

This collection of essays is based on presentations given at the 4th conference in an annual endowed series held at Duquesne University, USA. It addresses emerging concerns and pivotal problems about our planet's environment and ecology. The contributions gathered here highlight the inter-relation of topics and expertise regarding science and philosophy, ethics, religion, global issues, and generational perspectives. The book concludes with an ethical analysis of the multiple and over-lapping challenges that require urgent attention and long-term resolution. It will appeal to scholars and students in a variety of disciplines and fields that deal with the earth's survival and flourishing.

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The Global Sustainability Challenge

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# The Global Sustainability Challenge



*Edited by Gerard Magill  
and James Benedict*



## CHAPTER TEN

# TOWARDS A SUSTAINABLE AND ETHICAL E-WASTE MANAGEMENT IN WEST AFRICA: AGBOGBLOSHIE, GHANA

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### Introduction and Background

The assumptions that the earth is a separate entity from human beings and is, therefore, exploitable, and that some people are different and inherently disposable are fast melting away. Many people are waking up to the reality that issues which impact the earth and the environment also impact the people who dwell there. If some people possess access to the resources which help them relieve these impacts while some other people do not, then we have a social justice issue. This is the point of the Papal Encyclical on the Integrity of Creation, *Laudato Si*.

There is a place which immediately comes to mind when reading this Papal Encyclical and that is Agbogbloshie, Ghana—one of the world's largest e-waste dumps, a place some describe as “Sodom and Gomorrah.”

The authors were introduced to Agbogbloshie, as well as the severity of the problem of e-waste both in Ghana and globally, by Mr. Krobo Edusei, Jr., Chairman of Safebond Limited (SLC) when he delivered a presentation at Duquesne University on Thursday, October 26, 2017, which included his plan for addressing the situation which will be described in detail in this chapter. Following Mr. Krobo Edusei's talk, and his description of Agbogbloshie, we decided to see for ourselves whether what we had heard from him, and what we read about this wasteland afterward, was as horrible as depicted from all sources.

The fact is there is no accurate way to convey what the environment is like in this place unless and until you are there. Upon getting close to Agbogbloshie, on the main road entering the area where most burning of electrical equipment takes place, one may think that things are not much different than in other places outside of urban centers in Africa. There are

outdoor stalls where merchants are selling everything from produce to clothing to talk time for mobile phones. Vendors are busy trying to promote their goods, and people are milling around casually. As you continue to go deeper into Agbogbloshie, however, the nightmare descriptions become reality. The streets are no longer lined with shops, and the air begins to grow heavier. It is as though a dark cloud is not only visible; it has surrounded you.

Strewn along both sides of the road are pieces of every type of equipment imaginable with discarded wires and rubbish tossed in between. The pervasive smell emanating from everything one could imagine burning—from electrical equipment to tires to plastic and refuse—hits all of your senses at the same time. Amid the waste, are brightly colored umbrellas shielding e-waste workers from the sun as they are assembled in twos or threes. As they burn and strip metals from the fragmented, dismembered computers, refrigerators and every other item that one could imagine running when being plugged in, pockets of smoke coming from their midst surrounding them, they are seemingly oblivious to the smells and their dangerous environs.

Instead of remaining on the periphery of this activity which increases as you go further away from the road, you find yourself wanting to go further into the midst of many more pockets of workers, though experiencing an even greater thickening of the air and an ever-growing difficulty in breathing. While Ghanaians are known for being friendly and hospitable, these workers, predominantly male, do not look at you as you are in their midst. They are in their own world, a world that few could imagine or endure.

Few people in Accra want to go to Agbogbloshie and believe that they are far removed from the horror that those who live there have become accustomed to in their daily lives. If it is hard to fathom the environmental disaster and health hazards this waste dump exposes adults to as they strive to earn a living, imagine the toll it takes on children. It is no wonder that the average person does not want to take a side trip to Agbogbloshie. But as much as the residents of Accra and the surrounding area would like to separate themselves from what is happening there, they are also impacted daily by the pollutants emanating from this vast dumping ground. In fact, the largest market for vegetables and fruit, supplying huge numbers of residents in the city with produce, is very near Agbogbloshie.

Later, we will describe the ecological and environmental impact, in addition to the health hazards, resulting from Agbogbloshie. Suffice it to say, that our own experience has left a profound and lasting impression, one

that has caused us to examine how this situation, and those comparable in other developing countries, can be remedied.

Millions of tons of e-waste are produced yearly by developed countries, with China and the United States leading the way, and dumped into developing countries. One such country is Ghana, which houses one of the biggest e-waste dumps in the world and is the topic of this chapter. With rising economies in Asia, Latin America, and Eastern Europe, the quantity of electronic waste (e-waste) generated around the globe is expected to increase largely as a consequence of the introduction of new products that have a shorter lifespan. It has been estimated that the current global annual e-waste production exceeds 40 million tons and accompanied by an annual growth rate of 4 to 5 percent. Despite the increased generation, there is a current lack of an efficient, safe and sustainable infrastructure for the disposal of this waste in many regions of the world where a majority of the materials ends up as a final destination.<sup>1</sup>

The Agbogbloshie e-waste crisis has generated environmental, economic, health, social, and eco-ethical issues that can only be overlooked to our peril, and it poses a big challenge to sustainability. Sustainability requires maintenance of elements of human society such as human health and wellbeing, and culture (i.e., social aspect) and air, water, and soil quality, earth's temperature and taming of global warming (i.e., environmental aspect) as well as the economic aspect of sustainability.

Some solutions have been proffered, and a lot of authors have written about them. However, there is a nuance in a little-known solution proffered by Edusei and his company, Safebond, which attracted the interest of the authors of this chapter. This vision is distinguished from others by its humane and moral aspects, and its insistence on retaining (and incorporating) the current peasant workers, those individuals ruminating in dangerous, smoke-filled dumps for a living. There is little or no literature on it. This chapter seeks, therefore, to highlight and discuss this special ethical component of Edusei and company's vision, which we consider as a possible model approach to e-waste recycling methodology for West Africa.

### **Technology, E-waste, and Climate Change**

Technology and climate have a direct but strange relationship. It is strange in the sense that technology has both a positive and negative impact on climate, while climate equally has both a negative and positive impact on e-waste. Technology helps us to monitor weather and climate change. It also offers tools that aid sustainable development in addressing issues related to climate change. For example, technology and communication technology

offer smart applications that help us reduce carbon footprint by transforming the way we deliver services in areas such as energy, water and waste management, as well as early warning systems.

On the other hand, technology also adds to the problem of e-waste and thus contributes to environmental hazards and global warming. The growing use of information technology (its services, devices, and networks), increases the level of consumption of energy, emission of carbon dioxide, and production of e-waste, some of which contains hazardous substances.<sup>2</sup>

E-waste, electronic, and electrical waste has a devastating effect on both the ecosystem and the atmosphere. This negative impact is alarming, given the enormity of the quantity of e-waste we produce yearly. The United States produces more than 4.6 million tons of e-waste annually, some of this waste is recycled; some is shipped to developing countries where it is improperly disposed or inadequately recycled adding to the problem of global warming. Such improper disposal includes landfills and incineration. For instance, when the disposal is in the form of landfills, many toxins are introduced into the soil and may be released into the atmosphere adding to global warming. Incineration of e-waste causes it to lose its recyclability as well as causing the emission of dangerous substances like cadmium, lead, and mercury into the atmosphere. Incineration of products containing plastics and polyvinyl chloride (PVC) results in the formation of dioxides in the atmosphere leading to health issues and global warming.<sup>3</sup>

Just as e-waste pollution has a pronounced effect on the climate; climate change affects the behavior and impact of e-waste. Certain chemicals are emanating from the improper disposal of e-waste, and if these compounds are not disposed of properly, they spread uncontrollably into the air. One such chemical, polybrominated diphenyl-ethers (PBDEs), is a fire-retardant found in many electronics. While the full adverse effect of this chemical has yet to be assessed, and it has not been labeled toxic, it certainly cannot contribute to healthier air or environments for the inhabitants that ingest it.

Scientific studies have focused on the changes of this chemical in the atmospheric environment as it pertains to climate change. What is interesting to note is that temperature has a significant impact on the remediation of PBDEs, so what happens to this chemical when it hits the air can determine the level to which it threatens the environment.

It has been shown that an increase in temperature has lessened the impact of this chemical which is a positive outcome so in some instances there may be a natural way of correcting the atmospheric conditions resulting from this particular chemical. While it seems counterintuitive that increased temperatures due to climate change could lessen the threat of a

pollutant, it is as though nature is trying to meet the challenges being hurled at it by adapting in a most unusual, but natural way.

But PBDEs are not the only chemicals being emitted as a result of e-waste. There are many other chemicals, heavy metals, and e-waste pollutants that are threatening the environment globally. It is too soon to determine the overall environmental fate from e-waste and its many pollutants, or all the ways e-waste threatens people living in areas where it is disposed of in considerable amounts, but there is no escaping the fact that it continues to be a challenge that keeps getting bigger and more complicated.<sup>4</sup> Needless to say, that such activities pose challenges to sustainability.

### **E-waste and the Flow**

E-waste is a general term used to cover all items of electrical and electronic equipment and the parts that have been discarded by its owner as waste without the intention of reusing them.<sup>5</sup> E-waste includes large household devices such as refrigerators, air conditioners, computers, radios, televisions, and household appliances which have been discarded by their users. E-waste is also referred to as electrical and electronic equipment (EEE), or as waste electrical and electronic equipment (WEEE). In some regions, it is referred to as electronic waste or e-scrap. In general, e-waste contains precious metals such as aluminum, copper, gold, iron, lead, palladium, silver, and toxic elements.<sup>6</sup>

Under normal circumstances, this type of waste is to be disposed of through recycling or other environmentally friendly techniques. Though the problem of e-waste is global, prevalent in both developed and developing countries, it is particularly pronounced in developing countries. Developing countries, though not large manufacturers of electrical products, are the recipients of discarded electrical and electronic equipment from wealthier nations.

Some e-waste materials come into developing countries as second-hand goods since the majority of consumers in those countries cannot always afford to buy new electronic products. Due to the high consumption of imported second-hand electronics, there is additionally a huge internal generation of e-waste, which further exacerbates the problem.

Often, in shipping these second-hand goods to developing countries, the exporters send a percentage of electrical equipment that either does not work or has expired; therefore, is not useable or will not be functional for a sustained period of time. As a result of this practice, many developing countries have become the dumping ground for discarded computers and

other electronics from manufacturers, as well as from developing countries that are supposedly donating these goods. In some West African countries, for example, illegal e-waste is confiscated by local authorities at their respective ports of entry and later sold to local recyclers.

Electronic waste or e-waste is often exported from the United States and other developed nations to regions in China, India, Thailand, and less developed countries where recycling is done in a crude fashion.<sup>7</sup> African countries, not referenced in the abovementioned article, are among the developing countries that are recipients of a large amount of e-waste. Ghana and Nigeria, in particular, have increasingly become dumping sites for electrical materials.

In 2012, 50 metric tons of e-waste was generated worldwide, which amounts to 7 kilograms for every person on the planet.<sup>8</sup> It is reasonable to assume that this figure has risen dramatically since that time. For example, in West Africa, huge amounts of e-waste are generated within a very short of time because of the second-hand consumption of electronics.

The ramifications of e-waste have resulted in one of the biggest global threats to the environment, in addition to dangerous living conditions and health problems borne out of contaminated air, water, and soil. Given these environmental and health hazards, there is a need for adequate and sustainable solutions, and management, which involves environmentally friendly and safe treatment of this waste.

### **International Responses to the E-waste Problem**

There have been multiple attempts by the international community to address the problem of e-waste to include Conventions, regulatory bodies, and regulations. Additionally, there have been studies of the various techniques used in handling e-waste material.

#### **Conventions**

Many conventions pertain to the environment, but the ones that follow below are the most noted for the regulation of e-waste.

The Basel Convention of Hazardous Wastes and their Disposal regulates the export and import of hazardous waste and waste containing hazardous chemicals. Adopted in 1989, and entered into force in 1992, the Basel Convention has 180 parties.

It was amended in 1995 to cover all transboundary movements to States not included in the original Convention and hazardous wastes covered by



the Convention that are intended for final disposal, and other hazardous wastes destined for reuse, recycling or recovery operations.<sup>9</sup>

The Rotterdam Convention, adopted in 1998, and entered into force in 2004, regulates information about the export and import of 47 hazardous chemicals, 33 of which are pesticides and 14 of which are industrial chemicals. It has 152 Parties. The Convention includes two key provisions. The Prior Informed Consent (PIC) procedure is a mechanism for formally obtaining and disseminating the decisions of importing Parties as to whether they wish to receive future shipments of those chemicals listed in Annex III of the Convention and for ensuring compliance with these decisions by exporting Parties. The Information Exchange facilitates the exchange among Parties regarding a broad range of potentially hazardous chemicals, requiring each Party to notify the Secretariat when taking a domestic regulatory action to ban or severely restrict a chemical.<sup>10</sup>

Adopted in 2001 and entered into force in May of 2004, the Stockholm Convention included previously unregulated substances that are toxic, travel long distances, and can multiply in organisms. It has 179 signatories, out of which 152 countries ratified it. It was established as a global mechanism to safeguard human health and protect the environment from persistent organic pollutants (POPs) that have extended lifespans and do harm to both humans and animals.<sup>11</sup>

The Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa defines “wastes” as substances or materials which are disposed of, or are intended to be disposed of, or are required to be disposed of by the provisions of national law.<sup>12</sup>

The Convention resulted from negotiations between twelve African members of the African Union in 1991 but was not in full force until 1998. The reason the Bamako Convention came into being was that the Basel Convention’s intent to limit and safeguard against the shipment of hazardous waste was not working in Africa. African countries were increasingly becoming the dumping ground for toxic waste. Recognizing that the Basel Convention was not effective in stemming the flow of hazardous materials to Africa, the framers of the Bamako Convention adopted much stronger language prohibiting the flow of all hazardous waste, without exception, including those exceptions made in the Basel Convention such as for radioactive material.

Among its other mandates, the Bamako Convention specifies that countries should ban ocean disposal of hazardous wastes. It asks parties to limit trans-boundary movement of hazardous waste, to require the consent of importing and transit states within Africa, to cut back on hazardous waste

production, and to treat and dispose of waste in an environmentally friendly manner.<sup>13</sup>

### Some Proffered Solutions and Techniques

What is being done to deal with the e-waste problem differs from country-to-country and region-to-region in response to the severity of the challenge and the ability of various governments to address it. For example, Eric Williams et al., in *Global E-waste Monitor* define four scenarios: Official take-back systems, Disposal of e-waste in mixed residual waste, Collection of e-waste outside of official take-back systems in developed countries, and Informal collection and recycling in developing countries.

Under the official take-back system, the national e-waste legislation requires e-waste to be collected by designated organizations, producers, and all by the government. This is achieved through retailers, municipal collections points, and all pickup services. “The final destination of the collected e-waste is state-of-the-art treatment facilities which recover the valuable materials in an environmentally sound way and reduce the negative impacts.”<sup>14</sup>

Under the disposal of e-waste in mixed residual waste, consumers directly dispose of e-waste via the normal dustbins in conjunction with other household wastes. Thus, the disposed of e-waste is treated as regular mixed household waste. This waste can either go to landfill or municipal solid waste incineration with a low chance of separation before the final destinations. Landfill destination can lead to toxin leakage while municipal solid waste incineration leads to emission into the air; therefore, neither of these processes are seen as appropriate techniques to treat e-waste because they negatively impact the environment. It is worth noting that valuable e-waste is hardly deposited in dustbins in most developing countries. On the other hand, nonvaluable e-waste, such as lamps and small products, are disposed of through dustbins to landfills or incinerators.<sup>15</sup>

Regarding the collection of e-waste outside of official take-back systems in developed countries, e-waste is collected by individual waste dealers or companies and traded through various channels. They are sent to various places such as metal recycling, plastic recycling, special e-waste recycling, or exported. The particularities of this scenario for the collection of e-waste are that e-waste is traded freely and the quantity is neither systematically documented nor reported to the authorities. Likewise, in this scenario, e-waste a substantial amount of e-waste is shipped to developing countries for further treatment. What is driving this shipment is the demand for inexpensive used equipment and raw materials.<sup>16</sup>

Finally, informal collection and recycling in developing countries involves a big number of self-employed people who make their living on the collection and informal recycling of e-waste. Particular to this scenario is the door-to-door purchasing of e-waste from consumers. The commodity is then sold to the refurbishers and recyclers. Such informal collection activities provide jobs and means of livelihood for numerous unskilled workers.<sup>17</sup>

Information collection is followed by crude management, whereby products are recycled through backyard recycling or substandard methods that cause severe damage to the environment as well as human health. The substandard treatment methodologies include open burning of extract metals, unprotected melting of plastics, acid leaching for precious metals, and direct dumping of hazardous residues. This informal collection and substandard treatment methods are the results of the following: lack of legislation or legislation that is not being enforced, and the lack of environmental protection measures, treatment standards, and recycling infrastructure.<sup>18</sup>

Granted that the recycling infrastructure in these countries is weak, but even if this aspect alone were to be redressed, the system has another challenge to confront in this area. As well noted, "Rapid economic and population growth in developing countries is driving an increase in computer use and an increase in these parts that is outpacing the implementation of modern and environmentally-friendly recycling systems."<sup>19</sup>

The fourth scenario of informal collection and recycling in developing countries describes the situation or setting we are focused on in this chapter. That situation is typified by Agbogbloshie, the focal point of our study.

### **Agbogbloshie Waste Dump**

Geographically, Agbogbloshie is located in the capital city of Accra, Ghana, and is less than a kilometer from the central business district. Ghana is situated along the coast of the Gulf of Guinea in West Africa. Agbogbloshie covers an area of approximately 16 square kilometers. It is bounded by the Abosse Okai Road in the northwest, the Odaw River in the upper reaches of the Korle Lagoon and the Agbogbloshie Drain. It is politically situated in the Ododiodoo constituency of the Accra metropolitan assembly.

About 15 years ago, Agbogbloshie was a beautiful area with rivers, a lagoon, and many fish. Now it is the world's largest e-waste dump. This all began following the decline in the food crops, which caused the major food

market in the area, which was the primary source of revenue for many people, to decline as well. This led many people to turn their sights to the scrap business.

The scrap business eventually led them to discover the precious metals in electrical and electronic waste. Agbogbloshie's proximity to the ports where huge amounts of imported used electronics were received, together with Ghana's domestic consumption and disposal of electronics gave those in this industry a plentiful supply of e-waste material. The Accra harbor receives 600 to 1000 containers monthly which contain cell phones, cartridges, refrigerators, computers, televisions and other types of devices shipped from America, Europe, and Oceania.<sup>20</sup>

They started recycling this collective assortment of e-waste, which was very lucrative and a well-organized informal, but crude and dangerous, activity. This is how Agbogbloshie was transformed into the second largest e-waste processing site in West Africa and one of the ten most polluted sites in the world as of 2013.<sup>21</sup>

### **The Problems of E-waste**

E-waste and the crude recycling methods employed in Agbogbloshie and some developing countries have several hazardous impacts and thus, pose challenges to sustainability. The impacts include ecological and environmental, health, security, and ethical (i.e., environmental injustice and other social inequity) impacts.

### **Ecological and Environmental Impact**

Though the items classified as e-waste can be highly toxic, resulting in damage to the ecology and environment, e-waste is rarely viewed in this manner by the general public, which begs the question, why? People tend to consider electronics, such as televisions, refrigerators, and computers, as a necessary part of their lives and security and do not consider them to be unsafe. Having a new electronic item is very appealing, particularly when it is packaged in an attractive, modern way. There is no consideration by the majority of consumers as to how these items are discarded or the materials that are inside of them.

Even if images of landfills with pieces of equipment were to be seen by people living in developing countries, they would not view them as threatening. In fairness to the users of electronics, there has not been a great deal of media coverage about e-waste or its dangers. So, if you are not living in proximity to a waste dump and are not breathing polluted air daily, you



would not be as cognizant of the hazards of e-waste. In fact, even those populations living in the midst of waste dumps are not fully aware of the ramifications of e-waste. Therein lies a big part of the problem.

Yet, many of the components contained in electronics are very dangerous and include substances such as brominated flame retardants, cadmium, and lead, and these substances become even more threatening when not discarded properly.<sup>22</sup>

There is no escaping e-waste's detrimental effects on the air, water, and soil. With respect to the air, when e-waste is burned in a crude method to get to valuable metals, chemicals, such as dioxins, which have been linked to cancer, are emitted and pollute the air. There is also a damaging impact on the water attributed to e-waste. Heavy metals, such as lithium and mercury, among others, whether in landfills or just discarded carelessly, eventually seep into the soil to the water supply. This toxic water eventually makes any living thing that drinks from it, or relies on it in any form, subject to all manner of illness, having spread to rivers, lakes, and tributaries. Just as water is contaminated by these metals, soil also is subject to the same contamination. Thus crops, and ultimately, the food people rely on for their sustenance becomes contaminated.<sup>23</sup>

It does not take long for the destructive vestiges of e-waste to be clearly visible to any observer. In Agbogbloshie, for example, what remains of the once picturesque environment, including the river, is a polluted and highly toxic area. While fishermen once caught fish, they now catch old computers and refrigerators. The crude method of recycling is harming the health of poor inhabitants, devastating and polluting the environment and making the air unfit to breathe.

### Health Hazards

Upon visiting Agbogbloshie for twenty minutes, our eyes looked like those who lived and worked there, red-rimmed and completely bloodshot. The itching and shortness of breath we experienced lasted for many hours after our initial visit. Sadly, many people cannot escape after a brief period for their livelihoods depend on working in that situation -going through the remains of old computers, refrigerators, phones, televisions, and other small electronics. They continue their plight of searching for old cables to burn to collect small quantities of copper, gold, iron, and other metals.

These laborers, many of whom are youth, work very long days for very little earnings. They suffer from chronic headaches and respiratory problems and live in deplorable and hazardous conditions resulting in short expectancies. Better put, "Electronics are full of toxic chemicals and metal

leads that people not only breathe in, but that also contaminates the water, the soil and thus the food chain. Long term exposure harms almost all organs, bones, fertility, and IQ, to name just a few."<sup>24</sup>

As dangerous as these conditions are, some of the workers are oblivious to their toxic environment. For example, Alpha Alhassan, one of these e-waste workers, when asked about the situation, responded, "I'm not aware of pollution or health risks. I must come to work here to stay alive."<sup>25</sup>

A scrap worker, Mohammed Ibrahim, in response to the same question retorted, "My daily life is a struggle. I come to win my daily bread and have no time to think about pollution and environment."<sup>26</sup>

The lack of knowledge and concern among e-waste workers was borne out in a study of 20 male workers at Agbogbloshie who did not think that their health was impacted by the illnesses and injuries associated with their environment, other than physical injuries. Though they would have preferred to have worked in other occupations such as driving or farming, they did not eschew their making their livelihood in the scrap metal yard on the basis of its potential health hazards.<sup>27</sup>

More and more medical and scientific information is being discovered pertaining to the damaging health effects resulting from exposure to e-waste. It has been found that children are the most vulnerable and often are seriously harmed by e-waste exposure, thus requiring special protection. Given that children's weight is far less than the weight of adults, and proportionately their intake of air, water and food is greater, the risk of their absorbing more hazardous chemicals is significantly increased. They cannot escape the exposure resulting from unsafe recycling practices and living in polluted areas as it is everywhere they are, whether they are outside or in their homes or school. What happens to them as a result of exposure may thwart their development, compromise their immune systems, harm their nervous system, and ruin their health for the rest of their young lives.<sup>28</sup>

There are many routes of exposure to e-waste to include inhalation, ingestion, or through skin or clothing. Exposure can also come through food or dust or air or water. The severity of this exposure and the level of contamination from it largely depends on the type of recycling and the proximity of those it impacts as well as the frequency of that exposure. E-waste workers, particularly those engaged in informal recycling would be at a higher risk of exposure and the resultant consequences of it. Exposure can have serious consequences for all age groups, with the more severely impacted, as noted previously, being children. The elderly, disabled, pregnant women, and fetuses are also among those most sensitive to high rates of exposure. E-waste has been found to change physiologies, affect

breastfeeding, change how one eliminates toxins, and increase high-risk behaviors among youth.

As medical studies continue and those individuals living in areas where the e-waste industry is most prevalent can get healthcare treatment, the extent to which e-waste exposure takes its toll on human beings will be far better defined and recognized.<sup>29</sup>

### Security

The implications of the improper disposal of e-waste go beyond health hazards and environmental degradation. National and international security can be at risk as well. While formal recyclers in the United States and in other wealthy countries that export e-waste wipe materials containing sensitive information clean prior to shipping them, informal recyclers do not.

Agbogbloshie, in particular, has been named as a place where criminals have located information taken from computer hard drives that is highly sensitive and may be top secret, therefore, putting classified data in very dangerous and often ignorant hands. This material, ranging from U.S. Defense Agency and Homeland Security information and contracts, to credit cards, and other proprietary personal information pertaining to bank accounts and transactions, is immediately compromised.

It is estimated that Ghana and several other developing countries inherit close to 23% of e-waste from wealthier nations. This occurs in contravention of the Basel Convention, (ratified by 186 signatories, but not the United States), that mandates that limited amounts of hazardous waste can be shipped from richer countries to developing countries. As a result of not being a signatory to the Basel Convention, the United States does not have to comply with the regulations pertaining to hazardous waste; therefore, has no restrictions on the amount of hazardous waste being exported once any given country agrees to import this waste.<sup>30</sup>

### Environmental Injustice and other Social Inequities

According to David Schlosberg, environmental justice is defined to include equitable distribution of environmental risks and benefits; fair and meaningful participation in environmental decision-making; recognition of community ways of life, local knowledge, and cultural difference; and the capability of communities and individuals to function and flourish in society.<sup>31</sup>

Environmental injustice is characterized by economic inequity, the lack of healthcare, housing, and human rights, societal or political disenfranchisement, and an unsafe, unclean environment.<sup>32</sup> By this definition, it is clear that the people who reside or work in Agbogbloshie suffer from environmental injustice as evidenced by the gross disparity in wages, the hazardous health conditions, the toxic, polluted environment and the inability to remedy their standard of living due to their being disenfranchised.

Though everyone who is a part of the e-waste industry in Agbogbloshie is subject to dangerous conditions, there is stratification within their ranks. There are discrimination, dehumanization, and the lack of basic social services for the actual e-waste workers juxtaposed to their administrators. Residents outside of Agbogbloshie in Accra also look down on informal e-waste workers, especially the collectors. The collectors experience disrespect, derogatory comments from the public in the streets of Accra and are prevented by the local authorities from using certain streets.<sup>33</sup>

The mistreatment of e-waste workers is an abridgment of their right to work and earn a living and is due to the ignorance of the general public regarding the contribution of e-waste workers to the economy. For instance, dating back nearly a decade ago, the e-waste workers' contribution to the Ghanaian economy was estimated to be around US \$105–268 million.<sup>34</sup> The workforce is also comprised of youth who but for working in e-waste may have no other means to earn a living.

According to the Constitution of the Republic of Ghana, “Every person has the right to work under satisfactory, safe and healthy conditions, and shall receive equal pay for equal work without distinction of any kind” (Article 24 {1} of the 1992 Constitution of Ghana). But, in Agbogbloshie, working conditions are not satisfactory, safe or healthy, nor is there any semblance of equal pay for very hard work.

### Various Recycling Efforts in Agbogbloshie and Implications

The absence of a formal recycling infrastructure has resulted in the use of very simple and ineffective practices such as burning, leaching, shredding, manual dismantling, and melting. Workers manually disassemble parts and burn off the plastic encasements on computer wires and refrigerator coils to recover profitable metals. The work is often done by young adults using handmade tools without protective equipment, leaving them susceptible to respiratory diseases and overexposure to lead. After anything of value has been stripped away, the bulk is then dumped untreated into unlined pits and waterways. These crude forms of recycling are the



ones that were, and remain in some instances, most employed in Agbogbloshie.

There have been efforts to undertake new methodologies for recycling such as the ones used at the Pure Earth E-waste Recycling Center and the Basic E-waste Recycling Center. The Pure Earth E-waste Recycling Center was a project of Pure Earth through funding from EC/UNIDO, Comic Relief, The Addax & Oryx Foundation, and BI Reserve totaling \$226,865 US dollars. The Center contains automated wire-stripping units that were installed in Agbogbloshie in July of 2015. Wire-stripping machines can take apart the larger cables. They chop them up, separate the metals from the plastic coating, and dispense the materials in two separate streams. These machines are unable to process the thin bundles of electrical cables. The smaller cables, generated from car electrical systems, cannot be taken apart, so they are just burned.<sup>35</sup>

The Basic E-Waste Recycling Facility was established after the studies conducted at Agbogbloshie Market in 2010 by Blacksmith Institute, in partnership with GreenAd Ghana, the Ghana Health Service, and the City University of New York School of Public Health. The study focused on the occupational and environmental exposures of electronic waste recyclers. The report showed that e-waste processing, particularly the burning of copper wires, not only exposes e-waste workers but also local residents and family members to hazardous levels of heavy trace elements. The facility began 2014 as a pilot project by Blacksmith Institute and GreenAd Ghana to assist the recyclers in avoiding burning wires but in stripping the wires in such a way that is efficient and profitable. The Project was funded by the United Nations Industrial Development Organization (UNIDO), through the Global Alliance for Health and Pollution (GAHP).<sup>36</sup>

### Government Response

The Government of Ghana has taken some steps towards addressing the e-waste problem in Ghana, particularly in Agbogbloshie. It has also supported other peoples' projects geared to alleviating the Agbogbloshie e-waste issue.

In July of 2016, the Parliament of Ghana passed the Hazardous and Electronic Waste Control and Management Act, Act 917. The bill is meant to streamline the collection of and direct the control, management, and disposal of hazardous, electronic, and electrical waste. In addition to constituting a legal framework for managing e-waste, this measure covers Near End-of-Life used equipment which is not covered by existing international or regional conventions. One key provision of Act 917, 31,

states "The Minister on the advice of the Agency may make arrangements for the establishment of electrical and electronic waste recycling plants and related facilities in the country." In fulfillment of this law, the Government of Ghana announced the establishment of a state-of-the-art recycling facility to be constructed at Agbogbloshie in October of 2018.

Another key provision under the fifth schedule of the Hazardous and Electronic Waste Control and Management Act designates that all electrical and electronic equipment imported from exporting countries is subject to an Advance Recycle Eco Fee to be collected by external service providers.<sup>37</sup>

Yet another important aspect of the Act, the President highlighted, is the establishment of a fund to support key trade associations, such as the Ghana Union of Traders' Association (GUTA), the Association of Ghana Industries (AGI), and the Media, and to support research in academic and research institutions.<sup>38</sup>

Other progressive initiatives are underway, such as the E-Waste Management (E-Magin) project in Ghana, which will convert the informal recycling methods into a formal recycling of end-of-life electronic waste. Slated to be implemented in eight regions in Ghana, this project's activities follow the progress that the United Nations Environmental Programme (UNEP) and EU funded (€1.2M) Switch Africa Green Project has brought about in five other African countries. Ghana's Minister of Environment, Science, Technology, and Innovation, Professor Kwabena Frimpong Boateng, is confident that the E-MAGIN project, and others like it, will be conducive to a healthier environment.<sup>39</sup>

The above-mentioned project, spearheaded by the University of Cape Coast (UCC), is being implemented in collaboration with Ghana National Clean Production Centre (GNCPC), City Waste Recycling Company Limited in Ghana and Germany-based Adelphi Group.<sup>40</sup>

In addition to fostering a healthier environment, the project will provide 22,000 self-sustaining jobs for Ghanaian youth according to Ghanaian President Nana Akufo-Addo. Similarly, this initiative will provide collection centers which will, hopefully, retain and train the original poor e-waste workers, as well as provide raw materials to sustain the facilities' operation.

According to President Akufo-Addo, these actions help to realize what was intended in the United Nations Sustainable Development Goals (SDGs). The President as co-Chair of the Group of Advocates of Eminent Persons for the implementation of the 2030 UN SDGs, believes that the implementation of the National Integrated E-Waste Management Programme is directly linked to addressing six (6) of the 17 United Nations Sustainable Development Goals. They include Goal 3, that is, ensuring

healthy lives and promotion of well-being for all; Goal 6, ensuring availability and sustainable management of water and sanitation for all; Goal 8, promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; Goal 11, that is, making cities and human settlements inclusive, safe, resilient and sustainable; Goal 12, that is, ensuring sustainable consumption and production patterns; and Goal 14, conserving and sustainably using the oceans, seas, and marine resources.<sup>41</sup>

### **Proposal Envired by Krobo Edusei Jr.**

On Thursday, October 26, 2017, Mr. Krobo Edusei, Jr., Executive Chairman, Safebond Limited, (SCL), made a presentation to a group of graduate students and faculty about the Agboglobshie e-waste dump and his vision for addressing the problem. The occasion was EnviroBytes, an informal Center for Environmental Research and Education, (CERE) seminar that introduces students to diverse environmental issues and research topics. The series is organized by the Department of Environmental Studies of Duquesne University in Pittsburgh.

The CERE collaborated with the Center for African Studies to host this particular session during which Mr. Edusei spoke on the topic of “Tackling the Global Issues of E-Waste.” In his presentation, Mr. Edusei outlined his vision and plan regarding e-waste in Ghana, especially the toxic city of Agboglobshie.

During his visit to Pittsburgh, Mr. Edusei also met with representatives from the offices of the Mayor and the Governor where he was invited to present his plans for Agboglobshie, in addition to the CEOs of businesses specializing in e-waste and waste management more broadly.

His original plans were as follows:

1. Lobby the Parliament and the Government of Ghana to pass an e-waste bill (above referenced Hazardous Waste Control and Electronic Management Act, which passed in 2016. Technical Guidelines for Environmentally Sound E-Waste Management were not launched until 2018)
2. Apply duties on imports of e-waste
3. Set up an e-waste recycling factory
4. Recycling factory will incorporate the youth and workers currently dependent on e-waste for livelihood
5. To have educational and training facilities available for youth
6. To make the project sustainable and profitable for all the stakeholders

According to Mr. Edusei, his company, Safebond, was asked to draft a proposed e-waste measure outlining the control and management of e-waste in Ghana. Though the private sector’s role is crucial in remedying the e-waste problem, it cannot be done without the Government. He foresaw that this law would help the Government to manage the importation and reception of electronics and electricals nearing their end of shelf life. The Government could levy taxes and duties on these goods and gain some revenue.

The Government of Ghana can then spend less money and labor trying to stop or combat the importation and dumping of e-waste in the country. People can legally bring in the e-waste and pay duties on these articles. The law would also permit and set forth conditions for setting up recycling factories.

With a legal framework in place, the illegal and secret dumping of waste would be curtailed, mirroring the legal structure adopted in Nigeria. The Nigerian Government put duties on old computers imported for spare parts to prevent becoming an e-waste dumping ground.<sup>42</sup>

According to Mr. Edusei, international regulations prohibit the dumping of waste in other countries. Such regulations include the European Waste Shipment Regulation (WSR) and Organization for Economic Cooperation and Development (OECD) and those discussed earlier. These bodies put in place agreements meant to forbid the shipment of hazardous waste. The regulations pertaining to hazardous waste is supposed to permit only transportation of non-hazardous waste provided it will be recycled safely. Unfortunately, these regulations have not prevented the dumping of e-waste in Agboglobshie or other developing countries. That is why Mr. Edusei thought, following Nigeria's example, in terms of legislation, would be advantageous for Ghana.

The authors of this chapter believe that the issue of e-waste is one that is vitally important to the environment and the human condition, particularly in Agboglobshie. Moreover, if not well handled and managed, e-waste can pose a big challenge to global sustainability. For this reason, we made sure to visit Agboglobshie during our trip to Ghana to examine the situation in this wasteland for ourselves.

On June 5, 2018, we were taken to Agboglobshie by Mr. Krobo Edusei, Jr. As noted previously, he is the Executive Chairman of Safebond Africa, Ltd. Within Safebond’s very large portfolio is the management of a portion of shipyard operations for two commercial ports of Ghana. Given that vantage point, if anyone would have firsthand knowledge of the amount and type of e-waste entering Ghana, Mr. Edusei would. He and his group are at the forefront of handling the e-waste problem as he has been awarded a



contract by the Government of Ghana to construct a processing plant to process the huge amount of e-waste in this West African country. But that is not his only role, for his vision of how best to deal with this problem has been borne out of his considerable domestic and international experience and expertise in business, and in managing large operations and numbers of people. Mr. Edusei has been the catalyst for the concerted effort being undertaken in Ghana within the past few years to address this challenge.

Following our tour of Agbogbloshie, we interviewed Mr. Edusei to get a better understanding of just what his plan entailed. His succinct and very knowledgeable responses left us with no doubt regarding either his ability to implement this initiative or his considerable knowledge regarding all aspects of the e-waste industry.

He said, “Our plan is to move all of the waste and process it in a normal, scientific manner according to international standards. Get those young people, old people and all of the people that live there out of the five toxic square miles that you saw, get the place environmentally cleaned up and set up the factory that will process the electronic waste in a professional way. I was awarded the contract to process the waste by the Government of Ghana. I have given a facility by the Government of Ghana. The Germans are offering equipment and money. The Chinese offered us money, and the Italian Government has offered us money. Various institutions, various countries are offering money because the whole world is concerned about Agbogbloshie.”

“So it is not a Ghanaian matter anymore, it has become a regional, African matter—a symbol of reversible colonization in the sense that the rubbish and the garbage of the north is sent to the poorest of the poorest of the poorest and makes them even more poor because it wrecks their lives. It poisons people here in Ghana; the food is poisoned. The people do not know what is happening, they do not understand the effects of what is going on, they know it smells nasty, but they don't know that it kills them.”

Krobo Edusei, Jr. is a businessman, in addition to being a pragmatist. He believes that e-waste on its own is not a bad thing and understands that it constitutes big trade, in particular, the metals. Since it is cheaper to mine an ounce of gold from the computer than from a goldmine, stemming the flow of e-waste into Ghana is not likely to happen. The issue of the flow, if appropriately regulated, is not the issue in his view. The issue is what happens when these materials come to Ghana. He estimates that 80 to 90 percent comes as second-hand equipment which the poor are pleased to receive, but items such as refrigerators and generators are disposed of within two years and become e-waste.

When asked whether countries that use Ghana as a dumping ground should be assessed a fee, he spoke of the Eco-levy resulting from the Basel Convention that mandates a built-in fee for end of use disposal. In order to access these funds, however, there first has to be a law in place. Fortunately, for Ghana, it passed the previously referenced “Hazardous and Electronic Waste Control and Management Act” in 2016. In order for Ghana to access funds domestically from the Eco-levy, the processing company has to be set up, though some international funds are available presently for end of use disposal.

A question that comes to mind when examining the problem of e-waste and its flow is, why and how did Ghana and other developing countries end up becoming waste dump locations? The explanation is that richer, developed countries want to ship out the problem of processing. They do not want to process it in the United States or Germany or other countries because it costs far more to process. The wages are higher; there may be fees to pay predicated on environmental levies. The market has a way of choosing its preference, and the preference nearly always is finding the cheapest way of doing things, and Ghana has heretofore been of the cheapest destinations. The market has a way of regulating itself.

Often, in an attempt to modernize and change a given industry, companies will drive people out of their jobs and/or where they live. In this instance, Mr. Edusei plans to retain the current workers, while the processing plant is being built, and to employ up to 40,000 young people to work in regional collection centers. These slum dwellers and those who end up in Agbogbloshie from the hinterland are not a part of the normal economic cycle. They do not pay taxes, nor will they have pensions. Once they are in the collection centers, they will pay taxes and become a part of the formal sector.

When Mr. Edusei was asked why he was certain his model would work and whether Africa, specifically Ghana, could be the model the rest of the world would emulate, he provided the following rationale: “The market controls goods; the market is key. It will be a model for the middle income and developing world. There have to be pioneers everywhere. I went to Holland to see a similar plant and learned it is far cheaper to send it to Africa. Africa is often underestimated. For example, look at mobile money which started in Kenya. Instead of being a dumping stream for electronic waste, people will see there is another way of treating it and making money. I believe that what we are going to do will have a major impact all over the world for there is a way to treat it and make money from it.”

While Edusei's passion and determination are clearly evident in everything he says and does, he is particularly passionate about the plight

of young people living in Agbogbloshie. According to him, “The youth in Agbogbloshie presently have no type of education. The state has abandoned them. They are non-people who people do not want to see. They are people that have nothing to look forward to, for by the age of 14 or 15, their kidneys or livers are gone and by 25, they are dead. The state had abandoned them, but this same state has now passed this law for it knows this kind of system cannot go on forever. The youth bulge in Africa is the biggest problem facing countries in Africa. They cannot turn a blind eye to it.”

Mr. Edusei believes that with the private sector reaping its profits, the government deriving revenue, the youth being educated, trained, and employed, the project of controlling and managing e-waste effectively will be sustainable.

Since Krobo Edusei gave this interview, the contract awarded to him by the state for the processing plant has been rescinded by the current administration in Ghana and given to someone else. The matter is now being adjudicated in a Ghanaian court of law. It is our hope that the visionary model described above will ultimately come to fruition in Ghana, as well as in other countries in West Africa.

### **Uniqueness of Edusei’s Vision**

The uniqueness of this vision lies in its humane and moral aspects. His insistence on retaining the current peasant workers, those individuals ruminating in dangerous, smoke-filled dumps, and uplifting youth who have no hope for a better way to live are examples of these humane aspects.

The poor are always closer to death and danger than other people. In their bid to find food to survive, nothing else trumps this desperate need. They do not consider the hazards and risks to their health that come with certain activities. Everything is subservient to this fight for survival. This is why the poor, the ignorant and disenfranchised are the most affected by this e-waste toxicity because not only do they live in close proximity to the waste; they rummage in it to earn their daily bread. If there are required precautions and gear, the poor and ignorant are the very ones that may not have knowledge of them and, if they are aware of them, cannot afford them.

Unfortunately, when the appropriate, state of the art factories are built, either by the Government or by the private sector, these poor citizens are the first to be evicted and disposed of, and this why the consideration given to this group of people by Edusei and his associates is unique and should be a model for other countries. In making this moral or social justice consideration in his vision of recycling approach, Edusei is, indeed, incorporates ethics in the initiative towards sustainability.

### **Contribution to Global Sustainability**

Besides the social justice consideration, the establishment of appropriate e-waste recycling and handling will prevent further contamination of and improve the air, water, and soil quality. It will reduce the emission of temperature, raising chemicals and gases into the atmosphere and thereby contribute to the reduction of global warming.

In view of the above, the establishment of a proper e-waste recycling and handling project will help to improve the health and wellbeing of humans, animals, plants and other organisms in the Agbogbloshie area and Ghana. The vision if realized will, as stated above, provide jobs, education, and improve the economic situation of both individuals and the country.

Therefore, the venture will not only assist in reducing challenges to global sustainability; it will contribute toward sustainability. By sustainability we mean “the process of maintaining change in a balanced fashion, in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.”<sup>43</sup> Put in another way, sustainability is “a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.”<sup>44</sup>

Sustainability is frequently construed as having three aspects, environmental, economic, and social. The environmental aspect includes all the physical conditions of the world, such as species extinction rates, air, water, soil quality, earth's temperature, and time of global warming.

The economic aspect recognizes that human economic and business activities have a significant impact on the larger world environment and human society, and in our own world. The economy is critical to our effort towards sustainability. The social aspect includes many elements of human society, such as human health and wellbeing, culture, education, religion, and social welfare. No doubt, the sort of e-waste recycling approach envisioned by Edusei will positively impact and realize the three aspects of sustainability outlined here. That is why we opine that the venture will not only assist in reducing challenges to global sustainability but will contribute toward sustainability.

However, all the stakeholders must play their parts for any plan to be sustainable. The Government of Ghana must enforce the Electronic Waste Control and Management Act by regulating and monitoring waste production and adhering to all the provisions contained in it. The e-waste workers must comply by stopping the crude practices currently in use when



environmentally friendly e-waste recycling methodologies become available. All the stakeholders must be mindful of ensuring the protection and proactive management of human health problems related to the environment in forms of economic activity. With respect to economic activity, those in the private sector must ensure that some of the profit derived goes to the intended beneficiaries rather than simply a return on their investment.

### Conclusion

E-waste not only threatens the environment and the people who reside in a given developing country or countries, but it also impacts the human family in its entirety. The prevailing trend that everything is disposable, and often carelessly, from electrical equipment and electronics to poor people imprisoned in toxic waste dumps, has to change if the international community is to adhere to the many conventions and regulations it rightly put in place. More importantly, it has to change to save the earth, for climate change and e-waste are interrelated, pollution and contamination of the air, water, and soil are linked to e-waste, and the deterioration of the health of people, in particular children, is caused by e-waste.

While it may seem easy to put the blame squarely on those wealthy countries that export tons of e-waste with impunity, the fact remains that it is a far more complex problem. Consumer demand for new, shiny things - cell phones, laptops, televisions, kitchen appliances, and cars, among other items, controls the market. It stands to reason then that the more money people have, the more money they spend, thus driving the market, and, as Mr. Edusei said, "the market is key." It is presently not in the public's consciousness to consider the ramifications of its appetite for the latest technology or equipment. There is no reason to suspect that the amount of e-waste will decrease globally; in fact, it will continue to increase as long as people have an appetite for things they have learned are convenient and pleasurable for them to own and discard in lieu of a new model or when they no longer work.

The authors have learned while studying this e-waste problem, that very few people in wealthy countries, such as the United States, even know what e-waste is, never mind what is happening in Agbogboshie. The air they breathe does not smell every day, except in certain industrial areas or places where there are far too many cars. They are not contracting diseases as a result of polluted water or contaminated soil, except in isolated instances. The concept of recycling has been introduced and employed in developed

countries, but, for the most part, aside from landfills, it is cheaper to dispose of anything that is no longer usable by exporting it.

Many developing countries, whether or not they are a party to international conventions governing e-waste, have their own regulatory agencies, such as the Environmental Protection Agency in the United States, so there are internal safeguards in place to protect citizens from irresponsible and reckless procedures for disposing of waste. Up until recently, developing countries, such as Ghana, have not had these bodies or, if they do, their enforcement mechanisms are lax.

Today, as in the past, poor nations continue to inherit the bulk of e-waste and its associated health hazards. So where does the onus lie on the exporter, or the importer, or the billions of users of what becomes e-waste? Another question which comes to mind is what can be done to address the challenge of e-waste? And finally, how sustainable are new methodologies in addressing e-waste in the face of an ever-increasing flow of disposable electronics and hazardous materials?

Increasingly, exporters of e-waste are paying levies on materials shipped to developing countries and the domestic and international laws governing these exports are becoming more stringent, as the Bamako Convention is with respect to hazardous waste as compared to the Basel Convention. Importers should also be responsible for ensuring that they are aware of all of the materials being shipped into their respective countries, where it comes from, where it goes and how it is being handled. Increasingly, using Ghana as an example, developing countries are complying with international bodies and working on adhering to the Sustainable Development Goals as they pertain to the environment and the well-being of their respective citizenries.

With respect to consumers, educating them through public awareness campaigns as to the dangers of e-waste to their health, (or to the health of others), as well as urging that they keep their electronics as long as possible, and dispose of them safely when they are no longer useful, may help in curtailing the steady acquisition of new electronics.

Since the amount and flow of e-waste is not likely to decrease, finding ways to eliminate crude informal recycling methods is very important, as is building efficient, environmentally-friendly, recycling/processing centers, that are equipped to handle even the most sophisticated technology and electronic machinery. There must be collection centers, as stated by Mr. Edusei, where poor people and other people in possession of disposable waste, can turn in this material and be compensated. There must be rigid enforcement mechanisms that outlaw unsafe methods of recycling and regularly test the air, water, and soil to safeguard against pollution and

contamination. Those individuals working in the e-waste industry must have protective gear and access to regular healthcare and treatment. Most important, they must be given a way to earn a living that safeguards them against the hazard conditions they now endure.

The perpetrators of heaping e-waste on other countries cannot have a pass on endangering the earth -its air, water, and soil, nor can the recipient countries that do not protect their poor and uneducated from the consequences.

The authors have come to understand and to see firsthand the perils of e-waste. We believe, however, that there are solutions, the type articulated by Mr. Edusei in which every party has a role to play -the government, the private sector, and the e-waste industry. Additionally, the building of recycling entities and the techniques and strategies for managing e-waste must keep pace with the amount of e-waste that is being imported. Only then will any plan put in place to address the situation be sustainable.

As efforts to remedy this Herculean challenge begin to come to fruition, and modern techniques are utilized, poor people who have borne the brunt of e-waste, whose lives have been cut short and who have no education or place to go should not be sacrificed in the process. Instead, they should be educated and retrained so as to become an integral part of the formal economy. While, at this juncture, we do not know whether the Edusei proposal that factors in all of these complicated elements will be realized in Ghana, it is our hope that it will stand as a model to be implemented either there or in another developing country.

## Notes

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<sup>15</sup> *Ibid.*, 30.

<sup>16</sup> *Ibid.*, 32.

<sup>17</sup> *Ibid.*, 34.

<sup>18</sup> *Ibid.*, 35.

<sup>19</sup> Williams, et al., "E-waste."

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<sup>31</sup> David Schlosberg, *Defining Environmental Justice: Theories, Movements, and Nature* (Oxford-New York, Oxford University Press, 2007), 2-5. Simply put, environmental justice provides for basic human needs and improving the overall quality of life to include healthcare, housing, a safe and clean environment, and human rights. D. A. McDonald, *Environmental Justice in South Africa* (Cape Town, SAF: Juta and Company, 2004).

<sup>32</sup> Cf., McDonald.

<sup>33</sup> David Amuzu, *Unravelling Urban Environmental (In)justice of E-waste Processing Activities in Agbogbloshie, Accra-Ghana*, Unpublished MA Thesis, [MPhil in Development Studies, Specializing in Geography], May 2015, Norwegian University of Science and Technology Faculty of Social Sciences and Technology Department of Geography, Trondheim.

<sup>34</sup> S. Prakash, et al., *Socio-economic assessment and feasibility study on sustainable e-waste management in Ghana*. Commissioned by Öko-Institut eV in cooperation with Ghana Environmental Protection Agency (EPA) & Green Advocacy Ghana, Ministry of Housing, Spatial Planning and the Environment, VROMInspectorate, and the Dutch Association for the Disposal of Metal and Electrical Products (NVMP) (2010), retrieved at, <https://www.oeko.de/oekodoc/1057/2010-105-en.pdf>.

<sup>35</sup> Pure Earth Black Smith Institute, “Ghana (Agbogbloshie) – E-Waste Recycling.” *Pure Earth.org* (June 2015), retrieved at,

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<sup>36</sup> Ibid.

<sup>37</sup> Reuter, “Gov't to build E-waste recycling facility in Agbogbloshie,” *Ghana News*,” Myjoyonline.com, (August 29, 2018), 08:08:04 pm., retrieved at, <https://www.myjoyonline.com/news/2018/August-29th/govt-to-build-e-waste-recycling-facility-in-agbobloshie.php>.

<sup>38</sup> Reuter, Gov't to build E-waste.

<sup>39</sup> Paul Ploumis, “Ghana’s Electronics Recycling Boosted by €1.2M EU Funding,” *Scrap Monster.com News* (February 16, 2018), 02:30:48 PM., retrieved at, <https://www.scrapmonster.com/news/ghanas-electronics-recycling-boosted-by-12m-eu-funding/1/67024>.

<sup>40</sup> Ibid.

<sup>41</sup> United Nations, Sustainable Development Goals, retrieved at, [http://www.undp.org/content/dam/undp/library/corporate/brochure/SDGs\\_Booklet\\_Web\\_En.pdf](http://www.undp.org/content/dam/undp/library/corporate/brochure/SDGs_Booklet_Web_En.pdf). See also, Reuter, “Gov't to build E-waste.”

<sup>42</sup> Down To Earth News, “Nigeria slaps heavy duties on old computers,” *DownToEarth.org* (Saturday, July 4, 2015), retrieved at, <https://www.downtoearth.org.in/news/nigeria-slaps-heavy-duties-on-old-computers-4294>.

<sup>43</sup> Global Footprints, “What is sustainability?” retrieved at, [www.globalfootprints.org](http://www.globalfootprints.org).

<sup>44</sup> The World Commission on Environment and Development, *Report of the World Commission on Environment and Development: Our Common Future*, 1987, Ch. 1, no. 27.

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