A STUDY OF THE SCRAP METAL TRADE IN THE KUMASI METROPOLITAN AREA

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science in Environmental Resources Management and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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ABSTRACT

The scrap metal trade is growing steadily in Kumasi. To assess the impact of the trade on stakeholders and Ghana in general, there is the need to consider the economic, social and environmental ramifications. Indicators were selected based on the Millenium Development Goals (MDG 1 and 2) and International Labour Organisation's definition of decent work. Structured questionnaires were used to gather qualitative and quantitative data from scrap metal collectors, scrap dealers, the Kumasi Metropolitan Assembly, Environmental Protection Agency, Western Steel, Tema Steel and Special Steel companies. The results were analysed through frequencies and percentages of responses to specific questions. The results indicated that the average incomes generated by scrap metal collectors and scrap dealers were above the minimum wage of labourers in government institutions in Ghana. Nevertheless, the income levels were average figures and are highly variable. The revenue generated from the trade was somewhat sufficient to cater for the social needs of the scrap collectors and dealers. In spite of the significant economic benefits, the scrap trade has the potential to hamper progress towards achieving the MDG 2 which seeks to achieve universal primary education for all by 2015.

The EPA is currently not able to keep up with the activities of small scale operators in the scrap trade at the expense of the environment. They were, however, in control of the situation when it comes to steel companies. The KMA has no specialised system for harnessing scraps that come with municipal solid waste in Kumasi and does not regard the menace of stolen scraps from the built environment as a major concern presently. Scrap dealers appeared to be indifferent in the proper disposal of oil spills which were associated with their operations increasing the possibility of polluting underground water. Scrap metal collectors also contribute to environmental pollution by burning plastic coated metals to recover copper.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Scrap metal recycling has been in existence since the 18th century. The industrial revolution which saw the emergence of large metallurgical industries was commonly regarded as the period when large scale metal recycling truly commenced. Today, with increasing public awareness and research into the many environmental implications, metals recycling is now of paramount importance due to a number of reasons including reduced contamination of air and groundwater, reduction in energy consumption during production, reduction in mining raw materials and hence saving large scale destruction of the natural environment. These benefits as well as the economics of the scrap metal industry have established a great deal of collaboration between developed and developing countries (Tsikata *et al.*, 2008).

Many different types and grades of metals at present fall in the category where recovery is extremely economical with high levels of metals being recovered. Recycling basically occurs on three recognised levels. First is manufacturing in which this operation is normally well organised and often occurs in-house, incorporated into the production of primary metal in many cases. Second is industrial or post-sales scrap and residues and third is household scrap collected by a local scrap merchant or local authority via a local municipal solid waste (MSW) refuse collection system (Emery *et al.*, 2002). To have a truly successful recycling operation, the backing and participation of the general public, industry and the government is required. The scrap metal industry gathers waste scrap metals to ultimately produce a valuable raw material end product for use by the metal manufacturing industries. If the scrap metal industry did not exist then there would be vast

quantities of waste polluting our environment as well as an increased burden on primary resources (Emery *et al*., 2002).

1.2 Problem Statement

Kumasi is the second largest city in the country after Accra, the capital, and also has a thriving scrap metal trade industry. The scrap metal industry in Kumasi generally serves the Ghanaian market even though fractions of scraps collected are exported due to the relatively higher revenue obtained compared to selling locally (Price and Nance, 2009). The exportation of scrap metal generates revenue for the country. However, this practice affects the tonnage of raw material supplied to the local steel companies. Recently the government of Ghana placed a ban on the export of ferrous scraps because of the threat it poses to local steel industries which require scrap metals as raw materials (The Ghanaian Chronicle, 2012). The quantity of ferrous scrap collected and processed in the country is not known. In 2006, it was estimated that there were four steel industries requiring more than 300,000 tonnes of ferrous scraps annually (Bortsi, 2006). Recent survey indicates that there are about nine major steel industries in Ghana. This increases the demand of ferrous scraps required by local foundries.

Personal communication with scrap collectors suggests that the scrap metal industry is a lucrative business. Nonetheless, there is no proper documentation regarding the daily minimum wage of employees in this industry. Whether the income obtained from the scrap trade is sufficient and reliable to provide basic necessities such as food, clothing, shelter and medical insurance is not yet known. There is also the issue of child labour in the scrap metal trade (Moyes, 2005) in most developing countries.

Apart from the economic benefits, little attention has been given to hazards associated with this trade such as inhalation of fumes and working in extremely hot environments which can cause health risks (Muchová and Eder, 2010). In Ghana, not much attention has been

given to the negative impact of scrap metal industry activities on the environment. Nevertheless, it has been shown that scrap metal processing could release heavy metals into the environment from metal smelting and refining industries as well as burning of waste containing these elements (Kimani, 2007). With increasing number of people joining this business, competition is bound to occur which could lead to metal theft, destroying the built environment. Currently, there is no documentation on the amount and types of nonferrous scrap generated. The recycling of nonferrous scraps has the potential to generate lots of income for the country through exports.

1.3 Aim and Objectives

The aim of this project was to investigate the activities of scrap metal traders in the Kumasi metropolis. The specific objectives were as follows:

1. Determination of the economic impact of the scrap metal trade in the Kumasi metropolis.
2. Determination of the social impact of the scrap metal trade in the Kumasi metropolis.
3. Determination of the environmental impact of the scrap metal trade in the Kumasi metropolis.

1.4 Justification

The Millennium Development Goal 1 is to eradicate extreme poverty and hunger. The first target set under this goal, Target A, is to have 50% reduction of people whose income is less than $1.25 a day by 2015. The scrap metal industry has employed a number of people in Kumasi, most of them being scrap metal collectors, who receive income from the trade. However, income generated per person per day is not well documented. Whether the income received is sufficient and reliable in the long term is not known. The income

generated should be able to provide the basic necessities of livelihood such as food, clothing, shelter and access to quality health.

Additionally, the International Labour Organisation (ILO) is the body concerned with the working conditions of workers and is tasked with advocating for decent work for all people in the world. The ILO has identified poverty to be associated with the lack of a decent work. A decent work should earn some income for the worker which should be able to cater for his/her basic social needs such as healthcare and education (Ghai *et al*., 2006).

The activities of scrap metal industry could also pose a serious threat to the environment like any other economic activity. The processes employed by scrap collectors to recover metals could pose serious environmental threats (Brigden *et al*., 2008). However environmental threats associated with the scrap metal trade in Kumasi is not well documented. The Millenium Development Goal 7 is to ensure environmental sustainability. Whether the activities of the scrap metal industry in Kumasi makes the trade environmentally sustainable needs to be investigated.

1.5 Scope and Limitations

The study is generally confined by space and conceptual dimension. The study is therefore primarily limited within the boundary of the Kumasi metropolis. The conceptual dimension brings to the fore the involvement of industries which may not necessarily be in Kumasi but are stakeholders in the scrap metal trade. Selected steel industries were interviewed.

1.6 Thesis Structure

The thesis is divided into six Chapters. Chapter One introduces the thesis giving the background, problem being addressed, aim and objectives, justification of the objectives, and the scope and limitations of the study.

Chapter Two begins with the literature study and underscores the importance of scrap metal recycling. The review identifies the structure of the scrap metal industry, sources of scraps gathered and recycling of scraps and the current international and national trends and issues which have a link with the study. The review seeks to find out the benefits of recycling scraps in the context of the environment, social and economic. The factors that affect scrap prices on the international market are reviewed as well as the major country destinations for exports from developing countries. The indicators selected by way of measuring the objectives are also explained in this section.

Chapter Three outlines the method and materials used in the study. The sampling method and limitations to the study are also captured under this section.

In Chapter Four, the results obtained from the interview and field observations are presented. Chapter Five presents the discussion of the results and Chapter Six the conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Scrap Metal Recycling

Interest in metals recycling is not a new phenomenon that has just been thought about in the 20th century as mankind has always recycled in one form or another. For example, early Bronze Age man would have recycled old damaged or redundant metal rather than discard this precious resource. The industrial revolution (traditionally dated around 1730 to 1850), which saw the emergence of large metallurgical industries, was commonly regarded as the period when large scale metal recycling truly commenced (Emery *et al*., 2000; Javaid and Essadiqi, 2003).

Today with increasing public awareness and research into the many environmental implications, metals recycling is now of paramount importance due to a number of reasons. For instance, incineration and landfilling of metals result in contamination of air and groundwater. Additionally, recycling is extremely energy efficient (fossil fuel energy); the production of 1 tonne of copper from its ore consumes about 116 GJ of energy whereas from scrap copper this is substantially reduced to about 19 GJ per tonne (Emery *et al.*, 2000; Javaid and Essadiqi, 2003). Muchová and Eder (2010) also reported similar energy reduction for aluminium where the production of 1 tonne of aluminium from scrap requires only 7 % of the energy for primary production excluding bauxite production. Recycling also cuts down on the need for mining raw materials and hence saves large scale destruction of the natural environment.

These benefits as well as the economics of the scrap metal industry have established a great deal of collaboration between developed and developing countries which includes Ghana through exports (Tsikata *et al.*, 2008).

The ever expanding human population has brought about an increased demand for industrial and consumer goods, which in turn leads to higher production and the use of more energy. A well thought out economic/environmental model should be able to utilise the advances in modern technology, maximising energy conservation and minimising harmful pollutants. Metal recycling is one proven area where energy and environmental savings can be and are presently made. Many different types and grades of metals at present fall in the category where recovery is extremely economic with high levels of metals being recovered (Emery *et al.*, 2000).

Recycling basically occurs on three recognised levels. First is manufacturing or pre-sales scrap, in which this operation is normally well organised and often occurs in-house, incorporated into the production of primary metal in many cases. Secondly, the industrial or post-sales scrap and residues, and finally household scrap collected by a local scrap merchant or local authority via a local municipal solid waste (MSW) refuse collection (Emery *et al.*, 2000).

To have a truly successful recycling operation, the backing and participation of the general public, industry and the government is required. The scrap metal industry gathers waste scrap metals to ultimately produce a valuable raw material end product for use by the metal manufacturing industries. If the scrap metal industry did not exist then there would be vast quantities of waste polluting our environment as well as an increased burden on primary sources (Emery *et al.*, 2000; Javaid and Essadiqi, 2003; Muchová and Eder, 2010)

2.2 Types of scrap metals

The metal industry is divided into ferrous and non-ferrous metals (Turkish Metal Industry Report, 2010). The scrap metal industry is also classified along these two kinds of metals.

2.2.1 Ferrous scraps

Ferrous scraps comprise metals containing iron. Iron and steel scrap play an important role in the processing and final production of new ferrous products. Recycling of ferrous scraps prevent the environmental burden of large accumulations of scrap building up in landfill sites and other disposal areas. Recycling is also energy efficient. It is estimated that every tonne of steel that is recycled saves approximately 1,000,000 kg of iron ore, 600 kg of coal and 54 kg of limestone (Emery *et al.*, 2000). This results in reduced mining activities for the raw materials, again reducing the environmental burdens. Other environmental benefits occur in the form of 86% less air pollution, 76% less water pollution, 40% reduction in water used, and a 1.28 tonne reduction in the generation of solid wastes (Emery *et al.*, 2000).

Sources of ferrous scraps for recycling can be broadly classified into three (Fenton, 1998; Javaid and Essadiqi, 2003):

1. Internal Arising Scrap – these include reject materials from casting, rolling mill and other manufacturing processes. With more efficient steel production, these scrap quantities have fallen over recent years.
2. Prompt Industrial Scrap — scrap is produced from normal machining, stamping and other fabrication operations, normally of a fairly high quality. In a large number of cases, manufacturers sell directly to steel makers.
3. Obsolete or Capital Scrap – when a product has served its useful life and is then discarded. Large scale examples are decommissioned power stations, shipping

fleets down to small-scale examples such as cars and domestic appliances. With the restructuring of the developed world's base towards a lighter industry the main resource has now shrunk considerably.

Domestic appliances are a valuable source of scrap for recycling but firstly need other non-ferrous elements to be removed, such as tin and copper. These elements can be detrimental to the steel, altering the strength and surface quality. More than one million tonnes of electrical goods are produced each year with many having a life cycle of 10 years or less (The Ends Report, 2000). Plastics also now play a great part in the manufacture of domestic appliances and cars with the gauge of steel being ever decreased. Structural steel is also being reduced in thickness in the construction industry all adding to reduced quantities of scrap.

2.2.2 Non-ferrous scraps

Non-ferrous scrap comprises metals that do not contain iron. New changes in modern technology have reduced quite substantially the amounts of non-ferrous scrap generated as products are being made from thinner gauge metal and also with the increased use of other materials such as plastics for products including drink cans and plumbing. The most common non-ferrous metals that are recycled and are traditionally found and segregated in domestic waste in sufficiently large quantities are aluminium, copper, lead and brass. Aluminium is the most abundant metal (by volume) found in domestic waste, consisting mainly of drink cans (Emery et al., 2000). Sources of non-ferrous scraps can also be grouped into three, similar to that of ferrous metals. Source of aluminium scraps include vehicle and transportation, construction and building sites, aluminium packaging waste, cable wire and electronic equipment from homes (Emery et al., 2000; Muchová and Eder, 2010).

2.3 Scrap Metal Recycling Steps

2.3.1 Scrap collection

Scrap collection is the first step in recycling of metals. Scrap metal collection is largely performed by young men in their teens and twenties. Collection usually spans from early hours of the morning to late in the afternoon lasting about eight hours daily. Scrap metal collectors may usually go as individuals or in groups of two. The method of scrap collection varies from the use of simple technological tools to the use of the hands. Scrap metals are usually collected from the land surface with the hand and stored in the houses after collection for sale later depending on the situation in the local area (Moyes, 2005). Simple tools like metal detectors are often used for metals hidden underneath the land surface. The use of magnetic detector is paramount in the collection of scraps in that the collectors are able to differentiate between ferrous and non-ferrous scraps. Ferrous scraps are attracted to the magnetic detector when passed over a stockpile of scraps.

2.3.2 Scrap processing

Scrap processing is the second step in recycling of metals. Scraps come from a variety of sources in many different forms and must be processed to facilitate efficient use. The primary roles of the scrap processor are to collect, sort, grade, prepare, market and distribute scrap (Moyes, 2008).

Sorting is carried out following identification of the scrap. Sorting of scraps is done at the point of sale to the scrap dealers (European Commission Joint Research Centre Institute for Prospective Technological Studies, 2008). Scraps are usually sorted based on the metal types. However, the sorting of scraps is done, a lot of the time, by visual inspection and not with any special devices. This requires a lot of skill and expertise especially in cases where the metals have degraded beyond recognition. In some cases, chemical processes

are used in a wide range of metal scrap recycling industries as a means to separate scrap into its component metals. The chemical processes clean the scraps prior to using physical processes and also remove contaminants (such as paint) from scrap material. It also extracts selected metals from a batch of scrap containing many metal types. Chemical processes may include high-temperature chlorination, electrorefining, plating, leaching, chemical separation, dissolution, reduction, or galvanizing (Foulke, 2008).

The type and size of equipment they use depend on the types and volume of scrap available in the area and the requirements of their customers (Foulke, 2008). The largest and most expensive piece of equipment is the shredder. The shredder can fragment vehicles and other discarded steel objects into fist-size pieces of various metals, glass, rubber, and plastic. These materials are segregated before shipment by using fans, magnets, air ducts, hand pickers, and flotation equipment. Hydraulic shears, which have cutting knives of chromium-nickel-molybdenum alloy steel for hardness, slice heavy pieces of ship plate, railroad car sides, and structural steel into chargeable pieces are also used. Baling presses are used to compact scrap into manageable bundles thereby reducing scrap volume and shipping costs. Ferrous scrap metals are magnetic and are often collected in scrap yards by a large electromagnet attached to a crane, sweeping across piles of scrap to grab magnetic objects (Foulke, 2008).

2.3.3 Scrap smelting

Scrap processing is followed by scrap smelting. Smelting is done in a furnace at high temperatures. Smelting is done to fit manufactured metals to specifications of the industry. Scrap metal of lower grade, which may be contaminated or in a form that is not easily used, tends to be bought and used as feed by primary metal producers (and possibly transported to large smelters located near or at mining operations), where they pay a much

lower price per unit of metal than for high grade material (Global e-Sustainability Initiative & Electronic Industry Citizenship Coalition, 2008). The amount of scrap metal smelted is dependent on end-of-life (old) scrap recovery which is hampered in two ways:

- Products become physically distributed regionally and globally, making collection costly.
- There may be many different metals embedded in a single product, wherein a specific type of metal may be dispersed or mixed throughout a single product, making separation and cleaning difficult.

Cost-effective, efficient, end-of-life product recovery represents the limiting factor for increasing metal recovery and hence metal smelting (Global e-Sustainability Initiative & Electronic Industry Citizenship Coalition, 2008).

2.4 Scrap Metal Industry Structure

The scrap industry is characterised by many independent actors involved at different points in the supply and demand of scraps. According to Wernick and Themalis (1998), the actors of the industry are scrap dealers, brokers, dismantlers and smelters. Three actors were however identified by Moyes (2005) as scrap metal collectors, brokers and scrap metal processors. The structure of the recycling industry, from collectors until using the scrap in steelworks and foundries, could be described as a pyramid structure shown in Figure 2.1. Most of the stakeholders are small collecting companies which are supplying the larger companies for the processing, treatment and trading. These larger companies are delivering scrap to the steelworks or foundries.

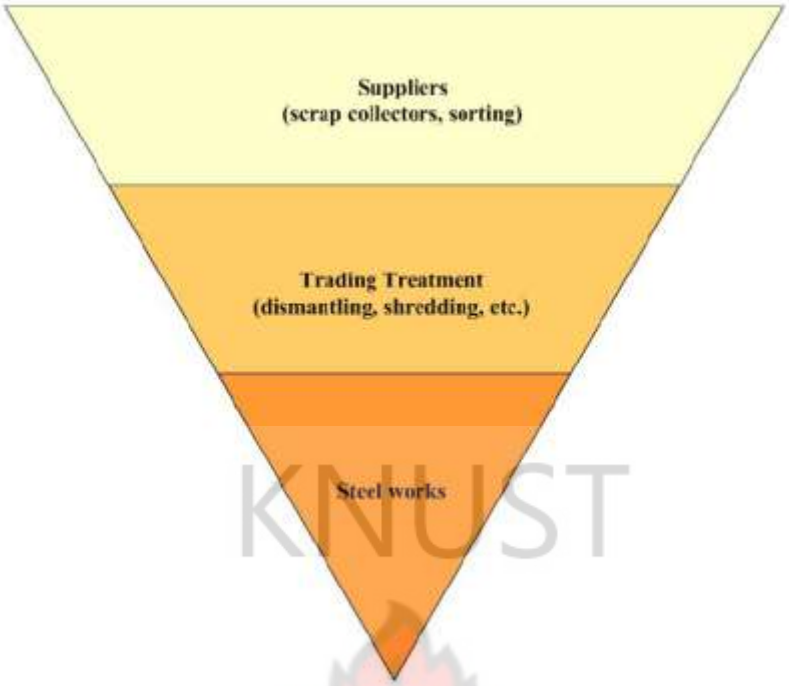

Figure 2.1: The pyramid structure of the scrap metal trade (Muchová and Eder, 2010)

The collection system can vary depending on the type of product and the country. Large-sized scrap metals and in high quantities, such as those from construction and demolition sites, are usually transported directly to the scrap yard or to scrap treatment plants. Small products such as packaging materials are collected by the scrap metal collectors within the municipalities, where sorting is done and baled for transportation to treatment plants or refineries (Muchová and Eder, 2010).

2.4.1 Exports and imports of scraps

Export and import of scrap metals to and from other countries has been established for decades. For instance, within the EU it is difficult to estimate the total quantity of the scrap being shipped. The largest scrap buyer from the EU is Turkey with its scrap requirement increasing by over 20 %, to 7 million tonnes during the first half of 2008 (Muchová and Eder, 2010). The key supplier to the EU is Russia. The main grades of the scrap which

were imported in EU-27 during 2008 included cast iron (2%), new scrap (3%), turnings (13%), stainless steel scrap (19%), shredded scrap (18%), and old scrap (45%). The exported scraps included cast iron (4%), new scrap (4%), stainless steel scrap (7%), shredded scrap (33%), and old scrap (52%). The majority of the imported and exported scrap was old scrap followed by shredded scrap and stainless steel scrap (Muchová and Eder, 2010).

Ghana exports its scraps to mainly the developed countries including China where aluminum alloy, aluminum waste and scrap as well as copper waste and scrap are exported (Tsikata *et al*., 2008). However, at the time of this research, there was no proper documentation as to the quantity and type of scrap exported or imported.

2.4.2 Quality of scrap in trade

Quality of scraps is reflected in the direction of exports of scraps in developed and developing countries. Quality is a major concern for environmental reasons mainly because of the potential pollutants that could be released into the atmosphere during smelting and the possibility of hazardous material being mixed in the shipment containers of scraps from exporting countries (Yoshida *et al*., 2005). Tighter environmental regulations in scrap importing countries help importers obtain a higher quality of scrap separation (Yoshida *et al*., 2005). At the time of this research, there was no proper documentation as to how the quality of scraps for smelting or export is being monitored in Ghana.

2.4.3 Economy of trade

In a free-market economy, scrap prices react quickly to changes in supply and demand (Fenton, 1998). When demand for steel mill and foundry products is low, demand for scrap is low, and prices fall. Dealers cannot influence sales of scrap if mills and foundries do not need it to charge their furnaces. Although prices of scrap depend upon the market

conditions for new products, the scrap industry uses inventory to absorb price differentials; that is, inventories increase as scrap prices decrease (Fenton, 1998). Prices are also influenced by technological changes in mills, processing of scrap, the use of scrap substitutes, environmental controls and other Government regulations, and export demand. Metal demand has been driven by development in China and other emerging economies. In China, the world's largest miner of tin, domestic consumption now exceeds production, resulting in increased imports of metal and ore concentrate (Moyes, 2005; Global e-Sustainability Initiative & Electronic Industry Citizenship Coalition, 2008). The industry continues to be susceptible to economic swings, as demand and prices are affected by increased production in end-use sectors like manufacturing, construction and telecommunications. In general, prices at the local level are linked to prices at the global or international level (Moyes, 2008). For instance, in the second half of 2008, with the onset of the global financial and economic crisis, falling output among many metal processing companies resulted in low levels of demand for scrap ((Muchová and Eder, 2010). Export restrictions on the raw materials used in the steel industry for instance can raise the prices of steel in the global market. These raw materials are iron ore, coke and steel scraps. China is the leading producer of these inputs and so restrictions on these exports can have huge impacts on the availability of these resources (Price and Nance, 2009).

2.5 Legislation and Regulation in Scrap Metal Trade

The scrap metal trade is characterised by legislation and regulation both at the local and international level. At the local level, legislations and regulations center on protecting individual country interests such as ensuring the security of employment in the scrap metal industry from possible threat of exports. For instance, many countries have placed a ban on steel scrap exports including Ghana. Ghana has banned the exportation of ferrous scraps

since 2004 by the Ministry of Trade and Industry, Ghana (The Ghanaian Chronicle, 2012). The reason for this ban is to ensure that the local steel industry has the required quantity of ferrous scraps to meet the capacity of its operations. Other countries like China have placed taxes on steel scraps making it unprofitable to export and encouraging recycling within their country (Price and Nance, 2009).

At the international level, however, legislation and regulations on scrap metal trade are geared towards sound environmental management or sustainability. For instance, Kopsick *et al.,* (2005) have reported the importance of laying down an approach for monitoring radioactively contaminated scrap metal due to its implications both on the environment and the health of workers at recycling plants. This consensus towards an approach for monitoring radioactively contaminated scraps came not because individual countries were not checking for it. On the contrary, they do have such systems in place. However, there is no central point for information on various protocols currently in use to monitor radioactively contaminated scraps. In the EU, the management of waste scrap metal is currently under the waste regulations, e.g. the Waste Framework Directive and EU Waste Shipment Regulation. Scrap treatment plants (e.g. shredders, dismantlers, media separation plants) as well as scrap collectors and sorting plants are operated under a permit for waste treatment, although the details of their permits vary across member states. The production of secondary metal at steelworks and the associated treatment of scrap metal on site are subject to the Integrated Pollution Prevention and Control (IPPC) Directive (Muchová and Eder, 2010).

2.6 Specification and Standards in Scrap Metal Trade

The worldwide scrap metal recycling industry has developed sets of specifications and grading systems to ensure consistent quality of source scrap material for a given grade of

metal scrap. The three most widely-used specifications are the Scrap Specifications Circular (U.S. Institute of Scrap Recycling Industries, Inc.), the European Classification for Non- Ferrous Scrap Metals, and the Standard Classification for Non-Ferrous Scrap Metals (U.S. National Association of Secondary Materials Industries, Inc.). These specifications generally set minimum and maximum content of certain metal impurities, and restrict levels of certain hazardous metals and other hazardous substances (Foulke, 2008).

Specifications and standard classifications for ferrous metal scrap exist at all levels: International, European, National, as well as between individual parties. It is clear that for the reason of marketing and trading, standards and specifications are needed not only to set the price but also to be used as reference for classification and quality control (Muchová and Eder, 2010). Traded scrap metal is classified according to many properties: chemical composition of metals, level of impurity elements, physical shape and size and finally homogeneity, that is, the variation within the given specification (Muchová and Eder, 2010).

2.7 Benefits of Scrap Metal Trade

The benefits of the scrap metal trade are many and are generally grouped under economic, social and environmental benefits.

2.7.1 Economic benefits

The economic benefit of the scrap metal trade at the international level is so great. In 2010, the United States alone earned more than $30 billion from exports of products manufactured from scraps (Wiener, 2011). Metal scrap that is collected for recycling is material that does not have to be managed as a waste reducing the overall cost of waste management. It is a valuable resource that is converted into value-added commodities

(Global e-Sustainability Initiative & Electronic Industry Citizenship Coalition, 2008). Furthermore, the relatively high value of recycled metal helps to sustain the economics of today's automotive and municipal recycling schemes (Martchek, 2000). Production of metal products from inexpensive raw materials like metal scraps is economically advantageous due to the reduction in labour costs as compared to the cost of importing the raw material for example (Hyde, 1995). Recycling scraps goes through stages such as collection, separation, cleaning, processing etc. At every stage a little value is added to the raw material and this goes a long way to increase the profit margin when the product is finished, making more productive use of urban waste (Furedy, 1984).

2.7.2 Social benefits

In the United States alone, more than 450,000 people are employed directly or indirectly by the scrap industry (Wiener, 2011). Recycling provides social benefits related to minimising waste landfills, which reduces competition of urban lands for different uses and generates employment for collection and recycling activities (Martchek, 2000). The economic potential of the scrap metal trade makes it an effective tool for improving the lives of local people who may be involved as scrap metal collectors. Another component of the scrap metal industry is the limited skills required to be a player in the industry. From collectors of scrap metals to dealers who supply steel companies with scrap metals the level of technical know-how is still low. This makes it possible for new persons to be employed (Martchek, 2000; Wiener, 2011).

2.7.3 Environmental benefits

Scrap recycling reduces greenhouse gas emissions by requiring significantly less energy to manufacture products from recyclables than virgin materials and by avoiding landfilling (Wiener, 2011). Energy saved using recycled materials is up to 92% for aluminium, 90% for copper, 56% for steel (Wiener, 2011). Beyond the energy conservation benefits, there

are additional environmental benefits, such as reduced land disturbance, water use, air emissions and waste generation (Global e-Sustainability Initiative & Electronic Industry Citizenship Coalition, 2008). Recycling is one of the best risk management tools available, as it allows reducing and even eliminating any risk that may be eventually generated by the disposal of products at their end-of-life (Martchek, 2000). Recycling also contributes to the conservation of natural resources and environmental improvement as metals can be recycled repeatedly without substantial degradation in quality by avoiding fresh raw material exploitation (Senfuka, 2011).

2.8 Negative Repercussion of the Scrap Metal Trade

In spite of the benefits associated with recycling scrap metals, some negative repercussions also pertain at different stages in the industry. Heavy metals may be released into the environment from metal smelting and refining industries, scrap metal, and from burning of waste containing these elements (Kimani, 2007). Employees in facilities that recycle metal scrap are exposed to a range of safety hazards associated with material handling methods, metals themselves (as dust or fumes), and with the hazardous substances used to process or recover these metals (Foulke, 2008). During loading and unloading of scraps, employees or workers are exposed to many health hazards which can be prevented by using the appropriate combination of personal protective equipment (PPE) such as hard hats, sturdy boots, gloves, thick clothing, and respirators (if the operation generates hazardous dust) to be adequately protected from safety and health hazards (Foulke, 2008).

Size-reduction of metal scrap is a necessary step in recycling scrap metals. Basic metal breaking processes often involve heavy manual labour to break up large or complex assemblies of scrap metal, or to cut or break the pieces into sizes that can be fed into a furnace. Employees involved in activities of this type may be exposed to metal fumes, smoke, hot environments, and hot material when working near furnaces, and may come in

contact with metals that present hazards through both skin contact and inhalation (Foulke, 2008). Handling sharp or pointed pieces of scrap metal poses cut or abrasion hazards to hands or bodies (Foulke, 2008). One of the most common tools used to break apart large metal pieces is the gas cutting torch. Thermal (gas) torches expose employees to sprays of sparks and metal dust particles, high temperatures, bright light that could damage eyes (light both inside and outside of the visible spectrum), and various gases (Foulke, 2008). Compressed gas cylinders can also present explosion hazards due to excessive heat or physical damage (Foulke, 2008).

Dust and air emissions from scrap processing are generally at low levels. However, emissions of hazardous air pollutants may be generated by the secondary metal production in a furnace, e.g. dioxins and furans and metals/metal oxides such as lead and zinc (Muchova and Eder, 2010).

A rise in prices of scraps, especially the non-ferrous metals, has the potential to incite an upsurge in metal theft from the built environment. For instance, the demand for copper has fuelled a conspicuous rise in the pillaging of the built environment around the world (Bennett, 2008). There is also the issue of child labour in the scrap metal trade (Moyes, 2005) in most developing countries.

2.9 Description of Study Area

Kumasi is the capital of the Ashanti Region of Ghana. It is Ghana's second largest city, after Accra the capital with a population of about 2 million (UNIDO, 2006; Ghana Statistical Service, 2012). The city of Kumasi is located 300 km Northwest of Accra (Cofie, 2003). It is located on latitude $6^{o}35'N - 6^{o}40'N$ and longitude $1^{o}30''$ W – $1^{o}35'W$. The city has an approximate land area of 254 km² and falls within the plateau of the south-

west physiological region which ranges from 250 – 300 m above sea level. Kumasi lies in the humid forest zone, and experiences much higher rainfalls than northern Ghana. In Kumasi, there are two rainy seasons: from mid-March to mid-July, and from mid-September to mid-November. December to February is the driest period of the year. Temperatures range from 20.7 to 33.6 degrees Celsius. This influences the time for the crop harvest, which in turn means an increased waste generation during this period (Bostrom, 2009).

Kumasi has ten sub-metropolitan areas as shown in Figure 2.2. Migration accounts for much of Kumasi's growth in recent years, and there is a significant migrant community. The city is an industrial centre with formal industries in timber, food processing (including beer brewing) and soap manufacturing, together with informal activities in woodworking, light engineering, vehicle repair, footwear, furniture manufacture and metal fabrication (Cofie, 2003). The service sector accounts for roughly 80% of the economic activity in Kumasi, and about 75% of employment in Kumasi comes from small informal businesses. Industry accounts for only 20% of the economy, and consists mainly of wood-working, sawmills, and breweries (though there are also factories that produce, for instance, foam products). Urban agriculture is an important source of food for the people living in Kumasi (King *et al*., 2001).

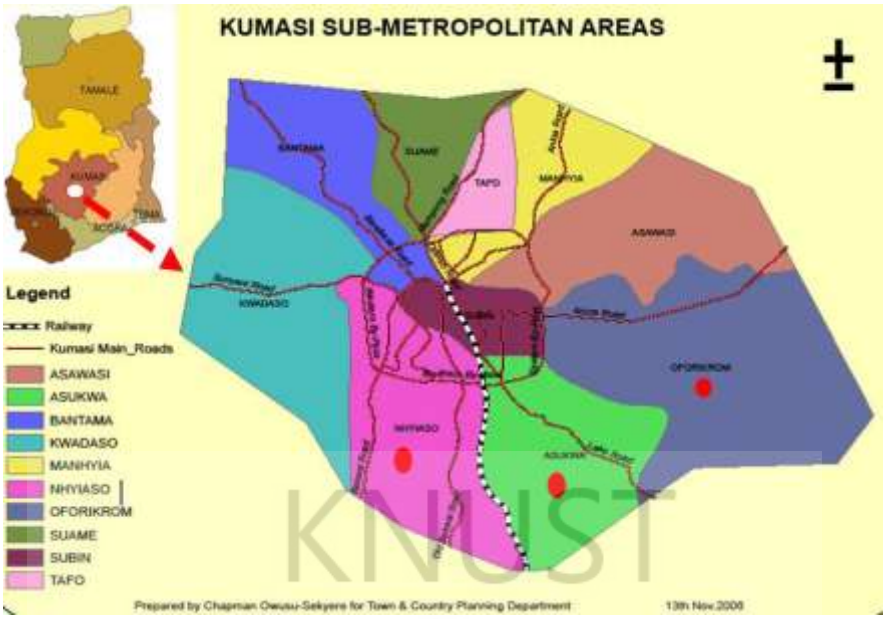

Figure 2.2: Map of Kumasi showing sub- metropolitan areas

2.10 Definition and Selection of Indicators

2.10.1 Definitions

The determination of the social, economic and environmental impact of the scrap metal trade was made possible by selecting indicators based on concepts of the United Nations Millenium Development Goals (UNMDG) of environmental sustainability, poverty reduction and the International Labour Organization's (ILO) definition of decent work. The UNMDG has set target under its eight Millenium Development Goals. Goal one under the UNMDG is to reduce by half the proportion of people whose income is less than $1.25 a day between 1990 and 2015. A second target under UNMDG one is to achieve full and productive employment and decent work for all including women and young people. The UNMDG seven is to ensure environmental sustainability. The first target is to integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. The third target under this goal is to reduce by half the proportion of the population without sustainable access to safe drinking water and

sanitation by 2015. The fourth and last target under goal seven is to achieve a significant improvement in the lives of at least 100 million slum dwellers by 2020 (The Millennium Development Goals Report, 2011). These principles served as a guide in the choices of indicators under each objective.

Decent work has been defined by the ILO as being productive work for women and men in conditions of freedom, equity, security and human dignity. Decent work involves opportunities for work that is productive and delivers a fair income; provides security in the workplace and social protection for workers and their families; offers better prospects for personal development and encourages social integration; gives people freedom to express their concerns, to organize and participate in decisions that affect their lives; and guarantees equal opportunities and equal treatment for all. The ILO seeks to achieve decent work for all through poverty reduction efforts or strategies and the advocacy for rights at work in favour of workers. Rights at work include working in a safe environment, using protective clothing to avoid injuries and accidents. It also forbids child labour. The ILO has identified poverty to be associated with the lack of a decent work. A decent work should earn some income for the worker which should be able to cater for his basic needs (Ghai *et al*., 2006). These concepts of decent work of the ILO were considered in the selection of indicators for each specific objective during the study.

2.10.2 Justification of selected indicators

Table 2.1 summarises the indicators selected for the study. In order to achieve the first objective of determining the economic impact of the scrap metal trade, the income generated from the trade by scrap metal collectors was assessed. The information gathered from income generated from the scrap metal trade by the scrap metal collectors would serve as a guide in determination of income sufficiency and reliability.

Table 2.1: Indicators used in assessing specific objectives of the research

Objective	Indicator
1. Assess economic impact	• Income generated from trade.
2. Assess social impact	• Occupational hazards of scrap metal trade. • Educational levels of stakeholders. • Job quality • Living conditions
3. Assess environmental impact	• Quality of scrap metals collected (smoke generated). • Chemicals and waste in secondary processing, energy consumption. • Scraps stolen from the built environment. • Health hazards of scrap metal trade.

The second objective, which seeks to determine the social impact of the scrap metal trade in Kumasi has four indicators: occupational hazards of scrap metal trade, educational levels of stakeholders, job quality and living conditions. The occupational hazards of the scrap trade are a function of the social nature of the trade. Possible accidents and the use of protective clothing would provide information on the level of safety measures incorporated into the scrap trade as a measure for ensuring the welfare of workers. The educational levels of stakeholders in the scrap trade is important in knowing the level of technical know-how of stakeholders involved in the trade and how this might have an impact on the activities of stakeholders in the trade. The working conditions are a function of the job quality of stakeholders in the scrap trade. Information on job quality or working conditions

is important in classifying the scrap metal trade as a decent work according to the ILO standards. The last indicator seeks to find out the living conditions of stakeholders in the scrap trade. This would serve as a function for determining whether stakeholders are able to access the basic necessities of life such as pipe borne water, electricity and health care facilities.

The third objective, determination of the environmental impact of the scrap metal trade has four indicators: quality of scraps collected, chemicals and waste in secondary processing, scraps stolen from the built environment and health hazards of the scrap metal trade. The quality of scraps collected has an effect on the level of emissions from the chimneys of furnaces used by foundries and steel companies. This information would be utilised to assess the potential for air pollution as a result of recycling scraps. The chemicals and waste in secondary processing would also serve as a guide to assess how stakeholders treat or handle waste after collection of scraps before transporting them to steel companies. The possible sources of waste generation and how such waste is handled would be investigated. The possibility of stealing scraps from the built environment is an ever present threat to city managers. In order to assess the magnitude of this menace, this indicator would be used to generate information on stolen scraps from the built environment. The environmental health hazards associated with the trade is also an indicator for assessing the environmental impact of the scrap metal trade. The potential health dangers of the scrap trade are investigated under this indicator.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The methods used in this study to collect data are interviews with structured questionaires, informal discussions and observations. The field observations generally served to authenticate the veracity of the data gathered through the interviews.

3.2 Research Approach

The research was carried out using qualitative and quantitative data. Data was gathered in the field and from institutions. These data sources were utilised for analysis. Data collected was analysed with the Statistical Package for Social Scientists (SPSS version 16).

3.3 Units of Analysis

The units of analysis were scrap metal collectors (SMCs), scrap dealers (SDs) and governmental institutions. The SMCs collect metal scraps within the Kumasi Metropolitan Area (KMA). They sell the collected scraps to the SDs located at specific points within the KMA. Governmental institutions considered included the Kumasi Metropolitan Assembly's Waste Management Department and the Environmental Protection Agency. The units of analysis also captured selected steel companies in Tema in Greater Accra region which received scraps from SDs in the KMA.

3.4 Data Collection

Data collection has been grouped into four namely, primary, secondary, rapid appraisal survey and interviews. Data was gathered from different sources to get a complete understanding of the issue or case under study. The field work was started in November, 2011 and ended in February, 2012 lasting a period of four months. Preliminary investigation indicated that scrap collection is mostly active in the dry season. Hence, this

period of study was chosen for effective collection of data. Data was collected from representatives of the Kumasi Metropolitan Assembly-Waste Management Department and the Environmental Protection Agency as well as selected steel companies in Tema which somewhat depend on the activities of the scrap metal collectors for their raw materials.

3.4.1 Primary data collection

The primary data collection encompassed the use of structured questionnaires to obtain data from SMCs and SDs. This data provided information on the economics, social and environmental impact of the scrap metal trade in the Kumasi metropolis. Information such as method of collection of scrap metals, industry structure, categorisation of scrap metals by dealers, and utilization of scraps collected were obtained. Representatives from public institutions like the Kumasi Metropolitan Assembly Waste Management Department and the Environmental Protection Agency were also included in the questionnaire administration. These institutions provided data on the environmental impact of the scrap metal trade in the KMA. Quantitative data was also gathered from steel companies to appreciate the economics of the trade and the sustainability of steel companies in Ghana. Samples of the questionnaires are provided under Appendix A.

3.4.2 Secondary data collection

Secondary data was obtained from journals, books, articles, newsletters and other useful materials on the internet. The secondary data assisted in reviewing existing information on the issue.

3.4.3 Interviews

Interviews were conducted for scrap metal collectors and dealers who consented to the study to gather data on the social, economic and environmental impact of the scrap metal

trade. Interviews were conducted in the local dialect (i.e. Twi) for ease of understanding and to provide the correct responses since most of them neither understood nor could speak the English language. On the average, 30 minutes was spent on each respondent. Some respondents also preferred to be interviewed in groups. However, not more than seven in a group were interviewed at a time. This allowed for effective contribution and responses to questions. The group interviews were done for scrap metal collectors only. The average time spent on a group was an hour. The field interviews started from about 3.00 pm when majority of scrap collectors were at the point of sale (i.e. scrap dealers).

Information was also gathered from the Inside Scrap Dealers Association (ISDA). Such information included the membership of the association which provided an indication of the number of SMCs and SDs in KMA.

3.4.4 Rapid appraisal survey

As a way of familiarisation, some time was spent in the field to observe scrap metal trade between scrap metal collectors and scrap dealers. This was necessary to obtain firsthand information on the scrap metal trade pattern in the area. Information such as bargaining power of scrap dealers, processing methods of scraps by scrap dealers, waste generated through processing steps and how the waste was treated were captured. Information gathered from the field observation helped in understanding issues in the scrap metal trade. Pictures were taken from such field observation tours and presented in Chapter 4 and 5.

3.5 Sampling Method

The sampling procedure for the study was deemed as being paramount in attaining the objectives of the study. Thus the sampling size was carefully selected to capture all the different phases of the subject matter.

Stratified random sampling was employed in the collection of relevant data for this study. Scrap metal collectors were randomly selected and interviewed. 100 scrap metal collectors

were selected from all the ten submetropolitan areas within the study area. 16 scrap dealers were selected randomly and interviewed with the help of questionnaires to gather relevant data. Steel companies were selected and interviewed as well as public institutions comprising of the Environmental Protection Agency (EPA) and the Waste Management Department (WMD) of the Kumasi Metropolitan Assembly (KMA).

3.6 Challenges

Most interviewees were cold towards the administration of questionnaires to them because they felt their job security was threatened. Many people declined from allowing pictures to be taken on their activities and answering any questions even though it was explained to them as being for academic purposes only. Another challenge was the language barrier. Many of them originated from the Northern part of the country and were thus not fluent in the Twi dialect which is the commonly spoken language in the area.

CHAPTER FOUR

RESULTS

4.1 Introduction

The results of the study are presented under this section. The results have been grouped into eight, namely: characteristics of scrap metal collectors, characteristics of scrap dealers, types and sources of scraps, scrap collection methods and processing, risks and hazards of scrap collection and processing, revenue from scrap trade and general comments on scrap trade in Kumasi.

4.2 General Characteristics of Scrap Metal Collectors (SMCs)

One hundred percent of SMCs (100 in number) interviewed were males. The reason for the male dominance is due to the labour intensive nature of scrap metal collection. Figure 4.1 shows the age distribution of the SMCs interviewed. The histogram shows a normal distribution with the highest percentage of SMCs (48%) between 21-25 years of age whilst the lowest percentage (2%) was under 16 years. About 18%, 28% and 4% were within the age group of 16-20, 26-30 and over 31 years, respectively. Thus, the average age of SMCs was about 25 years with the youngest being 12 years and the oldest 36 years. It was also observed that about 47% of SMCs have never married, 51% were married with only 2% divorced. About 75% of the respondents had dependants whilst 25% had no dependants. The number of dependants of SMCs has been represented in histogram form and shown in Figure 4.2. About 43% of SMCs had one dependant whilst 22% had two dependants. Only 1% had four dependants.

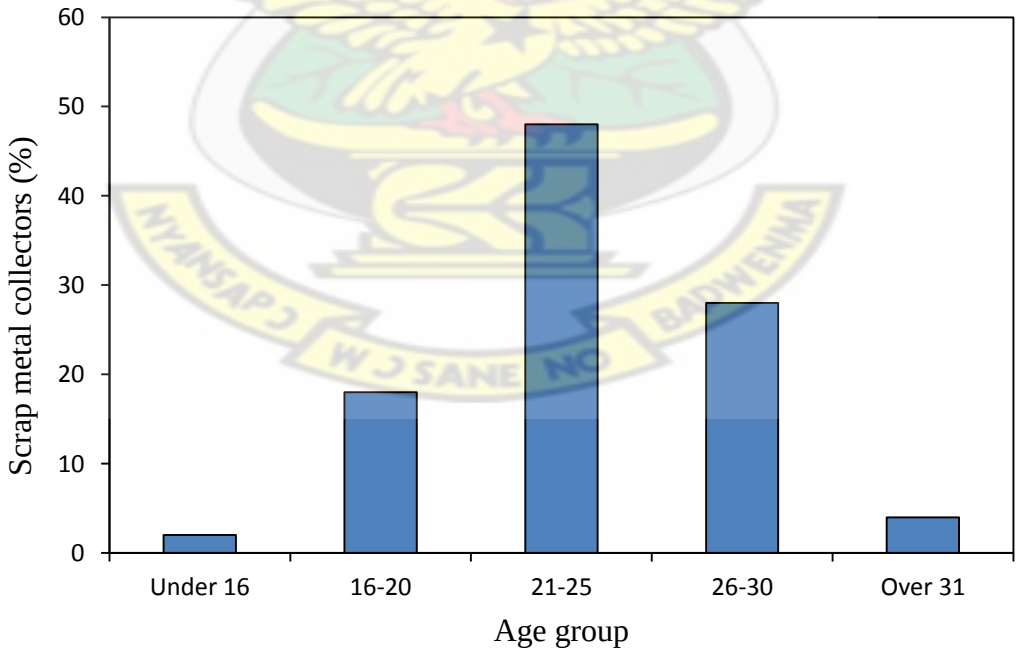

Figure 4.1: Age distribution of scrap metal collectors (SMCs)

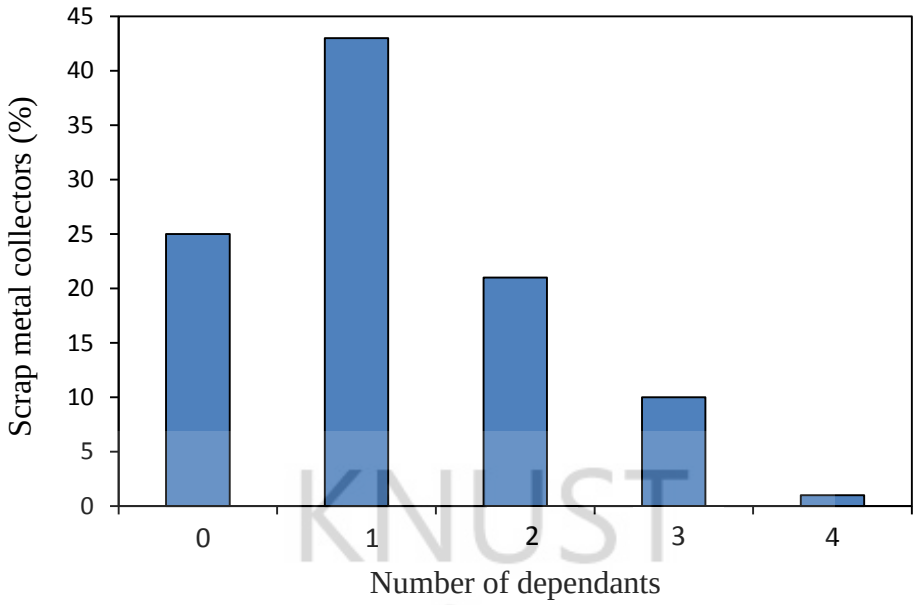

Figure 4.2: Number of dependants of scrap metal collectors (SMCs)

The educational levels of the respondents are shown in Figure 4.3. About 47% of SMCs had no formal education whilst 53% have had some form of education, either up to primary or junior high school level. Out of those with formal education, only 22% could read and/or write. The remaining 78% could neither read nor write. Even though some have had some form of education, all SMCs interviewed depended solely on scraps collection for their livelihood as they did not have any other job. They therefore were compelled to make savings from the revenue generated from the selling of scraps. In spite of the savings made, none of the SMCs had planned for their retirement age as they did not have any social security or pension fund. However, all the respondents had been able to either build their own houses (15%) or rented one (85%) from revenues generated from the scrap trade. Additionally, they were able to pay for their utility bills from the revenue generated. About 51% were able to access health care facilities of their choice whereas 49% relied on self-medication.

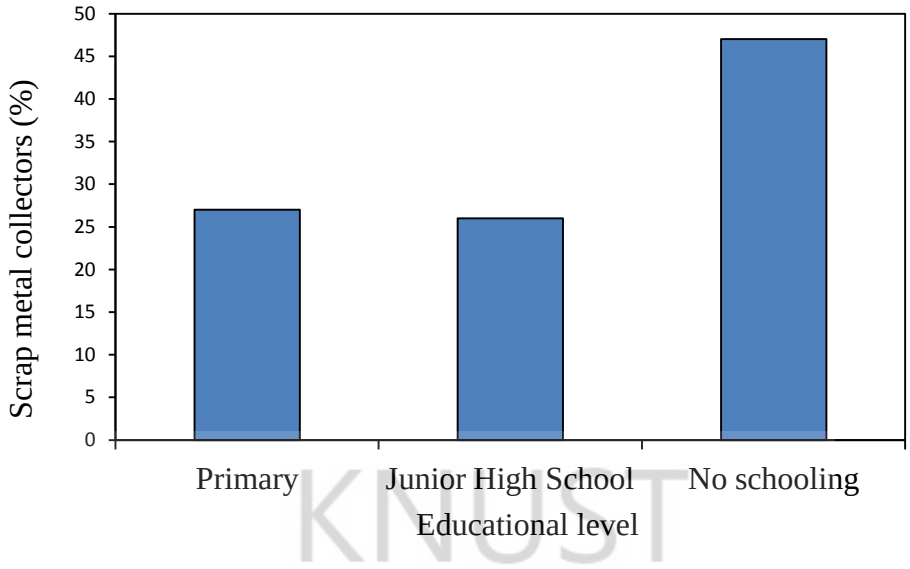

Figure 4.3: Educational level of scrap metal collectors (SMCs)

SMCs did not belong to any association to channel their grievances when need be. All respondents interviewed indicated that they were proud to be scrap collectors because of the financial benefits. Some of them (about 46%) had introduced at least one family member into the trade. Most of the respondents interviewed had at least 2 years of working experience. About 82% had worked for between 2 to 5 years whereas only 18% had worked between 6 to 10 years. It is interesting to note that all the respondents were migrants from the Northern sector of Ghana. It was observed that about 85% of the respondents were migrants from Tamale, 5% were from Savelugu (both in the Northern region), and 10% were from Bawku (in the Upper East region).

4.3 General Characteristics of Scrap Dealers (SDs)

About 87.5% of SDs (16 in number) interviewed were males and 12.5% were females. Figure 4.4 shows the age distribution of SDs interviewed. The histogram shows a gradual increase in age with the highest percentage of SDs (56.4%) falling within the over 31 years age group. About 37.4% and 6.2% fall within 26-30 and 21-25 years age groups,

respectively. Thus the average age of SDs was 35 years with the oldest being 52 years and the youngest being 23 years. Compared to scrap metal collectors, teenagers were not involved as scrap dealers. It was observed that 12.5% of SDs were single, 6.2% divorced and 81.2% were married. The number of dependents has been represented in a histogram and shown in Figure 4.5. Majority of SDs (31%) had one dependent, while 25% had two and three dependents, respectively. About 19% of SDs had four dependents.

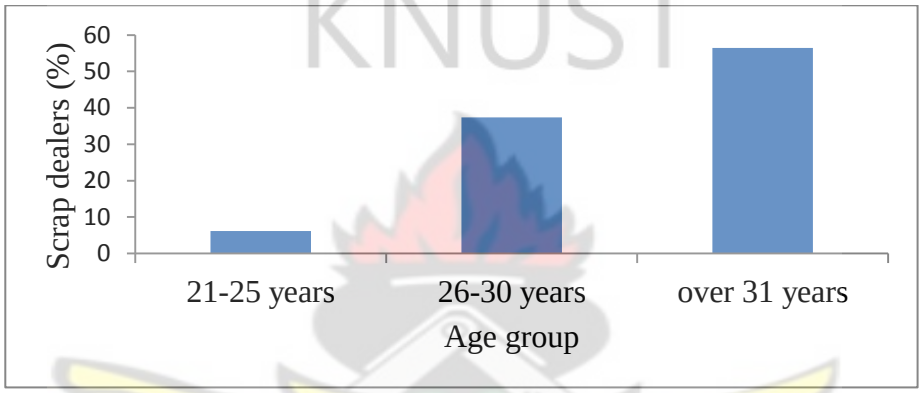

Figure 4.4: Age distribution of scrap dealers (SDs)

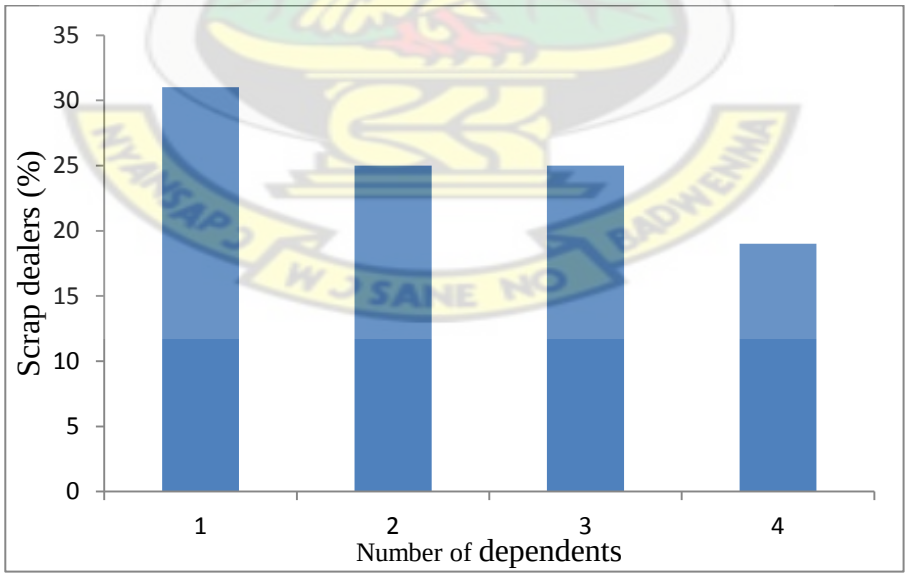

Figure 4.5: Number of dependents of scrap dealers (SDs)

The educational levels of SDs are shown in Figure 4.6. About 43.8% of SDs had no formal education whilst 56.2% had some form of education, either primary, junior high or senior high school level. Out of those with formal education, 43.8% could read and/or write. The remaining 56.2% can neither read nor write. About 87.5% of SDs depended solely on the scrap metal trade for their livelihood and did not have any other job, whilst 12.5% had another form of job which they relied on during periods when scraps were very scarce. All SDs (100%) had a susu savings or bank account and had retirement plans. About 31.2% of SDs had been able to build their own houses as against 68.8% who resided in rented apartments from the revenue generated from the scrap metal trade. Additionally, they were able to pay their utility bills from revenue generated from the scrap trade. About 68.8% of SDs were able to access health care facilities of their choice whereas 31.2% relied on self-medication.

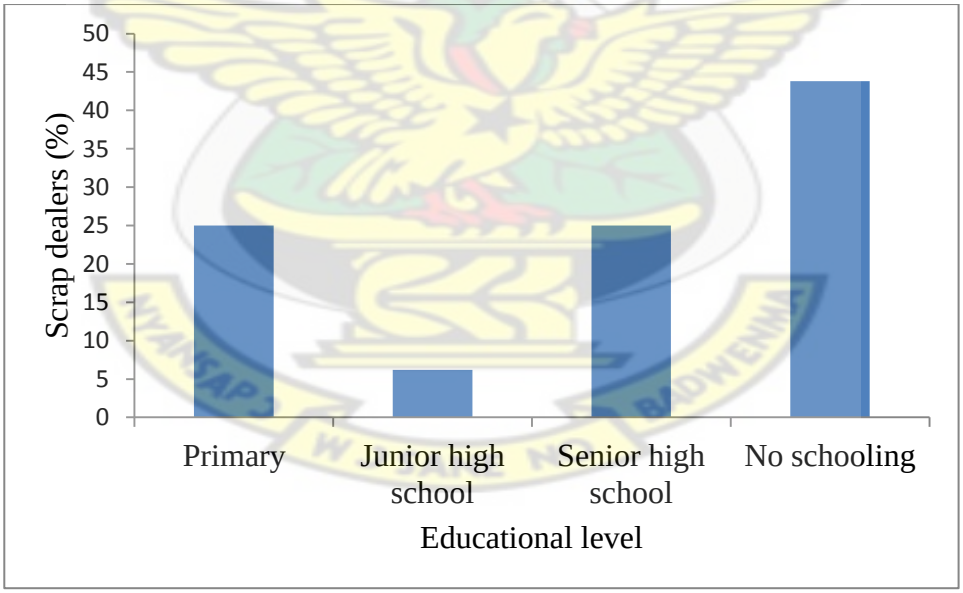

Figure 4.6: Educational level of scrap dealers (SDs)

SDs belong to an association to channel their grievances when the need arises. All respondents interviewed were proud to be in the scrap metal trade due to the financial

benefits associated with the trade and therefore had employed at least four other persons to assist in the trade. The highest number of employees by any SD was given as 35 and the average number of people employed by SDs was given as 10. Most of the SDs interviewed had at least five years working experience. About 68.7% had worked between 5-10 years whilst 31.3% had worked for more than 11 years. Like with SMCs, all the respondents were migrants from the Northern sector of Ghana. It was observed that 62.5% of SDs were migrants from Tamale, 12.5% were from Savelugu (both in the Northern Region) and 25% were from Bawku (in the Upper East Region).

4.4 Types and Sources of Scraps

There were different types of scrap metals of interest to SMCs and SDs. Scrap metals can be either ferrous or non-ferrous. The ferrous scraps were mainly steel and/or iron. The non-ferrous scraps included aluminium, copper, lead and brass. All the respondents interviewed including the steel companies indicated that scraps were scarce. About 90% of SMCs indicated that scraps were scarce during the rainy season whilst 10% indicated scraps were scarce all year round. This view of SMCs was confirmed by the steel companies interviewed.

Even though scrap metals were perceived to be scarce, sources of scraps identified by SMCs included houses, landfill sites, refuse dumps, mechanic shops, and demolition (industrial) sites. Figure 4.7 shows the various scrap types, sources and the quantity collected per week by 100 SMCs interviewed. About 30% of ferrous scraps collected in the Kumasi metropolis were from industrial sites. It was also observed that ferrous scraps were collected in larger quantities than the non-ferrous scraps as shown in Figure 4.7. Among the non-ferrous scraps, aluminium was the most collected metal followed by copper and brass.

Figure 4.7: Sources and quantity of scrap collected per week

4.5 Scrap Collection Methods and Processing

All the SMCs interviewed indicated that collection of scraps was done by hand picking into sacks and bags. SMCs did not consider the quality of scraps during collection. About 95% indicated collecting scrap metals regardless of the quality; only 5% indicated paying attention to quality when collecting scraps. The scraps collected were transported to the trading centres where sorting was done. About 99% of SMCs indicated that sorting was done by visual inspection and subsequent hand separation. Only 1% used magnetic detector. In addition, sorting was also carried out by some SDs. Sorting by SDs mainly was to group the scraps into the various types and quality.

Scrap metals were processed by compaction generally to increase the quantity of scraps that can be loaded into a vehicle for transport to steel companies as shown in Figure 4.8. Dismantling of large sized- scrap was done for the same purpose. Often cars, motor bikes

and refrigerators were reduced in size through dismantling. Simple tools like the hammers and chisel were employed in this exercise as shown in Figure 4.9.

Figure 4.8: Compacted scraps prepared at the Suame Magazine

About 63% of SDs interviewed indicated that quality of scraps mattered in the trade. The remaining 37% however disagreed. Even though majority indicated sorting scraps based on quality, about 81% of SDs did not have any standard procedure for quality classification. The remaining 19% determined quality of scraps by visual inspection. Meanwhile an interview with some steel companies suggested that steel companies considered quality of scraps when negotiating prices. Thus scrap dealers carefully sorted the scrap they sold, and steelmakers were careful to purchase scraps that did not contain unacceptable levels of undesirable elements (Fenton, 1998).

Figure 4.9: Tools used in dismantling of large scraps at Aboabo

4.6 Risks and Hazards of Scrap Collection and Processing

All injuries (100%) caused to SMCs were as a result of contact with sharp edges of scraps during collection into sacks or bags. About 88% of SDs indicated injuries from falling metals and hammers striking the hand as the major risk associated with scrap loading and dismantling. The remaining 2% indicated injuries from fire as the major hazard associated with the use of gas torch for cutting scraps into smaller pieces.

4.7 Revenue from Scrap Trade

All the respondents interviewed indicated that the revenue generated from the scrap trade was mainly used to sustain their families. There were two trade centres where SMCs and SDs could sell and buy scraps; Aboabo and Suame Magazine. Figures 4.10 and 4.11 show the income generated by SMCs and SDs per month. The revenue generated from scrap trade by SMCs ranged from GH¢ 200 to GH¢ 480 per month whereas revenue generated by SDs ranged from GH¢ 1,000 to GH¢ 10,000 per month. Thus the income generation for both SMCs and SDs were highly variable. About 27% of SMCs were able to get the maximum of GH¢ 480 per month whereas only 12.5% were able to get the maximum of

GH¢ 10,000 for SDs per month. Majority (43%) of SMCs earned GH¢ 400 per month whilst for SDs, majority (25%) earned GH¢ 1,000 per month.

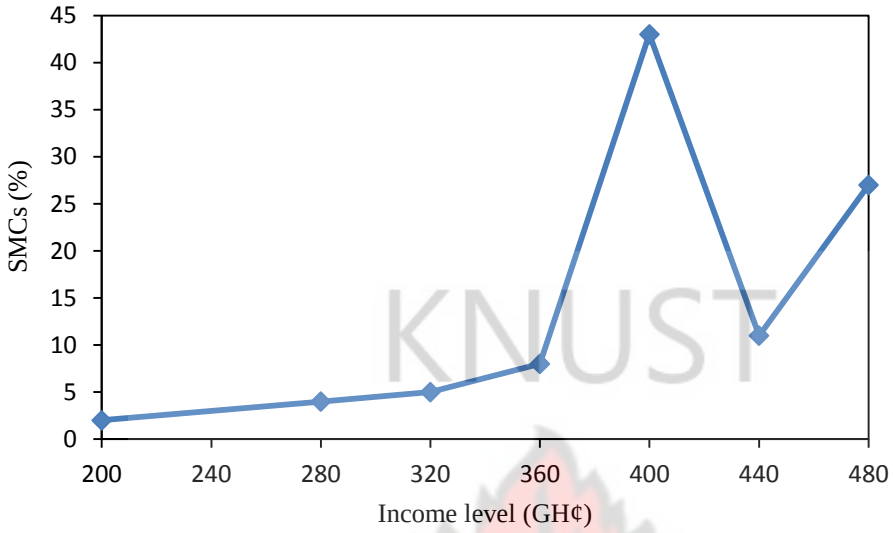

Figure 4.10: Revenue generation by SMCs per month

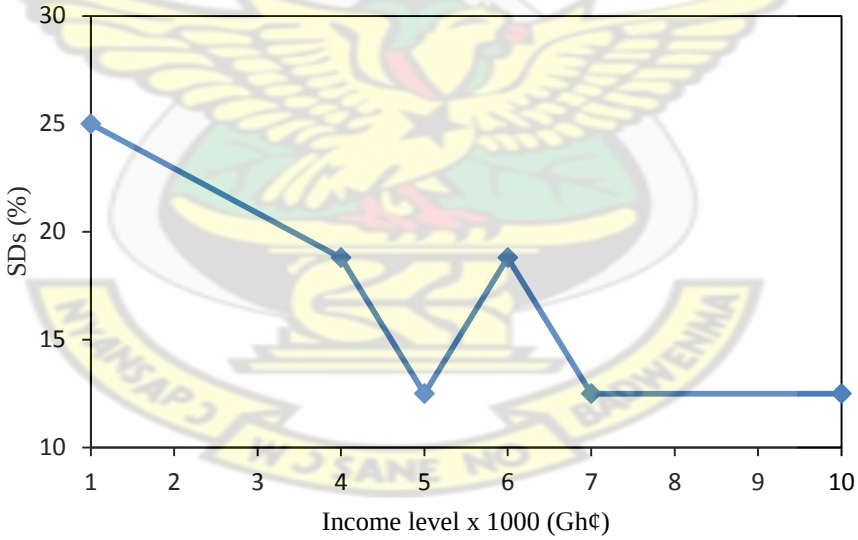

Figure 4.11: Revenue generation by SDs per month

There was a wide revenue margin (about 80-900%) between the SMCs and SDs. This huge gap was as a result of differences in the determination of scrap prices. There were no standards of pricing in the scrap trade. About 96% of SMCs indicated that prices were

determined by the SDs at the point of sale whilst the remaining 4% indicated that steel companies determined the prices of scrap metals. On the other hand, about 68% of SDs indicated that prices were determined by steel companies whilst only 12.5% indicated that prices were determined by SDs. The remaining 18% indicated prices were determined by SMCs. When steel companies were interviewed, about 67% indicated that prices of scraps were determined based on the quality whilst 33% indicated that prices were determined by bargaining powers of SDs and the company.

Table 4.1 shows the price of the various scrap metals obtained from the two trading centres. For comparison, the price list of steel/iron scraps obtained from selected steel companies has been provided as well.

Table 4.1: Unit price per Kg of scraps at trading centres and steel companies

Metal type	Price (GH¢) per Kg of scrap metals				
	Aboabo	Suame Magazine	Western Steel & Forgings Ltd	Tema Steel	Special Steel
Aluminium	0.31	0.41			
Copper	1.36	1.36			
Lead	0.54	0.54			
Brass	0.68	0.68			
Steel	0.09	0.11	0.52	0.52	0.62

4.8 General Comments on Scrap Trade in Kumasi

General questions concerning the impact of scrap trade on the society were asked during the interview with SMCs and SDs. About 91% of SMCs interviewed indicated their

unawareness of scrap collectors stealing scraps from the built environment whilst 9% were aware of this practice. Those who were aware were not able to provide information as to the type of metals stolen. On the contrary, all the SDs interviewed indicated they were aware of stolen metals from the built environment but could not tell which types of metals are stolen.

On the processing of scrap metals, about 94% of SDs interviewed did not think that smoke emission from furnaces could pose any environmental hazards whilst 6% believed otherwise. The SMCs and SDs were not aware of any environmental regulation governing their trade. However, the steel industries interviewed indicated that they were aware of environmental regulations governing their operations. The steel companies minimised pollution by trapping solid particles from smoke and by the use of waste water treatment plants.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the results presented in Chapter Four in terms of the set objectives using the indicators mentioned in Table 3.1. Thus the discussion has been divided into three namely; economic, social and environmental assessments of the scrap trade in Kumasi.

5.2 Economic Assessment of Scrap Metal Trade

5.2.1 Price fixing

From Table 4.1 it was observed that prices of aluminium and steel scraps were slightly higher at Suame Magazine as compared to Aboabo. This price difference was as a result of the competition at the centre where many SDs awaited the services of SMCs. SMCs used the slight differences in price at the two main points of sale to their advantage. Thus Suame Magazine received more scraps as compared to Aboabo. Prices of scraps depended on the specific metal type and its demand. High demand raised prices of scraps as asserted by Keeley (2008) in his studies in Vietnam.

Assessment of how prices were fixed revealed the lack of information flow within the supply chain of the scrap metal trade. For instance, 96% of SMCs interviewed were of the view that prices were fixed by scrap dealers at the point of sale whilst 69% of SDs interviewed claimed prices were fixed by steel companies. Meanwhile about 67% of steel companies interviewed indicated prices were determined by the company engineer. The company engineer fixed prices based on the trends of the international market. Some SDs simply went by what they had been told as the price for a kilogramme of scrap and did not probe further.

On the other hand, about 61% of SMCs regarded the fluctuating nature of scrap prices at points of sale to dealers as the highest risk associated with the scrap metal collection business. SMCs were therefore at the losing end of the chain and relied solely on their negotiation abilities to keep the price of scraps in their favour. Factors considered by SMCs in their negotiations included cost of transporting scraps to point of sale and cost of buying scraps from scrap owners.

5.2.2 Income sufficiency

Figure 4.10 and 4.11 shows the revenue generated from scrap trade by SMCs and SDs, respectively. One of the goals under the UNMDG is to reduce by half the proportion of people whose income is less than $1.25 (GH¢ 2.5) a day between 1990 and 2015. Majority of SMCs earned GH¢ 400 per month on the average. This figure translates to Gh¢ 13.33 per day for SMCs which is higher than the current minimum daily wage of GH¢ 4.48 for a formal sector employee such as a cleaner or labourer. The monthly income for a formal sector employee like a cleaner is about GH¢ 125. Although SMCs earned higher than a formal sector employee, this higher income did not give an indication of improved living standards for SMCs in general. It is worthy to note that the income value given above was only an average figure and thus SMCs could earn much less as shown in Figure 4.10. Even with the values provided in Figure 4.10, and with the fluctuating prices of scraps as indicated by the SMCs, one could say with certainty that the income levels were only representative of the plight of SMCs in the scrap metal trade. From the interview, only 28% indicated the sufficiency of their income to take care of their families. The remaining 72% indicated otherwise. The 28% who indicated that their income was sufficient belonged to the group of SMCs who earned GH¢ 480 per month.

On the other hand, SDs earned between GH¢1000 to GH¢10,000 per month from the scrap metal trade. SDs can therefore be described as making huge profits from the scrap metal

trade considering the income levels made by SMCs per month. The incomes of SDs were higher than SMCs since SDs were higher on the supply chain than SMCs and thus deal directly with steel companies who are prepared to offer higher prices for scraps by SDs. High demand raised prices of scraps as asserted by Keeley (2008) in his studies in Vietnam. It is worth noting that steel companies in Tema were in proximity to each other and therefore competition is high among them. SDs usually went round and compared the prices of the different steel companies and only supplied scraps when they were satisfied with the offer from the steel companies. The income levels of SDs are an indication of the benefits associated with the scrap metal trade. All SDs (100%) admitted that their incomes were sufficient to cater for their basic needs and made savings from the trade.

5.2.3 Income reliability

The income of SMCs was considered unreliable in comparison to the minimum wage of an employee in the formal sector who received a regular monthly salary from his/her work. Reasons for this unreliability associated with the incomes of SMCs were as follows. First, about 61% of SMCs regarded the fluctuating nature of scrap prices at points of sale to scrap dealers as the highest risk associated with the scrap metal collection business. Thus, it became very difficult for SMCs to estimate how much income they would get at the end of the month. Secondly, all the people interviewed including steel companies indicated that there was continuous risk of exhaustion of scraps in the backyards, refuse dumps and landfill sites in Kumasi. Thus if the accumulated scraps ran out, the fate of SMCs and for that matter the scrap metal trade in Kumasi would be under threat.

On the contrary, SDs indicated that their incomes were reliable considering their ability to afford their basic needs. Incomes of SDs were relatively higher than that of SMCs (80-900%). SDs generally could store scraps for a time in anticipation of higher prices. Thus SDs could influence prices of scraps by creating shortage of scraps. This was also

confirmed by steel companies interviewed. However, SDs were quick to admit that their income reliability depended on the continual inflow of scraps from SMCs.

Generally as you move along the supply chain of stakeholders in the scrap metal trade, conditions of service improve with marginal profit. Thus SDs were better off than SMCs in terms of conditions and profits generated from the business.

5.3 Social Assessment of Scrap Metal Trade

The social implications of the scrap metal trade in Kumasi were measured against the MDG 2 which seeks to achieve universal primary education for all by 2015. The social implications of the trade were again measured against the International Labour Organisation (ILO) definition of decent work. Decent work involves opportunities for work that is productive and delivers a fair income; provides security in the workplace and social protection for workers and their families; offers better prospects for personal development and encourages social integration; gives people freedom to express their concerns, to organize and participate in decisions that affect their lives; and guarantees equal opportunities and equal treatment for all (Ghai *et al*., 2006).

5.3.1 Working conditions

Scrap metal collectors (SMCs) in Kumasi employed various means to collect metal scraps for sale. The most common of them all was door-to-door collection by foot. Additionally, SMCs moved from one industry site to the other. From the interview conducted, it was observed that majority of SMCs (~ 95%) collected scraps from refuse dumps, mechanic shops, demolition sites and residential houses. The remaining 5% collected scrap metals from refuse dumps and mechanic shops. Nevertheless, SMCs combined several means to collect scraps in Kumasi. One major challenge with the door-to-door collection method

was that residents were most of the times not in their houses during weekdays. This problem is likely to persist and even increase in magnitude as Kumasi continues to expand towards the peri-urban areas. This compelled SMCs to search other areas such as refuse dumps and bushes with the hope of obtaining scraps to sell for a living.

During collection of scraps, no personal protective equipment (PPE) were used. Therefore collectors were prone to all sorts of health hazards including skin cuts from rusted metals, broken bottles and snake bites. About 39% of SMCs interviewed had experienced some form of injuries. The long walk in search of scraps also resulted in bodily pains and fatigue at the end of each working day. Collectors were often involved with the police for alleged stolen goods. Similar hazards associated with the working environment of SMCs have also been reported by Fofana (2009).

Although SDs did not walk for long hours in search of scraps like SMCs, they were nevertheless not spared from the harsh working conditions experienced by SMCs. This became more apparent during the loading of stored scraps into trucks for transport to steel companies. During such ventures, SDs and their employees remained in the heat of the sun (Figure 5.1) from five to six hours as mentioned by SDs during the interviews. Neither SDs nor their employees considered prevention of skin burns as a result of sun heat in their operations. However, it is worth mentioning that SDs considered the use of PPEs in their operational activities to some degree. Field observations revealed the use of simple PPEs such as gloves to prevent cuts during the loading of scraps into trucks for transportation to steel companies (See Figure 5.1).

Foundry workers, although not the focus of the study, were observed undertaking their activities. This group of workers worked under harsh conditions. They had to wait for long hours for the collection of smelted scraps. During the collection of the smelted scraps the

workers were exposed to excessive heat from the furnace. In comparison to SDs, foundry workers acknowledged the importance of PPEs. They employed the use of PPEs such as helmets and safety boots in addition to gloves (See Figure 5.2). Without these PPEs, foundry workers would be exposed to hazards such as burns from contact with smelted scraps.

Even though there were so many risks and hazards associated with the trade, all respondents interviewed did not feel ashamed of the kind of work they were involved in. This could be due to the fact that they were immigrants from the Northern part of the country to Kumasi in search of greener pastures. According to both SMCs and SDs, they were better off compared to when they were in the Northern region and so were not embarrassed about their work.

Figure 5.1: Working conditions of SD employees and the level of PPEs use

Figure 5.2: Personal Protective Equipment used by foundry workers at Suame Magazine

The working hours of SMCs and SDs depended on the individual; the more time one invested in the trade, the more income one generated. Typical working hours for SMCs started from 6:00 GMT till late in the afternoon. On the other hand, the typical working hours of SDs started from about 14:00 GMT when SMCs return with collected scraps for sale. SMCs admitted working more than eight hours a day whilst SDs worked for five hours a day. All the respondents interviewed worked six days in a week and rested only on Sundays. In comparison to the formal sector employee, working hours started at 8:00 GMT and ended at 17:00 GMT with a one hour break usually at 12:00 GMT. The formal sector employee worked for a period of eight hours a day and rested during the weekends.

Unlike the formal sector where an employee's job was somewhat secured, SMCs and SDs suffered from job insecurity due to the scarcity of scraps. Their existence in the scrap trade largely depended on availability of scraps and demand for metal recycling. Whereas the

demand for metal recycling was high due to the benefits in reducing production costs of manufacturing firms, the availability of scraps was questionable.

All respondents (SDs) indicated that they were able to save some money from the sale of scrap metals either with a bank or other financial institutions. However, none of them (SMCs) had a social security account to cater for their pension needs when they retired. Fofana (2009) in Sierra Leone reported of a similar trend about the lack of participation in the Pension Scheme. Interactions with SMCs indicated that most of them had not thought about retirement.

The Social Security and National Insurance Trust (SSNIT) is the body responsible for pension benefits of workers in Ghana. Until recently, the focus of the organisation was centred on providing pension benefits to workers of the public sector. However, SSNIT provide pension benefits for all categories of workers in the country now. Benefits payable under the scheme are old-age pension and survivor's lump sum. The old-age pension benefits is paid on monthly basis to retired workers usually above 60 years of age and the survivor's lump sum goes to the survivors of the breadwinner in the case of death of the SSNIT contributor (Boon, 2007). Interactions with SSNIT revealed that generally less people from the informal sector had signed up on the pension scheme. This was verified in this study. Even though SDs earned enough money from the scrap metal trade and employed a number of people, both SDs and their employees were not registered with SSNIT. The dependents of SDs and SMCs who may be the breadwinners of the families may be poverty-stricken in the event of any demise.

5.3.2 Access to social services

From the income generated from the scrap trade, about 85% of SMCs were able to rent apartments while the remaining 15% had put up their own houses. About 90% of SMCs

lived in slums which were densely populated. Even though they had access to water and electricity, the area did not meet the right standards of living conditions because of the lack of proper planning in the area. Field observations revealed the possibility of contamination of boreholes and wells by leachate from pit latrines located in close proximity.

SDs on the other hand had built their personal houses in residential areas that were usually more planned than SMCs. Interactions with SDs revealed that they had access to pipe borne water and electricity in their houses.

About 51% of SMCs had access to medical care in government hospitals in Kumasi. The remaining 49% relied on self-medication. Interactions with respondents revealed that some of those on self-medication relied on herbal treatment. Those who relied on self-medication did so because of the long hours spent at the hospital.

About 68.8% of SDs accessed medical care from health care facilities in Kumasi. However, 31.2% relied on self- medication. Reasons given for relying on self-medication centred on the long hours spent in wait to see the doctor in health care facilities in Kumasi.

5.3.4 Educational level

The level of education among SMCs and SDs was particularly worrying considering MDG 2 which seeks to achieve universal primary education for all by 2015. About 47% of SMCs and 43.8% of SDs had no formal education. The economics of the scrap metal trade served as a stumbling block to achieving primary education for all Ghanaians. This was confirmed by SMCs and SDs from discussions. About 46% of SMCs indicated having introduced one member of their family into the scrap collection venture (see Figure 5.3). These family members had thus been denied the opportunity of gaining primary education. These family members were also seen involved in loading scraps for transportation to steel companies (Figure 5.4).

Figure 5.3: Under-aged child collecting scraps

Figure 5.4: Under-aged child loading scraps into a track

5.4 Environmental Assessment of Scrap Metal Trade

Every economic activity has an impact on the environment upon which its continual sustenance depends. The environmental assessment of the scrap metal trade in Kumasi had both positive and negative dimensions. This section highlighted these points.

5.4.1 Aesthetics and ground water pollution

As stated earlier, scrap metals were generally considered as waste. However, recycling of scrap metals makes substantial savings on landfill space requirements and it helps in conservation of natural resources (Langenhoven and Dyssel, 2007). Recycling also contributes to cleaning up the environment. Even though all respondents indicated their involvement in the trade as entirely for economic reasons, this added benefit cannot be overlooked.

On the other hand, the processing of the scraps had its own environmental issues. For instance, the processing of scraps by SDs involving car engine blocks resulted in oil spills which could affect aesthetic value of the environment besides possible contamination of ground water system (see Figure. 5.5). Illegally dumped metals were not only unsightly but once they began to degrade and rust could create health and safety issues for scavengers and children as they could easily cut themselves on sharp edges.

Figure 5.5: Oil spills from dismantling of whole scraps at Aboabo

5.4.2 Impact on built environment

In situations where SMCs were not able to get scraps to make a living, SMCs could be tempted in stealing metals that had not reached their end-of-life. This was highly probable due to the economics of the trade. About 9% of SMCs and 100% of SDs were aware of SMCs stealing metal from the built environment. However, SMCs interviewed did not indicate their participation in this practice. Additionally, SDs were not able to differentiate between stolen and non-stolen scraps. Interactions with KMA did not give an indication of the cost of repair to the KMA due to metal theft since there was no data on the stealing menace. The lack of data from KMA suggested that metal theft may not be of serious concern in Kumasi metropolis, at least for now, as it is in the United Kingdom and elsewhere around the globe (Bennett, 2008).

5.4.3 Air quality

The burning of plastics in open fires by SMCs in recovery of non-ferrous metals revealed the possibility of air pollution (see Figure 5.6). Gases released into the atmosphere could affect health conditions of SMCs who are usually teenagers. Similar environmental assertions have been reported in Ghana (Brigden *et al*., 2008). Steel companies also mentioned that poor quality of scraps from SDs increased the amount of impurities which led to an increase in the fumes produced from the smelting process. The increase in the fumes generated posed a threat to maintaining air quality.

The Environmental Protection Agency (EPA) of Kumasi is charged with the responsibility of ensuring that business operations are conducted with sound environmental principles at its foundation. The EPA was often preoccupied by the environmental impacts of large business operations and usually failed to attend to small businesses in Kumasi. Personal communication with EPA revealed that presently there were no environmental concerns on the operations of SMCs and SDs.

In Kumasi, quality of scraps was not as important as the economics which was the main driving force sustaining the trade especially when scraps were transported to steel companies in Tema. However steel companies in Ghana had to consider environmental regulations and standards seriously in order to export. Interactions with steel companies revealed that the Environmental Protection Agency in Accra made sure their activities did not impact on the environment negatively through routine visits. Thus steel companies bore the responsibility of ensuring quality in the trade since quality affects the level of emissions. However, steel companies also admitted that scraps were scarce and thus they bought scraps from scrap dealers without authenticating the quality. For this reason, scrap metal collectors and scrap dealers were indifferent as to the quality of scraps collected and supplied to steel companies in Ghana.

Figure 5.6: Burning of plastic coated metals to recover metals

5.5 Stakeholders in the Scrap Metal Trade

Interactions with the SMCs revealed a complex network of stakeholders involved in the scrap metal trade. Figure 5.7 shows a flowchart indicating all the stakeholders.

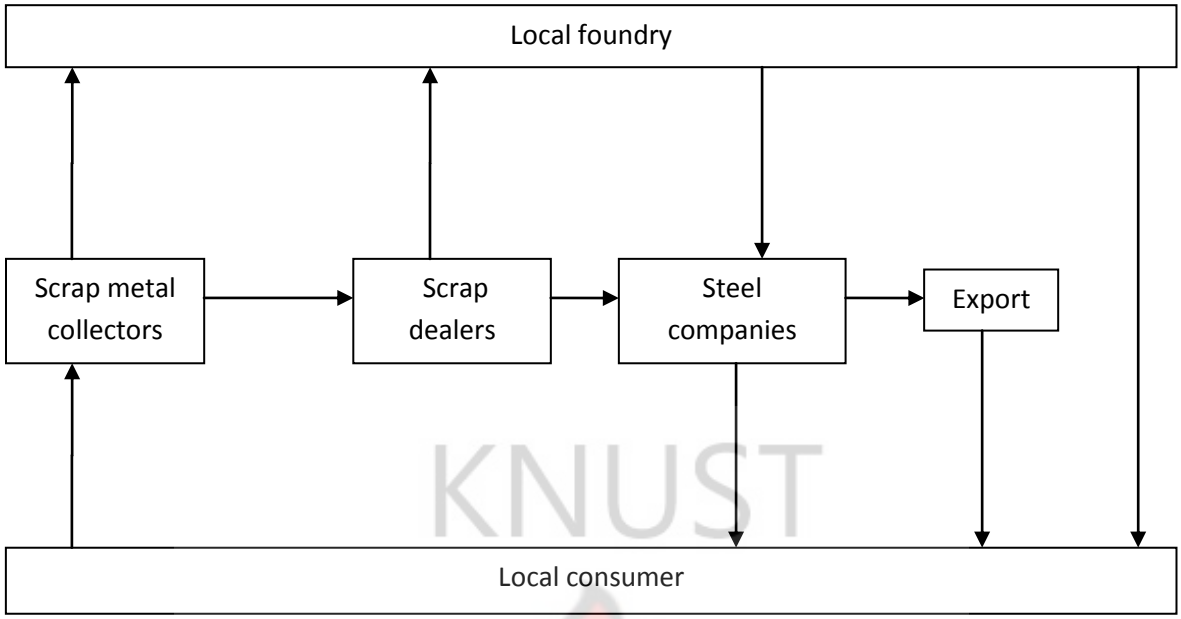

Figure 5.7: Scrap trade industry structure as seen in Kumasi metropolis

Scrap metal collection was done by SMCs who then sold collected scraps to SDs at either of the two trading centres: Aboabo and Suame Magazine. SDs after processing of the scraps sold them to steel companies in Tema or local foundries in Kumasi. Women were captured as part of SDs which offered them a competitive advantage over SMCs in the trade. They served as intermediary between SDs at Aboabo and SDs at Suame Magazine and the price difference between these two centres offered women a competitive advantage than the SMCs. The women bought scraps from SDs in Aboabo and retailed to SDs at Suame Magazine. Thus women were a critical link between these two stakeholders. Some local foundries also obtained scraps directly from SMCs and SDs in Kumasi.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The scrap metal trade had enormous potential of reducing poverty in urban areas. This was important in light of MDG 1 which seeks to reduce poverty by minimizing the number of persons whose income per day is less than $1.25. It was observed that the average monthly income from the trade was more than income obtained by unskilled employees from the formal sector such as a messenger or labourer. However, the income generated through scrap trade was neither sufficient nor sustainable as the income depended on availability of scraps and price fixing by either the steel companies or the SDs. Additionally, there was no provision made for their retirement as compared to unskilled workers in the formal sector.

Despite the economic benefits, the social implications of the scrap metal trade in Kumasi cannot be overlooked. The scrap metal trade in Kumasi stands in the way of achievement of the MDG 2 which seeks to provide free basic education for all by 2015. Majority of individuals involved in the trade were not educated whilst some were also under age. The conditions of work for SMCs and SDs included the long hours of walk in search of scraps and standing in the sun's heat during loading of scraps into tracks to steel companies. There were several risks and hazards associated with the trade including bodily cuts and pains as well as environmental pollution during processing (open burning) of scraps.

The scrap metal trade presented the added environmental benefit of minimising the amount of waste received by the municipal solid waste collection system in Kumasi. However, in spite of the environmental benefit associated with the trade, the current practice of burning plastics in the open to recover non-ferrous metals in Kumasi leaves much to be desired.

Considering that the KMA had no data on repairs of stolen metal parts from the built environment, it could be assumed that the magnitude of the problem is still not huge enough to arrest the attention of the KMA.

6.2 Recommendations

The activities of the stakeholders within the scrap metal trade in Kumasi could help in solving the unemployment problems in Ghana if policies and strategies are in place. In light of this, the following points have been listed as recommendations for the improvement of the scrap metal trade in Kumasi.

- SMCs should acquire employable skills which they could use in the situation where scraps run out.
- A holistic approach should be put in place where all stakeholders have a part to play in streamlining the scrap metal trade in Kumasi and ultimately standardise scrap metal prices and improve working conditions of all the stakeholders.

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APPENDIX A

Questions for scrap metal collectors/scrap dealers

Section A: Social impact assessment

1. Sex of respondent? Male/Female
2. Age of respondent? Ans:
3. Marital status of respondent? Single/Married/Divorced/Widowed
4. How many dependents do you have? Ans:
5. Where do you come from? Ans:
6. Have you been to school? Yes/No
7. Which level did you attain in education? Ans:
8. What skills did you acquire in school? Ans:
9. Do you have a susu savings or social security number? Yes/No
10. Where do you live? Ans:
11. Do you have your own house? Yes/No
12. Do you rent a house? Yes/No
13. Do you have electricity in your house? Yes/No
14. Do you have access to pipe-borne water in your house? Yes/No
15. Where do you seek medical care when you fall sick? Ans:
16. Is your scrap metal collection a registered business? Yes/No
17. Are you ashamed of your work? Yes/No
18. If yes, why? Ans
19. What is the means of transport of collected scrap metals to point of sale? Ans:
20. Are you regulated by the central government? Yes/No
21. Where do you gather scrap metals from? Ans:
22. What challenges are you faced with during scrap metal collection? Ans:

23. Are you aware of scrap metal collectors stealing metal coverings/pipes to sell? Yes/No
24. Have you ever thought of stealing metal coverings/pipes to sell yourself? Yes/No
25. When does this thought come to mind? Ans:
26. How can your livelihood from scrap metal collection be improved? Ans:
27. How many members of your family are into scrap metal collection? Ans:
28. Who are the different kinds of people involved in the scrap metal trade? Ans:
29. What do you think the government can do to help you? Ans:
30. What risks are associated with your business? Ans:
31. Which area do you collect scrap metals from in Kumasi? Ans:

Section B: Economics of the scrap metal trade

1. Why are you involved the scrap metal trade? Ans:
2. What is your weekly/daily income from sale of scrap metals? Ans:
3. How much do you sell your scrap metal per kilogramme/pound? Ans:
4. How is the pricing done? Ans:
5. What is your primary occupation? Ans:
6. What is your secondary occupation? Ans:
7. Is income made from sale of scrap metals enough to cater for dependents? Yes/No
8. Do you pay tax on your income? Yes/No
9. Can you afford payment of your electricity bills? Yes/No
10. Can you afford your water bills? Yes/No
11. Can you afford payment of your medical bills? Yes/No
12. What are the sources of scrap metals collected? Ans:
13. What types of scrap metals do you collect/purchase? Ans:
14. Who sets the price of scrap metals at the point of sale? Ans:

15. How do you transact your business? Ans:

16. Are there some particular times in the year when scrap metals are scarce? Yes/No

17. Which periods are these? Ans:

18. How much (GH₵ & weight, Kg) of each type of SM do you collect/purchase from different places?					
SCRAP TYPE	Houses	Landfill	Industries	Streets	Others
Steel					
Brass					
Copper					
Aluminium					

Section C: Environmental impact assessment

1. Do you collect cast iron? Yes/No
2. Do you collect steel? Yes/No
3. Do you collect stainless? Yes/No
4. Do you collect copper? Yes/No
5. Do you collect lead? Yes/No
6. Do you collect aluminium? Yes/No
7. What are the different scrap metal collection methods? Ans:
8. Are you aware of collectors stealing metal coverings/pipes from the streets? Yes/No
9. What types of metals are usually stolen? Ans:
10. Do you think the stealing has an adverse effect on the environment? Yes/No

11. Do you sort your scrap metals before selling them? Yes/No
12. How is the sorting done? Ans:
13. Do you consider the quality of scrap metals during the collection/purchase stage? Yes/No
14. How do you assess the quality of scrap metals at the collection/purchase stage?

Ans:

Questions for the Environmental Protection Agency (EPA), Kumasi

1. Are you aware of the SM trade in Kumasi? Yes/No
2. What is the composition of SM collected in Kumasi? Ferrous/Non-ferrous
3. What are the different SM collection methods? Ans:
4. Where are scraps collected from in Kumasi? Ans:
5. Are you aware of how SM are processed/treated after collection in Kumasi? Yes/No
6. Describe these processes/treatment? Ans:
7. Are you aware of people stealing metal coverings from the built environment to sell as scraps? Yes/No
8. What types of metals are usually stolen? Ans:
9. Does this stealing menace have an impact on the environment? Yes/No
10. Describe this impact (positive/negative)? Ans:
11. Has the EPA set some rules to regulate the operations of the SM industry in Kumasi? Yes/No
12. Currently, are there environmental concerns about the SM trade/industry? Yes/No
13. Describe this? Ans:

14. Is there an environmental policy on the quality of scraps that can be recycled? Yes/No
15. Describe this? Ans:
16. During the recycling of scraps, waste is generated. Does the EPA have procedures of the collection and treatment of such waste? Yes/No
17. Describe these treatment processes? Ans:

Questions for the Kumasi Metropolitan Assembly (KMA)

Section A: Environmental

1. Does the KMA capture scrap metals as part of the waste in Kumasi? Yes/No
2. What is the composition of scraps collected in Kumasi? (ferrous/non-ferrous)

Ans:

3. What fraction is ferrous and what part is non-ferrous? Ans:
4. What are the scrap collection methods in use by the KMA in Kumasi?

Describe them:

5. Where are scraps collected from in Kumasi? Ans:
6. Are metal parts being stolen from the built environment by collectors as scraps? Yes/No
7. Which parts are usually stolen? Ans:
8. What types of metals are usually stolen? Ans:
9. Which areas in Kumasi are most prone to the stealing menace in Kumasi? Ans:
10. What is the reason for this situation? Ans:

11. What is the impact of this stealing menace on the environment? Ans:

12. Are scrap metals treated after collection in the Kumasi metropolis? Yes/No

13. If yes, describe this treatment process? Ans:

14. How much (tonnes/week or month) of scraps do you receive at the landfill site?

Ans:

15. What do you do with these scraps that get to the landfill site? Ans:

Section B: Economics

1. What is the cost of repair to the KMA annually for these stolen metal parts from the built environment? Ans:

Questions for steel companies

Section A: Social impact

1. What is the name of your company? Ans:
2. Who are the different kinds of people involved in the scrap metal trade? Ans:
3. Are you affiliated to an association? Yes/No
4. What is the name of this association if you answered yes? Ans:
5. Is your company registered? Yes/No
6. Are you regulated by the central government? Yes/No

7. What risks are associated with your business? Ans:
8. What challenges are you faced in your work? Ans:
9. How many people are employed by your company? Ans:
10. How many different companies or individuals do you buy SM from who are based in Kumasi?

    Ans:

Section B: Economics of scrap metal trade

1. How many steel companies do you know of? Ans:
2. Mention them and their location? Ans:
3. Are you in competition for scrap metals with these other companies? Yes/No
4. Is the company exporting SM outside? Yes/No
5. Mention the country destinations? Ans:
6. Is the company receiving SM from Kumasi? Yes/No
7. Are there times when SM are in short supply? Yes/No
8. Which times are scraps in short supply during the year and **WHY**?

Ans:

9. How much do you buy?

Scrap metal type	**Quantity (Kg)**	**Price (GH¢)**
Steel		
Brass		
Copper		
Aluminium		
Total		

10. Who (company/people) do you buy SM from **(INDICATE THEIR NUMBER)**?

    Ans:

11. How much do you export?

Scrap Metal Type	**Quantity (Kg)**	**Price (GH¢)**	**Destination Country**
Steel			
Brass			
Aluminium			
Copper			
TOTAL			

12. Have you been forced to import SM for the company during periods of short supply from other countries? Yes/No
13. Which countries do you import from, if you answered yes above? Ans:
14. Which types of Scrap Metal do you import? Ans:
15. Who sets the price of the Scrap Metal you buy? Ans:
16. How much income do you receive in a week/month? Ans:
17. Explain how you conduct your business? (how do you make contact with suppliers?)

Ans:

18. What type of Scrap Metals do you receive from Kumasi in a month?

Scrap Metal Type	**Received/Not**	**Quantity (Kg)**	**Price (GH¢)**
Steel	YES/NO		
Brass	YES/NO		
Copper	YES/NO		
Aluminium	YES/NO		
TOTAL			

19. Who are your customers? Ans:

20. Do you pay tax to government? Yes/No

21. How much tax do you pay in a month? Ans:

22. Are you aware of intermediaries/agents exporting scrap metals? Yes/No

Section C: Environmental

1. Are there any specifications and standards in the industry based on environmental sustainability? YES/NO
2. Is the quantity of SM received enough to meet the company's capacity? YES/NO
3. What are the specifications/standards in the industry? Ans:
4. Are you aware of the environmental hazards associated with your operations? YES/NO
5. What are these hazards? Ans:
6. What measures are in place to minimize/manage these hazards? Ans:
7. Do you know of any environmental regulations by the government to ensure environmental management in your operations? YES/NO
8. Describe these environmental regulations?

Ans:

9. Is there a criteria for determining the quality of SM exported to other countries? YES/NO

10. Please, describe this criteria.

Ans:

11. Is there a way of authenticating the quality of SM bought by the company? YES/NO

12. Please, describe this procedure also.

Ans:

THANK YOU!!!