MAPPING THE ILLICIT E-WASTE TRADE BETWEEN THE UK AND GHANA

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Authored by

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About the Research

This project was commissioned by the Partnership for Conflict, Crime and Security Research (PaCCS). It involved a placement with the Centre for Maritime Law and Security Africa, based in Accra, Ghana. Interviews and surveys were used to scope out the extent, nature and impact of e-waste smuggling on the UK to Ghana route. This project was supervised by Dr Tristram Riley-Smith (PaCCS Research Integrator), Professor Tim Edmunds (Safe Seas Co-Director), and Dr Kamal-Deen Ali (Executive Director of the Centre for Maritime Law and Security Africa).

About the Author

Kanchelli Iddrisu is a researcher and PhD student in Education at the University of Cambridge. Her doctoral research focuses on youth unemployment in Ghana, examining the responses young people have to this issue. She also works in a law firm, specialising in anti-corruption research in West Africa.

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The Partnership for Conflict, Crime and Security Research (PaCCS)

The Partnership for Conflict, Crime and Security Research (PaCCS) was established by Research Councils UK (now UK Research and Innovation, UKRI) in 2008 as the Global Uncertainties Programme with an aim of delivering high quality, cutting edge research to help improve our understanding of current and future global security challenges. PaCCS presently focuses on the core areas of conflict, cybersecurity, and trans-national organised crime. Our team works to support research, to build connections amongst our research community, and to explore the results of UKRI-funded research projects in our core areas, with the aim of facilitating knowledge translation and research impact. PaCCS has supported collaboration by bringing together researchers from across disciplines to work together on

innovative research projects. By creating opportunities for knowledge exchange between government, industry, and the third sector, activities funded under PaCCS continue to deliver impact beyond the academic community.

The partnership is supported by a Research Integrator (Dr Tristram Riley-Smith) based at the University of Cambridge. This placement with the Centre for Maritime Law and Security Africa (CEMLAWS) and the Safe Seas Network is part of the Research Integrator's work stream linked to Transnational Organised Crime: Deepening & Broadening Our Understanding, a PaCCS programme.

Executive Summary

The rising global population, globalisation and digitisation have resulted in growing flows of e-waste to developing countries. The development of a digital era comes with consequences that have serious environmental and health effects. The use of Electrical and Electronic Equipment (EEE) has accelerated at unprecedented levels worldwide, with Ghana experiencing a rise in demand for EEE as well. Most EEE in Ghana is imported from countries in Europe, the USA, and Asia, with the UK being a major exporter of not only EEE, but e-waste to Ghana.

E-waste is the fastest rising waste stream. The presence of hazardous materials in e-waste makes it difficult and expensive to treat safely. Legislation tackling the issue of e-waste has improved, but enforcement of regulations is still lacking in developing countries, which are most burdened by e-waste exports. In countries such as Ghana, e-waste is often recycled using dangerous methods such as burning and by workers using basic tools without protective equipment. These unsafe practices, where valuable materials found in e-waste are usually scavenged for profit, constitute 'informal recycling' processes.

This report explores the extent, nature, and impact of the e-waste trade between the UK and Ghana by mapping sites along this route. These sites act as categories in which key actors in the e-waste trade have been grouped in order to understand their significance, how they interact, how the illicit aspect of the e-waste trade is formed, and the main factors that drive this trade.

The research consists of a literature review, interviews with 44 individuals and representatives from institutions in the UK and Ghana, and surveys handed out to these interviewees. The report opens with an examination of e-waste, information on the Ghanaian context, overview of the legal framework and literature review. The findings were then detailed and analysed. The findings of the research mapped eight key sites along the e-waste trade route between the UK and Ghana, characterised the illicit aspect of this trade, and established the main drivers of the trade. The following key conclusions were reached:

- E-waste is usually smuggled into Ghana as 'personal belongings'
- The domestic consumption of imported new and used electronics in Ghana is a major source of e-waste, with this site of e-waste generation being overlooked in much of the existing literature
- The e-waste trade is mainly profit driven with recyclers wanting lower recycling costs. Additionally, consumers in Ghana gain access to second-hand electronic goods in order to help bridge the 'digital divide'
- Poverty is the underlying factor of the unregulated e-waste trade, and there are not enough interventions acknowledging and addressing this

- The majority of the e-waste workers involved in informal, unregulated recycling operations are from the North of Ghana, yet there are limited interventions in those regions to create local job opportunities and create awareness of the consequences of informal e-waste recycling
- The e-waste trade is nuanced. It is challenging to separate legal actors and activities from illegal or illicit ones
- The question of whether illicit e-waste operations can be categorised as 'serious organised crime' (SOC) requires more research. Traditional models of SOC may be challenged here, with novel organisational structures providing a collaborative approach to crime, as opposed to a strictly hierarchical one
- There needs to be a deeper understanding of the risks, harms and consequences of these activities, in order to determine the resources that should be allocated to fighting this trade;
- It is possible, but not demonstrated, that the e-waste trade could provide a logistical network which could facilitate other criminal activities such as money-laundering, and the trafficking of arms, narcotics and other contraband
- Opportunities for organised criminality and corruption are likely to increase if, as is anticipated, e-waste trade becomes more organised and coordinated
- Ghanaian institutions are more likely to frame the challenge of stopping e-waste trade as Ghana's responsibility; the UK and international organisations regard this as an issue that needs to be addressed before e-waste reaches Ghana, by the exporting country.

This has led to the following recommendations, intended to counter harms arising from the trade in e-waste between the UK and Ghana and to deepen our understanding of the issues:

- Ghana should decentralise institutions linked to reducing e-waste flows, with a stronger focus on regions in the North of Ghana; namely the Upper West, Upper East, North East, Savannah and Northern regions
- Digitisation of data should be improved across institutions to increase access to e-waste statistics
- Increased data sharing and collaboration between institutions is recommended
- Ghana has signed the Bamako convention, but has not yet ratified it; Ghana should do this to strengthen collaboration with other West African countries
- Enforcement agencies and prosecutors should be more aware of the crimes that are concealed or made possible due to the logistical network that the e-waste trade provides
- The return of shipments of e-waste back to the UK should be facilitated
- UK manufacturers and consumers should be made more aware of their role in this trade

Recommendations for further research include:

- More research is needed on the effectiveness of current e-waste initiatives
- Further research is needed on current or potential levels of criminality associated with e-waste trade in Ghana
- More research on cybersecurity risks linked to e-waste is necessary
- Proceeds of crime and asset recovery linked will need to be researched in depth

Glossary of Terms

BAN – Basel Action Network

Basel Convention - Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

COMTRADE - United Nations International Trade Statistics Database

EEE – Electrical and Electronic Equipment

EPA – Environmental Protection Agency

E-waste – Discarded Electrical and Electronic Equipment

GHC – Ghana Cedis

GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit

GPHA - Ghana Ports and Harbours Authority

ILO - International Labour Organisation

INTERPOL - The International Criminal Police Organization

NCA – National Crime Agency

NVivo – Data Analysis Software

PENAf - Ports Environmental Network Africa

SEPA - Scottish Environmental Protection Agency

UNDP - United Nation Development Programme

UNEP – United Nations Environment Program

WHO - World Health Organisation

1. Introduction

The global market for Electrical and Electronic equipment (EEE) has increased exponentially, with the electronics industry considered to be the fastest growing industry worldwide[1]. Technological advancements and changes in consumer demands have contributed to this rise in the use of electronic goods[2]. Electronic waste, commonly referred to as e-waste, describes the electrical and electronic equipment that is discarded as a result of this process (*StEP Initiative*, n.d.). The issue of illicit flows of e-waste, often containing hazardous materials, to less developed countries raises serious environmental justice concerns.

The global electronics industry generates the most amount of waste (United Nations University, 2020). Approximately, 53.6 million metric tonnes (Mt) of electronic waste was created in 2019 (Forti et al., 2020). Measuring volumes of e-waste is challenging because much of this trade is undocumented, but it is estimated in the Global E-waste Monitor 2020 that the amount of e-waste produced globally will reach 74 million metric tonnes (Mt) by 2030 (Forti et al., 2020).

E-waste, containing hazardous substances that can threaten people's health and the environment when disposed of unsafely, is often dumped in countries with little or no regulation or enforcement of environmental laws. Dangerous recycling and disposal practices are often described as 'informal' due to the lack of regulation and rudimentary tools used to separate valuable materials from non-valuable ones, whereas 'formal' recycling refers to recycling processes that occur in licenced, regulated facilities. Many

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[1] https://www.statista.com/statistics/499891/projection-ewaste-generation-worldwide/
[2] https://www.statista.com/statistics/499891/projection-ewaste-generation-worldwide/

countries in Africa and the Asia/Pacific region are key destinations for e-waste. However, this report will focus on the trade of e-waste between the UK and Ghana.

This report aims to plot sites illustrating the flows of e-waste between the UK and Ghana. This approach uses interviews, qualitative surveys, and an extensive literature review to group actors in the e-waste industry into groups, known as 'sites'. This method contributes to a clearer depiction of complex e-waste trade routes, and the ways actors engage with each other.

Chapter 1 of this report provides an introduction to the e-waste industry, detailing the research questions, and the importance of the research. After this, Chapter 2 outlines the scope of e-waste, with Chapter 3 providing more details on the Ghanaian context specifically. Chapter 4 of the research includes a literature review of the e-waste research in Ghana, and Africa more broadly. The next chapter, Chapter 5, introduces this report's research design, with a focus on the site based approach of the study. Chapter 6 presents the findings of the research, answering the research questions introduced at the beginning of the report. This is followed by Chapter 7, the analysis and conclusion section of the report where the themes of poverty, structure of the trade, responsibility, and drivers of the trade are discussed in more detail. Recommendations are stated in the final chapter of the report.

Research Questions

This study scopes out the extent, nature, and impact of e-waste flows on the UK-Ghana route. Through outlining the significance of key sites along the e-waste trade route, it produces an overview of the complex links within this trade. The illicit features of this trade will be described by actors engaged in it, and the drivers pushing this trade will be detailed.

The study addresses the following research questions:

1. What is the significance of key sites along the illicit e-waste trade route between the UK and Ghana, and how do these sites interact?
2. How is the illicit aspect of the flow of e-waste between the UK and Ghana characterised by actors engaged in this activity?
3. What are the key drivers of illicit e-waste flows between the UK and Ghana?

These questions were selected to highlight the under-researched illicit aspect of the e-waste trade. In addition, when studies discuss the e-waste trade between Ghana and other countries, including the UK, the focus is often on Ghana, and not the links between Ghana and exporting countries. These research questions, which look at the significance of key sites and how actors engage with each other, will create a more detailed representation of the overall trade.

Interviews and qualitative surveys were used to answer this study's research questions. There were 44 participants in this study, with each interviewee also completing a survey.

Rationale of the Research

This report contributes to the growing body of research that addresses e-waste, transboundary movements of waste, and transnational organised crime.

Monitoring e-waste helps give a detailed picture of the effects of increased digitisation, consumer trends in electronic and electrical products, and global interconnectedness. In addition, an awareness of the consequences of this digital era sheds a light on global inequities linked to globalisation and exploitation.

Studying the impact of e-waste helps to identify and evaluate targets for sustainability, and is useful when developing legislation and policies, especially in the areas of health, the natural environment, and workers' rights. Policies and laws to address hazardous e-waste flows are more effectively enforced on the foundation of reliable data, and detailed insights into the e-waste industry (Forti et al., 2020).

This report also fills a gap in the research on e-waste on the UK-Ghana export route by using a qualitative approach that prioritises the narratives of those greatly affected. Ghana, and more specifically the flow of e-waste from the UK to Ghana, presents a unique opportunity to explore the e-waste industry. It is an ideal country to research when it comes to analysing flows of e-waste because, located in Ghana's capital city, Accra, is an area commonly known as Agbogbloshie. Agbogbloshie is popularly referred to as the site of the world's largest e-waste site.

In this report, the role, or significance, of key actors in the e-waste trade will be explored. Identifying key actors in the UK adds to a deeper appreciation of the roles many play in this trade, whether directly or indirectly. It is imperative to look at where waste originates from, and how it is trafficked or smuggled to several different destinations. Waste routes are not linear, with the burden of blame, responsibility, and accountability reflecting the nuance found in this journey.

Moreover, there is much more research on e-waste management once e-waste reaches Ghana than there is on the UK as an exporting country. This imbalance has global implications, revealing the possibility that not only are developing countries absorbing the negative impacts of e-waste, but in many cases the moral burden of it too.

2. The Scope of E-waste: Defining and Tracking E-waste

Electrical and Electronic Equipment (EEE) describes items that have a power cord or a battery[1]. Electronic waste, also known as e-waste, is EEE that has been discarded. In this report, e-waste will encompass all discarded Electrical and Electronic Equipment.

Table 2.1 Main types of e-waste

Category	Examples of E-waste
1. Large Household Appliances	Air conditioning units, gas cookers, water coolers
2. Small Household Appliances	LED torches, travel adaptors
3. Information Technology and Telecommunications Equipment	Satellite navigation systems, e-readers, HDMI cables, mobile phones, monitors
4. Consumer Equipment	CCTV, single-use cameras, digital TV dishes
5. Lighting Equipment	Streetlights, house lamps
6. Electrical and Electronic Tools	Electric pumps, household wind turbines
7. Toys, Leisure and Sports Equipment	Games consoles, electric bicycles, gym equipment
8. Medical Devices	Hearing aids, blood glucose monitors, blood pressure monitors
9. Automatic Dispensers	Photo booths, electric vehicle charge points
10. Display Equipment	TV screens
11. Appliances containing refrigerants	Boilers with refrigerants, fridges containing ammonia
12. Gas discharge lamps and light-emitting diode (LED) light sources	LED lamps, LED light strips
13. Solar Panels	PV panels
14. Monitoring and control equipment	Thermostats, fuse boxes, traffic lights

The table above shows e-waste categories and examples of each category, adapted from the UK government's guidance[3].

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[3] https://www.gov.uk/how-to-classify-different-types-of-waste/electronic-and-electrical-equipment

Composition of e-waste

E-waste contains valuable materials such as gold, copper, and cobalt. It is estimated that around 12% of global annual mine production of gold is used for the manufacture of EEE (UN Environment, 2019). Similarly, the Global E-waste Monitor, 2020, suggests that the value of raw materials found in e-waste globally was as much as $57 billion USD in 2019, with iron, copper and gold making the largest contributions to this calculation (Forti et al., 2020). It is likely that up to 7% of the world's gold supply may be in e-waste, with 100 times more gold in a ton of e-waste than in the same amount of gold ore (Leblanc 2020).

E-waste is non-biodegradable, meaning it cannot be decomposed by natural organisms, and toxic substances can persist in the environment (*Biodegradable and Non-Biodegradable*, n.d.). The dumping of EEE and unsafe methods to recover materials result in pollutants leaking into the natural environment, specifically the air, water, and soil.

Table 2.2 Composition

Element	Examples of sources in EEE	Ecological source of exposure	Health Consequence	Environmental Consequence
Lead	Light bulbs, Televisions, Batteries	Air, dust, water, soil	Damage to brain and nervous system. Hearing and speech problems, Anaemia, kidney damage	Accumulates in the bodies of natural organisms, Negative effect on soil
Zinc	Cathode Ray Tubes, Metal Coatings	Air, water, soil	Abdominal pain, Anaemia	Toxic to aquatic animals

Mercury	Batteries, LCDs, Thermostats, Sensors, Fluorescent Lamps	Air, water, soil, food, vapour	Toxic effects on immune system, nervous system, digestive system, corrosive to the skin, kidney and lung damage	Accumulates in the bodies of organisms
Nickel	Batteries	Air, water, soil, food	Lung fibrosis, allergies, kidney disease, lung and nasal cancer	Can end up in surface water, can damage plants, can affect the growth of algae
Cadmium	Switches, batteries, photocopying machines, Cathode Ray Tubes, mobile phones, toners, cartridges	Air, soil, dust, water, food	Lung damage, muscle pain, flu-like symptoms, cancer	Toxic effect on plants and animals
Lithium	Batteries	Air, water, soil, food	Diarrhoea, fatigue, nausea, increased thirst, heart issues	Harmful to soil, air contamination
Beryllium	Power supply boxes, computers	Air, food, water	Breathing difficulties, fever, coughing, lung damage	Some fruits and vegetables may contain

				high amounts of beryllium
Barium	Cathode Ray Tubes, Fluorescent Lamps	Air, food, water, soil	Kidney and cardiovascular diseases, neurological disorders	Accumulates in the bodies of aquatic organisms

The above table, adapted from an article on the health consequences of e-waste exposure, shows examples of toxic substances found in e-waste, and their effects on human health and the environment (Grant et al., 2013).

Overview of Global E-waste Flows

<u>Figure 2.1</u>
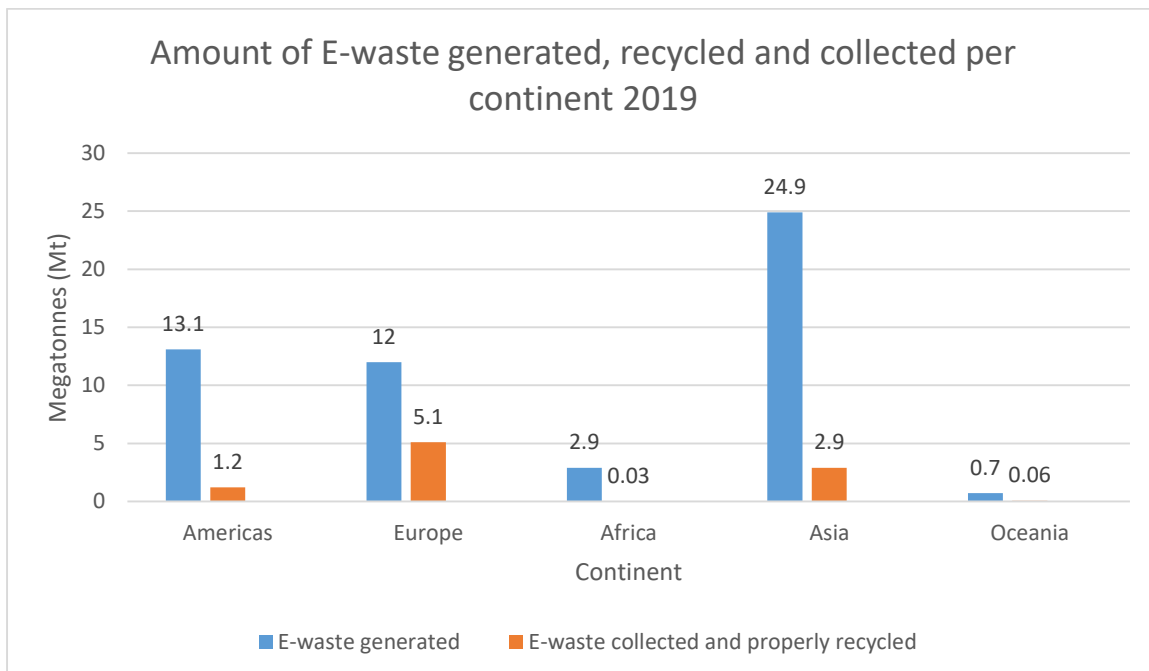
The figure above shows amounts of e-waste in million tonnes (Mt) produced per capita in 2019, using statistics from the Global E-waste Monitor 2020. The amount of e-waste shown

to be collected and recycled properly has been sourced from accessible documentation as the precise volume of waste generation worldwide is unclear (van Wingerde & Bisschop, 2019). In 2019, the UK produced 23.9kg of e-waste per capita, creating the second most e-waste per capita in the world (Forti et al., 2020). In 2019, around 17.4% of e-waste was properly collected and recycled (Forti et al., 2020). E-waste statistics show that 82.6% (or 44.3 Mt) of global e-waste flows are undocumented (Forti, 2020).

3. The Ghanaian Context

Access to EEE plays a major role in the development of Ghana. Ghana's increase in internet use and changing consumer patters has contributed to Ghana being an importer of used EEE, which is usually more affordable than new electronics. The management of e-waste remains an issue in the country.

According to the United Nations COMTRADE database on international trade, electrical, electronic equipment made up 6.6%, with a value of $685.92 million, of imports into Ghana in 2019 (UN COMTRADE, n.d.). In 2019, the UK was Ghana's third highest trading partner, after the USA and China (Trend Economy, 2021).

Table 3.1 Top 10 Used Electronics imports in tonnage volumes, Ghana 2010-2018

Category	Tonnage	% Used
Computers	130,756	7
Refrigerators	128,190	62
Air Conditioners	27,580	91
Radios	9,387	95
Mobile Phones	1,612	1
LCD Monitors	1,495	50
LCD TVs	1,336	17

Irons	832	25
Stereos	676	88
Kettles	116	19

The table above shows the top ten types of used electronics imported into Ghana between 2010 and 2018. It is adapted from Grant and Oteng-Ababio's report of the formalisation of Ghana's e-waste industry (Grant & Oteng-Ababio, 2021).

Ghana's Informal Recycling Industry

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit), a German development agency, reported that 95% of e-waste in Ghana is collected and recycled, but this mainly takes place informally, with the work carried out by unskilled workers (GIZ, 2021).
Accra is a central point for the e-waste industry. This e-waste industry can be said to be characterised by intensive manual labour, informality and self-governance, with recycling and repair being the central activities (Grant & Oteng-Ababio, 2021). There are numerous actors involved in the e-waste value chain, after collection. This division of labour and various stages of adding value includes dismantling, repairing, refurbishing, recycling, reselling, and secondary inputs (Grant & Oteng-Ababio, 2021).

Figure 3.1 Informal E-waste Recycling Process

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                              ┌──────────────────────┐
        ┌────────────────────▶│  E-waste Collection  │──────────────┐
        │                     └──────────┬───────────┘              │
        │                                │                          ▼
        │                     ┌───────────────────────┐   ┌──────────────────┐
        │                     │ Refurbishment and     │   │     Sorting      │
        │                     │ Repair                │   └─────────┬────────┘
        │                     └───────────┬───────────┘             │
        │                                 │                         ▼
        │                     ┌───────────────────────┐   ┌────────────────────────┐
        └─────────────────────│    Resale/Reuse       │   │ Treatment (Dismantling,│
                              └───────────────────────┘   │ Burning, Acids)        │
                                                          └─────────┬──────────────┘
                                                                    │
                                                                    ▼
                                                          ┌──────────────────┐
                                                          │ Segregation of   │
                                                          │ Parts            │
                                                          └──────────────────┘
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Treatment (Dismantling, Burning, Acids)

Segregation of Parts

Sale/Recovery of parts such as metals, batteries

Discard materials such as plastic

Stockpile

Export/Export for Further Recycling/Secondary Materials Market
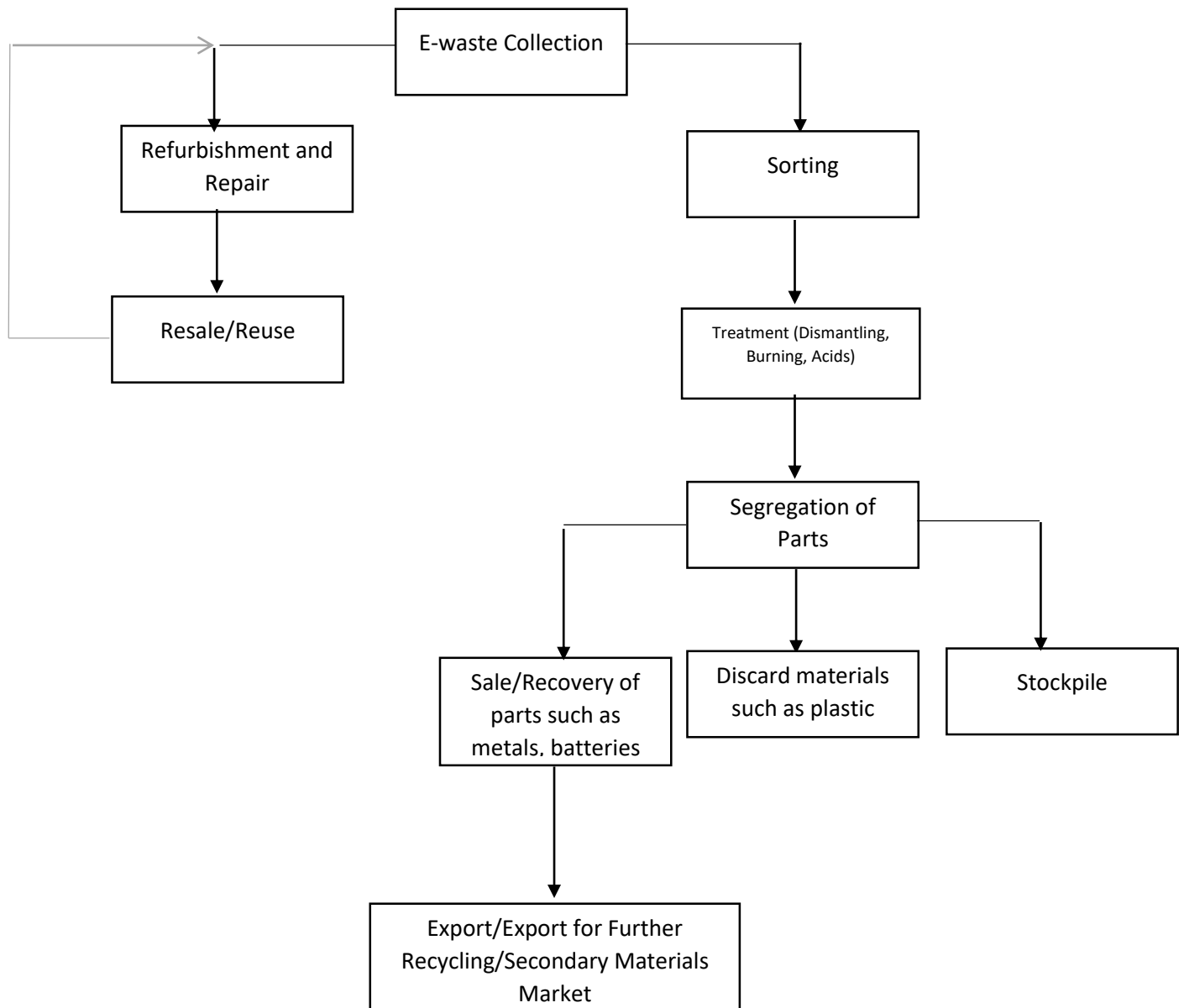
The figure above shows the processes that occur after e-waste is collected in Ghana. It can be reused and collected again, or sorted and recycled. After sorting, various processes such as burning and dismantling are used to recycle e-waste. This stage is referred to as 'treatment' in the figure above. After being treated, materials found in e-waste are usually separated, with some parts sold, discarded or stockpiled. After sale or the recovery of valuable parts, these metals, batteries, or other reusable substances are exported, or sold. The formal and informal economy intersect at several stages of the e-waste value recovery chain. Both formal companies and informal actors can resell collected e-waste, repair, and dismantle through formal or informal processes. Ghanaian companies often buy the metals found in e-waste for iron rods, and metals are exported to countries such as China and India.

Agbogbloshie

Ghana is home to one of the world's largest e-waste sites[4], known as Agbogbloshie. This area covers around 20 acres (Minter, 2016) with a population of approximately 80, 000 people and 10,000 informal e-waste workers (Bloomberg, 2019). The Agbogbloshie e-waste recycling or dumping site is situated close to the Odaw River and the Korle Lagoon. It is also home to many factories, offices, and small businesses, closely linked to Accra's Central Business District. Workers here often collect discarded EEE from households, companies, and offices in Accra, and treat it on the site. It is estimated that the e-waste industry supports around 200,000 livelihoods across Ghana. There are reports of e-waste sites growing in Tamale, a city in the Northern region of Ghana (Grant & Oteng-Ababio, 2021).

Overview of Legal Framework

The number of countries with a national e-waste policy, legislation, or regulation has grown from 61 to 78 (Forti et al., 2020). The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was formed in 1989 in response to the export of hazardous waste to developing countries. The Basel Convention entered into force in 1992 (UNEP, 2011) with the objective to protect the environment and people's health against hazardous waste. This Convention aims to reduce the creation of hazardous waste,

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[4] https://ejatlas.org/conflict/agbogbloshie-e-waste-landfill-ghana

restrict the transboundary movement of it, and provide a regulatory regime under which its disposal can be managed.

In 2016, the Hazardous and Electronic Waste Control and Management Act (Act 917) and the Hazardous and Electronic Waste Control and Management Regulations (L1 225) were passed in the Parliament of Ghana. This Act provides a legal basis for the control on the trade and storage of hazardous waste.

There are numerous international and multilateral agreements that target waste. Ghana has ratified many of them, including the agreements shown in the table below (Amoyaw-Osei et al, 2011).

Table 3.2 International and Multilateral Agreements

International and Multilateral Agreement	Aim
The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	To reduce the movement of hazardous waste internationally, and to prevent the trade of hazardous waste from more developed countries to less developed countries
The Vienna Convention on Protection of the Ozone Layer	To provide a framework for international cooperation to reduce chlorofluorocarbons that damage the ozone layer
The Stockholm Convention on Persistent Organic Pollutants	To reduce and prevent the production of persistent organic pollutants
Montreal Protocol on Control of Substances that Deplete the Ozone Layer	To protect the ozone layer
The Rotterdam Convention on the Prior Informed Consent (PIC0 Procedure of certain Hazardous Chemicals and Pesticides in International Trade	To promote an international information exchange and shared responsibilities on the import of hazardous substances
ILO Convention on the Safety of Chemicals in the workplace	To promote the sound management of chemicals in the workplace

The Rio Declaration on Environment and Development – Agenda 21	To address sustainable development
Convention on the Prevention of Dumping of Wastes and Other Matter (London Convention)	To limit waste disposed at sea and generated on land

The Bamako Convention is an African convention that aims to ban the import of hazardous waste into Africa, and to control the movement of hazardous waste within Africa. Ghana has signed, but not ratified this Convention.

4. Existing research on e-waste

The first e-waste research was distributed in 1981, and by 2013, the literature on e-waste had grown rapidly (Gao et al., 2019). Most research on e-waste has been conducted on countries in Africa and Asia, and the majority of accessible e-waste research has been published in English (Gao et al., 2019).

General e-waste research has focused on the issue of child labour in the e-waste industry (ILO, 2014). E-waste studies have also highlighted how many of the individuals involved in collecting and dismantling imported e-waste are members of marginalised populations in their communities such as ethnic minorities, rural migrants, and immigrants. These people may engage in this dangerous work because of financial necessity, and the lack of training required to carry out the tasks associated with informal e-waste recycling (ILO, 2014).

Largely, the literature on e-waste has tended to focus on e-waste management. A review of the literature shows that lesser researched topics on the e-waste industry include mapping trade routes, cybersecurity concerns, and corruption.

E-Waste Research in Ghana

In 2011, a comprehensive assessment of the state of e-waste in Ghana was published (Amoyaw-Osei et al, 2011). This study showed that most of the EEE imports into Ghana comprised of second hand EEE. It discussed how even though the import of EEE contributed to increasing Ghanaian's access to technology compared to other African countries, second-hand products still have a shorter lifespan than new ones, creating an even higher generation of e-waste (Amoyaw-Osei et al, 2011). It was found that in Accra particularly

there was a heightened awareness of the environmental consequences of e-waste (Amoyaw-Osei et al, 2011).

Much of the research on e-waste in Ghana focuses on Agbogbloshie as a central hub for e-waste. A consequence of this is that Ghana's role tends to be magnified, as opposed to a holistic approach being taken, examining the entire route. The impacts of e-waste in a health and environment context, and the management of e-waste are heavily researched in Ghana, following global trends of e-waste research. In a study on the key drivers for and barriers to household e-waste management in Accra, Badu-Yeboah et al. found that survey respondents were highly aware of negative health consequences of informal e-waste recycling, corroborating the research that shows that e-waste workers health is likely to be affected by their work (Badu-Yeboah et al., 2018).

In another Ghanaian study on e-waste management in Ghana, Oteng-Ababio used in depth interviews and extensive literature review to assess management practices and to analyse the part the digital divide plays in the trade of EEE (Oteng-Ababio, 2012). This study found that a large portion of work in e-waste sites in Ghana was carried out by children and that displaced young people from the North of Ghana were involved in the e-waste recycling industry (Oteng-Ababio, 2012). This is in line with other research which suggests that migrants, people from the Northern parts of Ghana, and young people are heavily represented in the e-waste industry. Other researchers have confirmed this such as Carolina Rapezzi who determined that many workers at Agbogbloshie were migrants from the North of Ghana and rural communities who were looking for better jobs in Accra (Rapezzi, 2020). Much of the research on e-waste in Ghana highlights the inequalities found in those most likely to work at Agbogbloshie, although the implications of this and reasons for this are not always scrutinised in depth.

The literature also identifies some advantages in the import of e-waste for Ghana. For example, in a study on the health and environmental implications of e-waste recycling in Ghana, Amankwaa found that daily income of an e-waste worker was GHC 30, while the average wage was GHC 4.48 (Amankwaa, 2013). Amankwaa also highlighted the creativity of workers and initiative they had to see the opportunity to be found in e-waste recycling, regardless of the consequences (Amankwaa, 2013). Amankwah-Amoah suggested in a 2016 study on the effects of e-waste that while there was more work on e-waste in Ghana, it did

not create a complete picture of the situation because not every consequence of the e-waste trade is negative. He noted that due to this trade, sectors such as the repair industry and second-hand market had thrived (Amankwah-Amoah, 2016).

E-waste research in Africa

The research on e-waste in Africa generally tends to focus on e-waste management practices, this is in line with global trends. In a 2020 assessment of e-waste management in Sub-Saharan Africa, Maphosa at al. discovered that most of the research on e-waste management in Sub-Saharan Africa was undergone in Ghana, Nigeria, and South Africa (Maphosa & Maphosa, 2020). They also found that most African countries do not have the recycling infrastructure and policies to safely take care of e-waste, with disassembling, burning and acid leaching being the most popular ways to recover materials (Maphosa & Maphosa, 2020). Research shows that three of the most researched e-waste sites in Africa are Agbogbloshie in Accra, Ghana, Alaba dumpsite in Lagos, Nigeria, and Elukwatini in South Africa (Jibiri et al., 2014).

An emerging aspect of research on e-waste in Africa looks at cyber security threats. Doyon-Martin suggests that cybercrime is prevalent in countries such as Ghana and Nigeria, and the importing of e-waste is a major factor in this (Doyon-Martin, 2015). Doyon-Martin also theorized that a reason why the e-waste trade and cybercrime occurs to the extent it does in Nigeria and Ghana is that both countries use English as their first language, making trade easier (Doyon-Martin, 2015). The shipping of e-waste to West Africa has created cybersecurity challenges in many ways. One of these is how information left on hard drives can be accessed after computers have been discarded. There have been reports of information found on hard drives being bought cheaply from e-waste sites in Accra (Doyon-Martin, 2015). More African research on e-waste should examine the role of crime in this industry, and this study hopes to add to filling this gap in the literature.

5. Research Design

This report focuses on the trade of e-waste between the UK and Ghana. This route is significant because the UK is a major exporter of e-waste to Ghana. An investigation by the

Basel Action Network (BAN), a non-governmental environmental organisation, found that the UK exported the most e-waste in Europe, and this went to countries such as Nigeria, Ghana and Tanzania (BAN, 2018). Ghana was selected due to the presence of Agbogbloshie, the largest e-waste dump in West Africa, and the country's placement as a coastal country, allowing for a deeper examination of the maritime trade route, and how this is facilitated.

Site-based Method

The main aim of this report is to map the illicit e-waste trade route between the UK and Ghana. In order to do this, actors involved in the e-waste trade were grouped into 'sites' encompassing the stages of the cycle of electronics becoming e-waste. This approach, where sites were identified in order to build a picture of the e-waste cycle, allowed for the journey of e-waste to be plotted, and a deeper understanding of the complex interactions between key stakeholders with a range of interests to be shaped. Sites were identified through an extensive literature review on the actors involved in various stages of e-waste, and their responsibilities. During initial interviews, the question of which sites should be generated was developed further and moulded by answers interviewees gave about connections to other actors. At the final stage of the fieldwork process, an eighth site was added to the report. This site arose from a discovery of valuable metals being exported to countries outside of Ghana by interviews with workers at Agbogbloshie. The table below shows the sites that were produced in order to more easily map the trade of e-waste.

Table 5.1 Sites along the E-waste Trade Route

Site	Role	Details
Site 1	Manufacturers of EEE	This site was selected to act as a beginning stage for the mapping of an e-waste journey. The role of manufacturers in the movement

		of e-waste is little researched.
Site 2	UK Consumption	The consumption of electronics in the UK was included to show how individuals and companies contribute to how electronics are used, and where they end up
Site 3	UK Collection	This site involved several actors, such as individuals, recycling companies and charities, who gathered used or discarded electronics with different intentions for them
Site 4	Movement from UK Ports	This site concerned describing the motion of e-waste, used electronics, and new

		electronics from the UK to Ghana
Site 5	Collection in Ghana	Collection in Ghana illustrates who receives these products, and gives an idea of the actors facilitating the movement of Ghana's side
Site 6	Domestic Consumption	This site is especially important to the mapping of e-waste as many reports do not highlight the role of Ghanaians consumers in the local e-waste industry
Site 7	Treatment and Disposal	The function of this site is to distinguish between the activities of informal and formal workers, and the impact this has on the

		industry as a whole
Site 8	Scrap Metal Export	The final site or stage of the mapping of this route for this report's purposes came about as interviewees in Site 7 spoke of a common practice of exporting scrap metals to countries such as China and India

At each site, representatives were asked about what they thought their role, or their institution's role was in the e-waste trade. They were also asked about their perceived responsibilities and how they interacted with other actors both domestically and internationally. Additionally, they were questioned about what they believed drove the e-waste trade between the UK and Ghana. Some sites had more representatives than others because of issues of access and availability. Both convenience and purposive sampling were used in this study. Convenience sampling describes selecting and approaching accessible research participants. As the research was conducted in Accra, Ghana there were several individuals and institutions based in Accra that were willing to participate in the study. At the beginning of the three-month research period, individuals likely to be relevant to the study were selected. By the end of the study, 44 individuals and representatives of institutions had been interviewed, and competed qualitative questionnaires.

A mixed method approach compromised of semi structured interviews and qualitative surveys was taken in this study. Semi structured interviews gave a narrative approach to the study, centring the experiences of those directly involved in different aspects of the e-waste

trade. Each participant was interviewed, with interviews ranging from 10 minutes to 2 hours, and was asked to complete a 10 question qualitative survey either before an interview, or during it. Survey questions can be found in Annex A at the end of this report. Interviews questions were used to build upon survey answers and to improve the accuracy of findings.

Interviews were conducted over Zoom, Skype, WhatsApp, or in person, depending on the availability of each interviewee. Interviewees were based in a range of countries including the UK, USA, the Netherlands, Ghana and Togo. While most interviews were held virtually, some were organised in person. In these cases, all COVID-19 protocols were observed. The organisations included in this study are stated, but representative's names are anonymous. The names of individuals have been changed for the purposes of this study in order to keep them anonymous.

First hand observation at Agbogbloshie was used to gain a better idea of the impacts of e-waste. Agbogbloshie and its surrounding areas were visited a total of four times over the three-month research period.

Data Analysis

The software, NVivo, was used for the data analysis component of this research. Thematic analysis was conducted to discern patterns in qualitative data and identify common themes from the interviews and surveys. (Clarke, 2003). Themes such as poverty, unemployment, exploitation, and a misunderstanding of trade routes were revealed from the data.

Limitations

This entire study occurred over a three-month period, meaning that a strict fieldwork schedule had to be observed. This limited the number of actors who could be interviewed due to time constraints. More interviewees would have given a better understanding of the roles and responsibilities of actors.
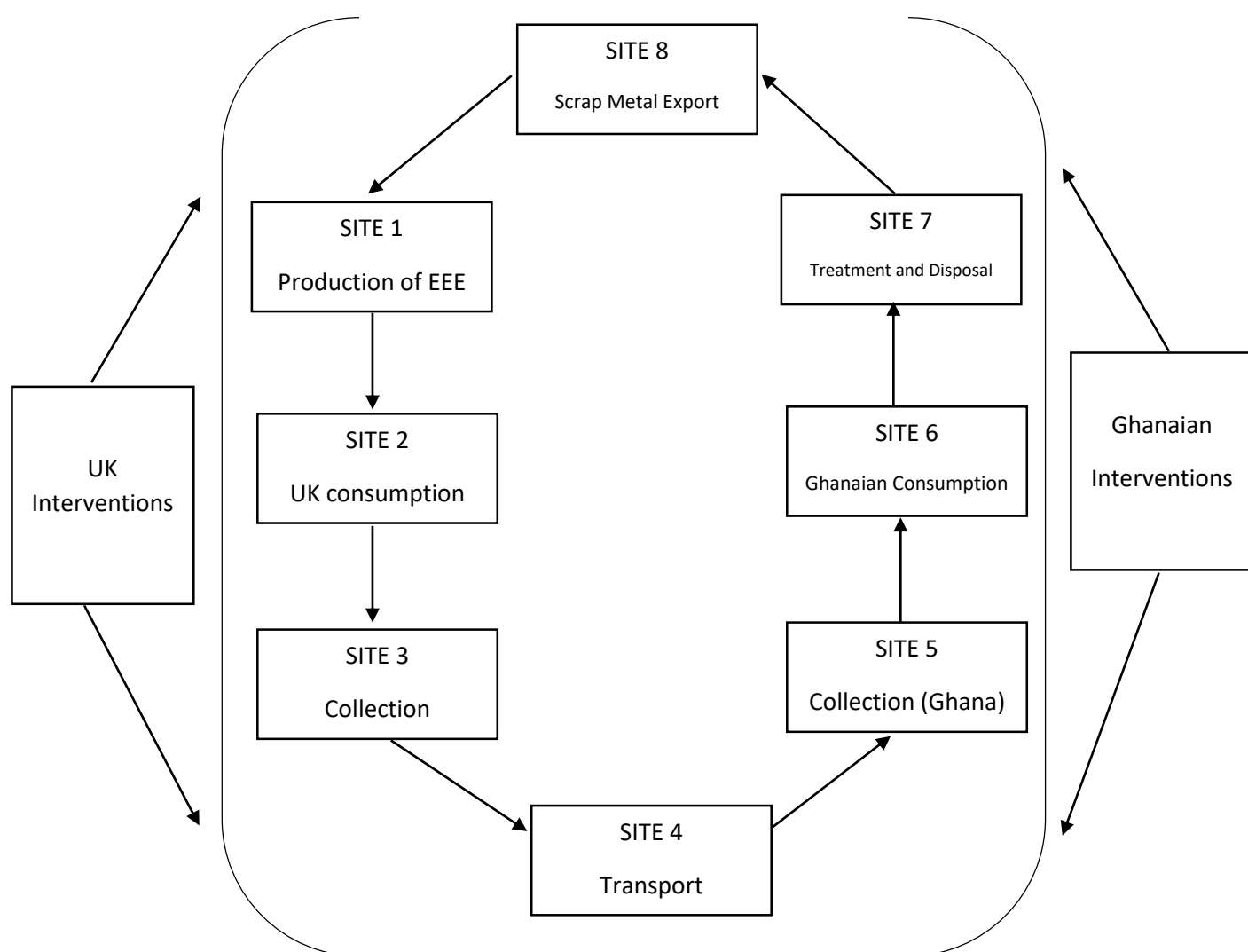
More so, due to factors such as the pandemic, lack of digitisation, and time constrictions, it was difficult to get up to date and reliable data on the import of used electronics into Ghana.

The research method used meant that individuals interviewed, especially representatives of companies, may have felt more inclined to discuss more positive aspects of their business activities.

6. Findings

Three research questions were introduced at the beginning of the study regarding mapping sites along the e-waste trade route, characterising the illicit aspect of the trade, and determining the main drivers of it. Findings were drawn from both interviews and surveys to answer these research questions. The movement of new and used electronics has been described in several ways in research, including as a 'chain' and as a 'life cycle'. The findings of this report generated a cyclical movement of new and used EEE that ends up as e-waste, shown by the diagram below.

Figure 6.1 Movement of EEE

SITE 8
Scrap Metal Export

SITE 1
Production of EEE

SITE 7
Treatment and Disposal

UK
Interventions

SITE 2
UK consumption

Ghanaian
Consumption

SITE 6

Ghanaian
Interventions

SITE 3
Collection

SITE 5
Collection (Ghana)

SITE 4
Transport

In this diagram, the production or manufacture of electronics is directly connected to the export of scrap metal because the scrap metal found in e-waste is exported outside of the country, and can be used for to manufacture more electronics, that may eventually be sent to countries such as Ghana, creating a cycle. On either side of the diagram, UK and Ghanaian interventions represent the various monitoring, enforcement and awareness raising institutions that play a part in trying to reduce e-waste flows.

Within the e-waste cycle shown above, are waste chains that link sites to each other, and show the complexity of the journey from site to site. Electronics, and e-waste pass through many individuals and groups, making it difficult to map this flow, and the actors involved at every stage. A representative from the National Crime Agency UK described this as, "*waste chains are so convoluted… I have seen waste chains 15 links long… you end up with a network of waste going in all different directions…"*. Participants were asked to describe the organisation or structure of the illicit e-waste trade between the UK and Ghana and interviewees gave nuanced responses to the question of how they perceived the structure of this trade, with most interviewees describing the structure of this trade as 'loosely organised'. A representative from the Scottish Environment Protection Agency detailed their ideas of the organisation of the illicit aspect of the industry by comparing it to other waste streams, "*to say it's organised crime I think is overstating it. It is quite loosely organised based around certain individuals. It's not a big organisation that's involved in this. It is not like other waste streams"*. A representative from the National Crime Agency UK outlined the lack of a perceived hierarchy within the structure of the e-waste trade, commenting that "*I never saw them with an individual above that was coordinating them… with an organised crime group you would get a chain of command and I never saw that"*. Fewer interviewees characterised the structure of the e-waste trade differently and as more organised, expressing that it was likely challenging to point to people controlling criminal activities. A Representative from INTERPOL (Ghana Office) pointed out that *"there could be 'big wigs' that are behind this, with criminality usually the big people do not show their faces, they always have the small agents going on so it could be a whole syndicate… it could be like that"*.

The findings in this chapter will detail the significance of each site, how the illicit aspect of the e-waste trade is characterised in reference to that site, and the drivers mentioned by engaged actors.

Site 1: Manufacturers of EEE - Production

Production constitutes the beginning stage of the cycle of e-waste in this study. It was selected as the first site because of the role manufacturers play in creating electronic equipment that will later need to be recycled or disposed of. Within the electronics industry, consumer electronics contribute to most of the growth in this sector (Investopedia, 2020). There is not much accessible research on the role of EEE manufacturers in the e-waste industry, but the awareness of actors in this stage of the movement of the goods they make is important in understanding the life cycle of electronics, and what drives manufacturers.

As part of this research, two computer hardware manufacture companies based in the UK were interviewed. One representative described the role of manufacturers in the journey of e-waste as '*critical*'. When asked about the importance of manufacturers of EEE, both interviewees described it as belonging in the beginning stages of the trade of e-waste, with representatives providing differing answers on where exactly in a cycle of e-waste manufacturing could be placed, with one manufacturer saying, "*I would not agree that we are the first site in this trade, consumers provide the demand for our goods and people provide the resources and metals used to manufacture computer hardware*". Manufacturer 2 underlined the importance of manufacturers as the first step in a cycle of e-waste by bringing up the knowledge necessary to facilitate EEE production; "*EEE producers or manufacturers are at the beginning of the life cycle of EEE you described because we have the technical knowledge that quite literally creates these products*".

In both interviews, representatives mentioned that the significance of their site is as the originator of technical innovation, using raw materials to supply an increased demand for electronics, and more specifically computer parts, due to the pandemic, with one manufacturer saying, "*manufacturing of EEE is important because it really is the site of technological innovation in my opinion. We play a part in creating these standards that regulatory bodies need to assess in order to keep up with how the electronics industry transforms so rapidly, especially now during the pandemic*". Both representatives from computer hardware manufacturing companies were asked how aware they were of where

their products ended up after being discarded. They provided assurances that they complied with the necessary regulations, but both could not say in which countries or in what form their equipment was discarded in, "*Computer manufacturers need to take on more responsibility to have a better understanding of where our equipment goes, it is difficult to keep track of this though as many of us in this industry only provide parts, and a lot of this recycling is outsourced.*"

The common responsibility that representatives perceived for themselves was complying with regulations. One representative mentioned that it was important to make sure customers had information on how to use EEE safely, but that the government had a bigger role in spreading awareness, "*We definitely have a legal responsibility to comply with all regulations, but I think spreading awareness is key and while of course we can help with that, other bodies have a much bigger platform to make consumers aware of these issues*".

An analysis of this site showed that EEE manufacturers are most linked to consumers who purchase their products. Also, this site is linked with the final site of this study, scrap metal export. This is because materials found in e-waste are often shipped to countries that manufacture EEE for reuse. This will be explored in the discussion of Site 8. Ghana does not have a domestic EEE manufacturing industry, with a representative from Ghana's Department of Factories Inspectorate (DFI), theorising that the import of new and used EEE, and e-waste could be a factor suppressing local manufacturing, "*Ghana's potential local manufacturing may be disturbed by the high imports of EEE coming into the country, production, and the question of who is producing, has an impact on e-waste and deciding where it ends up*". Actors in this site did not show much awareness of the final destination of their products.

Actors in this site showed a strong link to regulatory bodies.

On the drivers of the e-waste trade, both representatives from UK based computer hardware manufacturing companies, mentioned the need for second hand goods in developing countries as encouraging flows of e-waste.

Site 2: UK Consumption

Two representatives from computer shops in the UK were interviewed for this study. Through a representative from one computer shop, five buyers were interviewed to better gauge the awareness consumers have of issues related to e-waste. The role consumers of EEE play in the cycle is vital. Consumers choose when to purchase new products and when to either repair or discard their products. They also decide on methods of disposal. Consumers recognised that they influenced trends with six out of seven interviewees expressing the belief that consumers play the largest role in shaping the technology industry;

Hakeem (Computer Reseller): I believe those of us buying these goods, whether to resell or for personal use, play a role because we do influence buying trends and ultimately make the choice of how to dispose of whatever we have. I do repairs at my shop and encourage people to repair whatever they buy from me so it lasts longer

Leticia (Buyer): I'm a student so I buy second hand laptops. I do try to get them repaired but find the wait time to repair laptops a bit long, honestly it's easier for me to buy another laptop… I usually need to buy a new laptop every two years

When asked about where they thought their discarded EEE end up, five out of seven of those interviewed said they assumed it was formally recycled in the UK. One consumer who regularly buys EEE for his large household commented that it was easy to feel disconnected from the reality of waste issues, "*E-waste doesn't have a smell, I don't see huge piles of e-waste on my street, so I guess I would be less bothered about that than food waste for example which always has a smell. What I mean to say it is easy to ignore e-waste when you are not necessarily confronted with it. It feels like a problem that is shipped away neatly and dealt with elsewhere*".

Participants were asked about the responsibilities they have from their point of view. All participants said that their perceived responsibilities were to be aware of environmental issues and half of the participants said it was the consumers' responsibility to dispose of their products.

Most actors in this site expressed that they thought discarded EEE was recycled safely in the UK. This shows a lack of awareness of the export of e-waste from the UK to other countries,

which also has implications for who carries the moral burden of the harsh environmental consequences of EEE manufacturing and disposal. These findings show that consumers do not necessarily share the blame or feel they play a major role in e-waste being exported to developing countries, especially as they exhibited a low awareness of e-waste disposal and recycling sites. This lack of knowledge of how e-waste is recycled and by whom could be attributed to both the complexity of chains linking sites, UK consumers not being met with the reality of the impacts of e-waste in the same way that consumers in Accra who have seen areas such as Agbogbloshie first hand have.

Actors in this site seemed to be disconnected from actors involved with the collection of EEE, and those recycling it, both formally and informally. They seemed most aware of manufacturers of EEE, retailers shipping EEE around the world, and charities trying to increase people's access to the internet and consumer electronics. One frequent buyer expressed his knowledge of e-waste, saying, *"I am aware of how e-waste moves, and the popular brands such as Samsung and Apple, but wouldn't be able to tell you how it is recycled, no, I'm sure it's complicated though, tech is hard to get into".* Most actors said they did not know how to properly dispose of discarded EEE and prefer to either keep or give away old consumer electronics.

On the drivers of the e-waste trade, five of the actors of this site mentioned second hand goods being sent to other countries as the most important factor. Two participants brought up the short lifespan of EEE as likely contributing to e-waste flows, with one buyer saying, *"Nothing lasts anymore, especially the new stuff like Apple (electronics brand)".*

Site 3: UK Collection

Several groups are engaged in collection activities. This includes recycling companies, charities that collect EEE to donate within the UK or to be exported to other countries, people who collect discarded EEE in order to resell them in other countries (waste tourists), scrap dealers, and groups engaging in illicit activities. It is at this stage that illicit activities begin to more clearly have a role in the e-waste trade. When asked about the illicit activities that occur at this stage, a representative from the Scottish Environment Protection Agency expounded on the types of recycling and disposal activities that can be classified as criminal

in the UK, *"Falsely claiming recycling reuse evidence, landfill avoidance, obviously if you are shipping waste to Africa you are not having to pay for landfilling or processing here"*. Individuals and groups involved with the illicit aspect of the e-waste trade are active here too. Findings showed that the main actors facilitating this trade were individuals and small groups. A representative from the National Crime Agency, UK explained this further, noting, *"what I've seen is it being individuals, small groups of two or three sometimes, and of course friends or associates trying to come together to make money or families trying to come together to make money and then seeing an opportunity to make money through an import/export of a commodity"*. A representative from the Basel Action Network, an NGO aiming to stop this toxic trade, commented on the possibility that expats are involved in the collection stage of this trade; *"It's not a massive one flow, its dribs and drabs of all kinds of traders doing different things from different parts of Europe primarily, I do believe it's mostly from Europe and a lot of expats… like people between the UK and Ghana have gotten into the business of sending electronics"*. Individuals, groups and companies collecting these products, are likely to have knowledge of how they are shipped to Ghana, and to be involved in this process with intentions for what happens when products reach Ghana.

The diversity of actors with different goals for discarded EEE is an important aspect of this site. These various groups are responsible for the management of discarded EEE and determine the movement of EEE to another stage.

A representative from Close the Gap, an international social enterprise that provides computers donated by European companies to developing countries in order to help bridge the global digital divide, commented on the complexity of the movement of second hand EEE in the cycle of e-waste.

Close the Gap: Yeah, I think the biggest concern for us in working with clients thousands of kilometres away… it can be difficult to assess whether computers we offer to a local partner effectively end up at a school or a health institution of an NGO, and not necessarily at a local commercial business… we're trying to get by asking for our partners to provide lists with equipment and where it ended up… there is a fear but no fact to confirm that fear

As part of the research on this site, an individual known as Kwame was identified and consented to an interview. Kwame, a young person of Ghanaian descent working in the UK,

described how he collects old phones and laptops from friends and family, connecting with them through social media, and sells them to people in Ghana through his Instagram and Twitter accounts.

Kwame: I think collection is important because of the fact there are so many different people involved in this aspect of this industry, from individuals to businesses. I collect used laptops and iPhone as a side hustle, it's easy over social media… If you collect, I'm not sure if where it ends up is on you, but I am technically recycling

Several recycling companies can be involved in the recycling of the same products. A representative from the UK National Crime Agency commented on this chain of waste collection saying:

What we would see is we would refer to it as a 'waste chain' so we have a waste producer, and they would enter into a contract with someone to take their waste, but that individual would then sub contract that, you might sub contract again and again and again… suddenly you end up with lots of people in this chain disposing of this, or handling, or moving this waste… somewhere down that line somebody sees the opportunity to make money because they have been paid to dispose legitimately in the UK or Europe, but actually they can ship it to Africa very cheaply

A representative from a Surrey based recycling company pointed out that in the collection phase, waste can be split up as not all formal recycling companies can treat every part of EEE, making the process more convoluted.

Every participant involved in this stage of the study said that they were aware of how EEE becomes hazardous e-waste after being disposed of, and the potential health and environmental consequences of this, with a representative from a Surrey based recycling company explaining that "*at this stage, collectors are deeply aware of how e-waste is generated and the impacts* ".

Different groups of collectors expressed varied ideas of their role in the e-waste trade. Both recycling companies perceived their responsibilities to be to meet all quality standards and follow environmental regulations for proper e-waste management. The collector who was

interviewed believed that his responsibility was to help second hand goods be recycled by giving them a second home with people who need access to more affordable products.

An analysis of this site shows that actors operating both legally and illegally become involved with the e-waste trade at early stages. A representative from the UK Environment Agency commented on this by saying, "*There's probably a bit of a range and there will be people who are just trying to help and send things they do not perceive as waste and they want to help and support and there are probably others who know they are getting round legislation and it's not the ideal way for those items to be treated and they should ideally be treated in the UK… some of it is almost illegal trade but then they maybe not quite looking at the waste regulations as strictly as they should do… there are probably other actors using it as a cover for money laundering*".

In the research concerning e-waste, waste tourists, people travelling internationally to collect e-waste and ship it back to their home countries illegally, are mentioned substantially. However, this report found that that term is likely outdated currently, a representative from the Human Environment and Transport Inspectorate detailed this*; "I believe that small groups and family businesses are going on… mainly organised... what you see is that there are individuals but mainly communities are working on a family relationship or friendly relationship. You don't see waste tourists anymore, what you see is family related business or people who know each other from the communities*".

Most of the participants in this site stated profit was the main driver of the trade. Participants used other terms when discussing this such as 'money and 'economic factors' and described a number of profit-making opportunities driving this trade. These included formal recycling companies in the UK looking to cut costs by shipping e-waste to Ghana and individuals or groups taking advantage of e-waste for profit.

Site 4: Movement from UK ports

As part of the investigation on this site, several entities were interviewed and completed qualitative surveys. These were the Port of Felixstowe in the UK, the British Ports Association, one door to door shipping company, and one freight forwarder based in Ghana. Door to door shipping services ensure that products are picked up from and delivered to a specified location such as a household or office. UK ports are a major exit site for second

hand goods that become e-waste or for e-waste itself. Interestingly, the UK actors interviewed as part of this site did not discuss collaboration with Ghana's ports. The significance of shipping companies, individuals and groups who ship without formal registration of their businesses, and freight forwarders lies in facilitating the movement of EEE and e-waste, as described by GoExpress, a door to door shipping company operating between the UK. On ports as a site on the journey of e-waste, the following statement was made:

The Port of Felixstowe is primarily a container port where we do have first-hand dealings with the container, we do not have first-hand dealings with the contents in a container. The exception to this is if one of the authorities have pulled the container for an examination.

Therefore, ports also act as a site for examination by and collaboration with relevant authorities.

A representative from the British Ports Association explained the role ports play in the e-waste trade, indicating that they do not have authority over containers, "*Ports generally don't have any authority over cargoes that pass through them – the UK 'open port duty' means that ports cannot discriminate against vessels on the basis of the cargo they are carrying. If it is in containers they may not even be aware of what is in them. Ports may therefore play a role in facilitating the trade of e-waste but only in the same way as they do any other legitimate cargo. Ports are generally independent commercial entities. They will work closely with government agencies and authorities such as Border Force but they are not public bodies themselves.*" The UK is distinct in that almost 70% of tonnage is handled by private ports due to a greatly privatised port system[5].

Ports are facilitators of movement and the use of social media in this process came up during interviews. A representative from a door to door shipping company pointed out that they operate mostly over social media, and use apps such as Instagram and Facebook to run their door to door shipping business, *"it's easier to run this company over social media and most of my customers can be found on Instagram. App advertising means you connect with*

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[5] https://www.maritimeuk.org/about/our-sector/ports/

people quickly and can take pictures of things to send them, in my case it's laptops, phones and microwaves recently".

Two out of four of the participants included in the investigations of this site showed an awareness of e-waste being dumped in Ghana, and other countries.

Ports perceive their responsibilities to include collaborating with other agencies and enabling the movement of containers a representative from the Port of Felixstowe explained this as, *"our responsibility as the Port is to load and unload to/from the ships (or trains and haulage for inland movements)".* This is relevant because responsibilities to the environment were not mentioned.

When examining this site, the value of maritime routes in the e-waste trade between the UK and Ghana arose. According to an INTERPOL (Ghana office) representative, it is important to focus on the maritime route due to the size of the ships being a critical factor in allowing shipments to occur. A representative from GoExpress described how cheap it was to ship from the UK to Ghana, "w*e use container shipping because it is the most cost-effective shipping method".* In addition, a representative from the UK Environment Agency discussed the significance of the maritime route for e-waste flows, specifically between the UK and Ghana and how items besides electronics are shipped to save costs, "*there is obviously a well-established trading route… and when you ship a vehicle maybe they offset the cost of that by loading the container with clothing as well as electrical equipment".* West African road networks also came up as an important aspect of smuggling routes for e-waste, especially between Ghana and Togo with an INTERPOL representative commenting*, "it usually comes by ships, but what we know is that when it has been stopped in Ghana somehow, they will now get it to maybe Togo and from then transport it in vehicles in Ghana".*

Questions of whether the movement of e-waste and EEE from the UK to Ghana concealed other crimes emerged from interviews as well. A representative from the National Crime Agency UK mentioned that the illicit aspect of this trade can involve '*poly criminality'*, illustrating the link to other crimes, "w*e would also on occasion see other types of poly criminality so you would see things like high value stolen motor vehicles at the back of shipping containers surrounded by e-waste".* When discussing the illicit aspect of this trade,

institutions had different opinions on whether the illicit e-waste trade obscured other crimes such as money laundering or drugs trafficking. All interviewees at this site said they could not provide evidence that money laundering and drugs trafficking could occur through the movement of e-waste, though some expressed their suspicions that this was the case. A representative from the Economic and Organised Crime Office in Ghana said it was a possibility that trade based money laundering was being concealed by e-waste trade operations due to the complicated logistical network provided.

Investigations into the movement of e-waste from UK ports also raised the significance of Ghana's colonial history. Three institutions brought up this up and shared the common use of the English language as a contributor to the e-waste trade between the UK and Ghana.

Representative from Human Environment and Transport Inspectorate: What we have seen in the past is there is always a link to the colonial times… it is linked to communities living in the countries… language is an issue… if we speak about UK trade you see more going to Nigeria and Ghana than to Senegal and Cameroon for example, the trade from France would be completely different… language is one of the things that play a role

Representative from National Crime Agency: A very high percentage of e-waste went to Nigeria and Ghana… it was a guy that I got to know in Ghana who told me, and this makes perfect sense, that the reason it went to Ghana and Nigeria is because they historically were British colonies and they work on a 240 volts' electricity system so they have a 3 pin plug so e-waste in the UK can be plugged into the electricity system in Ghana and Nigeria.

Therefore, the movement of e-waste and EEE from UK ports is not only facilitated by ports and shipping companies, but by Ghana's historical links to the UK.

Actors were asked about the drivers of the e-waste trade. Two representatives described profit seeking by individuals selling electronics in Ghana or companies avoiding high formal recycling costs as pushing the trade. Representatives from the Port of Felixstowe and the British Ports Association did not comment on the drivers of the e-waste trade to Ghana.

Site 5: Arrival at Ports and Collection in Ghana

Representatives from Ghana Customs Excise and Service, Ghana Ports and Harbours Authority, Port of Tema, and the Ports Environmental Network Africa (PENAf) were

interviewed at this site. This site maintains links to shipping companies and consumers in Accra who collect their goods from the Ports. The site is the entry point for second hand and new goods that can become e-waste and most e-waste itself in Ghana. Findings also showed that e-waste does not go straight from ports in Ghana to e-waste dump sites, but individuals, groups and companies pick up whatever is delivered. A representative from the Ghana Ports and Harbours Authority described this process as, *"people bring these items, take it to the market to sell, people buy them and when they stop functioning they throw them away, and people go around collect these discarded items and try to retrieve materials from it. So it is not true the cargo arrives at the port and is driven straight to a place and they open it up and start burning".* There is a misconception that e-waste arrives in Ghana at the port and goes straight from the port to Agbogbloshie to be recycled unsafely. It is not uncommon for research to describe a situation similar to this. An example is found in an article describing how second hand items arrive to the port of Tema, and are offloaded, sorted, dismantled and traded to scrap metal dealers based in Tema, and whatever is not sold in Tema is taken to a dump site (Rapezzi, 2020). However, it is not as simple as waste arrives at the Port and gets traded in Port cities.

This site is one of collaboration and has little power to stop shipments. A representative from the Ghana Ports and Harbours Authority explained this saying, *"we are willing to collaborate with all agencies to stop this country being used as a dumping ground for electronic waste… what powers we don't have is stop anyone's shipment. Only Customs can say this item cannot be imported."*

According to the Ghana Ports and Harbours Authority, Ghana's ports have not yet confiscated hazardous waste brought into the country, *"the only cargo that stays here is cargo that Customs says you cannot clear… when you go to search where we keep those things you will not find e-waste there… I have never seen Customs prevent the clearance of used electronics".* In another interview, a representative from the UK Environment Agency also discussed how Ghana has never sent a shipment of e-waste back to the UK, even though the costs of this would be covered by the UK. Several studies have shown that e-waste definitely does enter Ghana, so this could disguise issues such as a lack of collaboration between UK and Ghana ports and enforcement agencies, or corruption. Corruption as a contributing factor to the e-waste trade between the UK and Ghana was

alluded to in some interviews, but never specifically mentioned. The complexity of the e-waste industry in Ghana and the UK certainly creates the space for corruption to occur. Bodeen argues that corruption is what permits the flows of e-waste (Bodeen, 2007). Within the e-waste trade, opportunities for corruption usually arise first in the exporting country. Corruption can happen in recycling companies that do not check whether used electronics are working or mislabel them intentionally to avoid recycling costs. Corruption also occurs in importing countries where there is an incentive to accept bribes to allow waste to enter the country.

While the UK was mentioned as a major exporter of e-waste, the Ghana Ports and Harbours Authority also identified Belgium as an important source of e-waste export, Antwerp in particular. A representative from the Ports Environmental Network Africa (PENAf) said that during his research most of the imports were from the UK, followed by the United States, then Italy, Germany and France, with negligible quantities coming from other African countries.

A representative from the Port of Tema also described the significance of the collection stage of the trade of e-waste as a site where port officials, the Ghana Environmental Agency, the Ghana Ports and Harbours Authority and other agencies collaborate. This representative described the cooperative activities between port officials and Ghana's Environmental Agency as necessary to enforce regulations, "a*ctivities include ensuring that consignments which require the Agency's prior consent to being cleared from the Port have the requisite approval. All consignments containing electronic goods have to be declared on the Integrated Customs Management System (ICUMS) platform and an eco-levy fee paid on them in order for them to be cleared".* The role Ghana Customs plays in this site adds to its significance as they play a monitoring role. This means at the 'collection' site, a regulatory aspect is introduced. There is a high awareness of e-waste and where it ends up at the 'collection' site. Both representatives from the Ghana Ports and Harbours Authority and the Ports Environmental Network Africa mentioned training as a vital part of a building of awareness. A representative from Ghana Customs described their perceived responsibility as, "*responsible for clearance of imports and exports from the Ports, Harbours and Land borders ".*

Interviews at this site revealed the main smuggling methods by which e-waste is brought into Ghana, further characterising the illicit aspect of this trade. Interviewees were asked what the main methods through which smuggled e-waste entered Ghana were with the general consensus being that e-waste usually enters Ghana mixed with other items.

Representative from INTERPOL: Most of what we have seen has been mixed with other items

The main smuggling method was determined as e-waste entering the country as personal effects (personal belongings) with a representative from Green Advocacy, a Ghana based organisation detailing their experiences*; "You would find that used or fairly obsolete equipment will come from other parts of the world, especially Europe, would come to Ghana in the name of donations or personal effects".* Three institutions interviewed mentioned e-waste was coming into Ghana specifically as donations by individuals or charities, with the Ghana Ports and Harbours Authority discussing this further by making clear that depicting all these donations as 'waste' is not entirely accurate as some of it is repaired, refurbished, used before it becomes waste. Additionally, a representative from the Ports Environmental Network Africa (PENAf) described the smuggling of e-waste into Ghana as occurring through misclassification or mislabelling of goods. A Tema port official went into more detail about the smuggling of e-waste into Ghana, portraying it as occurring intentionally, *"concealment in heterogeneous consignments and the deliberate misdescription of items in the container during the declaration stage".*

Three out of four institutions interviewed as part of this site highlighted profit as the major driver of the e-waste trade between the UK and Ghana. A Port of Tema Official explained the profit motive, stating that*, "waste traffickers are looking for profit that can be made through several ways. This can be through being paid to collect e-waste and ship it to West Africa and collecting e-waste or second hand goods to be sold in Ghana".*

Site 6: Domestic Consumption

Three Ghanaian computer resellers and two representatives from offices based in Accra, Ghana were interviewed at this site. A computer reseller in Togo was also interviewed. Data showed that domestic consumption is most linked to the treatment and disposal of e-waste. This site is as a facilitator of movement to Agbogbloshie and the same equipment can be

used by many different individuals before it is finally discarded. People who operate as consumers of EEE, second hand EEE and e-waste decide what happens to their products after they have used them. There are multiple actors in this site. It also includes people who sell EEE in markets all over Ghana. One computer seller interviewed worked to sell used computers on Oxford Street, a lively street in Ghana popularly known for many businesses operating both informally and formally.

Oxford Street Computer Reseller: I work with a friend in the UK who sells me batteries, chargers and screens from second hand computers there. He ships them over and they're all working. I mostly sell Dell laptop parts; Apple laptop parts are too expensive… I do work with people who assist at big electronic shops such as CompuGhana who refer customers there to me if they want computer parts cheaply… Resellers like me do contribute to this waste problem because I do pass on some non-functioning things to boys who may work at Agbogbloshie.

In his interview, this computer reseller mentioned that he sends some equipment by road to Togo. The Togo based computer reseller described this movement, "*we do receive some goods from Ghana such as computer and phones that we can resell here but I am not familiar with what happens to it after it goes to people's homes*".

Four out of five of the individuals interviewed as part of this site were aware of the e-waste trade, Agbogbloshie specifically and of the health and environmental consequences of e-waste

Labone Corporate Office: Yes, we are aware of the e-waste trade and everyone knows Agbogbloshie and the environmental issues present there. I do not know if there are companies who go office to office to maybe donate computers, fridges and more that we don't use anymore. I am not quite aware of what happens to things like that actually but they probably just get dumped.

The actors at this site who were included in this study gave differing ideas of their perceived responsibilities. Three computer resellers said that they were responsible for selling functional goods, with one mentioning he felt a responsibility to make sure customers knew how they could repair computers he sold them. Both office representatives said they felt a responsibility to make sure computers and other office electrical items were looked after

carefully and used as much as possible even when new equipment was released. *A Cantonments Law Firm outlined this by explaining, "I think we are responsible for taking great care of everything we use in this office, so we are responsible for what we have here".* No participants mentioned being responsible for the safe recycling or disposal of their EEE.

Ghanaian domestic consumption plays a major role in the flow of e-waste and this is overlooked in much of the research. Findings showed that most e-waste is collected from individuals, businesses, and households around Ghana, and not necessarily in Tema by people trading with foreign businesses. Computer resellers, Refurbishers, legitimate businesses, and more are involved in this flow. A representative from the Ghana Ports and Harbours Authority asserted that electronics have always been collected from the Port of Tema. This report seeks to address this misconception by including the reality of domestic consumption in Ghana and highlighting the fact that e-waste does not always enter Ghana as waste but can be generated through imported new and second hand EEE. This idea that second hand EEE enters into the waste stream is supported by Grant and Ababio who discovered that at the time of their research, 80% of used computers entered into the e-waste stream sooner rather than later and was the largest component of the e-waste steam (Grant & Oteng-Ababio, 2012). In 2012, a UNEP report based on data from Benin, Ivory Coast, Ghana, Liberia and Nigeria, found that domestic consumption made up around 85% of e-waste produced in Africa, with the import of used electronics, as opposed to e-waste itself, driving the production of e-waste in Africa (UN, 2012). This supports this report's stance that domestic consumption cannot be excluded as a site of e-waste generation.

The majority of participants identified profit as a leading factor in the e-waste trade, with two out of five interviewees saying the short lifespan of EEE was the main issue driving this trade.

Site 7: Treatment and Disposal

This site includes both formal and informal recyclers in Ghana. A representative from a formal Accra based recycling company, Dispose Green, was interviewed alongside three workers at Agbogbloshie Scrapyard, and two workers who collect e-waste from households in Accra and then dismantle them using unsafe methods. It is at these sites that the treatment of e-waste occurs through many different methods. Informal recycling sites and formal recycling sites interact closely as formal recycling companies sometimes collect e-

waste from informal workers in order to treat safely. Actors from a range of other sites such as computer resellers and repairers were also seen to scavenge for parts from informal recyclers. At formal recycling companies in Ghana, it is their job to collect e-waste and other forms of waste and recycle them in a sound manner. There is a stark difference between formal recycling companies and informal recycling sites in Ghana. Formal recycling companies visited in Accra, had offices, employee uniforms, cleaners, equipment, and large outside storage spaces. Informal recycling sites and centres lacked these facilities, operating outside with no protective equipment. The Department of Factories Inspectorate, an institution in Ghana that enforces health and safety regulations, detailed their activities concerning formal and informal recycling companies, "w*e enforce safety regulations but we struggle to do this at all recycling centres because a business needs to be formalised before we go there. We can only advise informal recyclers so we do that but they need to register their businesses and meet those certain requirements before we can do more".*

At a recycling site at the Agbogbloshie Scrapyard, funded by German organisation, GIZ, cables are collected and workers are paid for giving in their cables for safe recycling or stockpiling with the intention of recycling at another point. It is in the surrounding area that the health and environmental consequences of the e-waste trade and interventions by organisations can be seen and felt the most. An Informal worker at Agbogbloshie described the health effects of his work, saying, *"I know many people who have had health issues by working here, like coughing and other issues like that. I don't think things have changed in the last ten years. I have been here since 2003 and while the burning has been going down the effects are still there".* At the Agbogbloshie Scrapyard a worker estimated that 70% of cables collected and brought to the site are now being safely recycled due to interventions by GIZ, Green Advocacy and other institutions.

Agbogbloshie is also a site where many actors in this trade converge.

Interviewer: When these products come into Ghana, how do they get to you here?

Representative from Agbogbloshie Scrapyard: This is the big scrapyard, and we have people using bicycle, some are using tricycle, some are using trucks and some used to enter cars around town looking for scarps. Whatever you buy and it's spoiled in your house, you will sell

it to them… they go to houses and shops asking for scraps and they sell it to them, they dismantle it removing the iron from the plastic.

Furthermore, social inequalities in Ghana's society are clearer here than at any other site. A worker narrated the experiences of people working at Agbogbloshie, "*most of the people here have no other job. They say Accra has the best jobs so a lot of us come from elsewhere but it is still hard*". E-waste research suggests that migrants from the North of Ghana and surrounding African countries make up the majority of people at Agbogbloshie (Amankwaa, 2013), and this was evident during fieldwork.

All participants interviewed at this site were aware of the e-waste trade, and the impact of it on Ghana, with a worker illustrating the experiences of those making a living there by saying, "*they know, even those burning it know it's bad, but you can't stop someone from doing what they're doing, unless you find a job for the person. That's why this is still ongoing. If you watch social media, people are complaining about that if you want them to stop you need to find jobs for them*

At this site, formal recycling companies viewed their responsibilities as registering their businesses, using safe recycling methods, following regulations and creating awareness of the health and environmental consequences of e-waste. Individuals engaged in informal recycling all said that their responsibilities were to provide for their families. The differences noted between these responses show the variance in livelihoods and priorities between employees at formal recycling companies and those working informally. Formal companies were more likely to follow regulations as expected, whereas informal workers were mostly concerned with surviving and sustaining their families. Ghana is faced with a high unemployment rate which especially affects young people. As of 2020, Ghana's youth unemployment rate was 12% and the underemployment rate was over 50% (World Bank, 2020). People below the age of 35 make up the majority of informal workers at Agbogbloshie. The Northern regions of Ghana experience less development and poverty reduction than other regions in Ghana (Adekunle, Al-Hassan, & Jatoe, 2012) and people who have migrated from the North of Ghana make up most of the workers at Agbogbloshie. Some informal workers at Agbogbloshie have used social media in the past to protest unemployment, with some expressing during interviews their lack of job options due to several factors such as low educational attainment, struggles with the English language, and

low levels of transferable skills. One interviewee also brought up the lack of job opportunities in the North particularly encouraging young men to come to the capital city, Accra, to find work and settling at Agbogbloshie.

Tax evasion arose several times as a feature of the illicit aspect of this trade related to informal recyclers. A representative from the Economic and Organised Crime Office in Ghana discussed how it is a serious problem that people are avoiding taxes by not registering their businesses. People operating informally are encouraged to register their businesses but do not do so for many reasons, with another consequence of this being that the true number of those working in the recycling industry is unknown.

When reviewing the literature associated with the e-waste trade, cyber security risks, such as sensitive data being found on hard drives in used computers, surfaced as an under researched but significant part of the e-waste industry. During interviewees, no interviewee gave information on these risks. One worker at Agbogbloshie mentioned that he heard that it was difficult to access information on computer hard drives, with a friend of his trying and failing to gain access to a password protected hard drive two years ago, but that was the extent of information gathered on the potential dangers of e-waste collected in Ghana to cyber security.

The majority of actors at this site cited profit as the driver of the e-waste trade, with four out of six participants discussing this. One participant named the short lifespan of EEE as the biggest factor, and another brought up Ghana's desire for second hand goods, and more specifically how the prevalence of second hand EEE makes it more accessible to young people in school or university.

Site 8: Scrap Metal Export

This site was identified during the study where it was found that there are individuals who buy scrap metal from collectors. This scrap metal is then sold to scrap dealers who usually buy it from numerous collectors and buyers. Scrap dealers then sell metal scrap to exporters and businesses within Ghana. The two export destinations of scrap metal recovered in Ghana are China and India. This metal trade can involve individuals, groups and both formal and informal businesses. People who operate as scrap dealers usually are tasked with

collecting scrap metal from collectors at Agbogbloshie and determining how this scrap metal can be shared. Copper is commonly shipped to countries in Asia. To better understand the activities at this site, three scrap metal dealers were identified and interviewed. One interviewee commented on the trade in scrap metal saying*," I collect from those who just go around picking these things in Accra. They get it from houses and places of business… even the roadside. I am quite skilled now at identifying useful metal from things nobody would want. Copper is very popular, and this metal goes to China and India. I go between Accra and Tema to do this".* Another scrap metal dealer commented that*, "this is a good trade for me. I started off as a collector on the streets pushing the carts and picking the old computers and items like that. I would then try to burn and as I did it more, I learned I could be making more money selling the copper that my friends here found as I got a connection who then had someone send it to China".* A Representative from Agbogbloshie Scrapyard went into more detail portraying the processes before export out of the country, *"yes, you'll get some companies, you'll load it in a car, go and stand on a scale… some are exporting it to China, some are exporting it to India, and you'll get some companies in Ghana here and they'll use it for iron rods… yeah you get companies buying the scraps. One company here buys the cables, but not with the plastic so you burn it then they buy".*

Interviews from scrap metal dealers showed that there was a hierarchy within this trade, with collectors operating near the bottom of this hierarchy and well-connected scrap dealers organising the sale of larger amounts of scrap metal, "*I work with so many young boys here and they give me what they collect. It is a lot. I do not have a number for you, but I run this like a business, and I know people here are starting to rent vehicles, rent cars for taxis and Uber, they are growing their businesses. I have many connections, so I also sell parts to computer shops".*

A Representative from Human Environment and Transport Inspectorate added that*, "I think it's mainly about the metals… the demand for the raw materials or the recyclables that's only a little bit in Europe, I think that trade is mainly going to China… the Chinese are bringing the money into West Africa and the West Africans are ordering the materials for… reuse and second hand goods to bring them to West Africa where they are being dismantled or recycled… in a certain way then the raw material flow is going to Asia."*

At the formal recycling project at the Agbogbloshie Scrapyard, funded by the German institution GIZ to promote safe recycling, a worker at this site mentioned in passing that batteries collected would likely be sent to Germany for recycling:

Worker: The batteries, they have different types… phone batteries, laptop batteries, and this one is the big phone the one the police are holding… now they are bringing the container for it, that one we will pack it and box inside

Interviewer: So those ones you take it to Accra City Recycling

Worker at Agbogbloshie Scrapyard: That one when we finish it they will export it to Germany

Interviewer: Why do they export it to Germany?

Worker at Agbogbloshie Scrapyard: They say something is inside, some chemicals and things

GIZ could not be interviewed so this claim has not been corroborated by any other individual or institution. In an article on manufacturers' roles in e-waste, published in 2019, Fairphone, a social enterprise based in the Netherlands that aims to impact the electronics industry by using ethical sourcing and creating phones with sustainable materials, was discovered to have been reaching a goal to sustainable source 70% of tin, plastic, gold, copper, cobalt, tungsten, lithium, and neodymium through shipping e-waste containers from countries such as Ghana back to Europe (Peyok, 2019). Similarly, Bosch Global, an international German engineering and technology company, announced on their website that they had committed to a lead battery recycling project in collaboration with key stakeholders in Ghana (Bosch, 2020). While these companies and institutions such as GIZ's involvement in recycling has been heralded as a step to create more formal jobs and encourage sustainable sourcing, it raises the question of who is benefiting from the precious materials found in Ghana, but recycled abroad and who gets to keep the profit found in the sale of precious materials in e-waste recycled abroad. In an article on the importance of recycling smartphone batteries for sustainability, it was found that major recyclers of lithium-ion batteries such as Umicore, based in Brussels, can also act as major manufacturers of battery parts for smartphone manufacturers based in Asia. This means it is possible that precious materials found in waste are extracted, recycled in Europe and sent to Asia for electronics manufacturing, arriving back in countries such as West Africa,

producing a movement of precious materials where Ghana is left with more waste such as plastic and less precious metal.

Michio Nanjyo is often credited with creating the term 'urban mine' in the 1980s, which refers to the amassing of metals, usually precious metals, from e-waste (Grant & Oteng-Ababio, 2016). The concept of urban mining creates an idea of a global circular economy, connecting Ghana to the rest of the world and allowing precious metals to be reclaimed (Grant, 2016). Ghana exports metal scrap to around 31 countries and this trade is said to be worth millions of dollars. However, it is important to ask whether Ghana is benefitting from this trade when there is a lack of safe specialised recycling companies in Ghana, or merely operating as a 'waste bank' for the storage of valuable materials. The concept of a 'waste bank' describes the idea that precious materials trapped in waste are simply being collected and stored in countries like Ghana with little domestic use for them due to suppressed domestic electronics industries, or capabilities to use them, until more developed or technologically advanced countries are ready to reuse them for profit. There seems to be an unequal profit distribution between people collecting e-waste and scrap metal, and the major formal companies safely recycling and manufacturing batteries.

Ghana is no stranger to precious metal exploitation with illegal small scale gold mining, also known as 'Galamsey' plaguing the country and causing severe environmental effects. In cobalt producing countries such as Zambia and the Democratic Republic of the Congo, health and environmental consequences and the exploitation of African labour has long been documented. While the export of batteries for safe recycling and the scrap metal trade has often been framed as charitable and as sustainable recycling, it also be that these activities are hiding a deeper exploitation of African labour, and continuation of the exploitation of natural minerals found in Africa. Ghana is framed as the final destination for e-waste, especially when words like 'dump' are used, but these descriptions are outdated and may not be accurately describing the full extent of what is left in this country, what is revived, and what is removed. Waste is lucrative, especially with the advent of more efficient recycling techniques (van Wingerde & Bisschop, 2019). Ghana is not benefitting from the precious materials that can be found in e-waste as much as it could.

Scrap dealers interviewed showed a strong awareness of the e-waste trade, and the consequences of this trade due to their active participation at Agbogbloshie and a port city, Tema, where several scrap metal trading companies are located.

When asked how they perceived their roles and responsibilities, two out of three scrap dealers interviewed mentioned their responsibilities were to collect scrap, provide for their families, and sell scrap metals. One scrap dealer described his responsibilities as buying scrap metals for sale at the best price. No scrap metal dealers commented on what scrap metal was used for after being exported.

The majority of actors interviewed as part of this site asserted that profit was the most important factor driving the e-waste trade, with one maintaining that, "there is a lot of money to be made in this trade and you rarely get disturbed by people, I wouldn't say it's really illegal but some would".

7. Analysis and Conclusion

In the findings chapter of this report, themes of poverty, unemployment, exploitation and the structure of the trade were identified through mapping the sites along the e-waste trade route between the UK and Ghana. In this chapter, poverty, the structure of the trade, issues of responsibility, and the main drivers of the trade are analysed further. Recommendations for further steps and are detailed at the end of this chapter.

Drivers

Profit was identified as the main driver of the e-waste trade between the UK and Ghana. Much of the research on the e-waste trade agrees that financial reasons push this trade, with e-waste being highly profitable. According to a report by the International Labour Office on the global impact of e-waste, the trade is mainly profit driven with recyclers wanting lower recycling costs (ILO, 2012).

Bridging the digital divide by providing people in Ghana with access to cheaper second hand goods came up as another important reason for the e-waste trade. Most interviewees identified the supply of second hand goods as a positive aspect of the e-waste trade, making

technology more accessible and affordable to people, especially youth. This is a valid benefit of the e-waste trade, as there does exist unequitable access to technology globally. It is important to note however that Ghana does not have a big domestic electronics industry and the influx of relatively cheap second hand or donated electronics may be a factor in this.

The short lifespan of goods was also a response to the question of the main drivers of the e-waste trade. While it is true that electronic goods are discarded for more fashionable or more efficient electronics at a higher rate in recent years, it may also be that institutions are not dynamic enough to respond to the rate at which technology is being updated.

In Ghana, interventions to address the problems of e-waste often focus on strengthening regulatory frameworks, increasing collaboration between institutions and raising awareness of the impacts of e-waste. This report's findings suggest that poverty is the underlying factor of the unregulated e-waste trade, and there are not enough interventions acknowledging and addressing this. Efforts to regulate and formalise the e-waste industry in Ghana do not necessarily change the reality of high unemployment, and social inequality in Ghana.

Structure of the E-waste Trade

The e-waste trade is multifaceted and it is hard to separate legal actors and activities from illegal or illicit ones. According to van Wingerde and Bisschop, waste crime is the trade, treatment and disposal of waste that violate international and domestic environmental laws, causing environmental or health consequences (van Wingerde & Bisschop, 2019). There were differing responses to the 'organised' nature of the e-waste crimes, with most interviewees describing the structure of this trade as 'loosely organised', or co-ordinated. In a report on the illegal shipment of e-waste from the EU, the authors also described the nature of e-waste trafficking or smuggling as loosely structured, not showing traditional forms of hierarchy, but short periods of organisation with groups often disbanding to form new ones (Fajardo, 2014). This report noted that groups with links to West Africa seemed to be operating in a less professional manner than groups with links to Asia (Fajardo, 2014). The question of whether e-waste crimes can be categorised under 'serious organised crime' needs more research, and whether the definition of organised crime is not allowing for a more modern, dynamic interpretation, with novel organisational structures that may be providing a collaborative approach to crime, as opposed to a strictly hierarchical one.

It is important to clarify whether e-waste crimes can be categorised as 'serious organised crime' for a deeper understanding of the risks and implications of these activities, and to determine the resources that should be allocated to fighting this trade. This is difficult to ascertain because the nature of criminal groups is to operate under the radar. In the 1990s, Rebovich made the argument that 'organised crime' is not a suitable term to describe the trade of hazardous waste, using the term 'group crime' instead (INTERPOL, 2019). Whether e-waste crimes can be categorised as 'organised' or not is a matter of controversy with some experts saying that even if the e-waste trade is 'loosely' organised, it may still come under the Palermo Convention's definition of organised crime groups (Geeraerts, Illes & Schwizer, 2015). Liddick posited that the due to the transnational nature of hazardous waste trading, this is not simply an organised crime issue, but one in which individuals, and governments are involved with (Lambrechts & Hector, 2016). Regardless, there is an opportunity for the organisation of the e-waste trade to become more organised and less hierarchical, especially as technology becomes more complex, producing more waste streams and needing more skilled work to recycle it in the future. This means that even if the e-waste trade is not as organised now as other criminal groups, it should still be curbed before the organisational structure changes. Therefore, the e-waste trade provides a threat for organised crime, even if it may not be defined as organised itself.

When characterising the illicit trade, it was clear that a mix of actors operating both legally and illegally were involved. There are numerous studies that suggest that most legitimate companies are involved with the illicit trade of e-waste either accidentally or intentionally (Europol, 2011).

In response to this research question, the idea of the e-waste trade being used to conceal other crimes such as money laundering and drug trafficking emerged. No institution interviewed was able to present cases or evidence, but instead mentioned the possibility that it was linked to other crimes. The e-waste trade does provide a logistical network which could act as a basis for other crimes to operate alongside it. In a study on environmental organised crime and the business of hazardous waste disposal, it was found that the transboundary nature of hazardous waste disposal can provide an opportunity for money laundering, illegal arms dealing, and to conceal the origins of dangerous substances (Lambrechts & Hector, 2016). An investigation by the Environmental Investigation Agency, a

UK based NGO, found criminal groups engaged in the transboundary movement of e-waste, and these groups were linked to other crimes such as theft, drugs and weapons trafficking, and money laundering (EIA, 2011). It is evident that there are opportunities for varied criminal activities at numerous parts of the waste chain.

There exists anecdotal evidence that drugs can be shipped through African countries into Europe and vice versa but no institutions were able to provide proof. On Ghana's side this could be attributed to a lack of awareness of links between several crimes, and lack of investigation or resources to discover hidden crimes through e-waste.

Ghana's problem or the UK's problem?

Ghanaian institutions were more likely to frame stopping the e-waste trade as Ghana's responsibility, while the UK or international organisations were more likely to frame it as an issue that needs to be dealt with before e-waste even reaches Ghana, by the exporting country. A representative from the National Crime Agency in the UK made the point that the UK had never had a repatriation of a waste shipment from an African country, showing there could be issues of international collaboration at play here.

Recommendations

- During the fieldwork part of this research, it was found that many relevant institutions, offices, and companies were based in Accra, the capital city, and Tema, a port city. Most of the e-waste workers in Agbogbloshie were from the North of Ghana, yet the interventions to encourage local job creation and awareness of the consequences of informal e-waste recycling in regions in the North of Ghana are limited. It is recommended that Ghana implements more active decentralisation of institutions linked to reducing e-waste flows.
- Digitisation of data should be improved across institutions to increase access to e-waste statistics
- Increased data sharing and collaboration between institutions is recommended. This report found that some institutions were not up to date on current e-waste projects and interventions

- Ghana has signed the Bamako convention, but has not yet ratified it. It is recommended that Ghana does this to strengthen collaboration with other West African countries

- Enforcement agencies and prosecutors should be more aware of the crimes that concealed or made possible due to the logistical network that the e-waste trade provides. These crimes include tax evasion and money laundering in the e-waste industry.

- The return of shipments of e-waste back to the UK should be facilitated when appropriate.

- The problem of e-waste is often framed as Ghana's problem. Private actors in the UK such as manufacturers and consumers should be made more aware of their role in this trade.
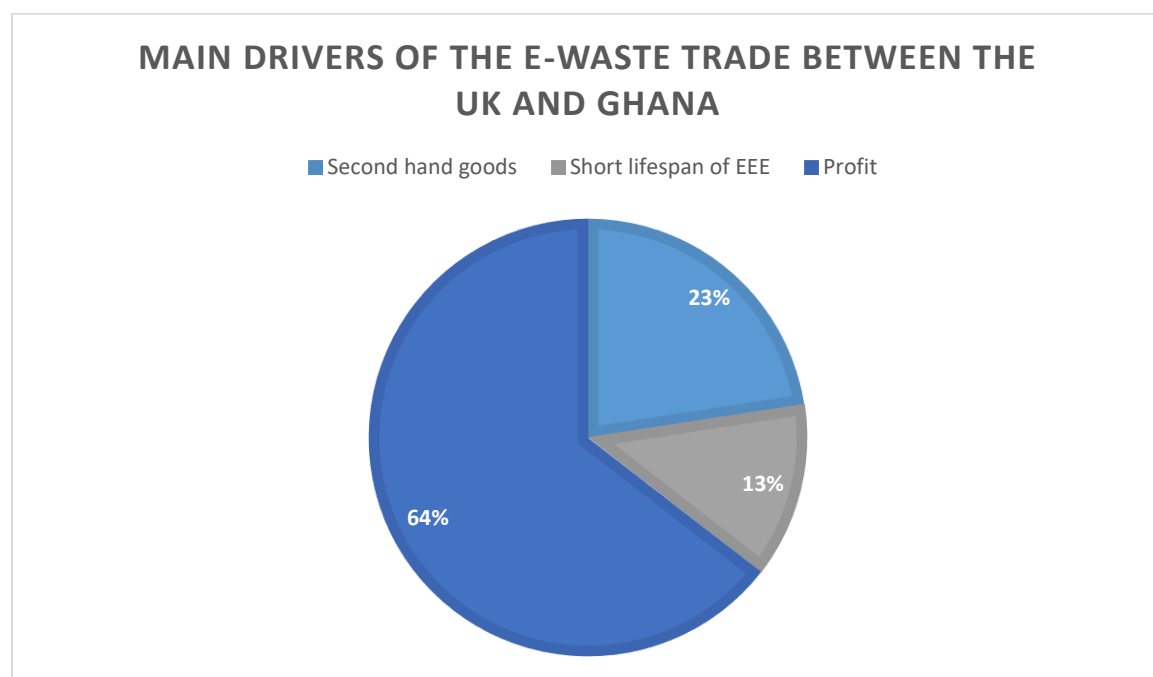
Recommendations for Further Research

- There are numerous projects focused on tackling e-waste. More research on the effectiveness of current e-waste initiatives is necessary to understand which strategies address the e-waste trade most successfully.

- As the situation escalates, corruption may become a larger component. The e-waste trade will become more organised and proceeds of crime and asset recovery will need to be researched in depth. More research on whether this is currently an acquisitive crime or is becoming one in Ghana is essential.

Annexes

Annex A List of Survey Questions

1) Please describe where you work, and what is the role of this workplace in the e-waste trade between the UK and Ghana?

2) How would you describe yourself?

3) How would you describe those you think may work at e-waste sites, and the processes involved?

4) Why is the UK a major exporter of EEE (Electronic Equipment) to Ghana?

5) What is your awareness of the e-waste trade, and its impact on Ghana?

6) Are you familiar with any of the UK's interventions to reduce the flow of e-waste to Ghana?

7) Could you please mention what you think is the main driver of the flow of e-waste to Ghana?

8) Are you familiar with interventions in Ghana to reduce the flow of e-waste?

9) What is the impact of e-waste in your community?

10) Where do you think the most e-waste in Ghana comes from?

MAIN DRIVERS OF THE E-WASTE TRADE BETWEEN THE UK AND GHANA

■ Second hand goods   ■ Short lifespan of EEE   ■ Profit

23%

13%

64%

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