Metal dealer boys and masters	49
Figure 44: Years of Experience of Metal dealer boys and masters	49

Content

1	Introduction	1
	1.1 Solid Waste Management and Resource Recovery in Accra	1
	1.2 Study Objective	1
	1.3 Research Questions	2
	1.4 Scope of the Study	2
	1.5 The study Limitation	2
	1.6 Organization and Content of the paper	2
2	Theoretical Framework	3
	2.1 The theory of Waste Management	3
	2.1.1 Defining Waste	3
	2.1.2 Waste categorization	3
	2.1.3 Concept of Waste Hierarchy	3
	2.1.4 The New Vs the Old concerns / thinking of waste management	4
	2.2 Informal Sector	5
	2.2.1 Informal Waste Recycling	5
	2.2.2 Organization and Trade hierarchy in Informal waste recycling	6
	2.3 Urban Governance and Solid Waste Management	7
	2.4 Network Theory	8
	2.5 Actor - oriented approach	8
3	Overview of Methodology	10
	3.1 Case Study as an Overarching Method	10
	<i>Exploratory Research</i>	10
	<i>Qualitative and Quantitative Methods</i>	10
	3.2 Data Collection Methods on the Field	10
	Primary Data	10
	Secondary Data	11
	3.3 Data Interpretation	11
	3.4 Problems Encountered	12
4	Background Information about the study area	13
	4.1 Geography	13
	4.2 Population	13
	4.3 Economy and Urbanization	14
	4.4 Governance	15
	4.5 Solid Waste Management in Accra	17
	4.5.1 Waste Management Department	17
	4.5.2 PPP	17

4.5.3	Waste composition.....	18
4.6	Policies and Bye- Laws on Solid Waste Management.....	18
4.6.1	AMA Solid and Liquid Wastes Management Bye-Laws 1995.....	18
4.6.2	Waste Management Policy.....	18
4.6.3	Integrated Solid Waste Management Strategy 2010.....	19
5	Existing Solid Waste Management Practices.....	20
5.1	Solid Waste Storage Practices.....	20
5.1.1	Primary Storage	20
5.1.2	Sorting of Waste	20
5.2	Waste collection and Transportation.....	21
5.2.1	Waste collection from the source.....	21
5.2.2	Collection backlog	22
5.2.3	Conflict between Zoomlion Ghana Limited waste collection crew and households.....	22
5.2.4	Waste transportation arrangements.....	22
5.2.5	Waste Collection Trucks.....	23
5.2.6	Safety of waste collection crews.....	23
5.3	Disposal at the Landfill	23
5.3.1	Leachet Treatment	24
5.3.2	Landfill Operations	24
5.3.3	Land Acquiring Issues	24
5.3.4	Fire at the Landfill Sites.....	24
5.4	Central Container System	25
5.5	Cost Recovery / Revenue Collection	25
5.6	Informal Waste Collectors (' <i>kaya Bola</i> ').....	25
5.7	Civil Society	25
5.8	Supervision	26
5.9	Monitoring and Evaluation	26
5.10	Resources Reuse and Recovery Activities.....	26
6	Results	27
6.1	Organization and Hierarchy of Informal Metal and Plastic Recovery System in Accra.....	27
6.2	Actors within the Informal Metal and Plastic Recovery System	27
6.3	Trade Hierarchy and Value Addition of actors within the informal Plastic and Metal recovery system	32
6.4	Scavengers Association	32
6.4.1	Organizational structure of the Scavengers' Association.....	32
6.4.2	Actors Attribute	34
6.4.3	Types of materials recovered	35
6.4.4	Dismantling of E- waste at the landfill	36
6.4.5	Scavengers - Middlemen Relations.....	36

6.4.6	Scavengers - Landfill Operators Relations	36
6.4.7	Challenges Encountered.....	36
6.5	<i>Asontaba</i> Waste Collectors' Association	37
6.5.1	Organizational Structure	37
6.5.2	Actors Attribute	38
6.5.3	Sorting of Plastics and Metals.....	40
6.5.4	Relations with households	40
6.5.5	Relation with Waste Management Companies	41
6.5.6	Relation with Scavengers.....	41
6.5.7	Relations with scrap metal dealers.....	41
6.5.8	Challenges Encountered.....	41
6.6	Scrap Metal Dealers Association	42
6.6.1	Organizational Structure	42
6.6.2	Dismantling and Extraction of Metals at Agbogloboshie Scrap Metal Yard	43
6.6.3	Bribery and Agobgloshie Scrap Metal Yard	43
6.6.4	Politics and Agobgloshie Scrap Metal Yard	43
6.6.5	Relations with Agents	44
6.6.6	Afa Alhussain Base / Korean Boys	44
6.6.7	Nyankpala Best	47
7	Discussion	50
7.1	Lack of Resource Recovery Initiatives by the Formal Sector.....	50
7.2	Weak Formal Waste Management System	50
7.3	Informal Metals and Plastic Recovery as a Booming System.....	51
7.4	Organization and Categories of Actors in the Informal Plastic and Metal Recovery System.....	51
7.5	Trade Hierarchy and Value Addition.....	52
7.6	Sources of Finance and Capital within the System	53
7.7	Reachability	54
7.8	Common Norms and Values	54
7.9	Reciprocity.....	55
7.10	Relation between the Formal and Informal Waste Management System	55
7.11	Risks of Informality	56
8	Conclusion	57
8.1	Further studies.....	57
9	References	58
10	Annex	62
10.1	The following table illustrates the number and the positions of interviewees	62
10.2	Questionnaires	63
10.2.1	Questionnaire for informal waste collectors	63

10.2.2	Questionnaire for Scrap Metal Dealers	65
10.2.3	Questionnaire for Scavengers	67
10.2.4	Common Network related Questionnaire.....	68
10.3	Observation Check list.....	69
10.4	Sample Interview Guide	69

The Cycle of Solid Waste: A case study on the Informal Plastic and Metal Recovery System in Accra

Gugssa, Beamlak Tesfaye, 2012: The Cycle of Solid Waste: A case study on the Informal Plastic and Metal Recovery System in Accra. *Master Thesis in Sustainable Development in Uppsala University*, No. 97, 84 pp, 30 ECTS/hp

Abstract

The thesis mainly deals with the analysis of the structure and organization of the informal plastic and metal recovery system in Accra. To give a clear picture of the context within which the informal waste recovery system exists, the study has examined the existing formal solid waste management system in Accra. To this end, the study employed a case study method using both qualitative and quantitative approaches to solicit the necessary data during the two months of field work in Accra. Furthermore, the thesis employs concepts and theories such as network theory, actors-oriented approach and waste management theories to look in to the structure and organization of the informal plastic and metal recovery system from a new perspective.

As a result, this thesis has revealed that the informal recovery system is built out of social ties and a wide range of reciprocity networks. These networks are of small in size with small number of membership; however, interconnected to one another. In most cases, the network members have common features such as gender, religious affiliation, place of origin and reasons to join the informal plastic and metal recovery system. These networks also have an organizational structure that shows the institutionalization of roles and responsibilities. This has further provided the structure and condition for the development and strengthening of common values and norms. These norms and values are more or less providing a sense of control and governance for the networks and their activities. In addition, these networks also provide a social security system for its members in case of emergencies.

The study has also revealed that the identified actors within the recovery system are organized in the form of trade hierarchy where the income and profit of the actors depends on their position within the trade hierarchy. In addition, the ability to add value and also being at the end of the trade chain has a positive impact on the amount of income or the profit margins of the actors. In addition, actors placed at the upper- most end are sources capital and finance to the recovery system.

Despite the fact that the informal plastic and metal recovery system functions in parallel and interacts with members of the formal waste management sector, the system is ignored by the government. The informal recovery system is not considered as a major stakeholder for solid waste management sector. Moreover, the formal sector is also creating a challenge for the existence of the informal sector. There is a need to integrate the informal recovery system in to the formal system as the activities of recovering plastics and metals are significant for the environment in particular and for sustainable development in general.

Keywords: Accra, Informal sector, Sustainable Development, Resource Recovery, Solid Waste Management, Networks

Gugssa, Beamlak Tesfaye, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden

The Cycle of Solid Waste: A case study on the Informal Plastic and Metal Recovery System in Accra

Gugssa, Beamlak Tesfaye, 2012: The Cycle of Solid Waste: A case study on the Informal Plastic and Metal Recovery System in Accra. *Master Thesis in Sustainable Development in Uppsala University*, No. 97, 84 pp, 30 ECTS/hp

Summary In most developing countries resource recovery is left for those who are classified as poor struggling to win their daily bread or to improve their livelihood. In major capital cities such as Accra, where there is high population pressure with high waste generation rate, high rural-urban migration and high unemployment rate, the poor are engaged in the recovery of plastics and metals on daily basis. The formal waste management system only concentrates on the provision of waste collection and transport services from the source to disposal sites, which are unengineered landfills polluting the surrounding environment including ground water. As a result, bad smell and littering of waste from the landfills affect the day to day lives of the people living in the area. It is ironic that the formal waste management sector and the government are more or less engaged in 'keeping the environment clean' by disposing waste indiscriminately at disposal sites. No stakeholder within the formal waste management system acknowledges that sorting recyclables have economic value in addition to saving landfill spaces, preventing environmental pollution and preventing resource depletion.

Both the formal and the informal waste management systems function in the same city and in the same neighborhoods; however, there is neither integration nor cooperation. Rather, the formal considers the informal as a very backward despite the fact that they are engaged in recovering resources either for reuse or recycling. Furthermore, the government has no established institutional framework to reduce, reuse or recycle resources in collaboration with stakeholders.

This study employed the case study method to examine the informal metal and plastic recovery system in Accra. Not only the recovery system, but also the formal waste management system was scrutinized. This has an importance to show the context within which the recovery system functions. As has been revealed by this study, the informal metal and plastic recovery system is not a chaos or disorganized system. Rather, the system has a number of actors organized in the form of reciprocity networks organized around the activities they are engaged in. These networks have their own organizational structure assigning different roles and responsibilities to members. The fact that they have common characteristics such as age, place of origin, gender, socio-economic status and perception place an important role for the formation and keeping intact of the networks. At this juncture, mentioning the importance of social ties is very important.

The informal plastic and metal recovery system is also organized in the form of a trade hierarchy. The major factors for the position within the hierarchy includes types of materials collected, ability for value addition and the amount and quality of materials collected. It is important to mention here that, the metal recovery seems to be much stronger than that of the plastic recovery. One major reason could be the fact that the metal recovery system is linked to the global recycling market. On the other hand the plastic recovery system is more or less within the domestic market and local industries. In most cases, local plastic industries are not interested to source recycled plastics as raw materials as it incurs more cost of production and will result in low quality products when compared to virgin materials. There is a need for more and further study on the informal plastic and metal recovery system in Accra. This will have great importance to understand and build on the existing system in order to protect the environment in particular and for sustainable development in general.

Keywords: Accra, Informal sector, Sustainable Development, Resource Recovery, Solid Waste Management, Networks

Gugssa Beamlak Tesfaye, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden

Acknowledgement

I take this opportunity to express my profound gratitude to my supervisor Dr. Cecilia Sandberg, Department of Energy and Technology at Swedish University of Agricultural Sciences (SLU), for her commendable guidance, supervision and constant encouragement. My heartfelt regards goes to my evaluator, Dr. Gloria Gallardo, Department of Earth Sciences, Uppsala University, whose constructive comments helped to improve my thesis.

In addition, I would like to thank the EU IWWA project that covered all project related costs. I would like also to express my heartfelt gratitude to Zoomlion Ghana Limited and its staff members. I would like to thank George Rockson, Kwodjo Meizah and Techane Bosona for all the constructive advices and support during and after the field work in Accra, Ghana. I would like further to extend my heartfelt appreciation to Mensah David Ablorh, Yawa Florence, Edem Benjamin, Emmanuel Bakuwin, Bawa and Israel Achipong, for the valuable support and guidance that helped me to complete the task at various stages.

I am obliged to Dr Zelalem Birhanu, Mimi and her family, Sigrid Nordberg and Linda for making my stay in Accra safe, enjoyable and memorable during the field work.

Last but not least, I would like to express my heartfelt gratitude to my mother (Genet), my dad (Tesfu) and my brother (Sami) who have always been there for me in every way they can. Without their unconditional love, support and commitment I would not have made it this far in life!

And also, Thomas Assefa Jimma, for extending all his love and support!

Above all, I would like to express my thankfulness to the almighty God for giving me a second chance in life to fulfill my dreams!!

Beamlak Tesfaye

1 Introduction

1.1 Solid Waste Management and Resource Recovery in Accra

There is a need for a long term and sustainable solution to establish an integrated solid waste management system in developing African countries where only 20 % of the waste is properly collected (ILO 2007:11). As Schübeler has been cited by (Amha 2010) solid waste management refers to the collection, transfer, treatment, recycling, resource recovery and disposal of solid waste in urban areas. As it has been stated as an example by the (UNHABITAT 2010:2) the informal sector collects nearly 300,000 tones of the waste generated in Mali annually and nearly 30% of the waste in Zambia. In these countries, the informal sector plays an important role in filling the gaps that have been created by the formal sector in the collection and recovery of solid waste materials.

Ghana is one of the African countries challenged with poor solid waste management system despite the introduction and encouragement of the formal private sector through privatization and franchising starting from the 1980s. Uncontrolled urbanization in major cities such as Accra is creating large quantities of waste which in turn strains the solid waste management system. In addition, the rapid urbanization made it a challenge for the proper collection of solid waste by the formal sector in certain parts of the city due to absence of properly laid down streets in slum areas (Boadi & Kuitunen, 2003:211).

Furthermore, the Government and the formal private sector engaged in solid waste management are challenged with lack of infrastructure, shortage of human and financial resources, difficulty in land acquisition for final disposal, lack of community action, high operational and maintenance cost among others (AMA 2010b:57-60). As it has been stated by (Edward 2004:7) the urban areas of Accra produces 760,000 tons of municipal waste per annum (2000 metric tons per day) and it has been projected to reach to 1.8 million tons per annum (4000 metric tons per day) in 2025. However, according to (Boadi & Kuitunen 2003:214) as the solid waste collection is inadequate only 60% of the waste is collected.

This study is more concerned with resource recovery, which is an integral part of sustainable solid waste management, but completely neglected by the government as well as the formal private sector involved in the solid waste management system in Accra, Ghana. Resource recovery is also an important aspect of sustainable development since it can also be considered as an indicator for environmental sustainability when conducted in a more organized and structured way to conserve natural resources (Gutberlet 2008:82). It is also cost effective in terms of minimizing the amount of waste ending up at the disposal sites by saving spaces at the landfills and supply of raw materials at low cost.

In the context of Accra, thousands of people are involved in the informal waste management system which is mainly focused on resource recovery as a major source of livelihood. As it has been stated by (Gutberlet 2008:82) the size of the informal sector demonstrates the extent of poverty and that the selection and separation of specific items of waste is the only available mechanism employed by the vulnerable, socially excluded and disempowered section of the society. According to AMA (2010a:68) it is only the informal sector engaged in the resource recovery and recycling. Furthermore, it is estimated that 80 % of metals and 3 % of plastics are collected, separated by the informal sector for new material production or recycling (AMA 2010a:70). For many years this informal sector has been considered as 'the economy of the poor' or 'backyard economy' which is unproductive and not worthy of support and change (Hemmer and Mannuel, 1989:1543). Such thinking has continued in the informal waste management system of Ghana as the exclusion and neglect has continued.

1.2 Study Objective

The overall objective of this study is to identify how the informal resource recovery system functions and how it is structured. In addition, it explores the context with in which the informal resource recovery system exists in relation to the formal waste management system.

1.3 Research Questions

The study addresses the following research questions:

Main Research Question

- How does the informal plastics and metals recovery system organized and structured?

Sub Questions

- Who are the main actors within the informal resource recovery system?
- How do the network members within the informal plastics and metal recovery system relate to one another?
- How does the informal plastic and metal recovery system fund itself?
- How and why the informal resource recovery system relate to the formal waste management system?

1.4 Scope of the Study

This study is restricted within the administrative district of Accra Metropolitan Assembly (AMA) in Greater Accra Region in Ghana. It also explores the existing waste management system in Accra. To explore the situation clearly and deeply a specific study area Ablekuma Central Sub metro (See Figure 4) was selected from the 11 sub metros in Accra.

However, the second part of the study further moves out of the Ablekuma Central sub-metro as it explores and follows the informal waste management system and the management of waste along the steps in the recycling chain. Due to the nature of the work, people engaged in the informal waste management system are not situated within one specific area of the city, but dispersed throughout the city. Therefore, the study had included major areas such as Agboghloshie metal scrap yard, which is adjacent to Ablekuma Central. It serves as a base for many scrap collectors that recover metal from different sources throughout the city every day. In addition, two major landfills (Abokobi and Sabah) managed by Zoomlion Ghana Limited taking in much of the waste generated in Accra. Including these areas are also found to be important as scavengers are engaged in resource recovery.

The study concentrates only on the recovery of metals and plastics. It does not look in to other recyclable waste materials. In addition, the study only looks in to recovered materials for recycling purposes; it doesn't include plastics such as plastic bottles for reuse.

1.5 The study Limitation

The study does not look in to the industries especially metal industries that are sourcing recovered resources at the stop and start of the chain. However, they are acknowledged as important actors within the resource recovery system. In addition, the study does not look deeply in to the local and international agents that are linked up to the metal and plastic recovery system. However, the study mainly looks in to the relations based on economic exchanges or transactions within the informal plastic and metal recovery system. Therefore, it only looks at partial network instead of the whole network.

In addition, the study uses a snowballing technique instead of the reputational approach due to the nature of the topic of the study as it looks in to looks mainly the informal plastic and metal recovery system where there is no listing or registered and known actors. The first plan was to use Reputational Approach however was not found to be manageable.

1.6 Organization and Content of the paper

This thesis is organized in to Eight Chapter. Chapter 1 deals with the introduction, research questions, objective of the study and the limitations of the study. Chapter 2 deals with the theoretical framework and describes the different concepts and theories on Solid Waste Management, Informal sector, Urban Governance, Networking and actor oriented approach. Chapter 3 gives highlight on the method used to generate the different data that are required. Chapter 4 is all about the general background of the study area including the geography, population, economy, urbanization, governance and infrastructure. Chapter 5 deals with the existing solid waste management practices in Accra and looks in to the situation from primary storage up to disposal. In addition, it looks in to the role of the different stakeholders in to the waste governance. Chapter 6 deals with the result from the questionnaires, semi structure interviews and observations. It mainly focuses on the informal plastic and metal recovery system. Chapter 7 deals with the discussion of results based on the theoretical framework from Chapter 2. Chapter 8 deals with the conclusion of the study.

2 Theoretical Framework

2.1 The theory of Waste Management

2.1.1 Defining Waste

There are a number of working definitions given for waste. One of the definitions given is 'Waste is the byproduct of human activity. It contains the same material as are found in the useful products; it only differs from useful products by its lack of value' (McDougall et al. 2008:1). According to the definition products turn in to waste when they are mixed and no more provide the service they were planned or designed to do. Similarly (ILO 2007:1) defines waste as 'something which the original owner or user no longer values, and has been discarded or discharged by the original owner or user. It is something you do not want anymore and want to throw away.' Both definitions stress on the inevitability of waste and its relation to the value given. (Gutberlet 2008:6) argues that the way waste is understood and defined has basic implication on how waste is managed.

In addition, the understanding of waste depends on age, gender and social status of people, however, the perception changes through time (Kadfak, 2011:7). However, the working definition of this thesis is the definition given by UNEP. The Program defines waste as 'objects which the owner does not want, need or uses any longer, which require treatment and/or disposal' (UNEP 2002:8).

2.1.2 Waste categorization

Waste categorization is also another feature of waste management that requires consideration. Waste can be classified in to different categories based on different attributes including the physical state, original use, material type, physical properties, origin and safety level (McDougall et al 2008). As the focus of this thesis is on solid municipal waste, more focus will be given to municipal solid waste.

According to Zhu et al (2007:3) solid waste can be defined as 'non liquid materials that no longer have any value to the person who is responsible to it'. There are a number of synonym words such as rubbish, garbage and refuse that can be used instead of solid waste. Furthermore, depending up on the source waste is classified as a municipal and non municipal waste. The sources for the municipal solid wastes are offices, households, streets and public places, shops and hospitals. The responsibility to manage municipal solid waste is left to the government and the different public authorities. In most cases, solid waste from industries are not classified with in municipal solid waste, however, the waste gets mixed in to the solid waste stream (Zhu et al 2007:3).

2.1.3 Concept of Waste Hierarchy

The concept of waste hierarchy is the basis for waste minimization strategies, and refers to the 3Rs which are reduce, reuse and recycle. According to Baud et al. (2004:6) a more environmentally friendly and sustainable solid waste management strategy emphasizes on activities in relation to reduction, reuse and recycling. The application of the 3R concept in to the waste management minimizes the amount of waste that goes in to landfills.

Reduction is aimed at reducing the amount of waste produced by adopting or optimizing the production process of manufacturers and industries. As a result, natural resources will be saved. *Reuse* does not involve re processing or transforming from one type of material in to another. Rather reuse occurs when one material served its original purpose and reused for another purpose rather than being thrown away. *Recycling* is all about transforming or reprocessing of materials that served the original function in to new products. Otherwise, those products that served the original function will be considered as waste. Recycling is common among materials produced of virgin materials such as glass, plastic, metals and electronic waste. Recycling also involves organic materials for the production of compost. (Zhu et al 2007: 126).

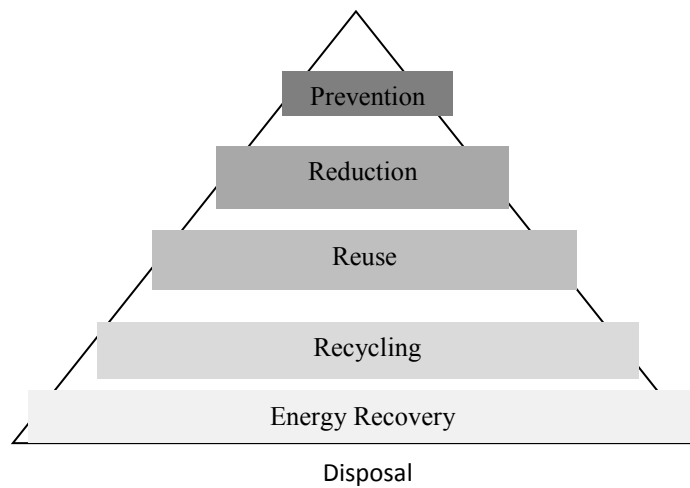


Figure 1. Waste Management hierarchy¹

The waste management hierarchy (see Figure 1) categorizes waste management strategies depending up on their ability to minimize waste as reduce, reuse and recycling. The concept promotes the collaboration between waste generators, collectors, processors and manufacturers, and reduces the amount of waste that is disposed. As a result, the amount of environmental deterioration will be reduced, emissions from landfills will be minimized and natural resources and energy will be saved (Zhu et al 2007: 126).

The government and the private sector are responsible for the minimization of waste by reducing the amount of inputs or resources used for production and consumption, and recycling makes these inputs more efficient. Both the reuse and recycling of waste can be carried out at the primary and secondary level. The primary level includes all the activities within the household, firms and institutions, on the other hand, the secondary level includes after the materials have entered the waste stream. At this point the extent of the source separation is an important aspect that determines the level where the recycling and reuse activities are carried out (Baud et al.2004:14).

2.1.4 The New Vs the Old concerns / thinking of waste management

Throughout the years the major concern of waste management has been changing. Health and safety were major concerns; therefore, waste management has been prioritizing and minimizing health risks (UNEP, 2002:31). Today, sustainability has become the major concern of waste management in addition to health and related issues. Accordingly, sustainable waste management incorporates the three major pillars of sustainable development which are economic, social and environmental. According to the Brundtland Report titled *Our Common Future* published in 1987, Sustainable development or sustainability is defined as 'a development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987: n.p). Therefore, sustainable waste management should be economically viable, socially acceptable and environmentally effective (McDougall et al., 2008:2).

As a result, waste management systems are providing consideration to environmental issues over economic costs in the decision making process. The two major concerns of waste management in relation to the environment are the conservation of resources and pollution and deterioration of renewable. The conservation of resources is more or less the old concern of waste management in relation to the environment. However, pollution of the environment is the recent concerns of waste management in relation to the environment (McDougall et al., 2008:20-25).

In general, sustainable waste management has three objectives these are: reducing the amount of waste generated, managing sustainably (by minimizing the environmental burden, minimizing the economic cost and maximizing the social acceptability), and the last objective is considering waste as a resource (UNEP, 2002:32). Changing attitudes towards waste and considering it as a resource shows shifting of societies towards sustainability (Gutberle, 2008:3).

¹ Sandec (2004) cited in Zhu et al 2007: 126, Improving Municipal Solid Waste Management in India: A source book for policy makers and practitioners.

Presently, a more systematic approach, *sustainable and integrated solid waste management*, has been developed to incorporate major aspects and stakeholders in the planning of a waste management system. This approach considers major planning aspects such as environmental, legal, socio-cultural, institutional and political, and additionally considers the importance of the role of stakeholders such as the informal recycling sector and small-scale enterprises in addition to the existing stakeholders. Other elements of the waste management system such as prevention, reuse and recycling, collection, street sweeping and disposal are also considered as the integral parts of the system (Zhu et al. 2007:6).

The approach strengthens the sustainability of the waste management system by providing economic service delivery and establishing cost recovery mechanisms. The approach gives recognition to the direct linkage of willingness to pay and the quality of service delivered. The approach makes sure that the cost is recovered through direct fees, indirect general taxes and revenues from recycling and resource recovery among others. The approach is also encourages the minimization of resource use and impact on the environment (Zhu et al. 2007: 5-6).

2.2 Informal Sector

The concept of informal sector or economy is recently developed in 1973 by the German Anthropologist, Keith Hart, subsequent to studies in the context third world. It has been used to describe the urban labor force that is working outside the formal sector. The 1960s marked with a rapid industrialization among urban areas of most developing countries which is resulting in the marginalization and neglect of rural areas. This resulted in an increased rate of rural-urban migration creating high unemployment rate pressurizing urban dwellers to be engaged in informal economic activities (Yusuf, 2011:624).

Different researchers have diversified understanding and interpretation to informality. The sector is characterized as a sector where workers are unprotected, excessive regulation, low productivity, unfair competition and under or no payment of taxes. (Perry et al. 2007: 21). These characterization come from viewing the sector from two perspectives: from the firm's (productivity) perspective and from the employee's (social protection) perspective. The ILO considers the informal sector as where there is unsafe and unhealthy working condition, long working hours with low and unsteady compensation, low skill and productivity level, lack of access to information, market, finance and technology (Gutberlet, 2008:3). Firms with in the informal sector include unregistered small-scale businesses such as family-based businesses involving family members, and also small micro enterprises with at most five employees (Oviedo, A. et al.2009:4). These businesses are more of labor-intensive and low- technology manufacturing or service provision (Wilson et al 2006:797).

Currently, more focus is given to the informal sector as it is providing employment opportunities and also providing goods and services to a large section of population without any support from the government (Hemmer & Mannel, 1989:1543). It is also argued that the informal sector cannot be seen as separate institutions form that of the formal sector. In most cases, the formal and informal sectors are more of complementary and the dividing line between the formal and the informal is blurry.

2.2.1 Informal Waste Recycling

An informal waste recycling activity is a phenomenon in developing and least developed countries as a result of low economic development. According to Wilson et al. (2006:798) this sector is left for those who are poor and marginalized urban dwellers that resort to scavenging and waste picking for survival. In cities with formal and municipal waste management system, there are at least four main categories of informal waste recycling. The categories are stated as follows:

- a) *Itinerant waste buyers*: these are waste collectors that are engaged in the collection and marketing of sorted dry recyclable materials. They collect the recyclable items from door to door, and this category of informal waste collectors are common in most parts of the world.
- b) *Street waste picking*: recyclables are recovered from mixed waste on the streets or from communal bins.
- c) *Municipal waste collection crew*: recyclables are recovered from vehicles transporting Municipal Solid Waste to the dump site.
- d) *Waste picking from dumps*: these are waste collectors that recover recyclables from dump sites before being covered. (Wilson et al. 2006:798).

Wilson has further shown the coordination of these categories as system in the context of Bangkok as per shown on Figure 2.

Based on the definitions that have been given, Waste is considered as something with no value and discarded by the original owner. Related to this conception of waste, many people that work on waste and mainly of the informal waste recyclers are perceived negatively and stigmatized by the society at large. Another aspect that needs to be raised is the question in relation to the ownership of waste in the context of the informal waste recyclers. In most cases, informal waste recyclers are considered as thieves for collecting recyclables from the waste disposed (Gutberlet, 2008:3-4).

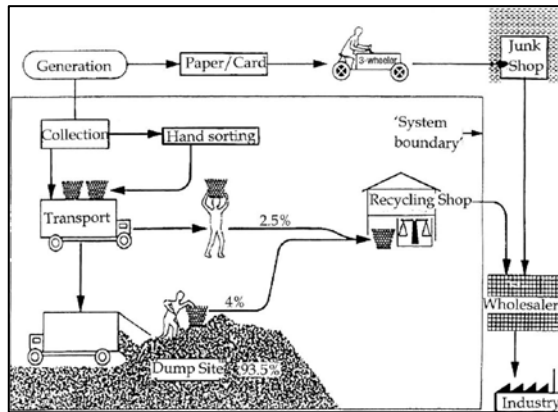


Figure 2. Informal recycling system in Bangkok in 1987 ²

However, informal waste recyclers have the skill of identifying waste with the potential of economic value even if discarded by the original owner. According to Wilson et al (2006:801) informal recyclers sort, clean and alter the shape of the waste and gives value in to a commercially viable quantity. The selection criteria for the recyclable materials include profit margins, accessibility, convenience, ease of transporting and handling. The most common materials that are recycled include plastics, aluminum, textiles, paper, steel and other metals. Almost all material can be recycled, nevertheless, the value given to the recycled material depends up on the demand and uses for it. The value of the materials is the major driving force for the informal sector (Zhu et al 2007: 127).

2.2.2 Organization and Trade hierarchy in Informal waste recycling

The income, working conditions and social status of the informal waste recyclers is highly dependent on the form of the organization of the informal activity. The informal recyclers are less exploited and can increase value to the recyclables when organized in a less formal way. As they will be marketing the materials in the local market there will be a number of dealers in between the informal recyclers and the end users, which are the local industries such as craftsmen. The trade chain may include both a formal and informal activities (Wilson et al 2006:808).

Those involved in the informal waste recycling as waste pickers' itinerant buyers, traders and small-scale recyclers of waste are characterized by both close collaboration and conflict. Their cooperation is mainly aimed at credit and informal social security arrangements. The nature of the informality allows some free riders to go unpunished (Baud et al. 2004:12).

The actors within the informal recycling trade are structured in the form of hierarchy as shown in figure3. When a secondary material is traded at the higher level of the hierarchy, it gets a more added value. In most cases, informal recyclers are found to the lower part of the trade hierarchy and this will minimize the potential of generating higher income. Within from the informal recyclers, Individual scavengers or waste pickers are the ones that are affected most. Their capacity to add value to the recyclables is very low as they have limited capacity for processing and sorting the materials (Wilson et al 2006:808).

² Wilson et al. 2009:808, Building recycling rates through the informal sector

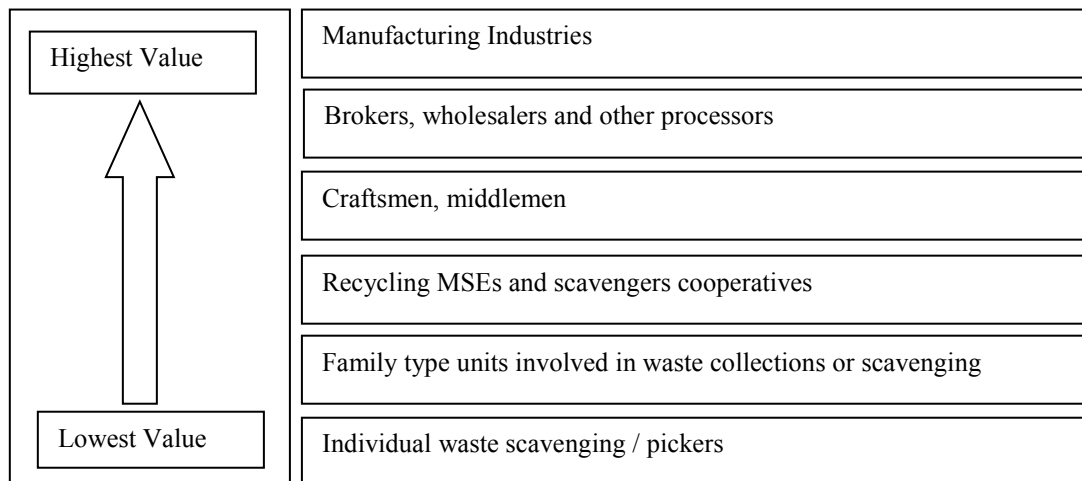


Figure 3. Hierarchy of actors within the informal resource recovery sector ³

2.3 Urban Governance and Solid Waste Management

Waste management has to be prioritized within the governance of urban areas. Urban life style contributes to larger extent on the amount and type of waste generated, as a result urban livelihood generates more waste than the rural (Gutberlet, 2008:4). Furthermore, urbanization in less developed countries are characterized with informal settlements, unemployment, poor housing and living conditions, under serviced neighborhoods and unsafe working environments among others.

According to UNHABITAT (2007) developing countries in Africa and Asia are expected to host the largest urban population, 748 million and 6.66 billion respectively by 2030. This urbanization will be characterized with urban poverty and inequality with high rate of formation of slum areas. Excessive urbanization and informal settlement result in the growth of informal economic activities with unhealthy and unsafe working condition. Informal recycling is one of the informal activities where individuals and families without income engaged with (Gutberlet, 2008:6).

There are wide ranges of definitions that have been given to governance. One of the definitions give by the UNDP is 'the exercise of political, economic and administrative authority to manage nation's affairs. It is the complex mechanisms, processes, relationships and institutions through which citizens and groups articulate their interests, exercise their rights and obligations and mediate their differences' (UNDP, 1997:9). In addition, Stocker (1998:38 cited in Devas 2004:24) defines governance as 'the action, manner or system of governing in which the boundary between organizations and public and private sectors has become permeable ... The essence of governance is the interactive relationship between and within government and non-government forces.'

Even if the concept of governance is expressed in broad terms urban governance can be considered as an interaction or relationship between the government and the people. Its people are organized under different forms in to actors such as Formal civil society organizations, Informal sector businesses, individuals/households in poverty, Informal community based organizations and Traditional authorities among others. Moreover, the presence of wide range of actors has affected the role of the state within the system of governance. Nowadays, governance takes place in the context of a wide range of actors and this has made the state less dominant when compared to previous times. This has also complicated the policy making process as there is no single actor who is in charge and legitimate to direct societal change. It also demands a consensus that is socially constructed than given by virtue of legitimacy granted to the states action. (UN-Habitat, 2001:61 – 62 cited in Devas 2004:24).

³ Wilson et al. 2006:808, Role of Informal sector recycling in waste management in developing countries

2.4 Network Theory

Alders et al (1993:9 cited in Zerihun 1996:30) a network is defined as 'any group of individuals and/or organizations who, on voluntary basis, exchange information or goods or implement joint activities and who get organized for that purpose in such a way that individual autonomy remains intact'. Based on this definition individuals' motivation to join the network, based on self interest and conducting activities of common interest, are considered as the major characteristics of a network.

Wasserman & Faust (1999:3) views these joint activities within the social environment as a pattern or regularities in relationships within the interacting units resulting in *structures*. The relationship among the interacting units can be measured using *structural variables* and the relationship can be of different aspects including economic, political and interactional among others. According to Boissevain & Mitchel (1973:25) the set of transactions that relate the individuals has its own implication on the people involved in the transaction.

Nnunduma (2003:20) argues that network theory has resulted from the conceptualization of a social group within an interacting community. (Boissevain & Mitchel 1973) described man is a social animal with the need to establish relation with others of his kind. Nnunduma describes networks within social groups by comparing it to living organisms as 'Networks are useful socio-economic systems with specific historical and cultural dimensions that emerge to meet the particular needs of people at a particular place' (Nnunduma, 2003:107).

Mark (1998:3) classified networks in the context of trade and market into two common models and ideal types of organization which are hierarchies and market. Networks exist in the middle of markets and coexist within hierarchies. He further noted that anything can be a network based on the definition of network given by Baber (1992) as 'network is a set of relationships within a defined population; the population can be a people or other relational nodes'. However, these networks should have resources, skills, legitimacy and means of coordination.

Nnunduma (2003:21) argues that individuals engaged in to the activities of a network establish common aims and interests that are expected to result in the development of rules, values and norms. These in turn are expected to create roles, obligations and expectation of reciprocity. Wasserman & Faust (1999, cited in Nnunduma 2003:21) argues the strength of relational ties among members of a network has an overall implication on the potential of the members of the network to execute collective actions and this in turn has effect on how the network behaves.

Actors and relations among actors are two major concepts in the study of a network theory. The concept of network has been introduced to the concept of the informal sector by the study of Lomnitz (1988) with the study titled *Informal Exchange Networks in Formal Systems: A Theoretical Model*. The study argues that Networks of reciprocity and patron-client relations has been playing an important role in the informal sector. The actors in the informal sector who are involved within the informal activities have been described by Lomnitz as 'disadvantaged' in comparison to the members within other sectors in the formal system. According to the study such a network and relation is important for the members of the informal sector in order to articulate or integrate in to the formal market system and create informal social security system to survive (Lomintz, 1988: n.p.).

2.5 Actor - oriented approach

An actor-oriented approach is developed in late 1960s by Norman Long and his colleagues at Wageningen Agricultural University. According to Thim (2010:45) the approach is meant to analyze a situation where a number of actors interact and fought over resources use mostly in the development process.

Actor within social context should be understood as a result of a social construction rather than a simple mere representation of individual (Long & Long, 1992:9). The different patterns of social organizations within every society are results of the continuous interactions, negotiations and social struggles among the different actors within the system. However, it is also important to take note of the different actors that might be absent from the face -to-face encounter but still influence the situation by affecting the actions and outcomes. (Long, 2001:13).

Therefore, to understand social change there is a need to understand the role played by the 'internal' and 'external' factors and to recognize the significance of the role played by human action and consciousness. Social actors provide different responses to similar structural circumstances resulting in differential

patterns. Social actors should not be considered as disembodied social categories such as based on class and passive recipients of intervention rather they are active participants processing information and standardize their dealings with other local actors and institutions (Long & Long, 1992:20 - 21).

'human agency' is the central concept within the actor oriented approach. As Giddens (1984: 1-16) cited in Long & Long (1992:23) 'the notion of agency attributes to the individual actor the capacity to process social experience and to devise ways of coping with life, even under the most extreme forms of coercion. Within the limits of information, uncertainty and the other constraints, social actors are 'knowledgeable' and 'capable'. They attempt to solve problems, learn how to intervene in the flow of social events around them, and monitor continuously their own actions, observing how others react to their behavior and taking note of the various contingent circumstances''.

According to Long & Long (1992:23) 'agency' is not simply a mere decision making capability rather it is composed and result of social relations. Organizational capabilities are required for the effectiveness of agency and this depends on the emergence of network of actors involved in other person 'project'. Furthermore, effective agency necessitates the strategic manipulation of a network of social relations and the channeling of specific items.

3 Overview of Methodology

This section describes in to the methods and the data collection techniques used on the field to generate the required data.

3.1 Case Study as an Overarching Method

Yin defines case study as a research method as 'an empirical inquiry that investigates a contemporary phenomenon in-depth and within its real life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin 2009: 5). Yin further noted that the using a case study research method is preferred whenever the research questions are 'how' and 'why' (Yin 2009). A case study suits to research a topic in depth and explain the 'complexity' and 'subtlety' of a real life situation and it is also important in terms of validating the data from a multiple sources through triangulation (Denscombe 2007). Therefore, this study uses a case study to address the research questions and the overall study objective.

Exploratory Research

As a start of the case study, I conducted a small and informal exploratory research in order to have a better understanding of the formal and informal waste management in Accra. Here, I would like to make clear that this exploratory research is used only to strengthen my understanding of the waste management system of Accra to start the case study, not as a research method to source data for the study. To this effect, I participated at the National Environment and Sanitary Conference in Kumasi, Ghana. This familiarized me with the different views of stakeholders representing the private and public institutions in the formal waste management system. However, the informal sector was not represented at the conference as the existence of the informal waste management system has been ignored and the workers within are not counted as important stakeholders.

To further understand the informal waste collection and material recovery system in Accra, I continued by identifying key informants that have been part of the system for long. At this stage the activities of the research department of Zoomilion Ghana Limited was important. In addition, I visited two landfills (Abokobi and Sabah) and low income areas where communal bins are located to identify scavengers' networks. Informal interviews and discussions were carried out with communal care takers, scavengers and landfill workers. Encounters with scrap collectors on major streets in Accra, and the information gathered led to the area called Agobgloshie which is considered as the base for metal recovery. At the end of the exploratory study, I used a snowballing technique to identify and build up the target population for the case study.

Qualitative and Quantitative Methods

The study uses both qualitative and quantitative methods to collect data. These methods are Focus Group Discussion, Observation, Semi-structured Interview and Questionnaires. These will be further discussed in the next section 3.2. The first part of the study which investigates in to the current formal waste management system entirely applies qualitative methods to generate the data required.

However, the second part of the study dealing with the informal waste recovery system employed mainly qualitative methods and used quantitative methods as necessary. Scott (2000: 2-5) states that in the study of networks there is a need to gather three types of data including attribute, relational and ideational data which are considered as social science data. He further noted that even if it is possible to use quantitative and statistical counts of relations, the study of network mainly contains qualitative measures of network structure.

3.2 Data Collection Methods on the Field

Primary Data

Focus Group discussion

In the study, focus group discussion is mainly used to identify the opinion and attitude of households on the current waste management system, handling and sorting of waste two focus groups were organized in Sabon Zongo and Metaiko representing low to high income areas in Ablekuma Central. The participants were randomly selected with the assistance of the respective Assemblymen in Ablekuma Central. Ten participants were included in each of the focus groups.

According to Johnson (2002:99) focus group discussion is defined as 'a type of qualitative research in which small groups of people are brought together to informally discuss specific topics under the guidance of a moderator'. Focus group discussions are flexible to make adjustments in process and questions allowing looking in to the specific topic from different angle (Johnson 2002:99).

As a moderator, I have tried to keep the discussion focused and encouraged all participants without being intimidated by fellow participants. During organizing and conducting the focus group discussions, I was assisted by two assistants from Zoomlion Ghana Limited. Their roles were limited to the translation from the local language into English as necessary, gathering the selected participants and organizing refreshments.

Observation

According to Kothari (2004:96) observation becomes a scientific tool when used to a formulated research purpose in a systematic and planned way. Observation is all about the researcher's direct own observation without the involvement of respondents. There are two types of observation methods depending up on the observers sharing or not sharing in to the activities or the lives of the group under observation. These are the participant and non participant observation. If the researcher takes part in to the activities of the groups that he / she observe, it is called *participant observation*. However, if the researcher chooses not to take part in to the group under observation, it is called *non-participant observation* (Kothari 2004:96).

For this specific study non-participant observation has been employed as participating with the groups under study would be attracting more attention as the group members have a high level of mobility in and around the city. Rather, I have observed network members while performing their daily routines without being actually involved in their activities.

Semi- structured Interview

Semi- structured interview was also used as a method of collecting primary data. It is one of the techniques used in the field to gather data (Kothari, 2004:97). The interview questions were prepared in a way to gain an in-depth insight into the formal and informal solid waste management system. Prior to the interview sufficient explanation was given regarding the purpose and aim of the study to the interviewees. The interviews were recorded based on the willingness of the interviewees in addition to the note taking during the interview. However, some refrained from being recorded. The interviewees and the sample questions are annexed at section 11.1.

Questionnaires

Two types of questionnaires were prepared for workers engaged in the informal waste collection and material recovery system. The questionnaires were found to be important in order to get both qualitative and quantitative data. The questions were mainly designed to collect the attribute data that is required to study the characteristics of actors and the networks. In addition, some of the questions were designed to give information about the individual perceptions regarding the social ties they have within their respective networks and in the trade hierarchy chain.

As the number of members of the networks or groups was small, ranging from 15 to 35, the initial target was to include all members in to the survey to assure accuracy. However, it was not possible to get the response from all members of the networks incorporated in this study. The problems encountered are further discussed in section 3.4.

Secondary Data

The secondary sources were reviewed to give information on formal waste management system in Ghana. There are no well documented resources regarding the informal waste collection and recovery system in Ghana.

3.3 Data Interpretation

For the quantitative data, mainly for the attribute data, variable analysis was used whereby attributes are measured as values of particular variable such as age, gender, income, place of origin. Regarding the qualitative data, an interpretive approach was used in which I have been dependent on the responses to the questions as basis for my description. For the consistency and relevance of the output, the patterns and themes of the responses were seen as an important aspect.

3.4 Problems Encountered

Absence of Secondary data

There are very limited secondary sources on waste management in Ghana and particularly on the informal sector. This has become a challenge, and made high dependence on primary data inevitable.

Building trust

Establishing contacts and building trust with actors within the Agobgbloshie scrap metal yard was found to be difficult and time consuming. One source of the mistrust has to do the fact that I am foreigner. In addition, similar problem was encountered with *Qualiba* men Association who are engaged in the collection of plastic bottles for reuse. They declined the request to participate in the study despite the repeated approach and explanation. There was a fear that the information generated would be passed to government authorities. In addition, some interviewees decline to be recorded even though they agreed to give information.

Undisclosed Actors

Some of the actors within the informal waste recovery system do not want to disclose themselves. Especially the ones located in the port city of Tema related to the very end chain of the recovered metals. These include companies that are engaged in the export of the metal and also supplying to the local industries. In addition, I have found it being so difficult to access information from local metal industries as well. During the start of the study, I had the plan to use the reputational approach which requires the listing of nominees for the study by knowledgeable key informants. However, the nominated actors that are considered as the most powerful in the sector have declined to be part of the study.

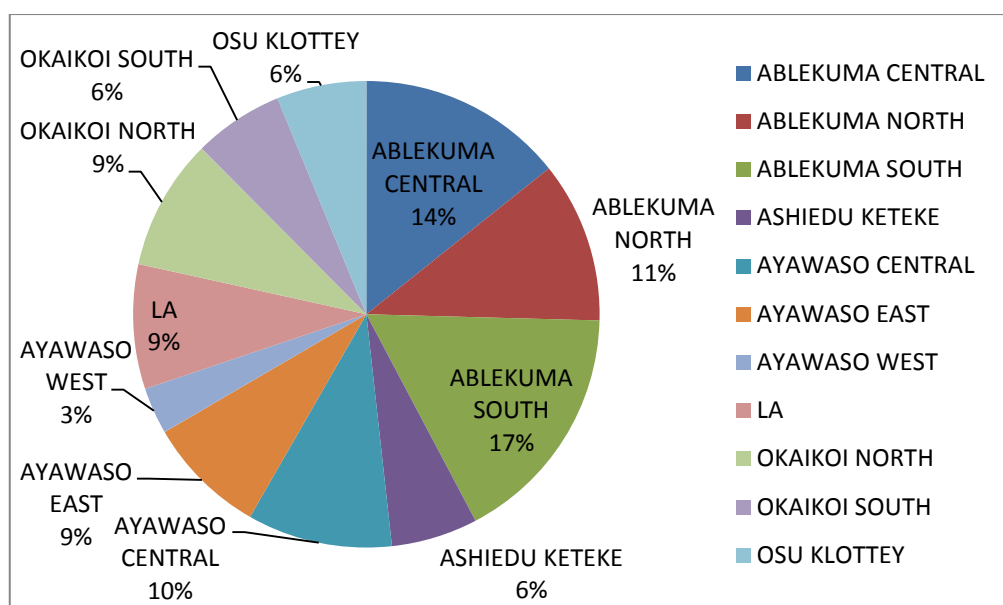


Figure 5. Estimated Population distribution By Sub Metro (2010) *Source: AMA*

The large population is considered as an asset as well as a problem for the development and management of AMA. One of the major challenges of the large population is the difficulty to provide appropriate sanitation and waste management services (Interview with Mr. Victor Okaye, 2011). In addition, high traffic jams are also serious problem especially during peak hours of the day (AMA: 2011). However, the large population is also considered as an asset in terms of providing a viable market for local and foreign investors.

The population density of AMA is estimated to be 250.73/ha in 2010 and expected to reach to 292.5/ha in 2013. Nearly 56% of the population is below the age of 24 and also the age dependency ratio is estimated to be 60% (AMA: 2011). In particular, the population density of Ablekuma central is estimated to be 538.73/ha in 2010 and it is expected to be 719.96/ha at the end of 2013. This makes the Sub- Metro to be the third densely populated following Ashiedu Keteke and Ayawaso East (AMA 2010a).

4.3 Economy and Urbanization

Since Accra is the capital city of Ghana and also considered as the economic capital for West Africa region. AMA has a number of establishments including manufacturing industries, financial institutions, companies, telecommunications, tourism and health institutions. This has created job opportunities besides the revenue generation for the government in the form of business operating permit, property rate and the like. In general, the economy of the Metropolis is cosmopolitan in nature (AMA 2010b).

The discovery of Gas and crude oil has also created a huge opportunity for the economic development of AMA and Ghana in general. In addition, AMA has a well developed trading, commercial and service sectors with markets and shops trading on a range of commodities that are available on the world market (AMA 2010b).

Despite the presence of different economic establishments and a seemingly economic boom there are still a number of challenges witnessed within AMA. The unemployment rate has reached to 10.6% in 2010. This has an immense contribution for the percentage increase of urban poverty from 4.4% in 1998/99 to 10.6% in 2005/06. However, the poverty rate in other parts of Ghana has been reported as declining from 39.5% in 1998/99 to 28.5% in 2005/06 (AMA 2010a).

The annual urbanization rate of AMA is estimated to be 4.2% with a very high urban-rural migration in search of better job opportunities and income. This rapid urbanization resulted in the creation of slum areas due to the shortage of low income housing and infrastructure. There are nearly 29 slum areas with unauthorized structure where 90% of the dwellers are within the very low income range (AMA: 2011).

4.4 Governance

Ghana has established a decentralized local government system based on the constitution of the Republic of Ghana adopted in 1992. This provision provided a legal ground for the decentralization process that began in Ghana in 1988 (AMA: 2010). Article 240 (1) of chapter 20 of the constitution states that 'Ghana shall have a system of local government and administration, which shall as far as practicable, be decentralized' (Constitution of the Republic of Ghana: 1992). Furthermore, Article 240 (2) stated the relationship between the central government and the local governments. Specific guidelines are also outlined on the transfer of functions, power, responsibilities and resources.

The Local Government Act (462) which was adopted in 1993 clearly articulated the provisions for the establishment of Districts, District Assemblies, Composition of the District Assemblies, Functions of the District Assemblies and so on. The Local act is adopted to establish and regulate the local government system in line with the constitution and to provide other related purposes (Local Government Act: 1993).

Based on the provisions provided by the constitution and the Local Government Act, AMA is made of 11 Sub Metropolitan Districts and the General Assembly that is the highest body of the governance structure. The Assembly is led by the Chief Metropolitan Executive nominated by the president and approved by the two-third of members of the Assembly. Under the Sub Metropolitan Councils, there are town councils which are made up of 15 to 25 members. The Local Government Act (Act 462) specifies the structures operating at the District level. In addition it specifies the roles to be performed by each structure as it has been shown on Figure 6. The deliberative and legislative functions of the Assembly are performed by General Assembly under the leadership of the Presiding Member (AMA 2010a).

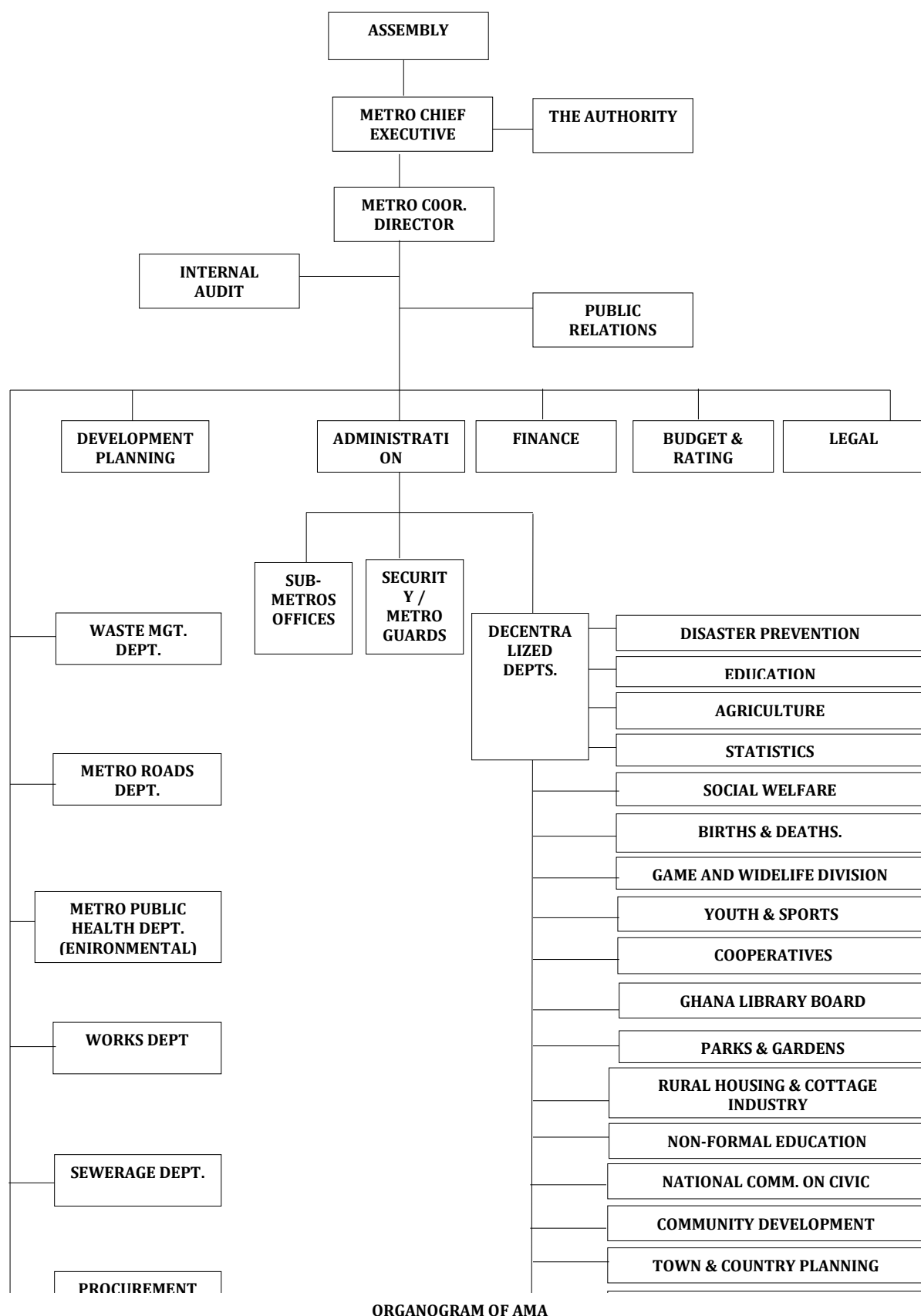


Figure 6. Organizational structure of AMA Source: AMA

4.5 Solid Waste Management in Accra

4.5.1 Waste Management Department

AMA provides solid waste management services both directly and indirectly through the WMD. Therefore, the department has the obligation to keep the city clean and environmentally healthy according to the Environmental Sanitation Policy. The current organizational structure shows that the department has a head and with nine units reporting to the head as shown on Figure 7 (AMA 2010b).

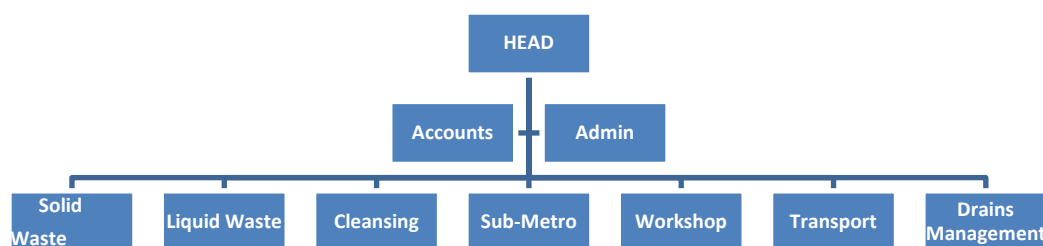


Figure 7: Current Organizational structure of WMD Source: AMA

The WMD is decentralized within the 11 Sub-Metropolitan Assemblies within Accra as shown in Figure 8.



Figure 8: Organizational structure of WMD at Sub Metro level. Source: AMA ISWMS

4.5.2 PPP

As per the Environmental Sanitation Policy WMD is to provide Solid Waste Management services indirectly through PPP and franchise agreements with private contractors, and expected to provide 20 % of the services directly. However, the department is challenged with shortage of resources to provide the mandatory requirements by the policy. Currently, there are nine private formal companies registered by AMA to provide Solid waste management services as of 2010 operating within the 11 Sub-Metropolitan Assemblies. Furthermore, the fact that sanitation and waste management services are classified as public good made the involvement of civil society very crucial. Civil societies are encouraged to involve through NGOs, traditional rulers, opinion leaders and CBOs in monitoring the delivery of services order to harmonies implementation of policy at the local level (AMA 2010b:31-32).

PPP has been in practice starting from the 1990's involving one big waste management company, CCWL and a number of smaller waste management companies until 2001. However, the contract with CCWL was obligated as AMA claimed that the company was inefficient. However, the main reason was the fact that CCWL was affiliated with the political party, NDC, which was in power when the contract was issued. When NDC loses election for NPP the contract was obligated and AMA was sued for contract breaching and paid nearly 12,000,000 USD. Starting from 2010, AMA got in to franchising agreements and re-zoning with private waste management companies to provide FPB solid waste collection services (Interview with Mr. Victor Kontey, 2011).

Based on the FPB system, waste generators are required to cover the cost for the disposal of the waste they created. The two main systems introduced for solid waste collection are house-to-house or door-to-door collection and central container. The door-to-door collection is for the higher income areas while central container system is to operate in the medium and low income areas. Disposal sites are also managed by these private solid waste management companies (AMA 2010b:48-49).

As per the franchise agreement, contracted private companies have the responsibility to register and collect the assigned fees and payments for their services. Private companies are required to work closely in the collaboration with the WMD and Metro Public Health Department within the assigned Sub Metropolitan Assembly (Interview with Mr. Victor Kontey, 2011).

4.5.3 Waste composition

As shown by Figure 9 it has been estimated that organic waste (65%) is the dominant type of waste that is generated in Accra. However, solid plastics and Metals are estimated to be 3.5 % and 2.5% respectively (AMA 2010b).

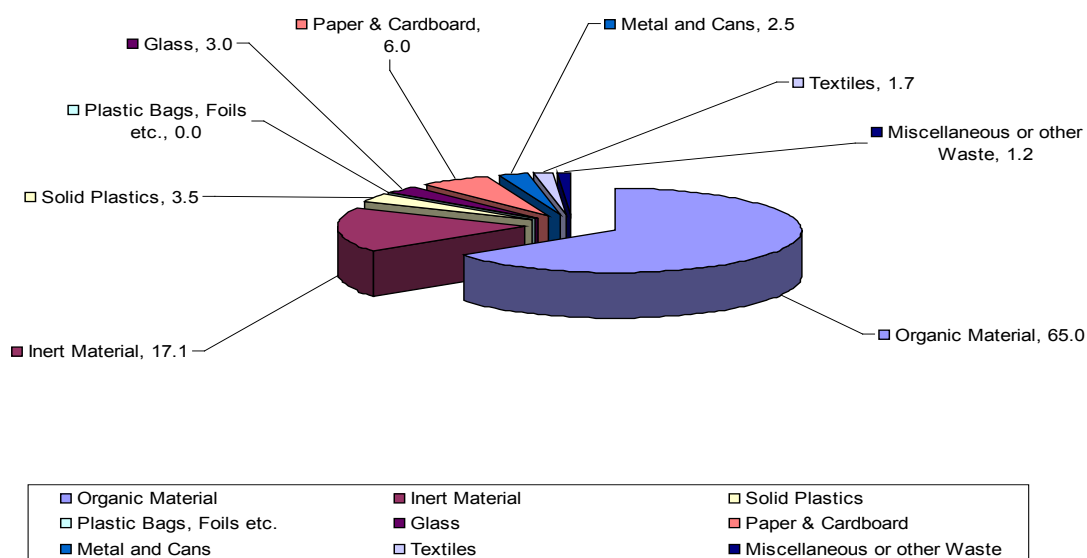


Figure 9. Average fractions of solid waste generated in Accra in 2003 Source: WMD AMA

4.6 Policies and Bye- Laws on Solid Waste Management

4.6.1 AMA Solid and Liquid Wastes Management Bye-Laws 1995

The bye-law was adopted in 1995 by AMA based up on section 79 of the Local Government Act of 1993 (Act. 462). It provides both the AMA and its contracted registered agents or contractors full authority for the management of both solid and liquid waste with in AMA. In addition, every waste generator has the obligation to make all solid and liquid waste accessible for the collection, treatment and disposal by AMA or its agents. If any waste generators including households render service from unregistered or unauthorized personnel, it is considered as an offence and will be fined or serve terms of imprisonment (Local Government, 1995:175-176).

4.6.2 Waste Management Policy

The Environmental Sanitation Policy was first introduced in 1999 and later revised in 2009. The overall objective of the revised policy is providing adequate and efficient waste management services with an effective utilization of national resources for clean and healthy environment in Ghana. To this effect, the revised policy proposes strengthening the private sector partnership (AMA 2010b:29).

Promotion of the benefits of waste reduction, re-use, recycling and resource recover are among the objectives and measures to improve the challenges of environmental sanitation problems in Ghana. In addition, it proposes legislations and regulations to support waste reduction, re-use, recycling and recovery. In general, the policy has proposed strategic elements under six policy focus areas including capacity building, information, communication and education, legislation and regulation, levels of service, sustainable financing and cost recovery, research and development, monitoring and evaluation (MLGRDE, 2007: 12-18).

4.6.3 Integrated Solid Waste Management Strategy 2010

The Integrated Solid Waste Management Strategy is based on the Environmental Sanitation Policy. It is designed to provide a road map for an effective and efficient solid waste management services and programs that are affordable and environmentally acceptable in Ghana. The major objectives of the strategy include increasing the collection of solid waste from 1750 to 2,100 metric tons per day representing 95% collection and also recycle 30% of the waste collected daily (AMA 2010b:20)

In addition, the strategy provides both regulatory and institutional frameworks for the effective and efficient provision of solid waste management. The private sector is identified as an important stakeholder to provide the services through privatization and public private partnerships. This also considered as one strategy to address the issue of high cost and budget constraint from the side of the government by mobilizing resource from other sources (AMA 2010b: 23)

5 Existing Solid Waste Management Practices

This chapter looks in to the current practices of waste storage, transportation and disposal within the study area. It is expected to show how the formal waste management system functions and the context with in which the informal waste recovery system functions.

5.1 Solid Waste Storage Practices

5.1.1 Primary Storage

According to the PPP agreement between AMA and Zoomlion Ghana Limited all registered households for the door to door collection are to be provided with a "standard" plastic waste bins free of charge. Accordingly, most households that are registered for the service have been provided with Plastic waste bins of two different sizes (1.2 liters and 2.4 liters) depending up on the anticipated amount of waste to be generated by the household.

However, based on my observations, households use a range of options for primary storage of waste in the study areas. These include polyethylene bags, metal buckets, broken plastic buckets and the like. In addition, most households use small polyethylene bags to put the waste before putting the waste in to waste bin as shown in Figure 10.



Figure 10. Usage of polyethylene bags within the waste bin at primary storage

Based on my observation, one of the major reasons for using the polyethylene bags is the fact that one waste bin is shared by more than two households. In low income areas such as Sabon Zongo there are up to 10 households with in one house of which two or three households share the same waste bin. Therefore, households put the waste in to smaller polyethylene bag prior to placing the waste in to the common waste bin.

On the other hand, households in low income areas such as Sabon Zongo use the waste bins for other purposes including for water fetching, food storage and keeping dirty clothing. In areas that are medium to high income such as Metaiko, households use waste bin is a more effective way (Interview with Hussein M. Suadiq: 2011).

5.1.2 Sorting of Waste

Based on my observations and focus group discussions, within Ablekuma Central and specifically to Sabon Zongo and Metaiko there is no initiative of sorting waste by Zoomlion Ghana Limited and the AMA. All sorts of waste are mixed within one waste bin for collection. The PPP agreement between the AMA and Zoomlion Ghana Limited does not include sorting of waste as a responsibility of the company or households.

However, households with in the study area sort waste to generate income. Especially in Sabon Zongo households sort plastics and metals. This helps to generate additional income to households as the area is mostly populated with low income households. In medium and high class areas, the sorting and recovery of plastics and metals is done mainly by house keepers.

5.2 Waste collection and Transportation

5.2.1 Waste collection from the source

According to the PPP agreement, Zoomlion Ghana Limited has the responsibility to carry out door to door collection of household waste twice per week. In low income areas such as Sabon Zongo households have to carry waste bins to the main road side as there are no access roads for the waste collection trucks in to the neighborhoods as shown in figure 11 and 12.

In households where there are only older people, it is not possible to pull the waste bins to the main road or converging points for collection. Some households are expected to pull their waste bins to more than 50 meters. Therefore, in most parts of Sabon Zongo and some parts of Mataiko it is difficult to say households are benefiting from the house to house service (Interview with Emanuel Bakuwain: 2011).



Figure 11. Households carrying waste bins from streets after collection



Figure 12 Waste bins left on the streets after waste collection

5.2.2 Collection backlog

The door – to- door collection lacks regularity according to the schedule. Even if the agreement is to provide the collection service twice per week, there are occasions where the waste bin remained for more than two weeks as seen on Figure 13. The major reasons for collection backlog are the continuous technical problem with the waste collection trucks; shortage of human resources such as drivers and janitors. Some clients are left out due to lack of client information and site map for drivers and janitors to identify households that the company is servicing with the door-to-door collection service. As a solution, if one of the picking days are missed the lifting of waste bins continue on to the following day.



Figure 13 waste accumulated due to collection backlog

5.2.3 Conflict between Zoomlion Ghana Limited waste collection crew and households

Based on the focus group discussions, pulling the waste bins to longer distances twice a week is considered by households as a problem affecting the life span of the waste bin. Households claim that the wheel is not strong enough to be pulled in rough road condition. Some households also got stolen their waste bins from road side. As a result, some households refuse to place their waste bins at the road side and this has become an issue for conflict between households and Zoomlion Ghana Limited waste collectors.

Another source of conflict among households and waste collectors is an extra waste attached to the bins. The extra waste is mostly generated due to the backlog created by the company. In addition, when the waste bins are left for the truck collectors other unregistered households put their waste in the waste bin or leave the waste close to waste bins. In addition, households, traders and small business owners situated close to main road are not willing to let the waste bins placed in front of their private properties due to smell and disorganized collection of waste bins that are left on the road for days.

5.2.4 Waste transportation arrangements

Zoomlion Ghana Limited has allocated a total of 4 waste collection trucks with 8 waste collection crews for the door-to-door collection of waste in Ablekuma Central. According to the schedule each truck is assigned to collect waste in two rounds from assigned households and converging points.

Much of the collection and transportation of waste is done during the night time for two reasons. High traffic congestion during the day time is the major reason as the trucks have to travel long distances to the landfill sites. The second reason is the complaint of street vendors and residents in the area regarding the bad odor created during the pouring of waste in to the trucks during the day time. However, such arrangements have also challenges as there are security issues to workers in low income areas such as Sabn Zongo when compared to areas where there are medium to high income areas in Mataiko (Interview with Hussein M. Suadiq: 2011).

According to my observation, the waste collection trucks are properly covered with net and also the trucks are labeled as per the PPP agreement.

5.2.5 Waste Collection Trucks

The waste collection trucks are old requiring maintainace and encountering technical problems frequently. According to my observation this has also created a major reason for the collection backlog. In addition, the trucks do not have the capability to pass the hilly roads towards the landfill sites especially Sabah landfill. Often the waste collection trucks break at the landfill sites.

5.2.6 Safety of waste collection crews

According to the Zoomlion Supervisor at Ablekuma Central, waste collectors or janitors that are collecting and pouring the waste in to the trucks are equipped with all the necessary safety tools including gloves, masks, pullovers and boots as seen on Figure 14. However, according to my observation in certain occasions workers prefer not to use the safety tools especially gloves. The supervisor agreed on the need for further trainings in order to raise the awareness on the importance of safety tools and also change the attitude instead of sanctioning workers without safety tools which has been the strategy used by the company to date.



Figure 14 Zoomlion Ghana Limited waste collection crew during door-to-door waste collection

5.3 Disposal at the Landfill

Currently, Zoomlion is managing two (Abokobi and Sabah) with in Accra that are un engineered landfills owned by AMA. Other waste companies use the landfill in addition to Zoomlion Ghana Limited. For the services, Zoomlion collects fees from the other companies as well as AMA. In addition, informal waste collectors use the landfills as well. The landfills face a range of problems resulting in frequent close down which in turn affects the collection and disposal of waste.



Figure 15 Partial view of Sabah Landfill

5.3.1 Leachet Treatment

One of the landfills Sabah (see Figure 15) is located close to a neighborhood and a nearby river. As it is not an engineered landfill, it has a leachet problem especially during the wet or rainy season that is affecting the surrounding area including groundwater.

Even if the landfill is owned by AMA according to the PPP agreement the site was selected and established by Zoomlion Ghana Limited in 2008 due to the urgency of landfill and the delayed response from AMA. The site was an abandoned mining site that has been filled but not lined properly with clay to avoid sinking of leachet. The Landfills Manager for Zoomlion Ghana Limited shares the view that the landfills are not technically right starting from the selection of the site. In order to minimize the leachet problem Zoomlion Ghana Limited has built tunnels that entraps the leachet from sinking and transported to treatment plants which incurs an additional cost to the company operation.

5.3.2 Landfill Operations

Based on an in-depth interview and discussion with Landfill supervisors and scavengers in the area, landfill operations at both Sabah and Abokobi are disrupted due to the breakdown of machineries such as compactors and bulldozers. Maintenance takes longer time due to bureaucracy and shortage of spare parts. These lead to the close down of landfill sites and the queuing of loaded waste collection trucks until the landfills resume activities. In most occasions, the trucks are directed to go to other landfill sites even if out of Accra. The landfill operation is also challenged with the shortage of trained mechanics and landfill operators as the area of landfill management is a new phenomenon in the country.

5.3.3 Land Acquiring Issues

Acquiring land to establish landfill sites is a major problem for AMA as land is owned by various communities. To lease the land AMA reaches in to agreement with community leaders in return to establish infrastructure such as schools, roads, markets and so on. Since these agreements are not fulfilled in most occasions, communities block the landfills. This is one of the major problems encountered by Zoomlion Ghana Limited at Abokobi landfill site. The landfill is closed frequently affecting the overall operation of waste collection and transportation of solid waste.

5.3.4 Fire at the Landfill Sites

Based on my observations fire is a common incident at both landfills that creating heavy smoke polluting the environment. The major reason for the start of fire at the landfills is the methane gas that resulted from the decomposition of piled up waste. Decomposition starts beneath the piling waste without an outlet for the gas, which is volatile in nature. The gas and the strong sun heat spark fire. The situation worsens during the dry season of *Hamatan* as the wind further blows the fire and expands the burning.

At the same time, the deliberate burning of waste at neighboring landfill also result in creating fire at Abokobi landfill during the *Hamatan* season as shown on Figure 16.



Figure 16. Fire at Abokobi Landfill site

5.4 Central Container System

There is central containers system in Ablekuma Central, and mostly common in Low income areas such as Sabon Zongo. Each central container has personnel in charge to collect fees from households and informal waste workers for disposing waste. There is no fixed fee that has been assigned by Zoomlion Ghana Limited rather central container care takers set the price based on the volume of waste disposed. However, in certain areas within medium to high income neighbor hoods, placing central container is a challenge due to the NIMBY syndrome. (Interview Mr. Emmanuel Bakwain, 2011).

Based on my observations and interviews with central container care takers, I have learnt that most central containers over flow and central container care takers are forced to burn the waste such as paper to make space. In addition, there are also plastic and metal recovery activities at the central container sites that are further discussed in upcoming sections.

5.5 Cost Recovery / Revenue Collection

Zoomlion Ghana Limited collects revenues from waste generators and also AMA for the solid waste management services as per the PPP and franchising agreements. However, the company is not able to collect the fee on the monthly basis especially from clients that are receiving door-to-door collection services in low and middle income areas.

Based on my in-depth interviews, there are two major issues from both the side of households and the company. Many households are not willing to pay as they are not receiving the service on a regular and reliable way as per the agreement. On the other hand, the company has an internal problem to collect the fee on a regular and systematic way from the clients that are willing to pay.

AMA is also behind in its payments for the management of landfills and other services that are given by Zoomlion Limited. This has created financial problem to the company's function. Budget related issues are always stated as the major issues that are delaying the payments from AMA.

5.6 Informal Waste Collectors (*'kaya Bola'*)

Based on my observation and interviews, informal waste collectors are common in all the areas from low to high income areas of Ablekuma Central. As Zoomlion Limited Ghana fails to collect waste as per the schedule, informal waste collectors are important service providers among the registered households for service. In addition, households whether registered or not prefer informal waste collectors as they pay less for the service when compared with Zoomlion Ghana Limited.

Based on an in depth interview with the District Cleansing Officer, in low income areas, the informal waste collectors are accused of collecting and dumping the waste on the streets and ditches after collecting fee. These informal waste collectors mainly use sacks to collect the waste. However, in the medium and high income areas, the informal waste collectors are more organized and use four wheel motors and wheel barrow for the service. They charge fees after providing the waste collection service for households and other waste generators. After collecting the waste, the informal waste collectors separate plastics and metals that are valuable prior to dumping the rest of the mixed waste. Based on my in depth interview with informal waste collectors, they are not allowed to work in the area as the service is only to be provided by registered companies. As a result, the informal waste workers get in conflict with Zoomlion Ghana Limited workers and District cleansing supervisors.

However, there is an initiative by Zoomlion Ghana Limited to integrate the activities of the informal waste collectors especially in low income areas where there is a problem to access due to poor infrastructure. Informal waste workers are also engaged in the sorting of plastics and metals from the waste collected. This will be further dealt with in the upcoming sections.

5.7 Civil Society

NGOs and CBOs

There are no NGOs or CBOs that are involved in waste management in Ablekuma Central. However, some NGOs and CBOs support clean up exercises that are organized by the WMD at the Sub Metro level. These NGOs and CBOs are mostly requested for assistance on those exercises by WMD, Assembly Men and Opinion and Traditional Leaders.

Opinion and Traditional leaders

Based on my observation and in depth interviews, Opinion and Traditional leaders plays an important role in smoothening the relation between the households and Zoomlion Limited by educating and changing attitude for better waste management at household level. In addition, their role is more important in low income areas such as Sabon Zongo.

5.8 Supervision

Based on my observation and in depth interview, Zoomlion Ghana Limited has assigned one supervisor for Ablekuma Central. He has the responsibility to make sure that the lifting of waste bins and central containers is executed according to the schedule. However, the supervision is challenged as there is no vehicle assigned and also assistant as the service covers large area.

5.9 Monitoring and Evaluation

As per the PPP and Franchise agreement, AMA is in charge of the monitoring and evaluation of the waste management services of Zoomlion Ghana Limited. The District Cleansing Office (see Figure 8), which is the lowest level of the WMD at the Sub Metro level is in charge of the daily supervision and monitoring of waste collection services in collaboration with the Sub metro Health Department. In addition, the WMD at the Metro level carries out additional monitoring and evaluation activity depending up on the agreed indicators on the PPP agreement.

Based on my in-depth interview, the cleansing office in collaboration with the sub metro health department inspect the primary waste storage and collection of waste bins as per the schedule. The inspection is mainly targeting the households registered for the door-to-door waste collection service. In low income areas such as Sabon Zongo, the inspection is assisted by the Metro Guards Police Force as households are not willing to cooperate with the inspection.

Based on my interview, the sub metro health department is in charge of monitoring the registration of new clients for the service in collaboration with Zoomlion Ghana Limited. However, there is no enough supply of waste bins to newly registered households. In addition, there are no enough human and financial resources to prosecute those who failed to register for the door-to-door waste collection service. However, the report from the cleansing department and also the health department are not used as an input for the separate monitoring and evaluation of the AMA at the metro level.

5.10 Resources Reuse and Recovery Activities

Neither Zoomlion Ghana Limited nor AMA is involved in resource reuse and recovery activities in Ablekuma Central. All the resource recovery activities are carried out by the informal sector and semi-formal businesses. This is explored further in the upcoming section.

6 Results

The upcoming sections present the result and findings on the overall informal waste recovery system and on the networks that make up the informal metal and plastic recovery system in Accra. In order to have a clear picture of the system, it is important to look in to the components (smaller networks) and how they are structured and function.

6.1 Organization and Hierarchy of Informal Metal and Plastic Recovery System in Accra

This section looks in to the metal and plastic recovery system in Accra which goes beyond the geographic limitations of Ablekuma central. Based on discussions, interviews and my observation, I have constructed schematic diagrams demonstrating the informal waste recovery system structure and organization (See Figure 20) and the hierarchy of the system in relation to value addition (see Figure 21) for metals and plastics.

6.2 Actors within the Informal Metal and Plastic Recovery System

Here with, I will be describing the actors within the metal and plastic recovery system and represented in the schematic diagram (see Figure 20).

Households

Households are one of the major actors playing an important role in the recovery of plastics and metals. Based on my interview and focused group discussions households are engaged in the sorting and recovering of plastics and metals to generate additional income. As it has been stated in the previous section (see section 4.1.2.) this is mostly common in medium and low income areas.

Waste collection truck crews

Waste collection truck crews are engaged in plastic and metal recovery activities based on my observation and interview waste collection janitors and drivers working on waste collection trucks. Janitors (responsible for the collection and pouring of waste in to the truck) search mostly for metals from waste bins prior to transferring the waste in to waste collection trucks during the door to door waste collection. They sell the recovered metals to scrap metal collector 'boys' that roam around looking for metals. The waste collection truck crews do not have the means and the interest to accumulate the metals or to bargain better price rather they sell it to any of scarp dealing 'boys' roaming around. They consider the small fraction of the generated income as a supplement to their daily spending.

Central Container Care takers

Based on my observation and in-depth interview, care takers are assigned to every central container to administer the container. They are involved in the recovery of plastics and metals to generate additional income. In addition to the care takers there are also up to three additional scavengers recovering metals and plastics. In most cases, they sell plastics and metals collectively to middlemen and scrap dealer boys and masters.

Informal waste collectors ('kaya bola')

Informal waste workers are also engaged with the recovery of metals and plastics. Based on my observation informal waste collectors sort plastics and metals prior to final disposal. In addition, they buy both plastic and metals from households occasionally. They sell the metals to scrap collecting 'boys' or at metal collection barriers points. Based on my interview with informal waste workers, they prefer to sell at barrier points as there is scale and also get better price compared to scrap dealing 'boys' roaming around. Based on my observation and interview, informal waste workers leave plastics as payments for scavengers at landfill sites or central containers in an exchange for the help they provide to unload the waste.

Scavengers

Based on my observation scavenging is a common activity at central containers and landfill sites. In terms of quantity, scavengers acquire mostly plastics than metals. Based on my interviews, the reason behind is that metals are collected by scarp dealing 'boys' and at barrier points prior to getting in to the waste stream unlike plastics. In addition, based on my observation the quality of the plastics seems to be of poor quality as a result of over use. Scavengers supply both the metals and plastics to middlemen.

Street sweepers

Based on my observation and interview, street sweepers are also involved in the recovery of plastics and metals. Street sweepers collect the materials from streets, waste bins and ditches during cleaning streets early in the morning (see figure 17). They are employs of private formal waste management company, Zoomlion Ghana Limited. Street sweepers sell recovered plastics and metals to scrap dealers boys and masters, barrier points or to scavengers at central containers. However, street sweepers prefer to sell at barrier points as there is scale and they offer better price.



Figure 17. Metals sorted and collected from streets by a street sweeper

Qualiba men

These are people involved in the collection of plastic bottles from sources for reuse. They roam around in neighborhoods looking for used plastic bottles. Street sweepers also supply plastic bottles to *Qualiba* men. Based on my observations and interview, the plastic bottles are sold at local markets. The bottles are used for refilling local drinks and oil for retail businesses at the local markets as seen on figure 18.



Figure 18. Plastic bottles used in the domestic markets for oil and local drinks retail

Scrap Metal dealer 'Boys' and 'Masters'

Scrap metal dealer boys and masters are specialized on buying metals and also any electronic materials that can be dismantled or extracted for metal. Based on my observation, scrap dealer boys roam around two in two using a four wheel push truck throughout Accra. Based on my observation, scrap metal dealer boys give lower buying price than at barrier points and Agobgloshie Scrap metal yard to increase their profit margins. In addition, as they do not have scales they rely on estimating the weight of the metal.

However, scrap dealer 'masters' are mostly situated at Agobgloshie Scrap metal yard in Accra and are engaged with buying metals and electronic materials from the boys and other waste generators. They are also engaged in dismantling of electronic materials to recover metals such as copper wire, aluminum, brass and zinc. This is further discussed latter in upcoming sections.

Barrier Points

I have observed that barrier points for the collection of metals are common phenomenon in Accra. Most of the barriers are composed of three to five group members that are engaged with buy metals from different sources including informal waste collectors '*kaya bolla*', Scrap dealer 'boys', street sweepers and other individuals. Most of the barrier points are situated near to streets having over head shed and a scale. They also rent spaces in nearby areas to keep the metals. As per my interviews and discussions with the groups, AMA authorities take bribes to allow them use the road side. Based on an estimate by one of my key informants, there are nearly 500 barrier points in Accra and its surrounding.

Based on my observation and interviews, they dismantle obsolete electronic materials to extract metals with simple tools such as hammer with unprotected or bare hands. They mostly send the metals to their base at Agobgloshie Metal Scrap Yard, and will be sold to company agents situated in Tema. Most barrier points are named after the group leader or the towns they come from are an extension of groups at the Agobgloshie Metal Scrap Yard. Price is given at the barrier points depending up on the price of metal at the yard and Agents at Tema. Based on my observation, the prices of metal are common at all barrier points and higher than the price offered by the scrap dealer boys.

MSEs

Based on my observations and interviews conducted, MSEs are engaged in the recovery of mainly plastics as seen on figure 19. These enterprises are semi formal mainly engaged in the sorting and processing of plastics to certain level prior to supplying to local plastic factories. The process includes sorting, cleaning and breaking the plastic in to pieces. The enterprises have links with middlemen that are situated at landfill sites buying plastics and metals from scavengers. MSEs supply metal to the factories without any process.



Figure 19 Collection of broken plastic chairs and kitchen utensils at one of the MSEs engaged in the semi processing of plastics

Middlemen

Based on my observation the middlemen are mostly situated at the landfill sites buying plastics and metals from scavengers at landfill sites and central containers. Based on my interview, middlemen are specialized on the materials they are buying, and have the ability and power to set the buying price collectively as they have more bargaining power than the scavengers. Based on my interview, middlemen provide down payment or partial payment to scavengers to win over other competing middlemen. Most middlemen sell metals to Agents situated in Tema and also in domestic market for small scale recyclers. In addition, they sell plastic to SMEs that area engaged in the semi processing of plastics prior to supplying to plastic factories.

Agents

Based on my interview, agents are the ones buying metals on behalf of companies that sell the raw material either to local metal industries or companies exporting to Asia mainly of China and India. Agents are based in Tema that is a port city neighboring to Accra. They source metal from Scarp dealer boys and masters situated at Agobloshie and also the different barrier points in Accra. Agents provide capital mostly to scrap dealers masters to buy more metals when there is shortage of capital.

Manufacturing Industries

Based on my interview and observation, manufacturing industries engaged in the production of Plastic and Metal source raw materials from Agents, SMEs and formally established companies. However, Plastic factories have more preference to use virgin materials for high quality production and also minimize the cost that will be incurred in relation to recycling.

Plastic factories that are engaged in recycling prefer to source semi processed plastic materials that are sorted, cleaned and broken in to pieces. SMEs are encouraged and financially supported to semi process plastic materials.

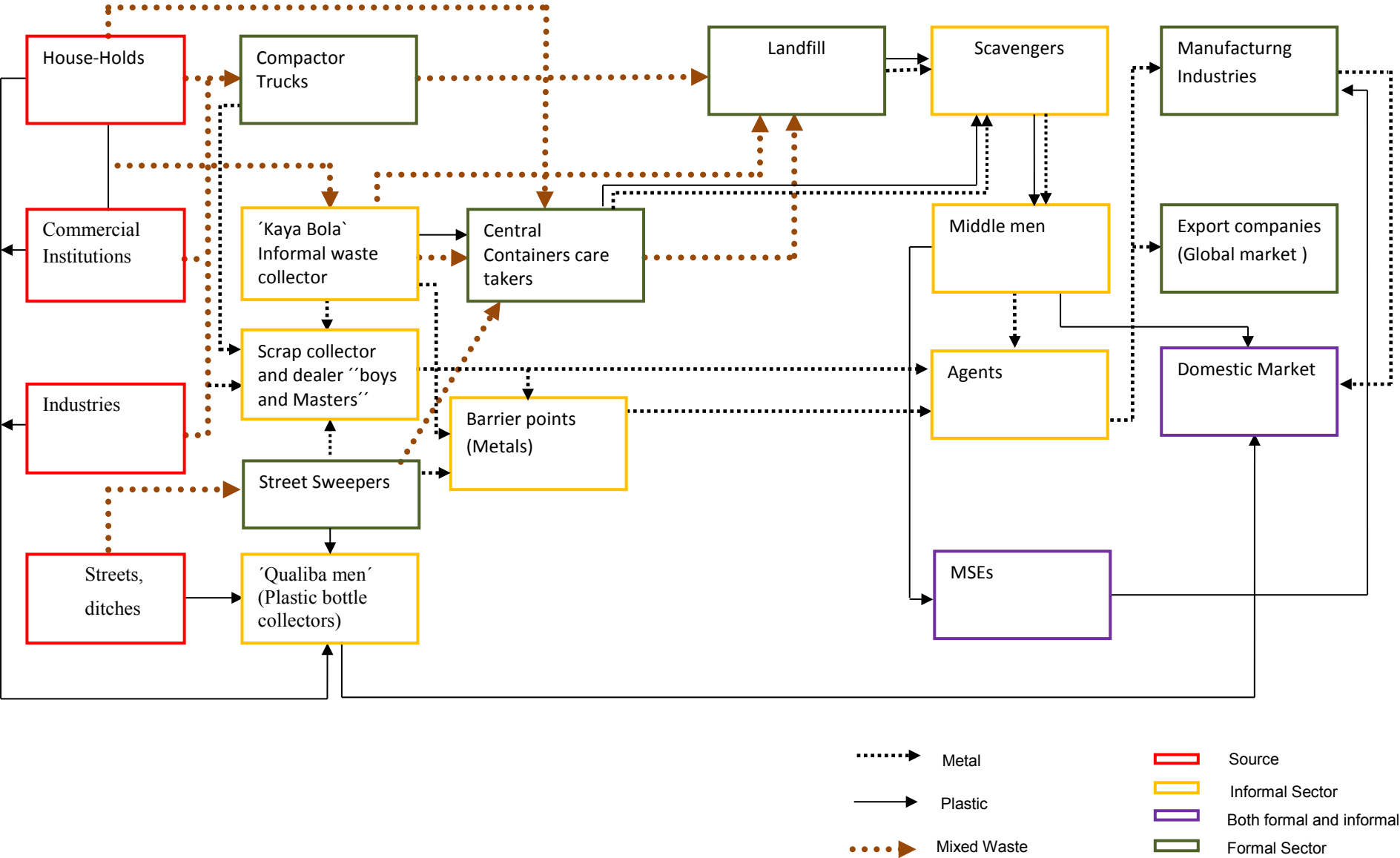
Export Companies

Based on my observation and in depth interview, these companies are established mostly by foreigners and are interested in exporting metals to the global market. The companies have agents that are engaged with the buying of metals from Accra. Most of the companies and the agents are situated in Tema.

Transportation arrangements

Based on my observation and interview, plastic and metals are packed and transported from the landfill sites and Agobloshie Metal Scrap Yard on a weekly basis. There are individuals that rent out trucks and provide loading services. Mostly the weighting of metals is done in Tema, if an agreement is reached to deal on the price based on the weight of the metal.

Figure 20. Schematic diagram showing actors and the movement of metals, plastics and mix waste within the informal recovery system in Accra, Ghana (Own construction)



6.3 Trade Hierarchy and Value Addition of actors within the informal Plastic and Metal recovery system

Based on my observation and in depth interview with key informants the informal waste recovery system is organized in the form of hierarchy as shown on figure 21. Depending up on the processing capacity, amount and quality of the collected materials and the type of material; different actors within the plastic and metal recovery system are placed in hierarchy from the lowest value to the highest value.

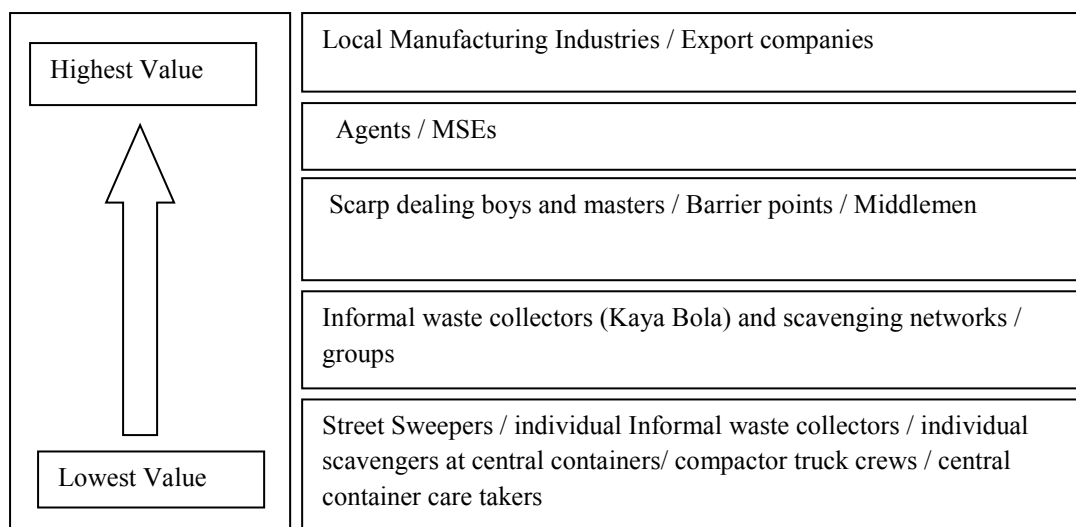


Figure 21. Trade hierarchy and value addition in the informal metal and plastic recovery system (Own construction based on Wilson et al 2008)

6.4 Scavengers Association

Based on the discussion and in depth interview with one of the founding members and current chairman, the network was first started in 2002 at Sufan landfill with an estimated total number of 70 members. However, the network reallocated itself to Sabah Landfill in 2010 as Sufan Landfill was closed due to the conflict aroused in relation to land ownership. As a result of re allocation the number of network members declined to 35 of which 22 from the previous network and the remaining are new members that has been scavenging at Sabah landfill. Some of the previous members are dispersed to other landfill sites including Anyaa and Abokobi.

Currently, the network is expanding membership by establishing relations to other scavengers in collaboration with previous network members in the other landfill sites. There is a flow of information regarding new buyers, prices of the recovered materials and new developments at the landfill sites that affect the activities of scavengers.

Based on my in depth interview, membership is open to anyone who is willing to abide the established norms and values that will be described in the next section. Anyone who is not member is not allowed to scavenge at the landfill site, and members are issued with an identification card by the WMD of AMA.

6.4.1 Organizational structure of the Scavengers' Association

The Scavengers' network has a chairman, two deputy chairmen, one secretary and two advisors to the chairman. The chairman and the two deputy chairmen are elected based on age, experience and knowledge of the business. However, there is no clearly defined term of office that has been agreed up on. The current leaders have been in powers starting from 2002.

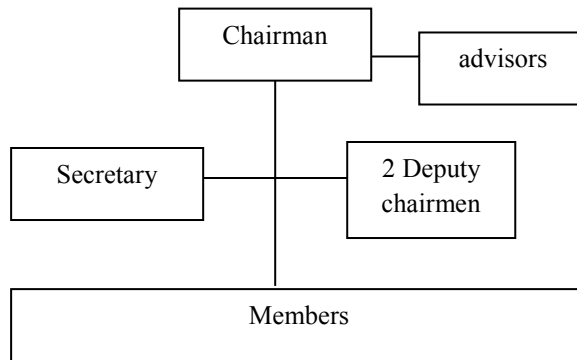


Figure 22: Organizational Structure of the Scavengers' Association / network (Own construction)

The main task of the advisors is to follow up the day to day activities of members on and around the landfill in search of materials such as plastics and metals. In addition, advisors get feedbacks from landfill operators regarding the conduct of members. At the end advisors inform the leaders regarding the situation. Network members and leaders believe that misconduct should not be accepted at the landfill site. Some of the things that are considered as misconduct include stealing properties collected by other members, stealing the landfill site properties, breaking business deals with middlemen, leaking price related information and other group decisions, showing disrespect to leaders and also fellow members and lack of obedience to guidance from leaders.

Such misconducts will result in the sanction of members from the landfill site from two weeks up to three months based on the gravity of the misconduct. Furthermore, depending up on the extent of the misconduct, the network and the landfill officials notify other landfills not to allow the scavenger to work until the situation is settled. At this juncture, the officials and operators at Sabah landfill play an important role in the enforcing of the decision made by the leaders and members by not allowing the sanctioned member in to the vicinity of the landfill.

The secretary has the responsibility to collect 2 GHC every two weeks from members. This is put aside to a common bank account to be used as a common fund to support network members in case of emergency including sickness and lose of family member. As all members contribute equally, all members are supposedly to benefit from the financial aid. The fact that the fund is put in to a common bank account has build up the trust and the confidence of most of the members. However, some members are less willing to contribute as they have questions on the clarity of how the fund is utilized. Based on my observation, this fund is not used for a purchase of safety tools which are of necessity for members' safety and efficiency during their scavenging activities as seen on Figure 23.



Figure 23. Scavenging at Sabah Landfill

Based on my observation and in depth interview with some of the members, there are incidents where two or more network members come across valuable materials on the landfill at the same time, which would have resulted in conflict over the ownership of the material. However, during this time one network member leave the material for the other as it will be reciprocated by other instances.

6.4.2 Actors Attribute

Age

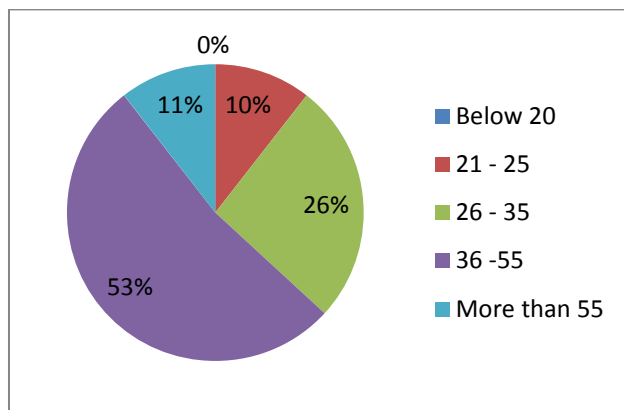


Figure 24: Percentage of age composition of scavengers

As it has been shown on Figure 24 nearly 53 % of the network members are within the age range between 36 to 55 years. 26% of the members are in the age range between 26 to 35 years. This shows that more than 50 % of the members are older.

Gender

The network has only one female member who has been engaged in buying scraps from scavengers'. However, after losing the capital she has started scavenging two years ago. The rest of the members are male. This shows that the activity is mainly dominated by men and women are discouraged due to the nature of the work which is labor intensive, dangerous and takes long hours of devotion.

Educational level

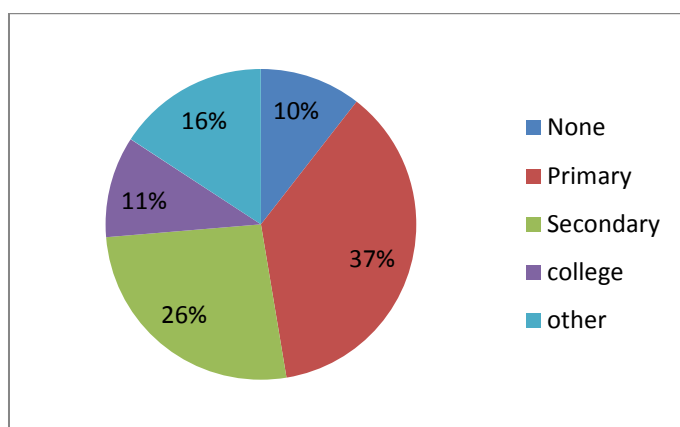


Figure 25: Years of Education of Scavengers

As it has been shown on Figure 25 almost 90 % of the members has some form of education. While nearly 37% of the members completed only primary education and 26% completed secondary level of education. 11 % went to college and 16 % had trainings on agriculture and farming.

Years of Experience

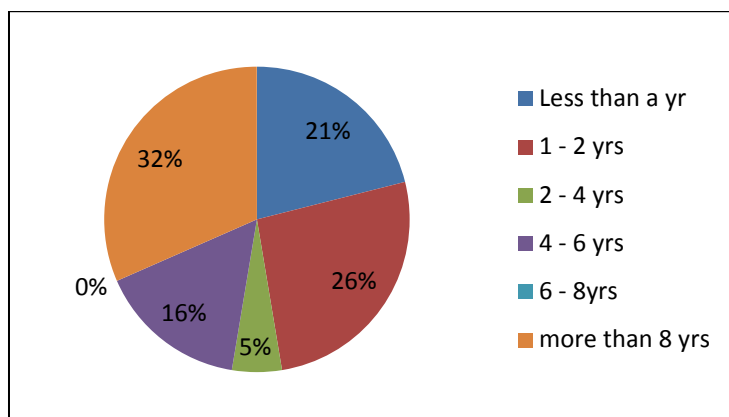


Figure 26: Years of Experience of Scavengers

As it has been presented in Figure 26, of the total network members 32 % have been engaged in the scavenging activities for more than 8 years. Prior to joining the scavenging activities, members has been engaged with a range of other jobs including welding, painting, hotel attendant, carpenter and stone cracker. This shows that the scavenging activity pays more than the other activities that they have been engaged in. Based on interview and my observation, members do not need startup capital to start the scavenging activity.

Working Hours per day

Of the total member of the network 63% spend 8 to 12 hours searching plastics and metals at the landfill. The starting time of scavenging mostly depends up on the arrival of waste collecting vehicles and the time schedule of landfill operations. This shows that members spend longer hours together with high level of interaction.

Origin and Ethnicity

The network is dominated by three ethnic groups which are Ewe, Ga and Fante which accounts to 27 %, 26 % and 21 % respectively. Based on this result, it can be concluded that most of the network members are originally from the Greater Accra and Volta Region. Regarding religious affiliation of network members, nearly more than 95 % are Christians and the rest are Muslims.

Socio-economic Status

Network members have no other source of income asides the income generated from their scavenging activities. Each member supports on average five family members showing that the scavengers has economic pressure to support large families. One of the common features of network members is that they have been engaged to other income generating activities prior to joining this activity. Regarding ownership of properties, nearly 87% of the members have their own houses. However, they do not have other property that is valuable.

Socio-economic Perception

Based on the interviews with members of the network and the survey conducted nearly 74% of the members believe that their socio economic status has improved after joining the scavenging activity. 16 % of the members feel that their status is declining when compared to their previous situation. The rest of the members consider their situation the same as before.

6.4.3 Types of materials recovered

Based on my observation, the scavengers recover both plastics (mainly of gallon, broken plastic chairs, rubber slippers and kitchen utensils made of plastics) (see figure 27), and metals (see figure 28). Polythene plastic such as water sachets which are very common in Ghana are not considered as valuable by scavengers.



Figure 27. Partial view of plastic materials collected from Sabah landfill by a network member



Figure 28. Partial view of metals collected from Sabah landfill by a network member

6.4.4 Dismantling of E- waste at the landfill

Based on my in-depth interview with the members of the association and my own observation, electronic waste is very common at the landfill site, Sabah. These electronic wastes include used televisions, water heaters, car batteries, refrigerator and mobile phones. Scavengers' dismantle the electronic wastes to extract valuable metals such as copper wire and aluminum. The extraction of the materials is done without any protective tools simply by using hammer and bare hands.

6.4.5 Scavengers - Middlemen Relations

There are buyers situated at the landfill site waiting for recovered materials every day except Sundays. These buyers have specializations as they buy specific materials while the scavengers are generalists that collect all materials that are valuable. The buyers specialize on plastics or metals. According to my observation there are four buyers at the landfill site and one scale man to weigh the materials.

Based on my in-depth interview, middle men have more bargaining power than the scavengers. As middlemen have more capital, better trade links and current market information when compared to the scavengers. In most cases, middlemen at the land fill site set common prices offer collectively to scavengers. Scavengers call meetings and set prices collectively; however, some members leak the information and middle men are informed ahead. In these instances, middle men tend to unite more and resist by fixing the same price to all scavengers.

6.4.6 Scavengers - Landfill Operators Relations

Based on my observation and in-depth interview, the scavengers have well established relations with landfill operators. Landfill operators are the main actors for the execution of decisions such as sanctions of members from the landfill site. In addition, when disagreement arises between scavengers and middle men, landfill operators negotiate in between to reach a business deal.

6.4.7 Challenges Encountered

Based on my in-depth interview and the survey conducted, all of the members are challenged with their working condition. There are frequent accidents in relation to needle pinches and cuts from broken glasses. Based on my observation, all members do not have protective tools such as hand gloves and boots (see Figure 23). Members are also accustomed to taking antibiotics as they are challenged with malaria, back pains and cough.

6.5 Asontaba Waste Collectors' Association

There is no documented record; however, according to an interview with the current chairman and founding member, Gabriel Appiah, the group started coming together four years back among five friends who are engaged in house-to-house waste collection in Ablekuma Central and Ablekuma South Sub-metros. Currently, the number of members has increased to 20.

6.5.1 Organizational Structure

As shown on Figure 29, the Association has President, Vice-President, Financial Secretary, Treasurer and Organizer. According to the members and the chairman, all the posts assigned have specific roles to play. The president has the responsibility of managing the association in general and making sure that the others perform as expected. In addition, the president sets agenda and leads weekly meetings. The vice president basically assists the president. The Financial Secretary manages the monthly contribution of members and makes record of expenditures in collaboration with the treasurer. The organizer has the responsibility of organizing the meetings of members every Sunday. Take record of the members participating at the meeting and also takes a minute of the agendas discussed. In addition, the organizer makes sure the facilitation of refreshments during the meetings.

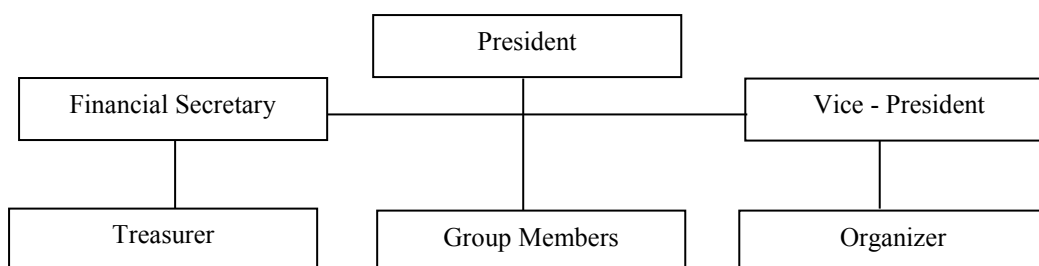


Figure 29. Organizational structure of Asontaba Waste collectors (own construction)

The president is elected by members vote every two years. The main qualities to be a president include experience and ability to lead according to interviews with members. However, if the president has proven the capacity to lead and perform as expected, he will be given another term of office. In some cases, if the president does not function as expected he will be voted off again. The vice – president, financial secretary are nominated by the president and vote will be given by the rest of the members. The organizer and the treasurer are nominated by the vice president and financial secretary respectively. Based on the interview with the president and members, membership is open to anyone engaged in the same line of activity. However, new members are expected to accept the norms and values of the association. The association has developed a system of rules as a form of “constitution” in a written format according to Gabriel Appiah, chairman of the association. This document is accepted by all members and consensus has been reached to be governed by it.

The system of rule is considered as very important in terms of strengthening the norms and values of members. Members are required to show respect to fellow members and support each other in case of emergency such as death of family members and sickness, and also when there are new born and weddings. One way of showing respect to fellow members and the association is attending weekly meetings which are normally conducted Sunday afternoons. Members are also required to pay their monthly contributions 4 GHC on time to the common association fund. In addition, members help each other in repairing wheel barrow, carts and motor bikes used by group members for waste collection. There is no money transaction following such kind of help as the member is expected to provide to others whenever they require support of some sort.

The document also requires members to handle clients in a proper manner and also to dump the collected waste in central containers or landfills depending up on the distance. Dumping of waste in the neighborhood and fighting with clients and other fellow group members will result in sanction and other kinds of punishments. However, based on my observation there is no clear understanding on the extent of the period of sanction and the types of punishments among members.

Based on my observation, as the number of members with motor waste collection vehicle is only three, the rest members use carts and wheel barrows that require energy to pull and push around the neighborhood (see Figure 30). Therefore, members support each other, whenever some members receive much work from clients. Occasionally, they borrow carts and motor bikes as necessary free of charge within the group members. I have observed that group members support each other in collecting waste from house to house and the owner of the

cart only buys drinks for the support and shows willingness to provide the same or other help as necessary. But there is no payment or sharing of money.



Figure 30. Network members helping each other to collect waste from households in Ablekuma Central

Based on my observation, it is manageable to exchange information easily in short period of time as the level of interaction of group members is high as they work in nearby neighborhoods and frequently meet at central containers and landfill sites while dumping the waste. In addition, group members meet every Sunday afternoon to exchange information and to refresh. The area where they live is also common (Ablekuma Central and Ablekuma South). According to Gabriel, in case of there is a need for exchanging information urgently, members call each other as all members has mobile phones.

6.5.2 Actors Attribute

Age Composition

Nearly 64% of the members are within the age range of 26 to 35 years. 29 % are within the range of 21 to 25 years. This shows that most of the members are younger.

Gender

All the members are male as the activity requires physical strength females are mostly discouraged from being engaged from waste collection activity.

Educational Level

According to the survey conducted, 43 % of the members completed only primary education while 36% managed to complete secondary school education. The remaining (21%) never managed to go to school.

Years of Experience in Waste Collection

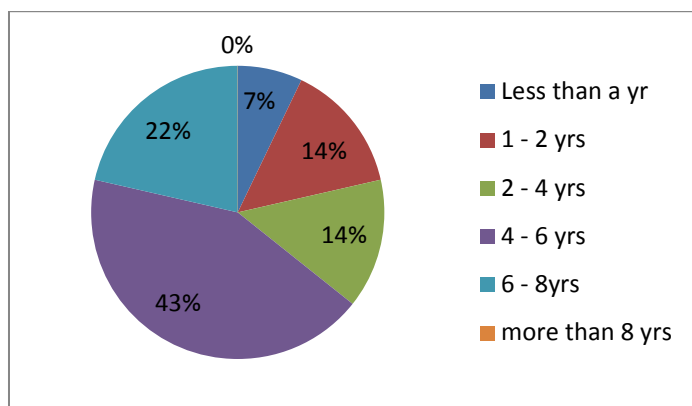


Figure 31: Years of experience of the member

As shown on figure 31, nearly 43% of the members have been engaged within the same activity for 4 to 6 years. 22 % have experience that ranges from 6 to 8 years. Prior to be engaged to informal waste collection activity, 57 % of the members were engaged in some other activities including street trading and farming. The rest 43% joined this sector due to lack of job opportunities in other sectors.

Start-up Capital

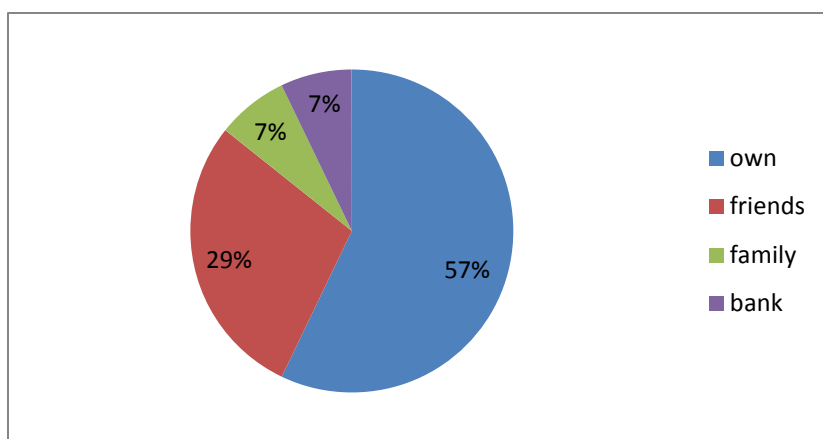


Figure 32: Start-up capital of Informal waste collectors

Unlike the scavengers, the informal waste collectors require initial capitals to join the informal house-to-house waste collection activity. The capital is required to purchase or rent waste collection equipments. 57% of the members use their own capital while 29 % got assistance from friends. The rest of the members claim to get the startup capital from the bank and family.

Working Hours per day

57 % of the members spend 4 to 8 hrs per day on providing waste collection services, the remaining spend 8 to 12 hrs. They work every day except Sundays that is dedicated for societal responsibilities and group meeting. 93% of the members have regular clients to whom they provide services when called up on and as a predetermined schedule. In addition, they provide the services whenever they get the request from new clients.

Origin and Ethnicity

Nearly 57% of the members are Grunusi people from the Upper Eastern part of Ghana while 36% are Frafra from the northern part of Ghana, and the remaining 7 % are Fanti. The Grunusi and Frafra speak common language and shared similar cultures. Regarding religious views, 79 % account for Christianity, while 14 % are Muslim. The rest members do not follow any kind of religious views.

Socio-economic Status

According to the survey and interviews conducted among the members, nearly 43% of the members own farm land in the rural side where they come from. 36% of the members do not have any valuable properties. On the other hand, 21 % of the members have farm land and motor vehicles. The motor vehicles are used for the house to house waste collection services. In addition, they support on average five family members.

Socio-economic Perception

93 % of the members believe that their socio economic status is improving after joining the informal waste collection activity as 43% were jobless with no income. The remaining group members percept that their socio-economic status have declined after joining this sector.

6.5.3 Sorting of Plastics and Metals

Based on my observation, all group members sort plastics and metals from the waste that they collected while providing the house-to- house collection service. They give more value to the metal they sort as it is considered as an additional source of income. However, based on my in depth interview, they mostly get plastics than metals mixed in the waste. In most cases, network members put the sorted materials in plastic bags and attach it to the wheel that they are pushing as it has been seen in Figure 33.



Figure 33. Network member hanging sorted materials around the truck for waste collection

6.5.4 Relations with households

Based on my observation, network members roam around neighborhoods to provide waste collection services mostly to households and occasionally to commercial institutions. Network members collect waste from clients as well as any one that requires the service within low to high income areas. Based on the focus group discussion with households, they prefer the service of informal waste collectors over formal companies such as Zoomlion Ghana LTD. The main reason is the fact that informal waste collectors are easily accessible and reliable on their services with cheaper service fees. Based on my observation, network members bargain with clients to set

service charge based on the quantity and the distance of the dumping site or central container. On certain occasions, regular clients pay on monthly basis to the services.

6.5.5 Relation with Waste Management Companies

As network members function within two Sub-metros where there are two formal waste companies are assigned by AMA; Zoomlion Ghana LTD and Asadu Royal Waste LTD. Based on my observation and in-depth interview, there is conflict with supervisors from the companies and WMD of the sub metros. However, network members relation with Zoomlion Ghana LTD is changing from conflict to cooperation as the company is attempting to help a national association incorporating workers with in the informal waste management system at different level. The company is also attempting to work with informal waste collectors in low income and inaccessible areas. Furthermore, some network members work as street sweepers for Zoomlion Ghana Limited as an additional source of income. However, the relation between Asadu Royal Waste is more of conflict oriented as they seize trucks and take physical measures in collaboration with WMD of the sub metros.

6.5.6 Relation with Scavengers

Based on my observation, group members receive assistance from Scavengers at central containers and landfill sites. As a reward or payment, the informal waste workers leave the plastic materials to scavengers free of charge. Scavengers assist by unloading the waste as the informal workers will be tired by the time they reach the central container or the landfill site (see figure 34).



Figure 34. Scavengers assisting network members in exchange for plastic waste

6.5.7 Relations with scrap metal dealers

Based on my observation and in depth interview, in most cases group members sell metals to scrap dealer boys that roam around looking for metals. As members do not have space to keep the metals they do not chose to keep the metals rather they sell as they get. However, group members prefer to sell the metals at barrier points as there is scale and better price offer than bargaining with scarp dealer boys. The relation is only based on trade.

6.5.8 Challenges Encountered

Based on my in depth interview and the survey conducted, group members are challenged with congestion of the road as they have to push truck for long hours on main roads. In addition, they have problems as they are not allowed to work within the areas that has already been assigned to formal waste management companies. Furthermore, the law does not allow waste generators to take service from unregistered waste collectors. Whenever they are found working in those areas, their trucks will be seized and will be fined by the formal companies. In certain occasions, there is also physical confrontation. Based on my observation, they are also challenged as they have no appropriate waste collection equipments and protective tools.

6.6 Scrap Metal Dealers Association

Based on an in-depth interview and discussion with the founding member and vice chairman of the Association, Yussif Mahama, the association was established in 1997. There are no official records; however, the vice chairman estimates the numbers of members are close to be 3000. Most members of the association have a working base in Agboghloshie scrap metal yard; however, some members also work in other parts of Accra city at barrier points collecting metals such as copper wire, aluminum, steel and iron. In addition, some members also travel to adjacent cities within the greater Accra region such as Tema looking for metals. The major sources for the metal waste are households, fitting shops, warehouses, industries and repair shops.

Based on my observation, members and their families are situated in a compound very much close to the yard. It is very common to observe their kids playing in the yard as well. In addition, the wives and other older family members are engaged in trading food items and cold water in the yard to generate additional income. The association has links with other similar associations outside the Greater Accra Region that are located in Ashama, Takoradi and Kumasi.

6.6.1 Organizational Structure

The association has 9 executives that are leading the association by occupying different positions from Chairman to Financial Secretary. Based on an in-depth interview and discussions with the vice chairman and other members, association members are divided in to two groups as 'Masters' and 'Boys' or truck pushers. As shown by the Figure 35, the association has sub grouping having more than one Master and a number of boy within.

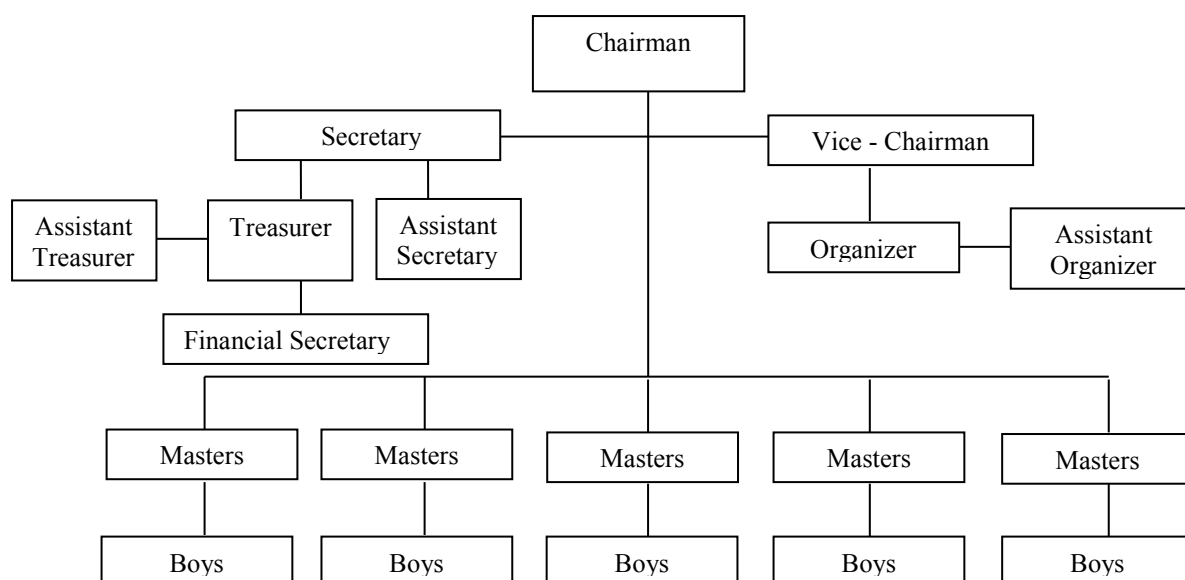


Figure 35: Organizational Structure of Scrap dealers Association (Own construction)

The executives of the association are elected among the Masters that are representing the sub-groups. The voting is done every four years by the Masters themselves. The role of the boys in the selection of the executives is close to zero. Masters get the status within the sub groups depending up on factors including age, experience with in the sector, knowledge about the business and the type of metals collected (for eg. copper wire is more valuable than Aluminum) and capital. According to the vice chairman of the association, the capital of Masters starts from 10,000 GHC (which is close to 6,200 USD). However, due to the nature of the work, there is a risk of losing capital and starting all over again. Boys are younger in age with small or no capital. Most boys come to the yard with small amount of capital (which is no more than 500 GHC (which is close to 805 USD)) of their own and get additional capital from Masters or friends in the business. As they learn more about the business and get more capital, they can achieve the higher level of being a Masters within the group, and at the same time new boys join the group.

In most cases, Masters have business links with companies and industries to collect waste metals in large quantities. However, the Boys have to roam around looking for these materials mainly from households, fitting shops and repair shops and they get in smaller quantities. In addition, Masters have well established links with Agents in Tema that are buying the metals either for local or export market. Masters also receive financial support from Agents to enhance their capital to collect more metals. However, boys mostly sell the collected

materials at the scrap yard to Masters from their own group or other groups depending up on the better price offered.

The association does not raise money on monthly basis and members do not have common fund at the association level. Most problems of members are left to be addressed by the smaller sub-groups. However, if members encounter serious problem such as sickness, death, police case and the like, members of the association will be requested to contribute certain amount of money based up on the decision of the executives.

6.6.2 Dismantling and Extraction of Metals at Agboglobloshie Scrap Metal Yard

The association and the Agboglobloshie scrap yard are also known for dismantling used electronic materials for the extraction of metals. Based on my observation, the yard has a number of bases or work spaces for dismantling and storing metals. These spaces are occupied by groups that are named after the Masters or the name of the town from where members originate. Based on my observation of the groups' activities at the yard and interviews with group members, Masters have better experience and knowledge on how to dismantle and extract metals when compared to the boys. However, none of them has a proper training and the appropriate equipments to do the dismantling.

Based on my observation, the dismantling is carried out on open spaces with lots of burning in the open air. Used water heaters, refrigerators, air fans, TV sets, electric cables and so forth as it has been seen on Figure 36.



Figure 36. Group members sorting waste materials such as fans and water heaters for dismantling and extraction of metals at Agboglobloshie Metal Scrap Yard.

6.6.3 Bribery and Agoglobloshie Scrap Metal Yard

Based on an in-depth interview with key informants, both Masters and Boys are held by the police force accused of buying stolen properties and mostly of public properties. In addition, the boys are accused of pushing trucks on the roads assigned as Ceremonial Roads. However, most of these cases do not go to the court rather they solve it through connections and by paying-off authorities handling the situation. When boys are accused of pushing trucks on those selected road, the metal they collected and the truck is taken over by the police force. Such scenario makes the metal business risky as many Masters and Boys have a good chance of losing the whole of their capital and forced to start up all over again. At this point, the association and the sub groups play an important role by extending support to the Masters and Boys.

6.6.4 Politics and Agoglobloshie Scrap Metal Yard

Based on an in-depth interview with key informants most Masters and Boys are politically affiliated with the major political parties in Ghana. As a result, they maintain the claim that they illegally occupy the yard and also accused of polluting the environment due to dismantling and extraction of metals and the call for improving the situation. In addition, political parties want to get vote from them and their family members during national elections. In certain occasions, the Boys are involved in political campaigns as they roam around in neighborhoods.

6.6.5 Relations with Agents

Masters has established trade relations with Agents that are situated in the port city of Tema. The Agents provide capital to Masters to buy more metals from the boys and other sources. If Agents provide capital ahead of the delivery of the metals, the agents and masters deal further on the price of the metals and calculate the price margins.

Price is mostly given by Agents and the bargaining power of Masters and also the association is very low. Based on an in-depth interview with the vice chairman of the association, they are mostly forced by the Agents to agree with the price given and sometime they realize that they have lost after selling the metals. Some Agents give fixed prices and weight the metals and others they prefer not to weight rather bargain.

6.6.6 Afa Alhussain Base / Korean Boys

'Korean boys' is one of the scrap collectors base at the Agobgloshie scrap metal yard. The group is also one of the sub-groups within the scrap dealers association. The base was previously known by the name of the founder of the group, Afa Alhussain who moved to the Northern Ghana for commercial farming. The second name, Korea, came following the nick name to one of the Masters within the group. Based on my in-depth deep interview with one of the Masters of the group and other members, the base was established in 2004 with a total of five members that have increased to 15 currently. However, as new comers are always welcomed to join the group there is a possibility for an increased membership.

Within the group, five are considered as Masters while the rest are Boys. There is no clear division of role and responsibility among Masters however, they have different role that the boys in the group. They have the responsibility to provide guidance for the boys on what kind of materials to collect for metal extraction, assist the boys in providing capital, conflict resolution within the group and providing guidance on how to dismantle and extract valuable metals such as copper wire, aluminum, iron and the like.



Figure 37. Boys or Truck Pushers roaming around looking for metals and / or used electronic materials for the extraction of metals

The boys roam throughout the city and beyond looking for metals and other scrap materials. Mostly they buy the materials from households, fitter shops, repair shops and informal waste collectors. On the other hand, Masters are situated at the base and buy the materials from the boys within the group or from other groups in the yard and barrier points in the city.



Figure 38. A shade and seats where group members rest

Based on my observation, group members share working space that has a shade and seats (see Figure 38). Group members are observed sharing food and playing games during break times. In addition, they support each other in logistics and also during dismantling and extraction of metals. Group members also share equipments such as hammer that is used for dismantling. Based on my interview, group members raise money to a member during certain occasions such as sickness, funerals, and weddings and new born. Otherwise they only raise money to pay for a guard looking after their storage at night.

Actors Attribute

Age Composition and Gender

38 % of the total members are within the age group that ranges from 26-35; whereas the remaining 62 % are within the age group of 21-25 years old. This shows that most of the members are younger. All members of the group are male. In addition, based on my own observation, females are not encouraged to be engaged in this activity due to the nature of the work as it is labor intensive and physical strength.

Educational Level

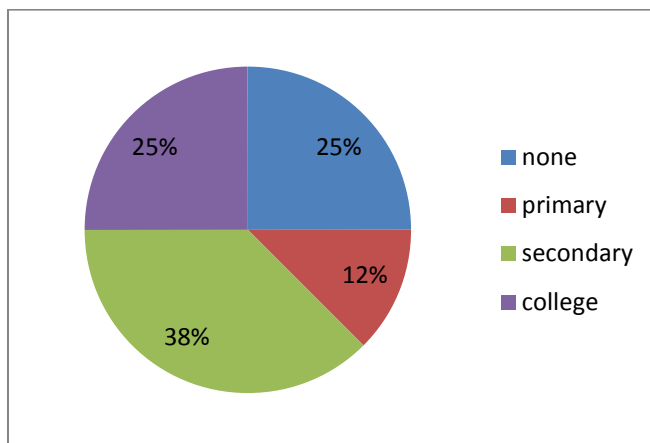


Figure 39: Years of Education of Metal dealer boys and masters

Based on the survey conducted among the group members, 25% have never got the chance to join school and 12% have only completed their primary education. 38 % completed secondary level studies while 25% joined college and studied courses in relation to agriculture and teaching. As shown on Figure 39, nearly 75% of the members have got some sort of education.

Years of Experience

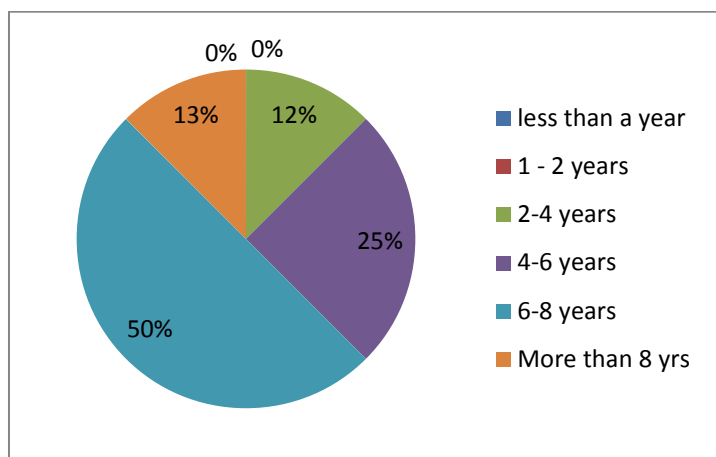


Figure 40: Years of Experience of Metal dealer boys and masters

Based on the survey conducted and shown on Figure 40 nearly 50% of the members have 6 to 8 years of experience in the collection and dealing with metals while 25% has 4 to 6 years of experience. 12% and 13 % of the group members have experience 2 to 4 years and more than 8 years respectively. Of the group members, 75 % had been engaged to other activities such as farming, street trading and transportation prior to be engaged in the collection and dealing of metals. They have chosen this activity for better income. The rest 25% had joined the sector as there is no other job opportunity in other fields. Based on the survey and the deep discussions with members, all of the members joined in to the activity following a 'brother' which is a very close friend. This shows that they have started looking for job opportunities to generate income at very young ages.

Start-up Capital

Based on the survey conducted among the group members, 50% have got financial assistance from a close friend or a 'brother' and the rest used their own savings. However, after joining the group Masters within the group provide financial assistance based on trust to the boys. In certain instances, the boys provide financial assistance to one another based on trust. The capital is important to buy metals and also rent four wheel trucks that are used to collect the metals. Even if Masters provide capital, Boys are not forced to sell the metals to the Masters rather they can sell to anyone who offers and better price and they are only expected to return the capital to the Master.

Working Hours per day

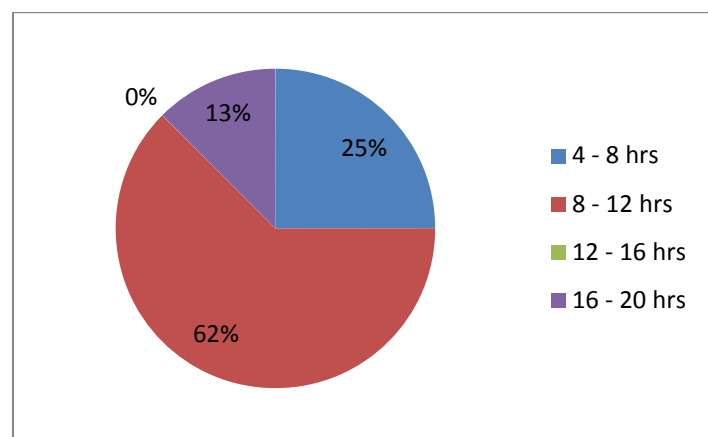


Figure 41: Working hours of Metal dealer boys and masters

As shown in Figure 41 Nearly 62% of the members spent 8-12 hours engaged in the collection and extraction of metals. The rest 25 % and 13 % of the group member spent 4-8 hrs and 16-20 hours respectively. Masters spent

most of the time at the base extracting metals while the boys roam around the different parts of the city to buy metals. According to my observation, the boys start roaming around early in the morning at 5 a.m. and returns back to the base at 4 p.m.

Origin and Ethnicity

All group members are from the Dagomba ethnic group in the Northern part of Ghana. Even if members are from the same ethnic group, they come from different towns within the northern part including Yendi, Tamale and Zabzungu. In addition, all group members follow the same religion, Muslim. This shows that group members have common background and culture.

Socio-Economic Status

Based on the survey conducted and deep interviews with group members, all members of the group own farming land in the rural areas in the Northern part of Ghana. In addition, 20% of the group members own a house and motor vehicle besides the farm land. They also support on average 7 family members, in addition to investing on accumulating properties.

Socio-Economic Perception

Based on the survey and discussions, all group members agree that their socio economic status has improved as they have managed to get more income from the metal collection when compared with their previous activities. Based on my observations and discussion, group members feels satisfied with the income that they are generating. They have also established clients to buy as well as supply metals.

6.6.7 Nyankpala Best

This group was formed seven years back with three friends that have been working at the yard. Currently, the group has 20 members of which 6 are not based at the Agboglobloshie scrap metal yard rather travel to neighboring cities within the Greater Accra Region. Based on my observation and an in-depth interview with members, the group members are composed of Masters and boys as the rest of the groups in the yard. The leadership comes from the Masters who are older, more experienced in the work having more capital. Of the total members three are considered as Masters and the rest are boys. In this group, capital is basic to be a Master in addition to the age and work experience.

Similar to the previous group discussed with in section 6.6.6, this group does not have specific specialization rather they deal with Metals in general, mainly of copper wire, aluminum, iron and steel. Group members have a common working area and share tools for dismantling and extraction of metal. Based on my observation, similar to the first group discussed and other groups in the area, there is no safety measures and tools used during the dismantling and extraction of metals. Unlike the previous group, this group has a common fund for its members. All members contribute 2GHC per day to be deposited at the bank. The fund is used when members have problems such as sickness, funerals and police or legal case. The three Masters are the ones administering the common fund on behalf of the rest of the group members.



Figure 42. One of the group masters sorting metals at the yard

Actors Attribute

Age Composition

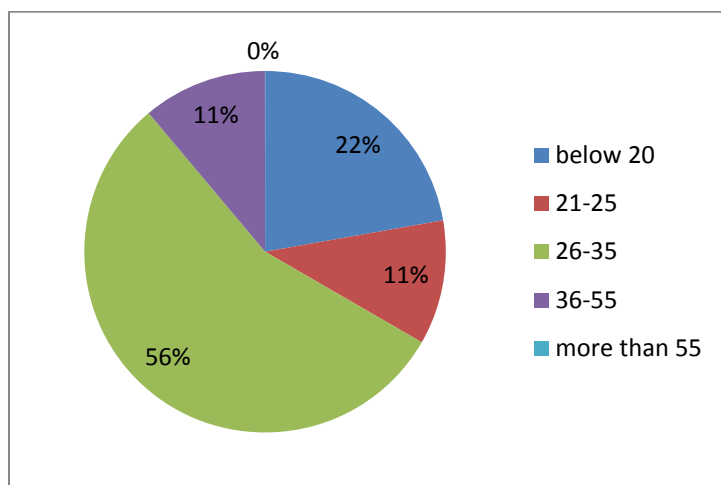


Figure 43: Age range of metal dealer boys and masters

Based on the survey and presented on Figure 43, 56 % of the group members are within the age range of 26-35 of years. In addition, 22% and 11 % of the members account to the age range below 20 and 21 -25 respectively. The remaining 11% of the members are within the age range of 36-55 years of age. This also shows that most of the members are young of an age less than 35 years.

Educational Level

Based on the survey conducted among the group members, 56% had never got the chance to join school while 33 % attended primary education. The rest 11 % studied up to the secondary level. This shows that group members have not got much of the chance for education.

Startup Capital

According to the survey conducted among group members, nearly 67% of the members have used their own startup capital. Whereas 22 % and 11 % used the capital from family members and friends respectively.

Years of Experience

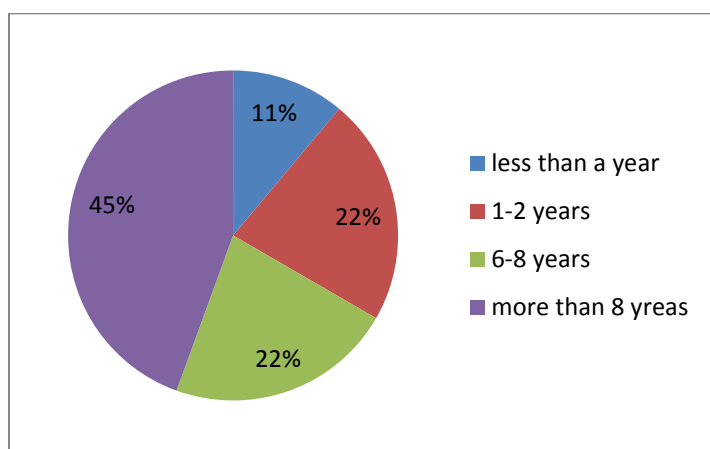


Figure 44: Years of Experience of Metal dealer boys and masters

AS it has been presented in Figure 35 45% of the group members have more than 8 years of experience in the collection and dealing of scrap metals. 22% and 11 % of the group has an experience ranging 1-2 years and less than a year respectively. The remaining has experience ranging 6-8 years. 56 % of the group members responded that they have been engaged to other economic activities such as farming and street trading prior joining the metal collection and dealing. The rest has never got other job opportunities.

Working Hours

Based on the survey and my observation, group members spent most of their time roaming around looking for metals, dismantling and extraction at the yard. Accordingly, 78% of the members spent nearly 8-12 hrs. While 11 % spent 12-16 hrs and the rest spent 4-8 hrs.

Origin and Ethnicity

All members of the group are Dagomba people from coming from different towns especially from the Nyakapala District in Northern part of Ghana. In addition, all members of the group are Muslims.

Socio-Economic Status

Based on the survey and interviews with group members, nearly all members of the group own Farmland and livestock in the towns where they come from in Northern part of Ghana. This shows that they re-invest the profit that is generated in to assets asides supporting on average 7 family members.

Socio-Economic Perception

Based on the survey and in-depth interview with group members 89% of the members have the perception that their socio-economic status have improved after joining metal collection. On the other hand, the rest of the members believe that they percept that there is no change in their socio economic status.

7 Discussion

In this chapter, the results presented in the previous sections are discussed based on the concepts and theories within the theoretical framework that was presented in the second chapter of the study.

7.1 Lack of Resource Recovery Initiatives by the Formal Sector

The Environmental Sanitation Policy is the main document providing the basis for solid waste management in Ghana. The revised policy has incorporated the concept of waste hierarchy; reduction, reuse and recycling by promotion and introduction of new regulations among others. The concept is further incorporated in to the medium and long term plans of Integrated Solid Waste Management Strategy which is designed based on the Environmental Sanitation Policy.

However, neither the policy nor the strategy document further identifies ways for the minimization or reduction of waste in collaboration with private sector. In practice, there are no legal or institutional frameworks that are laid on the ground for the collaboration of waste generators, collectors, processors and manufacturers to minimize the amount of waste ending at the landfill.

Furthermore, reuse and recycle activities are not incorporated into the franchise agreement between the government and private solid waste management companies. The agreement does not identify either AMA or the private companies as responsible to carry out recycling and reuse activities.

Oteng-Ababio (2010:4) describes the current waste management practices in Accra as only concerned with the collection and disposal of waste. The current practices do not consider waste as a resource with an economic value. Consequently, the formal sector has failed to carry out reuse and recycling at any stage. Waste generators mainly of households are encouraged to sort materials by the informal sector for reuse and recycling due to the income they generate. On the other hand, all other actors within the informal sector are engaged with reuse and recycling activities after the waste enters the waste stream.

7.2 Weak Formal Waste Management System

Poor communication

The line of communication between the WMD at the Metro and sub metro level is very weak and unorganized. This is more evident in relation to the monitoring and evaluation of waste management service providers, Zoomlion Ghana Limited. This has resulted in the wastage of human and financial resources, and also affected the overall monitoring and evaluation activities of AMA. The WMD at the metro and sub metro level conducts supervision as well as monitoring and evaluation of the waste management services without the collaboration of the WMD at the AMA level. In addition, there is no outlined mechanism to incorporate the feedback of other stakeholders. In general, the decentralization of waste governance is not functioning as it should have been with a clear flow of information, delegation of authority, duties and responsibilities through the different tiers of government.

Fragile financing and cost recovery system

The Environmental Sanitation Policy stresses the need of sustainable financing and cost recovery for the provision of regular and reliable waste management services (MLGRDE, 2010: 18-19). However, Zoomlion Ghana Limited is challenged to recover the cost incurred for the waste management services it provides. This has affected the sustainability of the services in the long run as it requires for the services to be economically profitable. In addition, the company has the responsibility to improve the system of collecting revenues from households on a regular basis as well.

Operational and technical problems

Zoomlion Ghana Limited is challenged with both operational and technical challenges. This has manifested at both the landfill and the door-to-door waste collection services. There is frequent breakdown of vehicles and equipments. As a result, the landfills are closed frequently, which in turn affects the waste collection schedules in turn. In addition, the activities of scavengers are affected during the closure of the landfill. In addition, the continuous vehicle breakdown has resulted in the collection backlog.

7.3 Informal Metals and Plastic Recovery as a Booming System

The formal waste management system has a number of shortcomings. The formal system is not at the position to introduce and change the attitudes of waste generators towards separating or sorting of waste at the source or household level. In addition, it lacks implementing strategies such as reduction, reuse and recycling of waste to minimize or recover resources from the waste stream. Rather the system is more concentrating on the collection and dumping of waste in to the un engineered landfills indiscriminately. Furthermore, the formal system has challenges in terms of providing the consistent and reliable waste collection services. These and similar shortcomings have created the opportunity for the informal waste management system involve both in separation of waste, recycling and also collection of waste from the various waste generators and mainly of households.

This situation supports the argument presented by Lomirtez (1998) that informality is not only resulting from traditionalism but also as a means to fill the shortcomings of formalization. However, lack of employment opportunities and the search for livelihood support mechanisms are also major driving forces and factors for the growth of the informal metal and plastic recovery system in Accra. As stated earlier in section 4.4, Accra is challenged with high rate of population growth and waste generation rate, unemployment, high rate of urban-rural migration.

The informal metal and plastic recovery system is made up of different set of actors involved in the recovery system at different levels with different potential and capability to influence the system. This is similar to the description by Scott (2000:16) as 'cliques', 'clusters' or 'blocks' which are the sub-groupings of large scale systems of informal relations. These sub-groupings or networks within the system have varying number of members estimated to be within the range from 2 to 35. They have also established norms of behavior and value that I will be discussing later in this section.

The networks and the actors within do not only relate to one another based on family, friendship, ethnic group, religious affiliation, lineage and place of origin as argued by Boissevain & Mitchell (1973) and Scott (2001). In addition, their economic and social position in relation to others based on income, education and occupation relate one actor to the other within the networks in the informal plastic and metal recovery system. Furthermore, this system is dominated mainly by people migrating to the urban areas. This is in line with what has been stated by Wilson et al. (2006) considering the informal sector in resource recovery and recycling is left and dominated by the urban dwellers including rural people that have moved to urban areas. Networks of scavengers and informal waste collectors show mixture of ethnic groups unlike the informal workers involved in the collection and recycling of metal who are from the Northern part of Ghana.

In general, metal recovery tends to attract more people in an organized and expanding manner faster than the other networks engaged in both plastics and metals. Furthermore, the metal recovery networks are composed of people from similar socio economic background and social status as opposed to those within the scavengers and waste collector networks that have a more diverse background. In addition, the demand for metals is higher when compared to plastics as plastic industries resort more to the use of virgin materials over recycled plastics as a raw material. The two main reasons are the fact that the cost of virgin materials is cheaper than the cost incurred when recycling plastics. Secondly, some of the plastic industries are engaged in some types of products that only require virgin materials to meet certain quality and standards within the global market. On the other hand, it is worth mentioning that the networks that are engaged in the recovery of metal are related to the global recycling market through agents and exporting companies as shown on the schematic diagram 20. This makes networks involved with metal to generate higher profit than plastics.

7.4 Organization and Categories of Actors in the Informal Plastic and Metal Recovery System

The organization and categories of actors within the informal metal and plastic recovery system in Accra has similarity to the schematic representation (see figure 2) of the informal waste recycling system of Bangkok by Wilson et al. (2006) but with some variations. The four main categories in Wilson's schematics; Itinerant waste buyers, Street waste picking, Municipal waste collection crew and waste picking from dump are also categories identified in the waste recovery system in Accra. However, drawing a clear line among the categories is challenging in the reality as some actors might fall into two or more categories at the same time.

Itinerant waste buyers

In the context of Accra, scrap metal collecting boys and masters are considered as Itinerant waste buyers that are roaming around buying dry waste, mostly of obsolete electronic materials for the extraction of valuable Metals. These materials are collected before getting in to the main waste stream. They use a four wheel push trucks and mostly they work in pairs as the nature of their work is labor- intensive similar to the context in other developing countries. Here also mentioning the *Qualiba* boys is important as they buy plastic bottles for reuse in the domestic markets. This category of the informal recovery system encourages source-separation among waste generators especially households in low and medium income areas.

Street waste picking

Street sweepers employed by Zoomlion Ghana Limited and other private formal waste management companies in Accra falls in to this category. They are engaged in to street waste picking as a means of generating additional income. Whenever possible they are also engaged in buying waste materials from households and other sources. Therefore, actors within this category also fall in to the Itinerant waste buyers category as they buy waste materials whenever they get the chance from neighbors and people they know.

Municipal waste collection crew

In the context of Accra, waste collection crew members of formal companies can be considered as part of this category. Even if they are part of the formal waste management system, they are involved in to the informal waste management system to generate more income. Therefore, they separate plastics and metals during the door-to-door waste collection service and sell to metal collector boys or at barrier points.

Waste picking from dumps

In the context to the Informal waste recovery system, scavengers' situated at the landfills and also communal bins are classified under this category. They are engaged in the sorting and collection of plastics and metals from the mixed waste after it got in to the main waste stream.

One of the diversion points from the schematic presentation of Wilson et al (2006) is the presence of *Kaya Bola* who are informal waste collectors within the informal waste recovery system in Accra. They are important actors as they sort valuables that have market value prior to dumping the waste or getting it to the waste stream. The second point of diversion is the absence of barrier points in the schematic presentation of Wilson (see figure 2). However, these collection barrier points, which serve as a collection points for the recovered metals, are common phenomenon in the city of Accra.

As shown in Figure 2 the different actors falling into the different categories according to Wilson (2006) have trade links or relations. *Kaya Bola* informal waste collectors, street sweeper and waste collection crew members are linked with both the scrap collector boys and barriers points. The relation is basically trade and convenience for the informal waste collectors, street sweepers and waste collection crew members. There is no cultural or ethnic affiliation as a basis for the trade relation. Informal waste collectors' sell the materials to any one they encounter on the streets or to the nearest barrier points instead of carrying it around as shown on Figure 33. This trade relation is only in relation to Metals with regard to the *Kaya Bola*. They leave plastics as a payment for the unloading service they get from scavengers at the communal bins and landfills.

7.5 Trade Hierarchy and Value Addition

Actors within the informal waste recovery system are organized in the form of a hierarchy in the relation to trade and value addition. The situation Accra (see figure 21) is more or less similar to the trade hierarchy described by Wilson et al (2006:808) as shown in figure 3. Individuals that are engaged in the recovery of metals and plastics such as street sweepers, individual informal waste collectors *Kaya Bola*, scavengers at central containers and compactor truck crew are found at the bottom of the hierarchy. They get a small amount of money or income from the recovered materials as they do not have any organized supportive system, and have less bargaining power. Mostly they get the metals and plastics for free as they sort them out of the mixed waste. Therefore, they tend to accept the selling price offered by buyers. In most cases, aside sorting the plastics and metals from the mixed waste, they are not engaged in additional value addition by extracting or dismantling of metals. The chain between them and the end users in longer when compared to the other actors situated in the hierarchy.

Informal waste collection and scavenging networks or groups are placed on the second level of the hierarchy as they have better support system and bargaining power when compared to the first level. However, they are still having no capability to add value to the recovered plastics and metals besides sorting the materials from mixed waste.

Scrap dealing boys and masters, barrier points and middlemen are placed at the third level of the hierarchy. They have better bargaining power and closer to the end of the chain of trade. In addition, scrap dealing boys and masters and barrier points have some value addition activities such as extraction of metals that in turn help them to add value and bargain on the profit margins. The fact that they are related to Agents which are mainly related to export market has increased their profit too. The boys are categorized at the same level as the masters as they are free to change their position from being boys to masters depending on their personal ability to make more profits and learn more about how the system functions. At the fourth level of the hierarchy are Agents and MSEs that are one step away from the last actor in the trade chain. Agents do not add value to the metals; however, they are related to companies that are functioning in the global market. This has put Agents in a better position to source better income.

MSEs are mostly engaged in the trade and processing of plastics. They add value to the plastic as they semi process prior to selling to Plastic industries. They have a higher income than all actors involved in the trade of recovered plastics. At the end of the trade chain are the local manufacturing industries and export companies. They make the highest income or benefit as they are the end of the chain and also close to the end user. Regarding exporting companies, they make highest profit as they are related to the global metal recycling market.

7.6 Sources of Finance and Capital within the System

There is a need for startup capital within the informal plastic and metal recovery system in order to purchase recyclables from the source. As it has been evident, members within the system have a wide range of financial sources in addition to their own capital. These sources include family members, friends, masters, middlemen and agents. Metal collector boys and masters always in need for more credit to purchase higher quantity of recyclables from different sources prior the recyclables enter the solid waste stream. However, unlike most actors in the informal waste management system; scavengers do not need startup capital as they collect the recyclables for landfill sites free of charge.

Networks within the informal metal and plastic recovery system source financial credits from actors placed at the upper level of the trade hierarchy as shown in Figure 21. The system sources finance from exporting companies through Agents. The Agents provide credits to scrap dealers mainly to masters situated at Agobloshie Scrap Metal Yard and the different barrier points throughout Accra. When the scrap dealer boys join the system their source of startup capital is mainly of friends, family members and their own savings. However, additional credit or capital is sourced from masters within the networks to purchase more recyclables. All financial transactions within the system are mainly based on trust and mutual understanding among the networks.

In addition, middlemen are also source of credit to scavengers to encourage and also to pressurize scavengers to be committed to them in supplying recyclables in a reliable manner. The sources of finance for middlemen is MSEs that has relation with middlemen in sourcing recovered materials especially plastics. MSEs in turn get financial support from local manufacturing industries that are sourcing semi processed plastic for the production of final products.

The flow of the financial transaction follows the trade hierarchy from the high value adding actors to the lower value adding actors. However, the actors at the lowest end of the trade hierarchy do not get any kind of funding from the system in most cases. Rather they rely mainly on their own capital and also small amount of profit generated from the sale of the recovered plastics and metals. This is probably related to the fact that the amount and type of plastics and metals collected is smaller when compared to the other actors at the higher level of the hierarchy. In addition, plastic is mostly collected by actors at the lowest levels unlike metals that are highly demanded by both the local and global market.

7.7 Reachability

The level of 'reachability', how easy and manageable it is to transfer ideas, resources, information etc, among members of networks, is important for the functions of networks (John 2000:32). Networks engaged in the recovery of metal and also scavenging activities have higher 'reachability' than networks engaged in informal waste collection. As metal recovery network members and also scavengers spent longer hours and sharing working space, it is easy to exchange messages and transfer information and resources faster. In addition, members of the metal recovery networks live in the same area which is very much close to the work area along with their family members.

The scavengers' network's 'reachability' is lower than the metal recovery networks as the scavengers' live in different parts of the city unlike members of the metal recovery networks. In addition, members of the scavengers' association are more ethnically diversified than that of the metal recovery networks that come from the same origin. However, members of the scavengers' networks have a better 'reachability' than informal waste workers. They spend more time on the same work area, the landfill sites, and this makes it easier to transfer information and resources.

7.8 Common Norms and Values

The networks of scavengers, informal waste collectors and scrap metal dealers have developed and adhere to certain types of organizational structure and practices that carries the cooperative norms and values of its members. For example in case of the scavengers' network, misconducts are not accepted and there are certain expectations and obligations required from each member based on the organizational structure. The same is true with the other networks. In terms of strengthening and further developing the norms and values of the networks, frequent and daily interaction of network members and the size of the network play an important role. This is in line with what has been stated by Hanson (2004:1291) who argues that regular interaction among network members of some sort have high probability to further develop common shared values and norms. This is important in terms of understanding and addressing mutual needs and sharing of resources, strengthening reciprocal exchanges and facilitating the delivery of assistance to one another.

The networks of the scrap metal collectors and dealers have more tendencies to abide by the established norms and values when compared with the networks of Informal waste collectors and Scavengers. Especially in terms of helping each as to add working capital and other financial transactions to buy more scrap metals. In the other networks, besides the financial support in case of emergencies there is no financial support for the expansion of their respective activities. This can also be further attributed to the fact that the metal collectors are from the same place of origin and share the same religion. In addition, the metal collectors spend much of their time at their shared working place and also the close by area where they live along with their family members when compared to other networks. These are important for the metal recovery networks to have more durable relations than the other networks.

At this point, the role of the formal sector such as Zoomlion Ghana Limited and AMA WMD can be seen as a watchdog for the adherence of the norms and values established within the scavengers' network. WMD has provided ID cards for network members to make sure that only members work at the landfill site. In addition, Landfill operators assist in enforcing the network leaders' decisions for example sacking of members from the landfill site for misconduct.

Scavengers and informal waste collectors' networks are weaker as the members come from different ethnic background and also their cooperation is mainly focused on emergency related issues rather than the actual plastic and metal recovery. In addition, the scavengers' networks are more of competitive to one another in certain occasions as they collect the recyclables for free after the plastics and metals enter in to the solid waste stream.

Patron-client relations

Patron client relations exist within the networks and also along the trade hierarchy chain. The patron client relation is evident especially among the actors within the metal recovery system. Within the metal recovery networks the relation between boys and masters is as a patron and client. Boys are loyal and trustworthy to their masters which are more powerful than the boys. Masters are more powerful than the boys as they have more capital, established business relations and knowledge of the business. According to Lomintz (ND: 6) when there is a wide difference in power among the partners of reciprocal exchange, the less powerful reciprocate with more loyalty and gratitude. Therefore, boys reciprocate for the more powerful masters by being more loyal and trustworthy. Furthermore, masters have patron-client type of relation with agents. Agents are also more

powerful and also source of capital to masters. This has resulted in the loyalty and obedience of masters to agents.

7.9 Reciprocity

The practice of reciprocity is a major component among network members within the informal metal and plastic recovery system. Network members seem to provide favors and services to one another and accept similar favors and services when needed. Network members help one another when repairing trucks, dismantling or extracting metals, during sicknesses and loss of a family member. In addition, there is sharing of tools and working spaces among network members especially in the metal recovery networks.

However, the level of reciprocity within metal recovery networks seems to be stronger when compared to other networks engaged in scavenging and informal waste collection. One of the reasons could be the fact that metal recovery network members have the same origin, ethnic group and religion. In addition, they have joined the system following an already established friendship. These are the basis for the development of trust and closeness among network members. This is further supported by Lomnitz (1971:102) cited in Lomnitz (1998) who stated that reciprocity within the context of informal sector requires the two parties in reciprocity exchange to have psychosocial closeness and trust.

Furthermore, the frequent contact and interaction of network members is important to strengthen and also encourage reciprocal exchanges. The fact that the metal recovery networks are situated in the same yard sharing working spaces and spending long hours together is an important in terms of encouraging reciprocal exchanges. This is in line with argument Hanson (2004:1294) that the more contacts and interaction exists among network members, the more supportive system they manage to develop. Furthermore, according to Boissevain & Mitchel (1973:25) this will result in a chain of expectation and obligation and this further binds network members together for more transactions.

7.10 Relation between the Formal and Informal Waste Management System

Most often the attitude and perception of the formal sector involved in waste management system is negative towards the informal waste management system. It is regarded as highly unorganized, backward, unhygienic and incomparable to the formal waste management system (Wilson et al, 2006:2). In spite of the fact that the informal resource recovery system is filling the gaps created by the formal system. Furthermore, informal networks are also considered as a cost effective mechanisms to fill the gaps created by the shortcomings of formal institutional arrangements (Meagher, ND: 8).

This is clearly shown in the relation of the formal and informal actors involved in the waste collection and recovery system in Accra. Especially, the informal waste collectors are not legally allowed to work within the jurisdictions where the formal waste companies functions. AMA has established bye-laws that require waste generators to get service only from registered companies. Furthermore, under the recent re-zoning under the PPP, if any informal waste collector is found in the jurisdiction, companies are allowed to take actions of any sort including seizing of trucks and issuing fines. The companies consider the waste within their contracted area as their own property even if they do not manage to provide adequate service to their clients.

The observed relation between the formal and informal system is similar to the view of Peter et.al (2003:11) which agrees with Medina (1997) that classified the responses of the formal sector to the informal waste management system in to four categories as repression, neglect, collusion and stimulation. The presence of the informal system is considered as a sign and also as a failure of the formal system. In most occasions such attitudes are expressed in the form of harassment and physical violence. Similar incidents are very common among the informal waste collectors. This is also supported by the AMA Waste Management Departments at the sub metro level. Supervisors cooperate with formal companies in seizing trucks and sometime beating of informal waste workers in the areas. Informal waste collectors are generally criticized for dumping waste indiscriminately after collecting their fees and also sorting recyclable materials. Scrap metal dealers have very little contact with the formal waste management system as they buy the valuable materials for metal extraction directly from households and other sources before the waste enters in to the waste stream.

On the other hand, there is a mutual understanding and coexistence that has been witnessed at the landfill sites. Landfill operators acknowledge the importance of the scavengers in terms of reducing the size of waste at the landfill sites. Furthermore, AMA WMD also issued IDs to facilitate the networks activity. In addition, Zoom Lion Ghana Limited has also started an initiative to assist the establishment of an association of informal waste collectors *Kaya Bola* and there is a plan to use of their services for door-to-door waste collection in areas inaccessible to waste collection trucks.

The government has also failed to acknowledge either the benefits or the disadvantages that has resulted from the informal waste management system. There is no initiative that is drawn by the government to incorporate the informal system in to the formal waste management scheme. In general, it can be stressed that the government and more specifically AMA has no clear understanding or knowledge of the activities of the informal waste management system.

AMA had articulated an integrated waste management strategy that incorporated medium and long term plans that will be in to effect up to 2017. In the document, there is a mention for the need of new innovations for the separation, recycling and energy production from waste. 'Upgrading the existing informal activities of scavengers through integration into the formal sector will be looked at very seriously in view of the potential for job creation at the grassroots level' (AMA ,2010b:69). However, the strategy does not have a detailed and articulated plan regarding how to integrate or incorporate the activities in to the formal system.

7.11 Risks of Informality

Poor Working conditions

Actors involved in the informal metal and plastic recovery system and especially those situated at the lower level of the trade hierarchy are exposed to poor working conditions. As it has been stated by Wilson et al (2005:797) the informal sector is labor intensive, uses low or no technology and is unregulated. Many of the actors such as the scavengers, informal waste collectors and scrap dealing boys and masters spend long hours in the recovery of plastic and metals. In addition, all the activities are highly labor- intensive and expose worker to health problems such as muscle strains and breathing problems. These working conditions have also discouraged the involvement of women and that the system is only left for men.

Environmental pollution and health risks

The services and activities within the informal metal and plastic system are important for the environment. The importance arises as the informal sector is engaged in the recovery and reuse of resources mainly of metals and plastics that might have ended in the landfill. However, the way these recovery activities are carried out has its own adverse effects on the environment and also endangers the health of both the informal workers as well as the society at large.

Especially, the dismantling activities to extract metals pose environmental and health problems. In most cases, there is burning of plastics and metals on the open air without any protective tools. For example in Agobloshie there is burning of materials for the extraction of metals. There are no special equipments or safety tools to conduct the extraction in a safe way. Burning and dismantling of metals results in environmental pollution. According to Prakash & Manhart (2010:4) the Agobloshie metal scrap yard have high concentrations of cooper, lead, zinc, and tin. It is important to note that in the area there is large population that resides and also get food items from the large open market of the area, Agobloshie market. Fresh fruits and vegetables and all sorts of food items are marketed in the open space. In addition to the yard, it is common to see the burning and melting of plastics and metals in nearby major streets by members of the metal collector barrier points. There activity is very much similar to the activities of the metal scrap yard.

Scavengers' are also highly exposed to hazardous wastes that are dumped indiscriminately at the landfill site. None of the members has safety or protective tools during the search of recyclable materials.

8 Conclusion

The informal plastic and metal recovery system is expanding as more people are attracted to join the informal plastic and metal recovery system due to unemployment, and as the system pays more compared to some other jobs they have been engaged in. The actors within the informal sector are engaged in the recovery system as a means of livelihood not for neither environmental protection nor sustainable development. This is evident in the fact that the actors within the informal system are selective and mainly interested in plastics and metals leaving other materials out. However, the activities of the actors are addressing the shortcomings of the formal sector engaged in waste management, as it provides waste collection and recovers material resources from the waste.

The actors within the informal system include Informal waste collectors *Kaya Bola*, Street sweepers, Scrap metal dealers, Scavengers, *Qualiba* men, Agents and MSEs. Depending on the specific ways employed to recover plastic, metal or both, the main actors are divided into four major categories that have been previously identified by Wilson et al (2006). These categories are; Itinerant waste buyer, street waste picking, municipal waste collection crew and waste picking from the dumps. However, in the case of Accra city there are additional actors, informal waste collectors *Kaya Bola* that does not fall in to any of the categories. Furthermore, in reality some of the actors fall in to two or more of the categories at the same time. These actors are involved in reciprocity networks in one way or another to access credits and some sort of informal social security. Members within the reciprocity networks relate to one another based on their shared common features. These include similar educational background, place of origin, socio-economic status, religious affiliation and socio-economic perceptions. They perceive themselves as belonging to the category of the low socio-economic status but improving due to their engagement in to the informal plastic and metal recovery system. High level of interaction coupled with these shared characteristics resulted in the development of norms and values among the members.

The recovery system for the metals seems much stronger than the plastic recovery activities. As a result, in most cases plastics are recovered after it enters in to the main waste stream unlike metals. Plastics are mostly recovered at the central containers and landfill sites by both central container care takers and scavengers. However, there are exceptions that certain plastic bottles are recovered by *Qualiba* men for reuse in the domestic market for traditional medicines and local drinks. In certain cases, plastics are also recovered by informal waste collectors *Kaya Bola* and used as a payment for scavengers at the central containers and landfill sites. On the other hand, the recovery of metal is before the metal enters the main waste stream. For this, the metal collecting boys and masters play an important role. They have also barrier points that make sure to collect metals from other sources other than households. However, scavengers at the central containers and landfills also recover metal has entered the main waste stream.

To date, the relation of the formal and informal waste management system is dominated by conflict, and neglect by the government. Despite the fact that there are environmental and health issues that can be raised in relation to the activities of the informal recovery system, there is a need to improve and integrate the system. The formal waste management system is now only concerned with collecting and transporting waste to landfills. In order to address its shortcomings in terms of recovering resources, the formal sector needs to understand and build up on the existing informal waste recovery system. However, there is no clear institutional framework involving all the stakeholders for the recovery of resources.

8.1 Further studies

I would like to suggest for further study to identify ways to improve and integrate the informal waste recovery system in to the existing formal solid waste management system. The integration is of importance in order to fill the gaps created by the formal waste management system.

9 References

- Ackerman, Frank 1996. *Why do we Recycle? Markets, Values and Public Policy*. Covelo: Island Press.
- AMA 2010a, *Medium Term Development Plan (2010-2013): Ghana Shared Growth and Development Agenda*, Accra: Accra Metropolitan Assembly.
- AMA 2010b, *Accra Metropolitan Assembly Integrated Solid Waste Management Strategy*. Accra: Accra Metropolitan Assembly.
- AMA 2010c, *Accra Metropolitan Assembly Franchise agreement between AMA and Formal Waste Management Companies*, Accra: Accra Metropolitan Assembly.
- AMA 2011, *Accra Millennium City: A New Accra for a Better Ghana*, Accra: Accra Metropolitan Assembly.
- Amha Ermias. 2010. *Micro and Small Enterprises involvement in Solid waste management in Addis Ababa: The case of Nifas Silk Lafto Sub City*. MSc. Thesis. Urban Development and Management Department. Addis Ababa University.
- Baud, Isa, Post, Johan & Furedy, Christine 2004. *Solid Waste Management and Recycling: Actors, Partnerships and Policies in Hyderabad India*. USA. Kluwer Academic Publisher.
- Boadi, Kwasi Owusu & Kuitunen, Markku 2004. 'Municipal Waste Management in the Accra Metropolitan Area, Ghana'. *The Environmentalist*, 23, 211-218
- Boissevain, Jeremy & Mitchell, Clyde J. eds. 1973, *Network Analysis Studies in Human Interaction*, Mouton & Co.,
- Denscombe, Martyn. 2007, *The Good Research Guide for small-scale social research projects*. Buckingham: Open University Press.
- Devas, Nick 2004, *Urban Governance, Voice and Poverty in Developing World*. Earthscan Publications.
- Edward, Anomanyo 2004. *Integration of Solid waste management in Accra: Bioreactor treatment technology as an integral part of the management process*. MSc Thesis. International Environmental Sciences Department. Lund University.
- Franchetti, Mathew J. 2005. *Solid Waste Analysis and Minimization: A system Approach*. McGraw-Hill Professional Publishing.
- Frank, Kreith & Tchobanoglous, eds., 2002. 2nd ed. *Handbook of solid waste management*. McGraw-Hill Professional Publishing.
- Gutberlet, J., 2008, *Recovering Resources – Recycling Citizenship: Urban Poverty Reduction in Latin America*. Oxson: Ashget Publishing group.

- Hanson, Kobena T. 2005. Landscapes of Survival and escape: social networking and urban livelihoods in Ghana, *Environment and Planning*, 37(A), 1291-1310.
- Harriss, John, Hunter, Janet, Lewis M.C.,eds. 1997. *New Institutional Economics and Third World Development*. London: Taylor & Francis Group.
- Hemmer, Hans & Mannel,C. 1989. On the Economic Analysis of the Urban Informal Sector., *World Development*, 17(10), 1543-1552.
- Hester R., Harrison R. 1995. *Waste Treatment and Disposal*. Cambridge: The Royal Society of Chemistry.
- Hester R., Harrison R. 2002. *Environmental and Health Impact of solid waste Management Activities*. Cambridge: The Royal Society of Chemistry.
- Hyden,Goran & Bratton,Michael .,eds., 1992. *Governance and Politics in Africa*. Boulder & London: Lynne Rienner Publishers.
- Johnson, Gail. 2002. *Research Methods for Public Administrators*. Westport: Greenwood Press.
- Kadfak, Alin 2011. An Analysis of the Social Relations in Waste Management: Two case studies on Somanya and Agormanya in Ghana. MSc Thesis, Sustainable Development Department, Uppsala University.
- Kothari, C.R. 2004. *Research Methodology: Methods and Techniques*. Delhi: New Age International Publishers.
- Local Government 1995. *Local Government Bulletin*, Accra:Local Government.
- Lomintiz, Adler, 2009. Informal Exchange Networks in Formal Systems: A Theoretical Model, *American Anthropologist*, 90 (1), 42-55.
- Long, Norman & Long, Ann, eds., 1992. *Battlefields of Knowledge: The interlocking of Theory and Practice in Social Research and Development*. London & New York: Routledge .
- Long, Norman, 2001. *Development Sociology: Actor perspectives*. London & New York: Taylor & Francis Group .
- Lourenco-Lidell,Iida, 2002. *Walking the Tight Rope: Informal Livelihoods and Social Networks in a West African City*. PHD Dissertation, Department of Human Geography. Stockholms University.
- McDougall, Forbes R. White, Peter R. Franke, Marina, Hindle,P., 2008. *Integrate Solid Waste Management: A life cycle inventory*. Chichester:Wiley.
- Meagher, Kate. 2005. Social Capital or Analytical Liability? Social Networks and African Informal Economies. *Global Networks*. 5(3), 217-238.
- MLGRDE 2007, Environmental Sanitation Policy of Ghana, Accra: The Republic of Ghana.

- Nnunduma, Bakar J. 2003. *Structure and Behavior of Food Trading Networks: The Case of Collecting Wholesalers in Da-re-Salaam and Arusha, Tanzania*. Department of Human Geography, Stockholm: Stockholms University.
- Oviedo, A., M., Thomas, R., M., Karakurum-Özdemir, K. 2009, *Economic Informality: Causes, Costs, and Policies - A Literature Survey*. Herndon: World Bank Publications.
- Perry, Guillermo E., Maloney, William F., Arias, Omar 2007. *Informality: Exit and Exclusion*. Herndon: World Bank Publications.
- Republic of Ghana 1992, *Constitution of the Republic of Ghana*. Accra.
- Republic of Ghana 1993, *Local Government Act*. Accra.
- Scott, John. 2000. 2nd Ed. *Social Network Analysis: A handbook*. London: Sage Publications Ltd.
- Thim, Ly, 2010. Planning the lower Mekong Basin: Social intervention on the Se San River. Bonn: LIT Verlag.
- UNEP 2002. *Industry as a partner for sustainable development: Waste Management*. New York: UNEP.
- UNHABITAT 2010. 3rd Ed. *Solid Waste Management in the World's Cities: Water and Sanitation in the world Cities 2010*. London & Washington DC: Earthscan.
- UN-HABITAT 2007, *State of the World Cities in 2006 /7: The Millennium Development Goals and Urban Sustainability*. Earthscan.
- WCED 1987. *Our Common Future*. Oxford: Oxford University Press.
- Weinberg, Adam S., Pellow, David N., & Schnaiberg, Allan, 2000. *Urban Recycling and the search for Sustainable Community Development*. Ewing : Princeton University Press.
- Wilson, David C., Velis, Costas, Cheeseman, Chris 2006, Role of informal sector recycling in waste management in developing countries, *Habitat International*, 30, 797-808.
- Wilson, David C., Chinwah, Kaine, Araba, O., Cheeseman, Chris, 2009, Building the Recycling rate through the informal sector , *International Journal of integrated waste management, science and technology*, 29, 629-635.
- Wasserman, S. & K. Fraust 1999, *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University press.
- Yin, Robert k. 2009, *Case Study Research: Design and Methods*. Sage Publications.
- Yusuf, Olabisi S. 2011, A Theoretical Analysis of the Concept of Informal Economy and Informality in Developing Countries. *European Journal of Social Sciences*, 20 (4), 624-636.
- Zerihun, Tadesse 1996, *A network Approach to the coffee market sub-sector in Uganda*. PDH Dissertation, Swedish University of Agricultural Sciences.

Zhu, Da, Asnani, P. U., Zurbrugg, C. 2007. *Improving municipal solid waste management in India: A source book for policy makers and practitioners*. Herndon: World Bank Publication.

10 Annex

10.1 The following table illustrates the number and the positions of interviewees

Public / Formal	No.
Assistant Planning officer AMA	1
Assistant Head of the AMA Waste Management Department	1
Cleansing Officer for Ablekuma Central, AMA	1
Assemblyman for Sabon Zongo – Ablekuma Central	1
Assemblyman for Metaiko – Ablekuma Central	1
Head of the Metropolitan Health Department - Ablekuma Central	1
Private / Formal	
Previous Assemblyman for Sabon Zongo / Opinion Leader	1
Sabon Zongo Chief leader / Opinion leader	1
Head of Domestic Waste Management Department – Zoomlion Ghana Limited	1
Supervisor – Zoomlion Ghana Limited	1
Landfill Manager – Zoomlion Ghana Limited	1
Head of the Monitoring and Evaluation – Zoomlion Ghana Limited	
Landfill Engineers at Sabah and Abokobi Landfill sites – Zoomlion Plc	2
Operation Manager - Dawa Plastic Factory	1
Operation Manager - Decor Plastic Factory	1
Meskon semi plastic processing facility owner and manager (MSEs)	1
Private / Informal	
Informal waste collectors	6
Communal bin care takers	3
Informal plastic and metal dealers	5
Metal collection barrier points	4
Street sweepers	3
Agents	4
Waste Collection crew	3
Plastic bottle collectors and traders	3
Assontaba Waste collectors – Chairman and members	4
Scrap metal dealers Association – Chairman and deputy Chairman	2
Scavengers Association – Chairman and members	3

10.2 Questionnaires

10.2.1 Questionnaire for informal waste collectors

1. Basic questions

1.1. Gender Female ☐ Male ☐

1.2. Age below 20 ☐ 21-25 ☐ 26-35 ☐ 36-55 ☐ More than 55 ☐

1.3. Educational level

- None ☐
- Primary level ☐
- Secondary level ☐
- College ☐
- Other-----

1.4. Marital status Married ☐ Single ☐ Divorced ☐ Widowed ☐

1.5. Number of family members -----

1.6. Ethnic group/ tribe / origin -----

1.7. Religion -----

1.8. Monthly income (GHS)-----

2. How long have you been involved in waste collection activity?

a) Less than a yr ☐ b) 1-2 years ☐ c) 2-4 years ☐

d) 4-6 years ☐ e) 6-8 years ☐ e) Other

3. Do you have another work experience before joining this activity?

No ☐ Yes ☐

If yes, please Elaborate -----

4. Why did you join this activity? -----

5. How did you join this activity? -----

6. From where do you collect the waste mostly? Please circle

a) Households

b) Commercial Institutions.....

c) Streets

d) Others please specify

7. From which areas or categories do you collect mostly? (Please circle)

a) Low income areas

b) Middle income areas

c) High Income areas

8. Do you collect recyclables from communal bins? Yes No ☐ ☐

9. Do you collect recyclable materials from Landfills? Yes No ☐ ☐

10. Do you have permanent clients from where you collect the waste?

Yes ☐ No ☐

11. How do you communicate to collect the waste from customers?

12. Do you have a standardized method to charge your clients for your services?

Yes ☐ No ☐ Please elaborate -----

13. How many hrs do you work per day?

a) 4 - 8 ☐ b) 8-12 ☐ 12-16 ☐ 16-20 ☐

14. How many days do your work per week? _____

15. On average from how many households do you collect waste per day? -----

16. Which are the busiest days of the week for waste collection? Why?-----

17. What is the volume of the container you use to collect waste? -----

18. What volume of waste do you collect per day? -----

19. Do you own the cart / container for waste collection? Yes ☐ No ☐

20. If rented from whom? -----

21. What are the major materials that you sort from the waste and sell? Please rank from 1 -5 as 1 is the most preferred and 5 the least preferred.

a) Plastics ----- b) Copper wire ----- c) Paper----- d) Metals-----
e) E-waste ----- f) Other, Please specify-----

22. Do you sell the materials for

a) Reuse ☐ b) Recycling ☐ c) For both ☐

23. Have you ever had any training in relation to waste collection and sorting? Yes ☐ No ☐

If yes, please elaborate -----

24. How much do you earn per day from the waste collection service you provide? -----

25. Do you believe you earn enough when compared to the service you provide? Yes ☐ No ☐

26. How much do you earn from the sorted materials per day? -----

27. To whom do you sale the recyclable materials mostly? Please circle

a) Scrap dealers ----- b) Scrap Boys ----- c) Fellow waste collectors -----
b) Others , Please specify -----

28. Do you have regular buyer/s that you supply for? Yes ☐ No ☐

Please elaborate -----

29. Who and how is the price fixed for the sorted waste -----

30. Do you believe you get good price for the sorted materials? Yes ☐ No ☐

31. Where do you dump the waste you collected?

a) Communal Bin b) Burning c) Land fill sites d) Others, please specify -----

32. How do you feel about the following statement? ' it is necessary to formalize our activities'. Please circle the answer (likert scale)

1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree

33. How do you feel about the following statement? 'it is possible to formalize our activities'. Please circle the answer (likert scale)

1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree

34. How do you feel about the following statement? "The current privatization and re-zoning (formal companies) activity affect our activities" Please circle the answer (likert scale)

1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree

35. How do you feel about the following statement? "I feel exploited for joining the informal waste collection activity"

1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree

36. Do you think sorting and recycling waste is important for the environment?

Yes ☐ No ☐ I have no Idea ☐

37. Are you involved in a group / network with other fellows engaged in similar activity?

Yes ☐ No ☐

Please elaborate -----

38. What is affecting your activity mostly? (please rank)

1. Formal companies.....
2. Perception of the society
3. Government laws
4. Police
5. Congestions on the road.....

39. What kind of challenges do you have to pursue your activities? -----

40. Do you believe you are contributing to the waste management of Accra? yes ☐ No ☐

Please Elaborate -----

41. Do you believe that your role is considered as important for waste management by the government?

Yes ☐ No ☐

10.2.2 Questionnaire for Scrap Metal Dealers

1. Basic questions

1.1. Gender Female ☐ Male ☐

1.2. Age below 20 ☐ 21-25 ☐ 26-35 ☐ 36-55 ☐ More than 55 ☐

- 1.3. Educational level
- None ☐
 - Primary level ☐
 - Secondary level ☐
 - Other-----
- 1.4. Marital status Married ☐ Single ☐ Divorced ☐ Widowed ☐
- 1.5. Number of family members -----
- 1.6. Ethnic group/ tribe / origin -----
- 1.7. Religion -----
- 1.8. Monthly income (GHS)-----
2. How long have you been involved in buying scraps?
- a) Less than a yr ☐ b) 1-2 years ☐ c) 2-4 years ☐
- d) 4-6 years ☐ e) 6-8 years ☐ f) Other
3. Do you have another work experience before joining this activity?
- No ☐ Yes ☐
- If yes, please Elaborate -----
4. Why did you join this activity?-----
5. How did you join this activity? -----
6. From where do you buy the scraps mostly? Please rank from 1 to 4
- a) Households
- b) Commercial Institutions.....
- c) Streets
- d) Industries
- e) Others please specify
7. Do you buy plastics as well? Yes ☐ No ☐
8. If yes, what is the source mostly? -----
9. What are the major scraps that you buy? Please rank from 1 -5 as 1 is the most preferred and 5 the least preferred.
- a) Plastics ----- b) Paper----- d) Metals-----
- f) E-waste ----- f) Other, Please specify-----
10. Do you collect scraps from communal bins? Yes ☐ No ☐
11. Do you collect scraps from Landfills? Yes ☐ No ☐
12. Do you have permanent clients from where you collect scraps? Yes ☐ No ☐
13. How do you fix the price when you buy and also sale? -----
14. How many hrs do you work per day?
- a) 4 - 8 ☐ b) 8-12 ☐ c) 12-16 ☐ d) 16-20 ☐
15. How many days do your work per week? -----
16. Which are the busiest days of the week for scrap collection? Why? -----
17. Do you own the cart / container for scrap collection? Yes ☐ No ☐

18. If rented from whom? -----
19. Do you work in pairs? Yes ☐ No ☐ If yes, why? -----
20. What do you do together asides collecting scraps together? -----
21. How much do you earn per day? -----
22. Do you believe you earn enough? Yes ☐ No ☐
23. To whom do you sale the scraps mostly? -----
24. Do you have regular buyer/s that you supply for? Yes ☐ No ☐
Please elaborate -----
25. Do you believe you get good price for the scraps? Yes ☐ No ☐
Please elaborate -----
26. Are you involved in a group / network with other fellows engaged in similar activity?
Yes ☐ No ☐ Please elaborate -----
27. What kind of challenges do you have to pursue your activities? -----
28. How do you perceive your social and economic status after joining this waste collection activity?
a) Declining b) same c) improving
29. Do you have health related problem due to the nature of your work? If Yes, Please elaborate -----

10.2.3 Questionnaire for Scavengers

1. Basic questions

- 1.1. Gender Female ☐ Male ☐
- 1.2. Age below 20 ☐ 21-25 ☐ 26-35 ☐ 36-55 ☐ More than 55 ☐
- 1.3. Educational level
- None ☐
 - Primary level ☐
 - Secondary level ☐
 - College ☐
 - Other-----
- 1.4. Marital status Married ☐ Single ☐ Divorced ☐ Widowed ☐
- 1.5. Number of family members -----
- 1.6. Ethnic group/ tribe / origin -----
- 1.7. Religion -----
- 1.8. Monthly income (GHS)-----

2. How long have you been involved in waste collection activity?

- a) Less than a yr ☐ b) 1-2 years ☐ c) 2-4 years ☐
c) 4-6 years ☐ e) 6-8 years ☐ e) Other

3. Do you have another work experience before joining this activity?

No ☐ Yes ☐

If yes, please Elaborate -----

4. Why did you join this activity? -----

5. How did you join this activity? -----
6. How many hrs do you work per day?
b) 4 - 8 ☐ b) 8-12 ☐ c) 12-16 ☐ d) 16-20 ☐
7. How many days do your work per week? -----
8. Which are the busiest days of the week for collection? Why? -----
9. What are the major materials that you collect? Please rank from 1 -5 as 1 is the most preferred and 5 the least preferred.
b) Plastics ----- b) Paper----- d) Metals-----
g) E-waste ----- f) Other, Please specify-----
10. Have you ever had any training in relation to waste sorting? Yes ☐ No ☐
11. To whom do you sell the recyclable materials? -----
12. Do you have regular buyers? Yes ☐ No ☐
13. Who and how is the price fixed? -----
14. What are your major challenges? -----
15. Do you have any health related problem due to the nature of your work?-----

10.2.4 Common Network related Questionnaire

1. Basic information about the group / network
 - Name of the group / network -----
 - Year of establishment -----
 - Total Number of members ----- Male ----- Female -----
2. What is the purpose / aim / objective of your group? -----
3. What are the requirements to be a member? -----
4. Is there any established rules and norms in the group? If yes, please elaborate -----
5. Do you receive any help or favor from others members with in your group?
Yes ☐ No ☐ If yes, please elaborate -----
6. Do you share working equipments and facilities? Yes ☐ No ☐
Please Elaborate -----
7. Do you feel exploited for being part of this network or group? Yes ☐ No ☐
If yes, please elaborate -----
8. What motivates you to continue in this waste collection activity -----
9. What is your future plan as a group? -----
10. Do you have any of the following properties as an individual?
a) Motor Vehicle b) House c) Farm Land
11. How do you perceive your social and economic status after joining this waste collection activity?
a) Declining b) same c) improving
12. What is the source of your startup capital?
a) Own b) Friends c) Bank d) Family e) Other , Please Specify -----

13. Does your group have links with other groups in :
- a) Different line of activity yes ----- No ---- If yes, Please elaborate -----
- b) Same line of activity yes----- No---- If yes, Please Elaborate -----
14. The level of trust in our group is very high
1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree
15. The level of our confidence on each other is very high
1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree
16. We have high level of transparency
1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree
17. Our frequency of interaction is very high
1. Strongly disagree 2. Disagree 3. Neither agree nor disagree
4. Agree 5. Strongly Agree

10.3 Observation Check list

- How households store waste prior to disposal?
- Do households sort and separate waste?
- How do the informal collectors collect waste and dispose?
- How the informal waste collectors interact among themselves?
- How the informal waste collectors sort recyclable materials and deal with wholesalers?
- How do the formal waste companies collect and transport waste?
- How landfills are managed?

10.4 Sample Interview Guide

For Scrap collector and dealer boys and masters

Sex Male Female

Age

- How long have you been involved in this informal sector?
- Why did you choose to be engaged in to this activity?
- What kind of materials do you buy?

Plastics

Metals

Paper

Wood

- From where do you buy it?
Accra City
Greater Accra Region
- Who are your clients?
Households
Small enterprises
Warehouses
- How do you decide on the buying and selling price of the materials?
- To whom do you sell the materials to?
- How do you get yours startup capital?
- What are the major challenges that you encounter?
- Do you like or feel secured of being part of this sector?
- What plans do you have for the future?

For informal waste collectors *Kaya Bola*

Sex Male Female

Age

- How long have you been involved in this informal waste collection activity?
- Why did you choose to be engaged in to this activity?
- In which part of the city do collect waste?
- How do you fix the fee for the services that you provide?
- How do you get your start-up capital?
- What do you do with the waste you collect?
Separate plastics and metals
Dump at the landfill
Dump at the communal containers
- How are your clients?
Households
Institutions
Enterprises
- How do you manage to get new clients?
- If you separate recyclables, which ones do you commonly separate?
Plastics
Metals
Wood
Paper
- To whom do you sell the recyclable materials?

- How do you fix the price of the recyclables?
- What the major challenges that are affecting your activities?
- What kind of relations do you have with the formal waste management system?
- Do you like or feel secured of being part of this sector?
- What plans do you have for the future?