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END OF THE LINE: TRACKING THE COMMODITY CHAIN
OF THE ELECTRONIC WASTE INDUSTRY

by

Jacquelynn A. Doyon

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
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Department of Sociology
Advisor: Paul Ciccantell, Ph.D.

Western Michigan University
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END OF THE LINE: TRACKING THE COMMODITY CHAIN OF THE ELECTRONIC WASTE INDUSTRY

Jacquelynn A. Doyon, Ph.D.

Western Michigan University, 2012

This study examines the transfer of electronic waste (e-waste) from core to peripheral nations, specifically coastal nations in Africa. The theoretical perspective marries green criminology with world systems theory in examining the ways in which marginalized populations bear the burden of hazardous waste disposal across the globe. The study is comparative, looking at legislation in the United States as well as international legislation and enforcement, and also employs case study methodology, contrasting e-waste disposal in Nigeria and Ghana. The final intent of this research is to determine whether or not the violation of national and/or international legislation regarding the transfer and disposal of e-waste constitutes a social harm.

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A very important academic mentor once told me, “a good dissertation is a done dissertation”—and I can honestly say that if it was not for a handful of very important people, this would dissertation would not even be close to “done.”

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Jacquelynn A. Doyon

TABLE OF CONTENTS

ACKNOWLEDGMENTS	ii
LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTER	
I. INTRODUCTION	1
Statement of the Problem	1
Purpose of the Study	3
Research Questions	4
II. LITERATURE REVIEW	6
The Basics of Environmental Justice	8
International Environmental Justice	11
Green Criminology	12
World-Systems Theory	17
III. METHODS	25
Data Sources	26
Data Analysis	27
Green Criminology Analysis	31
Commodity Chain Analysis	34
Introduction to Case Study Method	36
Designing the Case Study	37

Table of Contents—continued

CHAPTER	
Selected Case Studies.....	40
Nigeria	40
Ghana.....	42
Limitations	44
IV. LEGISLATION AND POLICY	48
Legislation in the United States	48
The Clean Air Act (CAA).....	48
The Clean Water Act (CWA).....	51
The Resource Conservation and Recovery Act (RCRA).....	52
The Toxic Substances Control Act (TSCA).....	54
Electronic Waste in the United States	54
Enforcement.....	59
Hazardous Waste Electronic Manifest Establishment Act	60
International Legislation	61
Early Regulation and the Basel Convention of Transboundary Movements of Hazardous Wastes and Their Disposal (1989).....	61
European Union Network for the Implementation of Enforcement of Environmental Law (IMPEL)	65
Waste from Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Waste Substances (RoHS)	68
The Case of Africa	70
V. THE COMMODITY CHAIN	73

Table of Contents—continued

CHAPTER	
Introduction to the Commodity Chain	73
Global Commodity Chains (GCC).....	75
Global Commodity Chain Sustainability Analysis (GCCSA)	76
Raw Materials and Manufacture	77
History, Evolution and the Technological Advancements of E- Waste Products.....	85
Consumption Levels of E-Waste Products / Average Lifespan	86
Analysis of Market Structure and Trends	88
Planned and Perceived Obsolescence	90
Changing Market Trends.....	93
Conclusion	97
VI. THE ELECTRONIC WASTE INDUSTRY.....	98
Evolution of the Industry.....	98
Externalization of Harm.....	101
Emerging Illegal E-Waste Markets	102
The Case of Executive Recycling Inc.....	109
Lobbying for E-Waste: The Political Economy of the Industry	113
Extended Producer Responsibility: Comparison between the U.S. and the EU	115
Tracking the Environmental Impacts of Transboundary E-Waste	118
Analysis of Social and Environmental Impacts of the E-Waste Industry.....	118

Table of Contents—continued

CHAPTER	
Conclusion	122
VII. CASE STUDIES	124
Case Study: Lagos, Nigeria	124
Toxic Waste Legislation in Nigeria	132
The Koko Incident	132
Case Study: Accra, Ghana	137
Toxic Waste Legislation in Ghana	143
Comparison of Case Studies	147
Challenges and Solutions in Nigeria and Ghana	151
Summary and Conclusion	157
VIII. DISCUSSION AND CONCLUSION	159
Electronic Waste Regulation	160
Lack of Enforcement	162
Inconsistencies in Regulations and Sanctions	165
The State of the Industry	167
Exporting and Importing Nations	170
Conclusions	171
Environmental Justice	171
Green Criminology	173
World-Systems Theory	175
Global Commodity Chain Sustainability Analysis	176

Table of Contents—continued

CHAPTER	
Future Research.....	179
BIBLIOGRAPHY.....	181

LIST OF TABLES

1. Methodological Coding System	29
2. Average Lifespan for Select Electronic Products	94
3. Harmful Chemicals Released during Dismantling and Recovery of E-Waste	121

LIST OF FIGURES

1. Generic Analytical Framework for Electronic Commodity Chain	77
2. Electronic Product Lifecycle in the United State.....	96
3. Successful E-Waste Management in African Nations.....	153

CHAPTER I: INTRODUCTION

Statement of the Problem

Concern for the environment has been on the rise over the last forty years and has penetrated mainstream media in an unprecedented manner over the last ten. Debates over human impact versus natural environmental change continue, placing blame on anything that moves or breathes. Grassroots organizations practice anything from passive dissent to violence and destruction in order to convey their concerns for the natural world. While there are articles, books, magazines, small groups, large organizations, laws, cleaning products, discussion groups, blogs and who knows what else dedicated to environmental protection, the social sciences have just recently begun to develop a more substantial body of literature on the subject. Although past research is resourceful, it is quickly becoming outdated from both economic and technological standpoints.

Electronic waste is an excellent example of product obsolescence that has permeated both consumer and waste markets. For example, electronic hazardous waste, or “e-waste,” consists of electronic products (computers, televisions, VCRs, fax machines etc.) that have reached the end of their useful life (as decided by the consumer) and must be discarded. Most of these products could be reused, refurbished or recycled, but many end up in the toxic electronic waste stream that is now circling the globe. Electronic waste disposal is swiftly becoming a burgeoning

business of toxic harm that, due to increasing technology, will not be disappearing or even declining any time soon. While this 'business' exists either through export or import in nearly every nation in the world, a lack of awareness of the life cycle of refuse in the general public is perhaps its most valuable supplier. The (often illegal) market of toxic trade has turned even the disposal of waste into a criminal enterprise, which has in turn garnered the attention of criminologists.

In the social sciences, there is a lack of data and consequently of interpretation of data on the intersection of environmental harm and crime. Several authors have called for increased research in this field (Beirne 2007; Lynch and Stretesky 2007; White 2008), in order to explore and identify how and when environmental degradation constitutes a social harm, and whether or not it can and should be labeled criminal. While some focus has been dedicated to environmental racism and injustice issues, little work has focused on the current criminological state of environmental harm and its relationship with environmental justice and green criminology. Furthermore, even less work has been dedicated to the study of national environmental legislation and its relationship to *international* environmental harm. Issues with globalization are relevant here and we see the ever-present themes of economic growth and success begin to govern environmental policy. By marrying World-Systems Theory with the relatively new field of green criminology, a sociological/criminological approach to environmental research can be used in an

exploration of the current state of electronic waste disposal as a case of environmental injustice.

Purpose of the Study

The purpose of this paper is to provide an in-depth, qualitative study on the current state of international e-waste disposal practices. The paper will attempt to identify current practices and procedures surrounding transnational environmental dumping, including an examination of: parties responsible for e-waste export and import; general international law governing transnational dumping; relevant legislation in the countries of origin for transported e-waste; current dumping practices by international corporations; enforcement of national and international law and legislation; and the environmental/human consequences of these actions. The study will explain the current state of the industry of e-waste disposal, as well as the interests of both private and state organizations in the industry. Furthermore, this paper will seek to identify the ‘spaces between laws’ should they exist in transnational e-waste disposal practices. The case study method will be applied in order to comparatively examine the practices of e-waste disposal under two different regulatory regimes.

It is hoped that this research will make a substantial contribution to the field in that it addresses the issue from a unique theoretical standpoint. The use of green criminology (which successfully encompasses environmental justice) paired with

world-systems theory (which is not commonly used in criminological research) will present a completely different picture of the industry of electronic waste than has previously been recorded in e-waste research. In addition, the combination of world-systems theory with the green criminological approach will also allow for a more in-depth analysis and discussion of relevant transnational legislation, as evidenced in the case study method.

Research Questions

The focus of this study is to explore and answer the following questions:

1. Identify transnational regulation of electronic waste (e-waste) dumping and/or disposal. Are these regulations enforced? Followed?
2. Describe the current state of the industry of e-waste disposal. What are the state and organizational interests in e-waste disposal? Are there spaces between the laws?
3. Are there any deficiencies and/or inconsistencies in transnational e-waste disposal regulation between country of origin and country of disposal?

In order to answer these questions, a thorough literature review will be conducted, covering a multi-theoretical approach. Environmental justice, green criminology and world-systems theories will be employed in order to better understand the structural framework of the electronic waste industry. An extensive review of current legislation governing the transboundary shipment of electronic waste will also be conducted, including policies from the United States, the European Union and West Africa. In order to gather data that will be needed for further analysis, commodity chain and

case study analyses will be utilized. The commodity chain of electronic waste will be explored beginning from the extraction of raw materials, to the production of electronics, to the distribution and consumption of these products, and finally to their recycling and disposal. The current state of the electronic waste industry will also be reviewed in an attempt to uncover potential regulatory failures and/or illegal e-waste markets. In depth case studies of port cities in Nigeria and Ghana will be conducted with the intent of realizing the full impact of transnational e-waste disposal. It is hoped that this research will be successful in determining the scale of the e-waste industry and the structural framework from which it operates.

CHAPTER II: LITERATURE REVIEW

The electronic waste industry may be relatively new, but there are decades of theoretical foundations upon which it can be examined. The environmental, social, political and economic implications of the international transfer of e-waste are complex; in order to better analyze these components, environmental justice, green criminology and world-systems theory will be employed. Environmental justice and green criminology can both work to illuminate not only the environmental harms of e-waste, but also the social harms that are inherent with any kind of toxic waste. World-systems theory is useful to tie in the complicated political and economic issues associated with the e-waste industry. A very critical component of world-systems theory—commodity chain analysis—will be used to address the complicated longitudinal journey of electronic waste across continents.

Although technology is often sought after and celebrated, especially in core nations, its benefits are not often experienced by those residing in the periphery. While new advances in communication and entertainment maintain their advantages, there is nothing new in the way they contribute to the international waste stream, which is increasingly being augmented by hazardous and electronic waste. The consequences of globalization have penetrated almost every corner of the globe at a cost that is only just beginning to be realized. As suggested by environmental justice activists, these costs are disproportionately impacting marginalized populations.

Many have noted that there is a direct relationship between the increasing globalization of the economy and environmental degradation of habitats and the living spaces for many of the world's peoples. In many places where black, minority, poor or indigenous people live...waste from both high- and low-tech industries, much of it toxic, has polluted groundwater, soil and the atmosphere (Robinson 2000: 18).

It is estimated that roughly 400 to 500 million tons of hazardous waste are produced annually in the world—approximately 35 to 40 million tons of this waste will at some point in time cross international borders (Liddick 2011). While not all trafficked waste is illicit, Liddick (2011) states that significant portion of it is:

Beginning in the 1980s, globalization and the liberalization of international trade policies made it easier for legitimate entities to conduct business, but it also facilitated the growth of transnational organized crime—all manner of goods, including waste materials, could more easily cross international borders. More strict environmental laws and regulations concurrently precipitated a steep rise in the costs of safe and legal disposal, and so it was that the perfect storm of conditions created the opportunity for the illicit (and cheaper) dumping of nonhazardous and toxic wastes (Liddick 2011: 13-14).

As demonstrated previously, concerns pertaining to hazardous waste have been present for decades. It is only within the last twenty or thirty years that the effects of electronic waste have come to light, and only in the last ten that our rapid cycling of electronics (“out with the old, in with the new”) has highlighted the increased pace of waste generation.

Electronic waste is most easily explained as the most frequently discarded electronic products (such as cell phones, computers, computer monitors and televisions) and the toxic elements of those products (such as lead, cadmium and mercury) (Schmidt 2006). The consequences of this continued system of production,

consumption and disposal are devastating. As would never be tolerated in the United States and other industrialized countries, peripheral nations endure buried waste that leaches into the ground and the water supply, and unburied waste that is burned in the open air. While visiting Nigeria in 2006, Basel Action Network coordinator Jim

Puckett:

[s]aw people using e-waste to fill in swamps... Whenever the piles got too high, they would torch them... Residents complained about breathing the fumes, but the dumps were never cleaned up. ...[there were] kids roaming barefoot over this material, not to mention chickens and goats [which wind up in the local diet] (Schmidt 2006: 232).

The case described by Puckett is not the exception but the norm; dump sites such as these persist across the country of Nigeria, as well as in several other peripheral regions in Africa, Asia and the Middle East.

Of particular concern is the lack of data recorded on the e-waste trade, rendering it impossible to even estimate the scope of the problem (Schmidt 2006). It is the intention of this research to obtain as much information as possible in order to fully comprehend the range of transnational exportation of e-waste. To achieve this, a theoretical base encompassing environmental justice, green criminology and world-systems theory is employed.

The Basics of Environmental Justice

Environmental justice in layman's terms is the right of all individuals, irrespective of race, ethnicity or income, to equal protection from harm caused by

environmental hazards. As defined by the Environmental Protection Agency in the United States, environmental justice denotes:

[t]he fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies (US EPA).

By fair treatment, the United States Environmental Protection Agency (EPA) holds that no group should disproportionately bear the burden of environmental consequences. When this (environmental *injustice*) occurs, it is often termed *environmental racism*¹ as race seems to be the key factor in cases of environmental injustice. A more widely accepted definition has since been expanded to include the equal distribution of environmental amenities as well (such as open space, parkland, protected waterways etc.) so that no one group has inequitable access to environmental benefits or exposure to environmental harm:

The most obvious and oft-cited evidence of environmental justice in the global realm is distributive-specifically the inequitable share of environmental ills with which poor communities, indigenous communities, communities of color and communities with economies outside the neoliberal model must live (Schlosberg 2007: 79).

Several authors and activists have sought to expose and reduce this form of injustice, which occurs daily across the globe (Bullard 1990; Clapp 2010; Jorgenson 2003; Liddick 2011; Madava 2001; Rice 2007; Schlosberg 2007; White 2008).

¹ As research has demonstrated, income is second only to race as a key factor in susceptibility to being directly affected by adverse environmental conditions (Bullard 1994).

Following the increase of economic globalization in the 1980s, the flow of international trade began to include a lucrative new product: waste. This led to the shift of environmental pollution from industrialized, core countries to less-developed, peripheral nations. Countries in Africa, Asia and South America regularly import what other nations can afford to export (Center for Progressive Reform 2011; Clapp 2003; Clapp 2010; Liddick 2011; Wynne 1989). Critics of this developing trade argue that weak (or in many cases, a lack of) environmental legislation governing the international trade of hazardous waste is responsible:

Weak environmental regulations and lax enforcement of laws foster this shift, supported by trade rules that force developing countries to make trade-offs between environmental protection and economic prosperity. Notwithstanding attempts to regulate the international waste trade by treaty, illegal exportation of hazardous wastes to developing countries continues to flourish. Moreover, the negative effects of widely recognized environmental degradation (ozone depletion, climate change, declining biodiversity, deforestation) are borne disproportionately by developing countries and poor populations across the globe (Center for Progressive Reform 2011).

Increased awareness of environmental degradation is evidenced by expanding bodies of literature on the subject, frequent mention of the issue in the media, a new market in environmental-friendly products for consumers, etc., etc. Once again, however, much of this consciousness is limited to those in industrialized nations with access to literature, media and products pertaining to environmental preservation. Ironically, it is also these nations that are responsible for a majority of the world's pollution and waste.

According to the Center for Progressive Reform (2011), the United States is responsible for 25 percent of global greenhouse gases, even though it only houses four percent of the world's population. As for hazardous waste, roughly 40 million of the 500 million tons generated globally each year is trafficked across international borders (Liddick 2011). Looking specifically at e-waste, the INTERPOL Pollution Crime Working Group estimates roughly 50 million tons are generated annually (Liddick 2011). In 2006, the United States alone generated 21 million tons of e-waste, up from 12.5 million tons in 2002 (Liddick 2011). The continuously evolving world of technology is largely responsible for the proliferation of e-waste, as consumers are keeping products for shorter time spans and consistently purchasing the latest gadget. An investigation into current legislation governing the disposal of hazardous waste (which encompasses e-waste) is necessary in order to better understand the management and distribution of e-waste.

International Environmental Justice

The unfair treatment of minorities is not news to any citizen of the global society. Since the establishment of colonies worldwide, racism has been institutionalized throughout international society and it persists to this day. Though more prevalent in some nations than in others, it is no secret that there are stark differences between core countries and peripheral countries when it comes to the overall wellbeing of a nation. The concept of 'justice' used to be defined solely as the

“distribution of goods in society” (Schlosberg 2007: 3)—it is now frequently expanded to also include the ‘bads’ of society (Schlosberg 2007), in that the distribution of the wastes of society should not fall disproportionately on one person, group of persons, or one nation. This latter tenet of environmental justice is just as frequently violated. Nations on one side of the international economy are able to ship and dispose of their waste in nations that lay on the opposite side of the spectrum. As aforementioned, this ironically benefits both parties as one saves on the cost of the disposal and the other generates profit by importing it. The environmental cost for the importing country and its citizens, however, is far greater. While environmental racism has been around in various forms for centuries, it has only recently been given a voice. Prominent environmental justice scholars such as Robert Bullard, David Pellow and Bunyan Bryant work to expose and, if possible, alleviate the environmental *injustice* that occurs on a daily basis. Criminological and sociological scholars (Clapp 2010; Liddick 2011; Lynch and Stretesky 2007; White 2008; White 2009) have recognized the escalating issue of e-waste and are working to examine and bring attention to this critical issue.

Green Criminology

The study of green criminology is relatively new to the criminological field, developing over the last couple of decades. Broadly speaking, green criminology is centered around the study of environmental harm, environment laws and

environmental regulation, as well as victimization and justice issues at local, national and international levels (White 2009). Green criminology is particularly relevant to this research as it encompasses the viewpoints of environmental justice, and is frequently international by nature:

A concern with environmental harm inevitably leads the analytical gaze to acknowledge the fusion of the local and the global, and to ponder the ways in which such harms transcend the normal boundaries of jurisdiction, geography and social divide. This observation is important because so much environmental harm is intrinsically transnational in nature (White 2009: 230).

Transnational environmental harm can include such happenings as trans-border pollution, oil and chemical spills in international waters, illegal trade in logging and fishing, and, of course, the illegal transference and subsequent disposal of hazardous and electronic waste (White 2009).

Of particular relevance, research in the field of green criminology is in one way or another linked to the economy—corporate influence on environmental happenings is more pervasive than one might think. A resurgence of the environmental movement (reminiscent of the 1970s movements) had been predicted for the 1990s, but never came to fruition (Lynch and Stretesky 2003). Instead, prominent environmental organizations were accepting donations from known environmental destructors:

During the 1990s, World Resources Institute, National Audubon Society, Conservation International, World Wildlife Fund and National Wildlife Federation received donations from corporations well known as polluters including Waste Management, Cargill, Chevron, Dow, DuPont, Ford, Motorola and Scott Paper (Lynch and Stretesky 2003: 220).

Furthermore, corporations began reconstructing the definition of ‘green,’ while simultaneously failing to reconstruct their environmental impact. This ‘green’ façade was accomplished via expensive public relations campaigns that painted major corporations in an ‘environmentally friendly’ light:

In a nutshell, the corporate redefinition of the word ‘green’ presented the public with a mild, less radical and de-politicized environmental vision along with less drastic responses (stressing consumption rather than production issues) to environmental issues (Lynch and Stretesky 2003: 220).

But major corporations did not stop there—their impact was witnessed not just in advertisements, but also in their production line, where they persuaded consumers to be ‘green’ as well:

The environmental responses crafted by corporations were also easily accessible to the general public: consumers could become ‘green’ simply by altering their purchasing behavior, i.e. by buying ‘green’ products from companies that claimed to be green. By ‘appearing green’, then, corporations were able to defuse and redirect support for environmental issues and movements. In short, corporations correctly observed that a growing public concern with environmental issues had generated conditions under which a broader segment of the population wished to join green-based movements (Lynch and Stretesky 2003: 220).

While environmental movements and calls for increased environmental protection do not necessarily present a great threat to big business, they can present a disruption to ‘business as usual.’ Lynch and Stretesky (2003) recognize two different approaches to dealing with public calls for environmental change, including green public relations campaigns (as aforementioned) as well as ‘small environmental concessions.’

McDonald’s is an excellent example of this, in that public pressure over their use of

styrofoam containers garnered so much negative publicity the company conceded and desisted in using styrofoam packaging altogether (Lynch and Stretesky 2003).

Often deemed “greenwashing,” these manipulative public relations campaigns encouraged consumers to both ‘think’ and ‘buy’ green, all the while projecting a ‘green’ corporate image (Greer and Bruno 1997; Lynch and Stretesky 2003; White 2002). The intrusive reach of corporate power over environmental protection and degradation is linked by some to the basic structure of capitalism (Lynch and Stretesky 2003; White 2002; White 2011). White (2002) goes so far as to state that the capitalist political economy is at the center of the construction of environmental harm as well as at the limits of existing environmental regulation. The complications of defining environmental degradation as ‘harm’ are compounded by what White (2002) deems the:

politics of ‘denial,’ in which particular concrete manifestations of social injury and environmental damage are obfuscated, ignored, or redefined in ways that re-present them as being of little relevance to academic criminological study or state criminal justice intervention. Similar to the denial of human rights violations, environmental issues call forth a range of neutralization techniques on the part of nation-states and corporations that ultimately legitimate and justify certain types of environmentally unfriendly activities....at the heart of these processes of denial is a culture that takes for granted, but rarely sees as problematic, the proposition that continued expansion of material consumption is both possible and will not harm the biosphere in any fundamental way (White 2002: 83).

These anthropocentric and capitalist-driven misconceptions are furthered using greenwashing techniques, but also cannot be disassociated from the consumer who chooses to buy into these campaigns—both literally and figuratively. It is here that

green criminology begins to cross international borders. The transnational movement of environmental harm (and e-waste specifically) is part of a larger process of the externalization of harm (White 2011). This externalization process can occur either at the point of production (involving the environmental impacts and pollution associated with production) or can involve the ‘socialization of harm’ where the impacts are experienced directly by the communities to which the ‘harm’ (or e-waste) has been transferred (White 2011). Pellow (2007) argues that the externalization of harm occurs for four reasons:

1. An exponential increase in the production of hazardous waste and the emergence of more stringent environmental regulation in industrialized nations, i.e. incentive for worst polluters to seek disposal sites beyond national borders;
2. Widespread need for fiscal relief among southern nations—construed as either ‘economically efficient’ or ‘garbage imperialism’ depending upon economic interests;
3. The power of economic globalization, that also includes hazardous waste management companies—that must access global markets and labor forces, increase automation and improve efficiencies; they must access buyers and markets where the prices result in increasing their profits and reducing their costs; and
4. Racist and classist culture and ideology within northern communities and institutions that view toxic dumping on poor communities of color as perfectly acceptable (Pellow 2007: 8-10).

As Pellow (2007) articulates, in many instances, as is the case frequently with e-waste, environmental harm is linked not just to the national economy, but also to the international political economy:

[T]he systemic causal chains that underpin much environmental harm are located at the level of the global political economy—within which the transnational corporation stands as the central social force—and this, too, is reflected in the pressing together of the local-global at a practical level (White 2009: 230).

The discussion of the international political economy and the environmental impacts of production, consumption and disposal lead directly into the discussion of World-Systems Theory.

World-Systems Theory

It is no secret that industrialized nations have outsourced labor and production in order to decrease costs while concurrently increasing profit. What often goes unnoticed, however, is that corporations inside these industrialized nations have also been outsourcing waste (Anderton, Anderson, Oakes and Fraser 1994; Broswimmer 2002; Frynas 2004; Pfluger 2001; Ulph and Valentini 2001; White 2008; White 2009):

Some of the core's hazardous products, production processes, and wastes are transferred to the peripheral zones of the world-system by transnational corporations (TNCs). Since few peripheral countries have the ability to adequately assess and manage the risks associated with such hazards, TNC export practices are increasing the health, safety, and environmental risks facing many peripheral countries. Increasingly, many impoverished peripheral states (seeking to attract industry and foreign currency, and promote economic development) have contributed to the risk transfer problem by establishing export processing zones (Frey 2003: 317).

Broswimmer (2002) considers the impact of globalization, focusing on the economic, political and cultural powers that only further the destruction of the environment. The

‘corporation,’—especially mega-corporations—are the most destructive in his view, as they are not held accountable for their actions. Specifically in under-developed nations, corporations are (in essence) invited to destroy the environment, if it means they will bring business to that country. Broswimmer cites an advertisement from the Government of the Philippines:

To attract companies like yours...we have felled mountains, razed jungles, filled swamps, moved rivers, relocated towns...all to make it easier for you and your business to do business here (Broswimmer 2002: 86).

Advertisements such as these are not uncommon and are often very successful in their attempts to lure corporations to their respective countries. The unfortunate truth seems to be that nations that lack the capital and industry required for large scale production and profit are instead becoming the dumping grounds for said corporations. It should also be noted that these corporations are not without blame; research demonstrates that they seek out cheap alternatives for waste disposal (which is usually accompanied by a lack of regulation, or failure of enforcement of regulation) (White 2008):

The perpetrators of environmental crime include individuals and groups from a wide range of backgrounds and socio-economic situations. However, the greatest harms are committed by those who have the power to do the greatest damage, the transnational corporations and other large business organizations. The actions of the entities are bounded by a political economic context that is fundamentally crime-producing. There are systemic imperatives to harm the environment (White 2008: 144).

Countries with higher levels of economic development are often stronger competitors in global markets (Chase-Dunn 1998) whose economies consume higher levels of

natural resources, thus simultaneously driving environmental degradation (Jorgenson and Burns 2006):

A key factor is relatively ignored in cross-national studies of environmental depletion and degradation: varied consumption levels and the associated natural resources required to produce the commodities in question...The capitalist world-economy produces commodities through labor and natural resource exploitation that usually end up in core markets...Although difficult to empirically identify, many social scientists argue that material goods consumed in the core have disastrous effects on the environment in other regions of the world (Jorgenson 2003: 378).

Power and wealth, in society today, seem to be inextricably linked not to just the exploitation of humans, but also to that of the natural environment.

Derived from the economic and structural viewpoints of Karl Marx, World-Systems Theory (WST) is largely the product of thought from theorist Immanuel Wallerstein. A macro-sociological perspective, WST views the capitalist world-economy as a total social system which has persisted over time and is unrivaled in history (Wallerstein 1976). Wallerstein (1976) identifies two basic dichotomies, one of which is class, and the other the hierarchy of economic specialization:

The operation of the system, once established, revolved around two basic dichotomies. One was the dichotomy of class, bourgeois versus proletarian, in which control by ruling groups operated primarily not through lineage rights (as in the mini-systems) nor through weapons of force (as in the world-empires), but through access to decisions about the nature and quantity of the production of goods (via property rights, accumulated capital, control over technology, etc.) The other basic dichotomy was the spatial hierarchy of economic specialization, core versus periphery, in which there was an appropriation of surplus from the producers of low-wage (but high supervision), low-profit, low-capital intensive goods by the producers of high-wage (but low supervision), high-profit, high-capital intensive, so-called 'unequal exchange' (Wallerstein 1976: 350-51).

Wallerstein (1976) argues that the brilliance of the capitalist system is the entwining of these two conduits of exploitation; though separate, they overlap and subsequently give rise to the cultural and political intricacies of the system, rendering it seemingly unstoppable. The transition away from a capitalist system, according to Wallerstein (1976), would require “the exhaustion of the limits of structural expansion which is required to maintain the economic viability of the capitalist system” (352).

Following Wallerstein, many social science researchers have continued to use and build upon WST. Ciccantell and Bunker (1998) discuss the costs and benefits of an integrated transport system and the ways in which it unequally distributes commodities internationally and subsequently “contribute[s] directly to the creation and reproduction of inequalities and subordination in the world-system” (2).

Particularly relevant to the research at hand, Andrew K. Jorgenson and James Rice explore the relationship between uneven global exchange and the environment:

Natural resource consumption and resulting environmental degradation are among the most pressing issues confronting us today. Paradoxically, nations with larger ecological footprints generally experience lower domestic levels of particular forms of environmental degradation within their borders, including deforestation and organic water pollution intensity...many social scientists posit that these relationships are illustrative of structural conditions and asymmetrical processes in which more developed countries externalize their consumption-based environmental impacts through the tapping of natural resources and produced commodities of less developed countries, reducing material consumption for the latter while increasing particular types of environmental destruction within their borders (Jorgenson and Rice in Hornborg, McNeil and Martinez-Alier 2007: 273).

The continued exploitation of the weaker classes (nations) by way of the capitalist economy is demonstrated in this excerpt. Not only are the dominant nations controlling the extraction of resources (which often occurs in peripheral nations), the production of goods (which often occurs in peripheral nations) and the consumption of goods (which often occurs in core nations), they are also dictating the disposal of these toxic products (which often occurs in peripheral nations) when they are no longer of use to the country of import. The role of the political economy in environmental policy is undeniable (Clapp 2003).

Stemming from WST, the concept of ‘commodity chains’ examines the life cycle of any product designed for sale and consumption:

What we mean by such chains is the following: take an ultimate consumable item and trace back the set of inputs that culminated in this item – the prior transformations, the raw materials, the transportation mechanism, the labor input into each of the material processes, the food inputs into the labor. This linked set of processes we call a commodity chain. If the ultimate consumable were, say, clothing, the chain would include the manufacture of the cloth, the yarn, etc., the cultivation of the cotton, as well as the reproduction of the labor forces involved in these productive activities (Hopkins and Wallerstein as quoted in Bair 2005: 155).

We see this happening particularly with e-waste in the example given above following products from extraction to disposal. To further this concept, Arrighi and Drangel (1986) discuss the unequal distributions of harms and rewards between core and peripheral nations, and how all aspects of the world economy are involved in these commodity chains. Though the original interpretations of what constituted a ‘commodity’ were most likely referencing ‘products’ rather than ‘waste,’ it can

certainly be argued (even from what has been discussed already) that ‘waste’ is indeed a product for sale and purchase itself and therefore a functioning part of the commodity chain:

world-systems theorists are most fundamentally interested in how commodity chains structure and reproduce a stratified and hierarchical world-system...researchers understand commodity chains as sets of inter-firm networks which connect manufacturers, suppliers and subcontractors in global industries to each other, and ultimately to international markets, and they are principally concerned with the question of how participation in commodity chains can facilitate industrial upgrading for developing country exporters (Bair 2005: 156).

The constant transfer of goods and subsequently ‘bads’ across the globe—which has only increased with improved technology and transportation (Ciccantell and Smith 2009)—does indeed encompass all possible outlets. This is echoed in green criminology, as explained by White (2009):

International systems of production, distribution, and consumption generate, reinforce, and reward diverse environmental harms. These range from unsafe toys to reliance upon genetically modified grains, from the destruction of out-of-date ships and planes to the transportation and dumping of hazardous wastes. A basic premise of green or environmental criminologists is that we need to take environmental harm seriously, and that in order to do this we need conceptualizations of harm that go beyond conversational understandings of crime. However, the work of green criminology also requires a sense of scale, and of the essential interconnectedness of issues, events, people, and places (White 2009: 230).

Indeed, globalization has invited the exploitation of both humans and the environment. The pairing of WST with green criminology can help to illuminate the possibility that ‘business as usual’ in the hazardous waste trade may indeed be criminal:

unsustainable transformation of the environment under globalization differs from environmental damage in previous epochs. Although contemporary environmental abuses have harmed their antecedents in earlier periods of history, globalization coincides with new environmental problems such as global warming, depletion of the ozone layer, acute loss of biodiversity, and forms of transborder pollution (e.g. acid rain). These problems have emerged not singly but together. Moreover, some ecological problems are clearly the result of global crossborder flows, as with certain kinds of groundwater contamination, leaching, and long-term health threats traceable to importing hazardous wastes (Mittleman 1998: 847).

White (2002) continues the conversation of consumption and environmental harm by considering the perceptions of global capitalism as the “central defining feature of production” in environmental and criminological literature (84):

Built into the logic and dynamics of capitalism is the *imperative to expand*.² Increasing labor’s production of surplus value—the sources of profit—demands constant changes in the ways labor is exploited and in the things that can be transformed from simple use-values (objects of need) into exchange-values (commodities produced purely for exchange)...this expansionary dynamic—the extended reproduction of capital accumulation—has several major implications for the environment. (White 2002: 85).

Among these implications are the commodification of natural resources and the “remaking” of nature into ‘products’ (genetic alteration of crops, etc.) (White 2002). The inherent implications of such a relationship with the environment (increased pressure on nonrenewable resources, excess of waste in need of disposal) are an escalating issue.

Several nations (including the United States) have developed legislation protecting forests, the air and water from the hazardous and toxic substances that have the potential to harm them. Though enforcement of this legislation is still a struggle,

² Italics original.

there are indeed penalties in place that define the violation of these regulations as criminal. Similarly, green criminology and, more specifically, the environmental justice literature has highlighted the increased probability of marginalized populations—in this case, populations of peripheral nations—bearing the burden of environmental harm. In the United States, President Clinton issued Executive Order 12898 in 1994 (Bullard 2001). Section 1.1, Implementation of the Order reads as follows:

1-101. *Agency Responsibilities.* To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Marian Islands (Executive Order 12898 1994).

In spite of the Executive Order, environmental injustice still persists in the United States (and other nations) and is now perpetrated against marginalized nations across the globe. By marrying world-systems theory with the ideas of environmental justice and green criminology, it is the purpose of this research to determine if the transboundary movement of electronic waste has violated national and international environmental law. And subsequently, if this violation does exist, can (and/or should) it be perceived as constituting environmental injustice or environmental crime? Through an examination and comparison of case studies in Nigeria and Ghana, it is hoped that an answer to this question may emerge.

CHAPTER III: METHODS

Considering that the problem of excessive electronic waste is relatively new, the field of e-waste research is also relatively new, and thus presents many challenges. The transfer of e-waste has historically been primarily destined for Asia; more recently, shipments of e-waste have begun to cross borders on the continent of Africa. Though it is becoming common knowledge that e-waste is now a transboundary 'commodity,' few records of the shipments are kept, which creates difficulty for the researcher. In order to document the transfer of electronic waste, the scope must be narrowed. A qualitative, content analysis will be employed to assess the scope of environmental legislation regulating e-waste, as well as the scope of the evolving e-waste industry. The content analysis will focus on a variety of sources, from international legislation to industry documents, as well as previously recorded accounts from ethnographic studies. To better track the path of e-waste, commodity chain analysis will be employed. It must be acknowledged that because of the limited accessibility of data (as well as the limited amount of data available to begin with) the study will be inevitably limited in its reach. In order to observe direct impacts of electronic waste in detail, case study methodology will be used. For the purposes of this research, two case studies on the western coast of Africa (Nigeria and Ghana) will be explored.

Yin suggests that case studies fall into three categories: explanatory, descriptive, and exploratory (2009). The exploratory case study is most often implemented to explain the phenomenon which is left unanswered in the research literature. Because of the limited data available on e-waste (which will be discussed in this chapter) it is this method of exploration that will be utilized here, as the issue of e-waste is still relatively new to the sociological literature. In addition to the case study method, commodity chain analysis will be used in order to better understand the life cycle of electronic waste and the ways in which it impacts the communities where it is deposited.

Data Sources

When studying environmental offenses, White (2008) recommends a specific strategy for research. First, the researcher must define the scope of the research area (which for the purposes of this study is harm to the natural environment as well as to humans) and then identify: relevant legislation, relevant penal provisions, relevant civil enforcement proceedings and the responsible government agencies (White 2008: 109). Each case study will methodically identify and examine each of these elements in order to examine potential liability (or lack thereof) pertaining to the environmental act/crime. In order to maintain this strategy, multiple data sources will need to be consulted.

An extensive content analysis will be conducted utilizing multiple forms of data from a variety of sources. Government documents concerning the environmental regulation of waste will be gathered from the United States as well as from other nation-states, and international agreements will also be consulted. Statistical data will be retrieved from the international database of hazardous waste disposal maintained by parties of the Basel Convention, as well as from non-governmental organizations (NGOs) and other international organizations tracking hazardous waste. Scholarly research articles will also be consulted, since there is an emerging discussion on the international trade of e-waste. These articles will also be used to help uncover additional sources of data. Industry journals, magazines, websites and internal documents (where available) are also an important segment of data collection, as these can offer information that is largely left out of most other sources. And lastly, the national and international media will be reviewed in order to garner an understanding of current public knowledge and perceptions of the issues.

Data Analysis

Once retrieved, government and legislative data will be employed to identify the transnational regulation of waste dumping and/or disposal and the enforcement of these policies, and the states, organizations and/or other parties involved in this legislation. What regulations are in place? Who is monitoring the movement/shipment of e-waste? Who is enforcing national and international

legislation (in both the country of origin and the country of disposal)? Are the policies and regulations effective? Once reviewed, these documents will offer insight into any deficiencies and/or inconsistencies in transnational waste disposal enforcement and regulation between country of origin and country of disposal.

Government documents, scholarly research and news articles will be used to determine the relationship between environmental regulation and the international political economy. How has legislation shifted over time? Is there evidence of this in the media? Are there any political or social organizations that have vested interests in the legislation? Are there active industry or company lobbyists dedicated to e-waste related issues? Lastly, do the data suggest through theoretical perspectives that the transnational movement of e-waste can be interpreted as a violation of international agreed-upon norms of environment injustice/social harm that constitutes a form of environmental crime?

Answers to these questions will be sought using a content analysis of previous studies; the empirical materials aforementioned will be systematically studied in order answer the research questions. Given the historically short timeline of e-waste regulation and its relevant legislation, it is not necessary to set a time restriction on data gathering, as all practice and regulation relating to e-waste is applicable for the purposes of this research. As for the electronic waste industry, data will be gathered on the history of the industry, as well as on the particular ‘commodity chain’ of e-waste (explained below). Content analysis is particularly useful to this study as it is

very difficult, expensive and time consuming (if and when it is possible) to collect original data on the transfer and disposal of electronic waste. In order to categorize and organize the data, a methodological coding system will be used; once collected, data will be logged and marked with their appropriate code (see Table 1). It is hoped that the collection and analysis of available empirical materials will yield sufficient data to adequately and fully answer the research questions.

Table 1: Methodological Coding System

CATEGORY OF DATA	SUB-CATEGORY	CODE
United States Environmental Legislation		EL-US
	<i>Clean Air Act (CAA)</i>	EL-US-CAA
	<i>Clean Water Act (CWA)</i>	EL-US-CWA
	<i>Resources Conservation and Recovery Act (RCRA)</i>	EL-US-RCRA
	<i>Toxic Substances Control Act (TSCA)</i>	EL-US-TSCA
International & European Union Environmental Legislation		EL-EU
	<i>Basel Convention on the Control of Transboundary Movement of Hazardous Waste</i>	EL-EU-Basel
	<i>European Union Network for the Implementation of Enforcement of Environmental Law (IMPEL)</i>	EL-EU-IMPEL
	<i>Waste from Electrical and Electronic Equipment (WEEE)</i>	EL-EU-WEEE
African Environmental Legislation		EL-A

Table 1 – continued

	<i>Basel Ban</i>	BaselBan
Ghanaian Environmental Legislation		EL-G
	<i>Constitution Revisions of 1992</i>	EL-G-C
	<i>National Environmental Action Plan</i>	EL-G-NEAP
	<i>Environmental Protection Agency Act</i>	EL-G-EPA
	<i>Chemical Control Management Center</i>	EL-G-CCMC
Nigerian Environmental Legislation		EL-N
	<i>Harmful Wastes Decree</i>	EL-N-HWD
	<i>Federal Environmental Protection Agency Act</i>	EL-N-FEPA
	<i>National Policy on the Environmental</i>	EL-N-NPE
Additional Environmental Legislation for Review		EL-ADR
Relevant Theory – Green Criminology		T-GCrim
Relevant Theory – World-systems Theory		T-WST
	<i>Commodity Chain Analysis</i>	CCA
	<i>Global Commodity Chain Sustainability Analysis</i>	GCCSA
Relevant Theory – Environmental Justice		T-EJ
Electronic Waste (E-Waste) Industry		EW
	<i>Industry Documents</i>	EW-Industry
	<i>Illegal Markets</i>	EW-Illegal
	<i>Changing market trends</i>	EW-Market

Table 1 - continued

	<i>Production levels of electronics</i>	EW-Production
	<i>Consumption patterns</i>	EW-Consumption
	<i>Environmental hazards of electronic waste</i>	EW-ENV
Case Study Data – Ghana		Ghana
	<i>E-waste Industry</i>	Ghana-I
	<i>E-waste Impacts</i>	Ghana-EW
	<i>Demographic Information</i>	Ghana-D
Case Study Data – Nigeria		Nigeria
	<i>E-waste Industry</i>	Nigeria-I
	<i>E-waste impacts</i>	Nigeria-EW
	<i>Demographic Information</i>	Nigeria-D
Additional Data for Review		ADR

Green Criminological Analysis

As stated earlier, green criminology will be utilized to better understand the social and environmental implication of electronic waste transfer. While the field of green criminology utilizes several different methodologies, a framework has recently been developed to help with the application of the approach. Lynch and Stretesky (2011) introduce a typology of four different approaches that can be utilized by green criminology, green science, or, in some cases, both.

Focusing on environmental harm and crime, environmental law, legislation and regulation, environmental justice and victimization, and the ways in which these

issues impact both human and non-human species, green criminology is an exceptionally complex field. The first three typologies articulated by Lynch and Stretesky (2011) are common areas of study and can be utilized by both green science and green criminology, and are as follows:

- (1) *Eco-approaches* or those views that consider environmental issues in relationship to nonhuman species and their intersections with the natural ecology.
- (2) *Enviro-approaches* or views that address pollution issues that impact human species in interaction with the environment.
- (3) Policy-approaches and perspectives that address solutions to and the prevention of environmental harms (p. 294).

Though research for this particular study does not directly consider the impacts of nonhuman species (and therefore cannot be considered an '*eco-approach*') there are elements of both the *enviro-approach* and the *policy-approach* involved. Throughout the discussion of the case studies, the research will cover the social and physical impacts of improper e-waste disposal on affected populations. Furthermore, the study thoroughly reviews and considers current policy and its abilities (and shortcomings) in the prevention of environmental degradation as a result improper e-waste transfer and disposal.

While these two approaches are most certainly applicable to the research at hand, it is the fourth typology that is particularly fitting:

In addition to these three overlapping areas of research, we also describe a fourth area of study that is unique to green criminology, one that is concerned with economic, social, political and philosophical theories (ESPP) that explore

the causes and development of environmental harms, environmental policy and law, and social control reactions (i.e., enforcement) to environmental harms. This fourth area of study exists independently of green scientific research (Lynch and Stretesky 2011: 294).

By way of green criminology, environmental justice and World-systems theory, this research will undoubtedly be employing the ESPP typology. This particular approach is unique to the field as it is not utilized by green science; green scientists are typically not concerned with explaining *why* human and nonhuman species are exposed to pollutants (Lynch and Stretesky 2011), but instead focus on explaining *how*:

In addition, unlike green criminologists, green scientists are not concerned with exploring why humans pollute environments, or with studying the effectiveness of social controls designed to minimize environmental pollution (Lynch and Stretesky 2011: 301).

The typology presented here will be employed to help in the analysis of the wide range of offenders (corporate, state and local) as well as the wide range of environmentally harmful activities (illegal transfer of waste, illegal dumping and disposal, improper recycling processes, exposure of humans to toxic waste etc.) As suggested by Lynch and Stretesky (2011), the typology can serve to function as a guide for organizing research in the field of green criminology.

Commodity Chain Analysis

The concept of the ‘commodity chain’ will be used in order to trace (what will eventually be) e-waste from its production to its disposal. Bunker and Ciccantell (2005) state that:

[t]he historically accumulating power and prosperity that technological and organization innovation made possible depended absolutely on the diversity of material and energetic forms that had evolved through multiple configurations of these laws and rules, but the incorporation of these diverse firms into social history was driven by human agency (79).

The evolution and persistent change and development of technology today is primarily driven by those who *consume*. The ever-expanding ‘consumption’ of the global society is directly related to this research, and therefore the commodity chain of e-waste itself will offer additional insight and interpretation into the discussion.

The commodity chain of e-waste begins with the extraction of raw materials for use in electronic products. This extraction process includes the consideration of environmental and social impacts of the process, which directly affect the communities in which the extraction takes place. The increased practice of outsourcing will also be explored, as this contributes directly to the displacement of environmental hazards during raw materials extraction, and production and manufacture processes. After identifying the history and evolution of technological advancements, the electronic industry and its production levels can be more fully understood. It will be imperative to therefore examine the manufacture, production and subsequent consumption levels of the manufactured goods as well as their

estimated lifespans. This rate of production/consumption will then be compared against the rate of disposal of these goods in order to determine whether or not there is a significant relationship. This is a necessary step given the difficulty in obtaining (as well as ascertaining the reliability of) data on electronic waste shipment. It is assumed that this 'relationship' may reveal a new and expanding industry of e-waste disposal.

E-waste disposal sites delineate the completion of the commodity chain, and are therefore of particular interest. This study will attempt to approach the commodity chain in both directions: first, the commodity chain will be examined both from production, to consumption and then to disposal (using industry data) and then also in reverse (disposal, consumption and then production) via the case studies—that is to say, first the waste will be identified at the disposal site (Nigeria, Ghana)³ and then will be traced back to its location of sale and consumption (the United States, Europe) and then to its country of origin and specific brand/producer (i.e. Sony, RCA, Apple etc.). After recording all of this information, it will be possible to track the progress of e-waste throughout its life-course, which will allow for a more thorough analysis of the commodity chain of e-waste.

In order to successfully examine the commodity chain of e-waste, Global Commodity Chain Sustainability Analysis (GCCSA) will be used. This method

³ It should be noted that this will not occur through ethnographic or field research in Nigeria or Ghana, but instead the information will be obtained from other studies and records from each site. All research gathered will be examined through content analysis of previous studies.

provides a framework for analyzing the social and environmental impacts, commodity chain governance, market structure and trends, and, lastly, develop policy recommendations that may improve (or in some instances mitigate) the overall impacts of the commodity chain of electronic waste (Eugster, Huabo, Jinhui, Perera, Potts and Yang 2008). GCCSA also provides an effective framework for studying e-waste, as it extends past consumption and provides for the end-of-life (EOL) state for electronics products. Therefore, it covers the manufacture, distribution, use and EOL segments of the e-waste commodity chain. It is hoped that the use of this method will elucidate the limitations and inadequacies of the current electronics market and provide for suggestions that may lead to a more sustainable electronics transfer market.

Introduction to Case Study Method

In order to examine the causes and consequences of international trade in e-waste, case study methodology will be utilized. This method is particularly useful as it is best used to answer the “how” and “why” questions of the study, as well as to emphasize the detailed contextual analysis of a very limited number of events and their larger implications and relationships. This is directly relevant as this study attempts to identify and explain the research questions delineated earlier:

1. Identify transnational regulation of electronic waste (e-waste) dumping and/or disposal. Are these regulations enforced? Followed?

2. Describe the current state of the industry of e-waste disposal. What are the state and organizational interests in e-waste disposal? Are there spaces between the laws?
3. Are there any deficiencies and/or inconsistencies in transnational waste disposal regulation between country of origin and country of disposal?

Yin (2009) recommends that the use of case study methodology depends largely on the research question; the more a researcher is intending to explain a present circumstance or social phenomenon, the more relevant the method. Indeed, the current issue of e-waste is a perfect candidate for this method. Cozby (1989: 119) argues that:

“[c]ase studies are valuable in informing us of conditions that are rare or unusual and thus not easily studied in any other manner. Insights gained through the case study may also lead to the development of hypotheses that can be tested using other methods.”

Additionally, if research questions require extensive and detailed explanation, the more relevant the case study method becomes (Yin 2009).

Designing the Case Study

One specific forte of case study methodology is the use of multiple sources and techniques throughout the data gathering process. The predetermination of which evidence to collect, which techniques should be used, and how the data should be analyzed in order to best answer the research question are all key aspects of appropriate use of the method (Yin 2009). The design of the study must be carefully

constructed in order to ensure validity. Internal validity is specifically relevant in this case as it seeks to begin to address causality. The research seeks to outline potential causal chains regarding the e-waste industry and trade in e-waste, with the goal of formulating statements such as condition 'A' can lead to condition 'B' (and so on). These causal chains can be detected through the use of multiple sources to unearth converging data and findings (for this study, the examination of the commodity chain will lead the research from production to consumption and then to disposal of the e-waste). An analysis of the method of disposal (i.e. does it adhere to national and international legislation, does it cause harm to the surrounding environment or residents, etc.) can suggest if a reasonable deduction can be made as to whether or not the consequences violate agreed upon international standards of acceptable action. A smaller study such as this can provide a solid base for potential future research, utilizing an expanded number of case studies, which could then in turn determine causality, as well as an evaluation of the criminality of e-waste disposal activity and the subsequent consequences of this industry. This will also be important for external validity as it can lend credibility to the generalization of the findings beyond the immediate study itself (Yin 2009). Lastly, the case study method should be executed in such a way that it is stable, accurate and precise and could be repeated with the same results and, thus, is reliable.

Because of the complexity of this study, organization of the data is undeniably important. In order to combat disorganized collection of data, Yin (2009)

recommends the construction of a map of the research. In this instance, detailed 'maps' will be used to organize environmental legislation governing e-waste and the subsequent implementation of such legislation. Maps will also be utilized to link the theoretical perceptions of the World-Systems approach to the current state of the e-waste trade.

The purpose of both case studies is to determine which populations (if any) are most likely to be affected by or exposed to e-waste, and to answer the following questions: What legislation or regulation is in effect in these locations regarding e-waste? Roughly how much e-waste is disposed of in these locations annually? Are there proper facilities for recycling and/or disposing of e-waste in these locations? Who is responsible for the shipments of e-waste into this location? How do the local residents of the community perceive e-waste? How (if at all) does it affect their daily life?

The use of multiple case studies (two, for the purpose of this research) can additionally lend validity to the results which cannot be obtained by simply using one location of study. Cross case analysis (also called multiple site analysis) is the process of collecting and analyzing data from several sites. Merriam (1998) argues that multiple case analysis can "lead to categories, themes, or typologies that conceptualize the data from all the cases; or it can result in building substantive theory offering an integrated framework covering multiple cases"(195). A cross case analysis will be applied here in order to determine if both locations are experiencing

the same effects from e-waste disposal. For example, do they perceive e-waste in the same way? How does it affect their daily lives? It is hoped that this segment of the research will offer a ‘human element’ to the paper in order to acknowledge the tangible effects of improper e-waste disposal.

Selected Case Studies

Nigeria

As the suggested leading dumping ground for electronic waste in Africa, Nigeria is an important nation in the study of this burgeoning industry. With a population of around 155 million, Nigeria is the most populous nation on the continent and Lagos its most populated city (CIA World Factbook: Nigeria 2011). Social indicators in Nigeria are far below those of core nations; life expectancy in Nigeria is roughly 49 years, and the infant mortality rate is 103.2 per 1,000 live births (UN Data 2012). With an economy based largely on oil, Nigeria has struggled to achieve economic stability. Political volatility, corruption and insufficient infrastructure have slowed progress in the nation since its independence from Britain in 1960 (CIA World Factbook: Nigeria 2011). Roughly 95 percent of foreign exchange earnings and about 80 percent of budgetary revenues are generated through the oil sector of the economy (CIA World Factbook: Nigeria 2011). In spite of the booming oil industry, roughly 21 percent of the nation’s citizens are unemployed and

over 70 percent live below the national poverty line (CIA World Factbook: Nigeria 2011).

Already burdened with poor social indicators, Nigerians also face poor environmental conditions in their major cities and ports, as well as in rural areas. In addition to e-waste pollution, the nation suffers from deforestation, desertification, soil erosion, oil pollution (from numerous oil spills), water pollution, biodiversity losses, coastal erosion, floods, urban decay and industrial pollution (CIA World Factbook: Nigeria 2011; Odubela, Soyombo, Adegbite and Ogungbui 1996)

There are several factors that have contributed to the increase in e-waste disposal in Nigeria. As aforementioned, the economy in Nigeria has historically been impaired by political instability, corruption, and lack of infrastructure; this instability has often led industrialists to seek out “cheap secondary raw materials and goods” (Odubela et al. 1996: 1). Additionally, lack of knowledge or regulation of standing transboundary shipment laws coupled with porous borders has led to an increase in shipments to Nigeria (Odubela et al. 1996).

The dumping of 4,000 tons of toxic wastes (shipped from Italy) in Koko Port, Nigeria in 1988 is one of the most notorious instances of harmful waste deposits, since many parties (private and governmental) stood to gain significant funds from this deal. Upon detection of the deal, monies were ordered to be returned and the waste to be transported back to Italy. Following this remarkable case, the Nigerian government promulgated the Harmful Waste Decree 42, which maintained a special

criminal provision (Odubela et.al. 1996). The decree declared it a criminal act (punishable by life imprisonment) to carry, deposit, transport, import, sell, buy or negotiate in trade of harmful waste within Nigerian territory (Odubela et al. 1996).

This decree is important as it is indicative of Nigeria's commitment to eliminating the importation of toxic and hazardous wastes into the nation. Indeed, Nigeria was the first country in Africa to sign the Basel Convention and maintained considerable influence over the text of the document as well (Odubela et al. 1996). In spite of this, it cannot be ignored that Nigerian ports are some of the most active and lucrative in the e-waste industry; it is estimated that around half a million second-hand computers are dumped in Nigeria every month (Consumers International 2008). This is why Nigeria and the port of Lagos specifically are an obvious choice for a case study.

Ghana

Roughly a third of the size of Nigeria, Ghana is smaller in size but no smaller in its role in the global e-waste trade. With a population of roughly 25 million, Ghana constitutes a small portion of the population for the continent, yet it is an increasingly popular destination for much of the waste intended for Africa. Taking social indicators into account, Ghanaians fare better than Nigerians with an average life expectancy of 58 years, and an infant mortality rate of 67 per 1,000 live births (UN Data 2012). A recently strengthened economy has also improved life for Ghanaians,

bringing unemployment down to eleven percent, and the population of citizens living below the poverty line down to around 29 percent (CIA World Factbook: Ghana 2011). Work in the agricultural sector employs over half the workforce in Ghana and supplies roughly a quarter of the GDP (CIA World Factbook: Ghana 2011). Gold, cocoa and (very recently) oil generate most foreign exchange for the nation and are expected to continue to boost the economy (CIA World Factbook: Ghana 2011).

Akin to Nigeria, the nation suffers from deforestation, frequent droughts, soil erosion, and water pollution, as well as overgrazing, poaching and habitat destruction, and inadequate supplies of potable water (CIA World Factbook: Ghana 2011).. The sudden rise in Ghana-destined shipments is what makes it of particular interest for this study.

Agbobloshie, a popular dumpsite in Accra (Ghana's capital) is an excellent example of the growing e-waste trade in Ghana, what some are calling "reverse piracy." Though dumping has only been occurring in the region for about five years, it is already receiving hundreds of thousands of tons of e-waste annually (Frontline 2009), most notably from the US and European nations:

Ghana is increasingly becoming a dumping ground for waste from Europe and the U.S. We are talking about several tons of obsolete discarded computers, monitors, etc. We don't have the mechanism or the system in place in this country to recycle these wastes. Some of these items come in under the guise of donations, but when you examine the items they don't work (Mike Anane, Director of the League of Environmental Journalists in Ghana, as cited in Consumers International 2008: 2).

An assessment of e-waste in Ghana by the Secretariat of the Basel Convention calculated that annual imports to the country will double by 2020 (Secretariat of the Basel Convention 2011).

What distinguishes Ghana from Nigeria in this study is that, although the Basel Convention has been ratified by the country, it has not yet been incorporated into local law and therefore has not come into force (Secretariat of the Basel Convention 2011). This is not to say that Ghana is lacking regulation entirely, as there are indeed a number of lesser laws (such as the Environmental Protection Agency Act) which have some bearing on the control and management of hazardous wastes (Secretariat of the Basel Convention 2011). The discrepancy between the two is that these national laws and regulations do not speak to the proper handling and disposal of e-waste so as to avoid the subsequent harm to humans and the environment (Secretariat to the Basel Convention 2011). It is then the objective of this study to compare practices and outcomes between the two countries—one of which is utilizing international legislation (the Basel Convention) locally, and the other which is not.

Limitations

As with all research, there are limitations to this particular study. First and foremost, there is general lack of data on the disposal of e-waste. While there is a statistical database, it simply tracks (when reported) the movement of waste from one country to another, not all details of the actual disposal (i.e. how much is

recyclable/reusable, which entity/corporation is responsible for the waste and which for shipment, what is the method disposal for the waste, etc.) Additionally, there is a ‘dark figure’ of waste that is lost in this database—it can only track what has been officially reported for disposal. What seems most evident in this field is that there is an ‘illegal’ market for e-waste and therefore there are undeterminable amounts that have simply gone untraced. Furthermore, since there are indeed improper and illegal methods of disposal, those involved have gone to great lengths to cover their actions, thus burying the data even further.

Of the data that is retrievable, most of it contains estimations at best. Because this is a relatively new practice, there are no set standards for the documentation and recording of data on e-waste. Additionally, because there are many private entities collecting data (i.e. NGOs), the accuracy of such data may also be suspect. To make things more complicated, most data that are available are outdated—some as much as thirty years old.

An inherent limitation of international research is the inability to obtain and/or interpret locally produced documents in local languages. In both case studies, for example, there are potential resources on the import, sale and disposal of e-waste in local markets that will inevitably be lost to this research. There may also be local publications, political paraphernalia, and information regarding the health impacts of electronic waste that simply cannot be retrieved. In addition, there are publications and documents pertaining to the topic at hand that have not been translated into

English and therefore cannot be documented and interpreted for the purposes of this research.

Finally, there are limitations associated with the method itself. It is often thought that the ‘case study method’ is an easy way out of larger theoretical research; several authors contest this and one in particular (Yin 2009) articulates the complications of case study methodology:

Unlike other research methods, a comprehensive “catalog” of research designs for case studies has yet to be developed. There are no textbooks, like those in the biological and psychological sciences, covering such design considerations as the assignment of subjects to difference “groups,” the selections of different stimuli or experimental conditions, or the identification of various response measures (Yin 2009: 25).

Another frequent critique of the case study method is the idea that we cannot (and should not) generalize from a single case (Kaarbo and Beasley 1999; Seawright and Gerring 2008; Yin 2009). The rebuttal is simply that case studies (like experiments) are generalizable to theoretical propositions—not to populations or universes (Yin 2009). In this sense, repeated studies (which are called for in the discipline) can only further reinforce findings inferred in preceding case study research. In the instance of this study, the cases will be used as a comparison of practices and outcomes between the countries—one of which is utilizing international legislation (the Basel Convention) locally, and the other which is not—and the larger implications of both.

Another concern with case study methodology is the tendency for the researcher to collect massive amounts of data, rendering the study too dense,

exhaustive and saturated for its own good. While case study methodology has been used and abused in this form in the past, it is recommended that case studies now steer clear of the 'lengthy narrative' and avoid the temptation to slip into ethnographic methodology (Yin 2009). These limitations will undoubtedly place restrictions on the research and will have to be considered in the discussion of the results.

To conclude, case study methodology will be carefully applied in order to ascertain the extent to which e-waste has permeated global markets, particularly in Nigeria in Ghana. Furthermore, it will be used to establish the effects (or lack thereof) of national and international legislation on the transfer and subsequent disposal of e-waste in these nations. Through the use of multiple, varied data sources, it is hoped that the research questions can be answered and explained.

CHAPTER IV: LEGISLATION AND POLICY

Now a fundamental and integral part of most nations' body of law, environmental legislation is relatively new in the history of law-making. Though humans have more or less always imposed an anthropocentric reign over the environment, it is just over the last several decades that we have really begun to take notice *and* take action. We now have various national and international legislation protecting the natural environment and its ecosystems, all species and varieties of life and their habitats, as well as humans and their subjection to environmental degradation. Although these laws and regulations are becoming more and more commonplace, the adherence to and enforcement of said laws and regulations is lacking. A relatively new addition to environmental regulation, the governance of electronic waste and relevant legislation pertaining to it, is especially inadequate and deficient. The strengths and weaknesses of both national and international legislation pertaining to e-waste will be reviewed here.

Legislation in the United States

The Clean Air Act (CAA)

While environmental awareness has been around for centuries, it really began to come to the surface in the United States during the 1960s. Rachel Carson's *Silent Spring*, the environmental destruction perpetrated during the Vietnam War, and

grassroots organizations all served as catalysts in bringing environmental issues and concerns to the forefront. During the 1960's and 1970's, attention was drawn to the harm inflicted upon ecosystems by anthropocentric policies and behaviors. It was not long before the government began to feel pressure to develop more effective environmental legislation.⁴

Perhaps the most pivotal period in time regarding environmental legislation in the United States can be marked by the development of the National Environmental Policy Act (NEPA) and the Environmental Protection Agency (EPA) in 1970 and 1971 respectively. The Council on Environmental Quality (CEQ) was also created at this time, and was designed to review the Environmental Impact Statements produced per NEPA requirements, as well as to advise the president on environmental issues. NEPA, the EPA, and the CEQ, however, were all preceded by hundreds of years of pollution and destruction. Most early environmental legislation was primarily repairing past damage, rather than curtailing future destruction.

The Clean Air Act (CAA)

The Clean Air Act (CAA) of 1970 authorized the government to exercise more control over the regulation of air pollution—emissions were now being controlled on both stationary and mobile sources (EPA 2010). Perhaps more importantly (for the purposes for this study) enforcement authority was also substantially expanded at this time (EPA 2010). Every source of emission covered

⁴ The first Clean Air and Clean Water Acts passed in 1960 were deemed largely ineffective and often criticized, provoking legislators to enact more effective policies.

under the CAA must have a permit, which is issued for a maximum of five years at a time:

As required by the 1970 Clean Air Act, the EPA must establish national ambient air quality standards (NAAQS) for pollutants that may endanger public health or welfare and that result from numerous and diverse sources. The pollutants regulated by NAAQ standards are referred to as criteria pollutants. Currently there are six criteria pollutants: total suspended particulates, sulfur dioxide, nitrogen oxides (NO_x), carbon monoxide, ozone, and lead. Once NAAQS are developed by the EPA, each state is required to determine how to attain and maintain NAAQS by developing a State Implementation Plan (SIP). SIPs are submitted to the EPA for approval. The control measures included in a SIP depend on whether or not the state areas are in attainment (whether the areas meet NAAQS) (Knudsen: 1).

Amendments to the CAA in 1990 further extended environmental protection, now listing 189 air pollutants that were deemed threatening to human health. Furthermore, the CAA puts into operation elements of the Montreal Protocol by phasing out harmful substance such as CFC's, halons, carbon tetrachloride and methyl chloroform (Knudsen 2010).

Failure to meet these requirements or direct violations of the Clean Air Act result in sanctions which include civil penalties, criminal penalties, and field citations for minor violations. The EPA has the power to levy civil penalties up to \$25,000 per day for specific violations (Knudsen 2010: 2), including the failure to obtain a permit (EPA 2010). Additionally, penalties may be enacted to "remove any economic benefit that an operator may receive from noncompliance" (Knudsen 2010: 2).

The Clean Water Act (CWA)

The Clean Water Act (CWA) regulates the discharge of pollutants into the waters (including lakes, streams, rivers, oceans, etc.) and oversees the attainment of quality standards for surface waters. Once again, a permit must be obtained for any discharge into navigable waters from a point source⁵ (EPA 2010b). The EPA employs several pollution control programs under the CWA, including wastewater standards and water quality standards (EPA 2010b). If state regulation standards are not up to par, the EPA has the authority to step in and properly manage enforcement:

With the approval of the EPA, states can issue National Pollution Discharge Elimination System permits within the state. The EPA, however, retains the authority to veto permits that would jeopardize the objectives of the Clean Water Act and the EPA can revoke a state's permitting authority if the program is not as stringent as the federal program. State requirements may be more stringent than the federal program (Knudsen 2010b: 1).

As for enforcement under the CWA, an administrative order requiring compliance can be handed down, as can civil penalties or criminal penalties (Knudsen 2010b):

“Enforcement actions can be brought by the federal government, the states, or citizens” (Knudsen 2010b: 1). However, even though enforcement is key to environmental protection, it is enacted relatively infrequently, as unfortunately seems to be the case with much environmental regulation (Liddick 2011).

⁵ “Point source” is any man-made source, such as pipes, ditches etc.

The Resource Conservation and Recovery Act (RCRA)

Passed to address issues with accumulating waste and subsequent risks to human health, the Resource Conservation and Recovery Act regulates the generation, transportation, treatment, storage and disposal of hazardous waste (EPA 2011b):

In 1976, the United States established the Resource Conservation and Recovery Act⁶ (RCRA) which provided procedures for the classification of hazardous substances, developed systems of tracking the movement of hazardous waste from generation to safe disposal and authorized states to register and license corporations in the generation and disposal of waste respectfully (EPA 2011b; Liddick 2011).

Prior to this Act, hazardous waste was not “legally distinguishable” from other waste (Liddick 2011: 18). For obvious reasons, the establishment of the RCRA immediately created the need for legal disposal options which were not always available and/or economically attractive to corporations in need. This often led to infringement of RCRA guidelines or failure to comply altogether; ironically, these behaviors were rarely curbed by RCRA enforcement:

The RCRA was poorly implemented and enforced from the start—the lack of a legitimate hazardous waste industry at that time necessitated interim licensing and bred lax monitoring of the manifest system. In fact, the manipulations of manifests allowed corporate entities to “orphan” their waste, and thus escape liability. Even minus cases of public corruption and regulatory incompetence, private waste generators effectively lobbied Congress so that the RCRA would demand less of them, minimize their liability, and ultimately make the industry amenable (though perhaps not purposefully) to organized crime infiltration (Liddick 2011: 18).

Others have suggested that the RCRA is lacking in comparison to international law governing hazardous waste (Billinghurst 2005; Kahhat, R., Kim, J., Xu, M., Allenby,

⁶ The RCRA encompasses the Solid Waste Disposal Act of 1965.

B., Williams, E., and P. Zhang 2008; Liddick 2011). For example, many items listed as hazardous waste in the international Basel Convention (covered in the following section), to which the United States is not a ratified party, are classified as nonhazardous or non-waste under United States law and therefore are not covered by the RCRA (EPA 2011b; Liddick 2011):

The RCRA does not address e-waste as a unique form of hazardous waste—under existing law, materials that are commonly understood to constitute e-waste is largely unregulated because it is classified as nonhazardous, or as non-waste. So in the United States, much e-waste is either exempt or excluded from environmental regulation. Waste excluded from regulation includes electronic equipment designated for reuse and materials that can be recycled into new products (for example, processed scrap metal, shredded circuit boards, and CRT⁷ glass). However, most e-waste cannot legally be placed in U.S. landfills (Liddick 2011: 32).

Unable to dispose of waste legally in the United States, many corporations resort to shipping and dumping their hazardous waste overseas. As will be discussed in the following section, this waste is commonly labeled for ‘recycling’ (even though a majority of it is not reusable) and is thus more affordable to discard. This has proved to be a common method of disposal, especially in states where strict laws governing hazardous waste are already in place.⁸

⁷ A cathode ray tube (CRT) is a vacuum tube that is used to create images in the form of light and is commonly found in items such as televisions and computer monitors. CRTs contain toxic substances such as cadmium and can also contain leaded glass and therefore must be disposed of properly in order to prevent health risks due to exposure.

⁸ Some states, including California, Maine, Washington and Minnesota, have implemented mandatory e-waste recycling (US House of Representatives 2009).

The Toxic Substances Control Act (TSCA)

The Toxic Substances Control Act (TSCA) was developed in 1976 and began regulating toxic (hazardous) waste in 1978. This act requires corporations and other private entities to report on toxic substances generated by their facilities, to keep records of the volume of toxic substances imported (for use in production) and to report on how these substances are used and subsequently disposed. The TSCA regulates over 83,000 chemicals, including polychlorinated biphenyls (PCBs), asbestos, radon and lead-based paint (EPA 2011a):

EPA is required to maintain an inventory (known as the "TSCA Inventory") of each chemical substance which is manufactured, processed, or imported in the United States. The TSCA Inventory, which currently contains over 75,000 chemicals, provides EPA an important tool for identifying, prioritizing, and evaluating toxic chemicals and for developing a profile of the chemical industry in the United States (EPA 2011a).

The RCRA and TSCA have been beneficial for the United States in monitoring and requiring the proper disposal of harmful waste. However, the environmental law governing hazardous waste in the U.S. is strictly national; the United States is not party to any international treaty governing hazardous waste. Perhaps the most glaring of these is the Basel Convention, which the United States has failed to ratify.

Electronic Waste in the United States

Most recently in the United States, both House and Senate committees have met on the issue of e-waste. In April of 2008, the Committee on Science and

Technology of the House of Representatives met for a hearing on “Electronic Waste: Can the Nation Manage Modern Refuse in the Digital Age?” at which many witnesses testified to the growing problem of e-waste. The Committee heard testimony on the management of e-waste, the challenges of recycling e-waste, and efforts to decrease toxic materials used as well as the possible implementation of a ‘take-back’ policy for producers of these products (U.S. House of Representatives 2008a). The hearing highlighted that thirteen states across the nation⁹ had already implemented e-waste regulation, but that the U.S. government had yet to do so.

In February of 2009, the Committee on Science and Technology of the House of Representatives met for a hearing on “Electronic Waste: Investing in Research and Innovation to Reuse, Reduce and Recycle” during which five witnesses discussed how to address the challenge of managing the disposal of e-waste (U.S. House of Representatives 2009). The hearing identified “televisions, computers, cell phones, monitors, etc., that are ready for discard” as e-waste (U.S. House of Representative 2009: 3), of which only an estimated eleven percent are successfully recycled.¹⁰ To account for such a low measure of recycling, the hearing delineated the following:

While e-waste recycling is increasing in the U.S., the industry faces a number of challenges. These challenges include convincing consumers to recycle, the logistics of collecting e-waste, efficiently disassembling products, safely removing hazardous substances, efficiently processing materials, and recovering value from many of the e-waste constituent materials (U.S. House of Representatives 2009: 4).

⁹ By 2012, twenty-five states had implemented e-waste regulatory policies (Gui et al. 2012).

¹⁰ It should be noted that of this eleven percent, an estimated 80 percent is then shipped outside of the U.S. to either be recycled or disposed of (U.S. House of Representatives 2008a).

In addition to the difficulties of recycling, research has found the roughly 80 percent of e-waste intended for recycling in the U.S. is not recycled, but instead exported, sometimes illegally (U.S. House of Representatives 2009). Lacking national legislation governing e-waste, some states have taken action to encourage the recycling of modern electronic conveniences. For example, California, Maine, Washington and Minnesota have implemented mandatory e-waste recycling (U.S. House of Representatives 2009). While some advocate for recycling programs at the state level, many are concerned that state-by-state regulation could greatly hinder interstate commerce. The political economy of e-waste seems perhaps one of the most difficult aspects to navigate, and was indeed a factor in international regulation (Clapp 1994a; Clapp 1994b).

The process of disposal of electronic products is not nearly as organized and efficient as their development and sale, as explained by Dr. Valerie Thomas,¹¹ witness to the House Committee Hearing on Electronic Waste:

The supply chain for making and selling electronics is a model of efficiency managed with electronic data interchange, electronic manifests, radio-frequency tags on pallets and cartons, and UPC codes on every single package. In stark contrast, the end-of-life supply chain is managed almost entirely by hand with little recordkeeping or even potential for monitoring or oversight. That the results have included unsafe, polluting, and illegal activities at the end-of-life should not be a surprise (U.S. House of Representatives 2009: 16).

¹¹ Dr. Valerie Thomas is an Associate Professor of Natural Systems in the School of Industrial and Systems Engineering, and School of Public Policy at the Georgia Institute of Technology.

In order to promote recycling among producers and consumers, and at a reasonable expense, Dr. Thomas recommended the following: “increased efficiency and lower cost for recycling, opportunities for recycling incentives, rebates, coupons and trade-ins, improved warranty management, and better after-sale services” (U.S. House of Representatives 2009: 17). Other witnesses at the hearing (such as Dr. Paul T. Anastas¹²) advocated for a change in the beginning stages of the product, rather than at its end. That is to say, the production process should work to eliminate as many hazardous and toxic substances as possible (U.S. House of Representatives 2009). Whether it be regulation of manufacture or regulation of disposal, legislation does little if it cannot be enforced. For years, governmental agencies have been recognizing issues with lax regulation and thus ineffective enforcement of environmental laws governing e-waste.

In 2008, the Government Accountability Office (GAO) produced a report on electronic waste entitled, “EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation” directed at the Chairman of the Committee on Foreign Affairs (Government Accountability Office 2008). In sum, this report found that:

U.S. hazardous waste regulations have not deterred exports of potentially hazardous used electronics, primarily for the following reasons:

1. *Existing EPA regulations focus only on CRTs.* Other exported used electronics flow virtually unrestricted—even to countries where they can be

¹² Dr. Paul Anastas is the Teresa and H. John Heinz III Professor in the Practice of Chemistry for the Environment and Director of the Center for Green Chemistry and Green Engineering, Yale University.

mismanaged—in large part because relevant U.S. hazardous waste regulations assess only how products will react in unlined U.S. landfills.

2. *Companies easily circumvent the CRT rule.* GAO posed as foreign buyers of broken CRTs in Hong Kong, India, Pakistan, and other countries, and 43 U.S. companies expressed willingness to export these items. Some of the companies, including ones that publicly tout their exemplary environmental practices, were willing to export CRTs in apparent violation of the CRT rule. GAO provided EPA with the names of these companies at EPA's request.
3. *EPA's enforcement is lacking.* Since the CRT rule took effect in January 2007, Hong Kong officials intercepted and returned to U.S. ports 26 containers of illegally exported CRTs. EPA has since penalized one violator, and then only long after the shipment had been identified by GAO. EPA officials acknowledged compliance problems with its CRT rule but said that given the rule's relative newness, their focus was on educating the regulated community. This reasoning appears misplaced, however, given GAO's observation of exporters willing to engage in apparent violations of the CRT rule, including some who are aware of the rule. Finally, EPA has done little to ascertain the extent of noncompliance, and EPA officials said they have neither plans nor a timetable to develop an enforcement program (GAO 2008: 2).

In order to combat this lax regulation, the GAO (2008) recommends the expansion of hazardous waste regulations to cover other exported electronics, the ratification of the Basel Convention (an international treaty governing e-waste, to be discussed later) by the United States, and coordination with Customs and Border Protection to improve the identification and proper tracking of exported electronics. Although these measures of enforcement are certainly achievable, implementation of enforcement is something with which the U.S. struggles.

Enforcement

As evidenced here, the U.S. has several environmental laws as well as a process for sanctioning those who violate said laws. One of the strongest critiques of U.S. environmental regulation is the lack of enforcement that accompanies it. The 1980's saw an increase in environmental criminal prosecution as scholars simultaneously began to debate the requirements for environmental crimes. Some saw environmental prosecution as unfair because often the crimes lacked *mens rea*, or a "guilty mind" (O'Hear 2004). There are concerns that environmental defendants, who may have made inadvertent mistakes, could be convicted of a crime more serious than their actual offense (O'Hear 2004). One inconsistent aspect of environmental prosecution is sentencing—this aspect is also routinely ignored (O'Hear 2004), offering little incentive for big business to follow regulatory frameworks. Studies have recognized that sentences are not handed down consistently; for example, appellate courts have been handing down increasingly severe sentences, but district courts have been handing down increasingly lenient sentences (O'Hear 2004). These sentences, however, are by no means as severe in their penalties as they could be, as "few environmental defendants of *any* type go to prison" (O'Hear 2004: 136, italics original). Current guidelines seem to be more equipped to sentence low culpability offenders to incarceration than high culpability violators. That is to say, those who bear less control over the violation (perhaps those acting on orders from a 'higher up' at the organization) are more likely to be sentenced than those who actually gave the

order. O'Hear (2004) suggests that sentence length should be directly proportionate to level of culpability. In 1987, a new section on environmental crime was authorized by Attorney General Meese within the United States Department of Justice. It was also around this time that Congress "upgraded" several environmental crimes from misdemeanors to felonies (O'Hear 2004). The lack of regulation, coupled with lax enforcement of what few regulatory measures are provided, does not encourage corporations or individuals to participate in the safe disposal of hazardous waste. As the e-waste market continues to expand, there is little to suggest corporate players will be seeking environmental protection measures on their own to curtail transnational pollution.

Hazardous Waste Electronic Manifest Establishment Act

In 2008, the Committee on Environmental and Public Works proposed an Act that would direct the Administrator of the EPA to establish a hazardous waste electronic manifest system that would track and provide for the safe 'cradle-to-grave' management of hazardous waste (U.S. House of Representatives 2008b). This system would operate under the RCRA and would establish standards governing e-waste to protect human and environmental health:

An essential aspect of the manifest system is to ensure there is a traceable record showing who is in the control of the hazardous waste at any given time and where the hazardous waste is destined for its ultimate disposition (U.S. House of Representatives 2008: 2).

This Act would not only create a special database for e-waste, but would also greatly assist in the tracking of e-waste as it moves nationally and internationally from the United States. Although the Act was first proposed in 2008, it did not pass through the Senate until August of 2011, and is currently waiting for approval by the House. If and when the Act is implemented, it will mark a major step in the regulation of e-waste in the United States. Even with the Hazardous Waste Electronic Manifest Establishment Act in force, e-waste regulation in the United States still pales in comparison to international efforts.

International Environmental Legislation

Early Regulation and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989)

As industrialized nations began to realize and acknowledge the potential harm of hazardous waste, exporters of said waste began targeting peripheral nations that lacked legislation governing environmental dumping, were in need of the financial compensation for disposal (and offered low disposal costs), and/or were unaware of the dangers of hazardous waste, making them very attractive dumpsites:

The lower disposal costs in developing countries generally stem from low or nonexistent environmental standards, less stringent laws, and an absence of public opposition due to a lack of information concerning the dangers involved. Given these considerations, the economic logic for exporting hazardous waste to developing countries is indisputable (Lipman 2002: 68).

In the 1980s, the problem of disposing of toxic waste began to become a topic of discussion not only in environmental circles, but also in political circles.

Governments across continents recognized the need for regulation of the increasing transfer of hazardous waste. In 1982, the United Nations Environmental Program (UNEP) became the first to develop plans to regulate the international waste trade; by 1987, UNEP had drafted the Environmental Sound Management of Hazardous Wastes (Liddick 2011). Toward the end of the 1980s, the U.S., the European Commission (EC) and the Organization for Economic Cooperation and Development (OECD) had also established regulations governing transboundary toxic waste. However, these regulations lacked the “teeth” needed to protect peripheral nations because they only required prior informed consent—that is to say, the exporters must make the importers aware of the contents of the shipment, and the importers must give their consent (Liddick 2011).

Even though close to 40 peripheral nations had banned waste imports by 1988, more were still accepting waste. In 1988, a scandal was revealed that brought attention to what had quickly become a global concern. Greenpeace uncovered:

a deal to import 15 million tons of US and European pharmaceutical and tannery wastes into Guinea-Bissau, which was to receive 600 million dollars, more than four times the country’s gross national product and twice its national debt. Proper disposal of the wastes in their countries of origin, however, would have cost ten to twenty times more (Wynne 1989: 121).

Members of the international community recognized the vulnerability of these under-developed nations (as they were the most economically and socially susceptible to the

trade) and subsequently adopted the Basel Convention on the Transboundary Movements of Hazardous Wastes and Disposal in 1989.

Developed to reduce the movement of hazardous waste between nations (specifically under-developed nations) the Basel Convention has 176 signatory parties; only the U.S., Afghanistan and Haiti have not ratified the agreement (Basel Convention 2011). The Basel Convention requires notice, consent and tracking of waste across national boundaries (Basel Convention 2011; Lipman 2002; Schneider 1997). The Convention does not ban the transboundary movement of waste (except to Antarctica), but instead seeks to regulate the movement of waste based on a process of prior informed consent (Lipman 2002). In order for hazardous waste to be transported from one nation to another, authorities in both participating nations were to be notified in advance and provide written consent (Basel Convention 2011; Lipman 2002). Failure to obtain proper permission/documentation prior to the movement of the waste is consequently illegal under the Basel Convention (Lipman 2002). Section 2(e) under General Obligations of the Basel Convention requires parties to prohibit the import of hazardous wastes if “parties, particularly developing countries, which have prohibited by their legislation all imports, ...has reason to believe that the wastes in question will not be managed in an environmentally sound manner” (Basel Convention 2011: 10).

It was not long before the Basel Convention came under attack by environmentalists across the globe. Critics accused the convention of “legitimizing

international toxic waste dumping rather than criminalizing it” (Basel Action Network (BAN) 1998)—a criticism that did not go unanswered by the Basel Convention Conference of Parties. Immediately, new decisions were made regarding the import and export of waste, specifically designed to protect peripheral nations. By 1994, the Decision II/12 was proposed, banning the export of hazardous wastes from OECD¹³ nations to non-OECD nations; by 1995 the Decision (now called the ‘Basel Ban’) was adopted and took effect on January 1, 1998 (BAN 1998).

Under the Basel Ban, the exchange of e-waste between core and peripheral nations is permitted if the items can be recycled. This aspect of the Basel Convention has recently come into play, as imports are now more often deemed as material to be “recycled” rather than “dumped.” While some material shipped is indeed recycled and reused by the recipient country, it is a very small portion of the actual shipment. Estimates suggest that less than 25 percent of shipments labeled for recycling are used for such; the rest is irreparable junk (Ladou and Lovegrove 2008; Liddick 2011; Schmidt 2006). The remaining waste is often burned (releasing dangerous chemicals into the air), improperly buried (releasing dangerous chemicals into the ground), or simply left to sit (Ladou and Lovegrove 2008; Liddick 2011; Lipman 2002; Schmidt 2006), clearly violating the intended protections of Section 2(e) provided under the Basel Convention.

¹³ Organization for Economic Cooperation and Development

The regulations stipulated under the Basel Convention were indeed under contention during their development. Some countries (particularly under-developed nations) were fond of strict laws, and many African nations favored a complete ban of importing waste into struggling nations altogether, in order to end the polluting of already disadvantaged nations. Even though the regulations are much less stringent than originally intended, “waste traders have adopted new tactics to circumvent international waste trade regulations in the 1990s” (Clapp 1994a: 18).

In response to the limitations of the Basel Convention, 69 African, Caribbean and Pacific (ACP) states pressured the EC to ban the export of hazardous and radioactive wastes to ACP states. This became what is now known as the Bamako Convention and was significant because it prohibits (rather than simply places restriction on) the import of hazardous waste and radioactive waste, ocean dumping of wastes, and the importation of waste banned in the country of export (Liddick 2011). Unfortunately, while the Bamako Convention has the ‘teeth’ mentioned earlier, it lacks the funds necessary for proper enforcement. In 1992, Central American states implemented a similar directive to the Bamako Convention, which also struggles with enforcement (Liddick 2011).

European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL)

An informal network of environmental authorities, IMPEL has been a leading international association in the regulation of e-waste movement. Focusing broadly on

the effective application of environmental law, IMPEL concentrates on raising awareness of environmental regulation, encourages enforcement cooperation, and works to offer feedback to lawmakers and regulators on the enforceability of environmental legislation (IMPEL 2012). Recognizing the need for regulation of e-waste within the EU, IMPEL focuses largely on the responsible shipment of waste. In order to track the shipment of waste, IMPEL specifically regulates three types of waste delineated in “Green,” “Red,” and “Amber” lists. Liddick (2011) organizes the lists as follows:

Green List—nonhazardous substances that can be traded more freely (not all low-hazard waste is green list; green list wastes include cadmium, lead and some plastic defined as hazardous under Basel).

Red List—hazardous wastes like PCBs that are subject to strict controls and the principle of Prior Informed Consent.

Amber List—potentially hazardous but less risky than red-list materials—subject to “tacit” agreements, and may be shipped to some countries for recovery purposes only.
(Liddick 2011: 25).

More recently, ‘red list’ and ‘amber list’ waste is being condensed into one category of hazardous substances (Danish Environmental Protection Agency 2011). IMPEL also controls the movement of these wastes in various capacities, depending upon the purpose of the shipment. All transboundary waste movement requires notification (save for some green list waste), and the transfer of ‘red’ or ‘amber’ list waste from IMPEL parties to non-OECD countries (even if for recycling) is prohibited (Liddick 2011). Taking this even a step further:

[r]egardless of whether or not waste is green listed, it must not be contaminated by other materials to an extent which means that they may be considered as hazardous. Furthermore, contamination of waste must not be present to the extent that recovery of waste in an environmentally sound manner is prevented (Danish Environmental Protection Agency 2011: 3).

While this may seem like ‘common sense,’ contamination is a frequent issue in transported waste, devaluing many shipments marked for recycling and recovery.

In February of 2008, IMPEL signed an agreement with the Secretariat of the Basel Convention to collaborate on a project designed to better equip West Africa and other African nations in their fight against e-waste from the industrialized world (IMPEL 2012). The project focuses on four major components:

1. A study of the flow of e-waste into such places as Benin, Ghana, Liberia and Nigeria.
2. A national assessment of e-waste in Benin, Ghana and Nigeria.
3. A socio-economic study on e-waste in Nigeria and Ghana with a feasibility of international cooperation between African and European recycling companies.
4. And enforcement programs in Benin, Egypt, Ghana and Nigeria led by IMPEL with the aim of preventing illegal export from Europe to West Africa (IMPEL 2012).

IMPEL seeks to achieve these goals by training African officials on e-waste management and inspections, holding e-waste enforcement workshops in the participating African states, developing an e-waste monitoring ‘toolkit’ and the building of an enforcement network operated by both the EU and African nations

(IMPEL 2012). Thus far, the activities of IMPEL have yet to be paralleled by any organization or legislation in the United States.

Waste from Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Waste Substances (RoHS)

In 2006, the European Union passed the Waste from Electrical and Electronic Equipment Directive, or WEEE. This legislation seeks to target the source of the problem, by encouraging the reduction of the production of electronics. Furthermore, the WEEE directive aims to improve the environmental health of products during the manufacturing, consumption and recycling processes of electronics (Environment Agency 2012).

Unmatched by legislation in the United States, WEEE bans the disposal of e-waste in landfills; instead, producers must take back their products once consumers are done using them (Hileman 2006; Liddick 2001; U.S. House of Representatives 2009). The implementation of the “take back” policy varies from country to country because it has been difficult to agree on a process of reclamation (U.S. House of Representatives 2009), as has also been demonstrated by states in the U.S. The question of who should bear the cost of recycling (producer or consumer) is a subject of constant debate, since the cost of recycling e-waste is increasingly expensive in both regions. The issue of cost has indeed inhibited the implementation of the Directive (U.S. House of Representatives 2009). Producers wish to push the cost of

recycling onto the retailer, but retailers are reluctant to charge any additional fees to consumers (for fear they may not want to purchase the product) and are unwilling to absorb the costs themselves. Therefore even the difficulty with and decision of how to recycle these products is of constant concern throughout their lifecycle.

Following WEEE, the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) law came into force in July of 2006, setting standards for the production of electronic equipment and the toxic materials contained within them. This legislation (developed in coordination with the Department for Business, Innovation and Skills in the UK) mandated that manufacturers stop using or greatly reduce the level of toxic chemicals and heavy metals in their products, including cadmium, mercury, lead, hexavalent chromium, and brominated flame retardants (Hileman 2006; Liddick 2011). Furthermore, RoHS regulates the toxicity of electronic products that are imported from outside of Europe,¹⁴ as well as of products that are refurbished within the EU (National Measurement Office 2012). Documentation demonstrating that products are compliant with toxicity levels must be provided to both the RoHS enforcement officials and consumers if requested, and must be maintained for four years after the producer has removed the product from the market (National Measurement Office 2012). Legislation such as this has yet to be realized in the United States.

¹⁴ This regulation is beginning to put pressure on manufactures outside of the EU who wish to market their products to these consumers (U.S. House of Representatives 2008a).

The Case of Africa

The African region is of particular importance in this case because it was the first area to resist toxic dumping from the global North (while other regions, particularly China, were still ambivalent). Several African governments, along with NGOs and IGOs, worked to protect their nations from toxic waste:

Two opposing viewpoints emerged at the Basel Convention negotiations. On the one hand, there were those who wanted the waste trade across borders to continue to be legal. Waste dealers and waste producing firms that were reaping large profits on such deals obviously wanted to have no restrictions on their activities... The less industrialized recipient states, in particular those states in Africa, were strongly in favor of an outright global ban of the trade. These states...saw the negotiations as an ideal forum to demonstrate solidarity on opposition to waste imports (Clapp 1994: 24).

Following what many African nations saw as the failure of the Basel Convention to protect them from industrialized waste dumping, some African nations worked with non-governmental organizations (NGOs) to implement a complete waste import ban (Clapp 1994a). This effort to stop the import of toxic waste into Africa has been supported by NGOs since the 1990s (Clapp 1994a) and is even stronger in response to the growing trend of e-waste. The intention of the ban was to halt the shipment of waste from OECD nations to non-OECD nations. The ban, however, is more symbolic than effective, since there is no legislation or regulation to bolster it. Both local and Northern environmental groups have supported and assisted African nations in their efforts—despite this, African nations (particularly on the western coast) are attractive destinations for e-waste. Large corporations and even international

organizations have recognized the economic benefits of exporting their waste. Former Chief Economist of the World Bank Larry Summers stated that Africa is vastly under-polluted and “the economic logic of dumping a load of toxic waste in the least wage country is impeccable” (as quoted in Clapp 1994a: 19). The ‘economic logic’ was indeed sound; what would have cost US\$250 per ton of waste for disposal in the United States would have only cost somewhere between US\$2.50-\$40 per ton to dump in Africa during the 1980s (Clapp 1994a)—rates which are still comparable today (Liddick 2011):

Africa had quickly become a favorite site for waste dumpers in the 1980s, as African countries generally had weak environmental laws and had very limited state control over customs officials who approved import shipments. Moreover, the weak position of Africa in the international political economy only encouraged waste exports to the continent. African countries, many gripped by poverty, war and famine, were in desperate need of the foreign exchange to be gained from offering dumpsites (Clapp 1994a: 19).

It became clear that the economic gains outweighed the environmental harm in the opinion of those proctoring the import of waste. In the example of Guinea-Bissau stated earlier, the government was offered the equivalent of four times the GNP of the country in exchange for the import of 15 million tons of toxic waste over the course of 15 years¹⁵ (Clapp 1994a). It was also reported that European trading firms had offered officials in Somalia US\$80 million in the 1980s, should they agree to accept 500,000 tons of hazardous waste over of a period of 20 years (Brigland 2010; Clapp 1994a).

¹⁵ Government officials later withdrew from the contract after pressure from other African nations (Clapp 1994a).

The political economy of the global North is encroaching on that of the global South, even in the commodity of waste. Under the guise of ‘donations’ or recycling, many peripheral nations end up shouldering the burden of the world’s electronic waste. Despite attempts at international legislation, the situation is only worsening:

It is illegal under the Basel Convention to ship irreparable electronic products to developing countries. But...the authorities are not testing the products before export to see if they can be refurbished. [Jim Puckett, of the Basel Action Network states] “what we saw in Africa was in some ways worse than in China because there was so much more open burning of the waste.” [He states that the Basel Action Network] is also receiving reports that electronic trash is being sent to Senegal, Kenya and Tanzania (Hileman 2006: 20).

Despite continued efforts by African nations (as aforementioned) to obstruct and impede the importation of e-waste into their countries, this appears to be one of the most vulnerable and targeted regions, and therefore is the focus of this study.

As evidenced above, national and international legislation governing electronic waste—in both the core and periphery—varies greatly in every way. What is consistent across continents is that current legislation seems to be ineffective at stopping (or even slowing) the illegal shipment of electronic waste. Though the failure of current legislation is recognized by all parties concerned, efforts to develop new and more effective legislation are sluggish, given the severity of the problem. It appears no level of legislation—to date—can keep pace with the ever-expanding markets of technology and consumerism.

CHAPTER V: THE COMMODITY CHAIN

Introduction to the Commodity Chain

As transportation, communication and technology expand, so do local, national and global markets. The consistently developing process of globalization has caught the attention of economists, political scientists, social scientists and environmentalists (among many others) and is frequently a topic of research in these circles. One unique concept that has the ability to bring many of these varying perspectives together is that of the ‘commodity chain.’

Often employed by World-Systems theorists, the ‘commodity chain’ is a concept developed in the late twentieth century as a method for the analysis of globalized networks, taking into consideration the development of an international division of labor. The commodity chain itself refers to “the set of economic actors and activities involved in the creation of a good or service” (Grossman-Thompson and Lake 2012). The original authors of this concept, Hopkins and Wallerstein (1977), sought a more inclusive method of analyzing the reach of capitalism in the world market:

Let us conceive of something we shall call, for want of a better conventional term, “commodity chains.” What we mean by such chains is the following: take an ultimate consumable item and trace back the set of inputs that culminated in this item—the prior transformations, the raw materials, the transportation mechanism, the labor input into each of these material processes, the food inputs into the labor. This linked set of processes we call a commodity chain. If the ultimate consumable were, say, clothing, the chain

would include the manufacture of the cloth, yarn, etc., the cultivation of the cotton, as well as the reproduction of the labor forces involved in these productive activities (128).

The length of the commodity chain extends even further than perhaps Hopkins and Wallerstein had originally envisioned, now following consumer goods beyond consumption. For example, the commodity chain of electronic products begins with extraction of necessary metals and other materials used within the product (often from the periphery), to the production of these products (again, often in the periphery), to consumption (often within core nations), and finally to recycling and disposal (often occurring back in the periphery). The complete commodity chain is of much importance to this research as the cycle of electronic waste is clearly beneficial to core nations at the expense of peripheral nations in that many of the materials to make these products (as well as the production of the products themselves) often come from within peripheral nations—nations that are very unlikely to benefit economically from the distribution and consumption of these products—and the final disposal of said products completes the chain, with many of these electronic devices returning to the region from which they originally were extracted. The occurrence of this event is only increasing as our technological advancements concurrently increase the availability and affordability of electronic products.

Global Commodity Chains

Global commodity chains (GCC), also referred to as ‘global supply chains (GSC),’ or ‘global value chains (GVC),’ can be employed to study issues of analytical scope, chain governance and even the operationalization of the chain construct itself (Bair 2009). For the purposes of this research, GCC will be used to study the sociological and political implications in the commodity chain of e-waste (Bair 2009), such as national and international legislation governing the transfer of e-waste, the impact on communities burdened with e-waste, and the responsibility of core nations regarding e-waste.

The concept of the ‘commodity chain’ itself is a little misleading, in that it is not linear, but instead functions more as a network of relationships that are held together by interlocking systems of production, distribution and exchange (Bair 2008). What seems to be a primary focus of commodity chain analysis is to demonstrate the role of political power within the world economy, which inevitably works to shape each individual ‘chain’ (Bair 2008). These chains then become “functionally integrated but geographically dispersed systems of production” (Bair 2008: 348) that are influenced by systems of governance that regulate the allocation of financial, material and human resources within each particular chain (Bair 2008; Gereffi 1994).

Global Commodity Chain Sustainability Analysis (GCCSA)

As aforementioned, Global Commodity Chain Sustainability Analysis (GCCSA) methodology, developed by the International Institute for Sustainable Development, is a relatively new addition to commodity chain analysis. It provides a framework of developing policy recommendations in the context of global supply chains and international markets:

The basic elements of the GCCSA consist of an analysis of market structure and trends, and analysis of the social and environmental impacts along the global supply chain, and analysis of the global supply chain structure and governance and, finally, policy recommendations. The GCCSA effectively links life cycle and related sustainability impact analysis to supply chain decision-making structures and public policy (Eugster, Huabo, Jinhui, Perera, Potts and Yang 2008: 2).

Because of the size, volume and complexity of the EEE industry, GCCSA recommends breaking down the commodity chain into four phases: manufacturing, distribution (trade), consumption (use) and end-of-life (which includes recycling and disposal) (Eugster et al. 2008). A generic analytical framework for electronic chains is demonstrated in Figure 1. Elements of this framework will be discussed throughout the chapter during the analysis of market structure and trends, the discussion of the global supply chain, and the discussion of the social and environmental impacts surrounding the electronic waste industry.

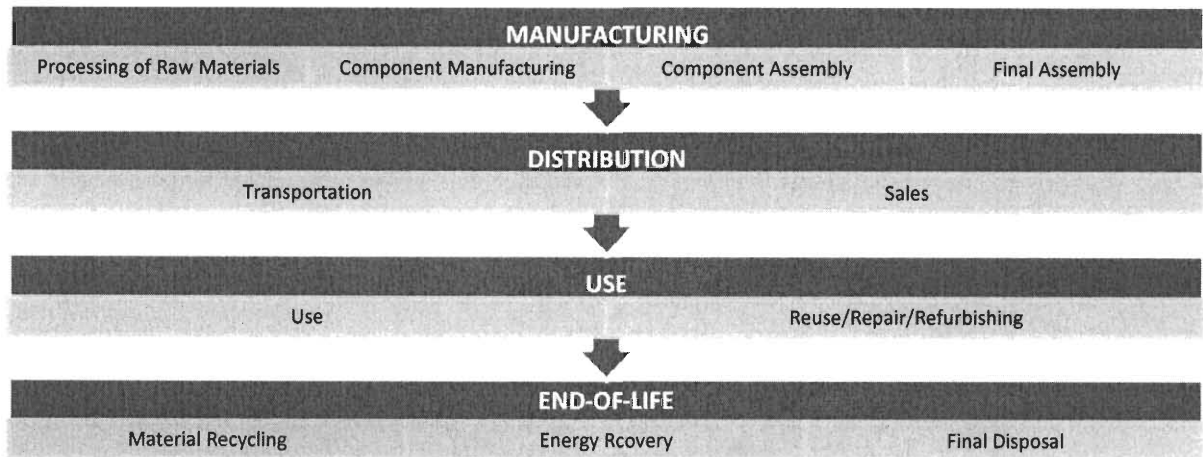


Figure 1: Generic Analytical Framework for Electronic Commodity Chains

**Adapted from Eugster et al. 2008 and the International Institute for Sustainable Development*

The objective of utilizing GCCSA is to illuminate shortcomings of the current market and to help suggest potential solutions that may lead to a more sustainable electronics transfer market.

Raw Materials and Manufacture

Electronic products contain thousands individual parts, which then are combined to develop individual components (such as the central processing unit (CPU), random access memory (RAM) etc.) which work together in order to form a functioning product. Each electronic device has its own set of components, but all contain important raw materials. Included within the necessary raw materials are rare

earth elements, which are a group of 17 chemically similar metallic elements¹⁶ that are used in a variety of commercial products, such as hybrid cars, wind power turbines, computer hard drives, cameras and cell phones, as well as individual components of larger products, such as glass additives, fiber optics and batteries (GAO 2010). In order to obtain these elements, mining of rare earth ore must first take place, and then the ore must be separated into individual rare earth oxides in order to be refined (GAO 2010). These metal elements are then formed into rare earth alloys and can then be manufactured into their respective components for use in commercial products.

While rare earth ore deposits are geographically diverse (including within the United States), “current capabilities to process rare earth metals into finished materials are limited mostly to Chinese sources” (GAO 2010: 13). In fact, estimates suggest that China produces roughly 97 percent of all rare earth metals available today (GAO 2010):

The United States has previously performed all stages of the rare earth material supply chain, but now most rare earth materials processing is performed in China, giving it a dominant position that could affect worldwide supply and prices (GAO 2010: 13).

Environmental and mining regulations in the United States and other industrialized nations have decreased global production. In addition, some previously operating

¹⁶ Lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium, and yttrium (GAO 2010). Additional raw materials needed for electronics include base metals (aluminum, copper, brass, zinc, nickel, tin, steel, lead) and precious metals (gold, silver, platinum and palladium) which are mined all over the world.

facilities in the United States have moved production to China because of lower operating costs and availability of less regulated mining practices and labor (NY Times 2012). Because of this, American and European electronics manufacturers are forced to purchase these raw materials from China, and subsequently also often end up moving manufacturing overseas (outsourcing) to both decrease costs and increase production in order to keep up with rising consumer demand.

Extraction of these raw materials can have substantial environmental and social impacts on the communities in which they are extracted and refined. Moving the raw material extraction processes and electronics production to the periphery is one way in which core corporations ‘externalize harm.’ White (2011) argues that this harm can occur in one or both of two ways,¹⁷ and in both instances directly affects marginalized populations. One way harm can be externalized is through the point of production, meaning the location in which production occurs will inevitably experience the environmental and social harms associated with raw material retrieval and large scale manufacture. For example, raw material extraction can cause water scarcity and pollution, air pollution and high volumes of waste generation (environmental harm); in many of the peripheral regions in which resource extraction takes place, workers are exploited and endure considerable health and safety risks (social harm). Lack of worker safety and environmental regulations in these regions only amplifies these hazards—however, it is primarily these under-regulated areas

¹⁷ The second process of externalizing harm is discussed later in the chapter.

that are attractive to companies looking to outsource, as they drive production costs down considerably. As demonstrated, this transference of harm is obviously occurring in the early production phases of the electronics industry.

Outsourcing in the electronics industry is relatively new; in fact, electronics manufacturing has accounted for roughly 30 – 40 percent of the United States' GDP since World War II (Cole, Mason, Hau and Yan 2001). In recent years, however, subcontracting for design, prototyping and printed circuit boards has been realized (Cole et al. 2001):

There are several factors that are primarily responsible for this increasing trend, such as short product life cycles, global competition, and lower inventory requirements. In addition, reductions in cost are often achieved through large volume procurement of consumables and components, better utilization of high cost capital infrastructure and manpower, and improved process control leading to improved process yields (Cole et al. 2001: 4).

The electronics manufacturing process is extensive, including design, development, fabrication, assembly, and then the subsequent testing of electronic parts, tools, technology, components and systems (Mason, Cole, Ulrey and Yan 2002). When a majority of these processes are occurring overseas, energy consumption for manufacturing and production is also outsourced. To build a desktop computer, for example, the total energy and fossil fuels used are roughly 6400 megajoules (MJ) and 260 kg respectively (Williams 2004). Because of the rapid turnover with personal electronics, energy consumption for these products far surpasses that used to make larger products (such as refrigerators) which maintain their longevity (Williams

2004). Electronics manufacturers play a key role in coordinating all aspects of commodity chain for both locally produced electronics (which are declining) and outsourced electronics.

In the 1990s, the distinction between producer-driven commodity chains (PDCCs) and buyer-driven commodity chains (BDCCs) was made by Gereffi (1994), emphasizing the role played by commercial capital in BDCCs (Bair 2008). Producer-driven commodity chains are often more capital-intensive industries wherein power lies with (often vertically integrated) manufacturers, as opposed to BDCCs where retailers, marketers, etc. often manage the flow (Bair 2008). Producer-driven commodity chains are those in which large, (usually) transnational manufacturers are central in coordinating production, as we typically see in the automobile, aircraft and computer industries (Gereffi 1999). In the electronic industry, Timothy Sturgeon (2002) acknowledges a different structure of governance centered not around the traditional ideals of “trust, reputation and long-term relationships” (2002: 2), but instead the sharing of industry-wide standards that promote easy production and ‘turn-key’ suppliers:

Thanks to the development of industry-wide standards and systems that permit the codification of complex information, lead firms (so-called ‘own equipment manufacturers’, or OEMs) and highly competent suppliers can exchange rich information, such as detailed specifications for particular products, without need of deeply relational ties (Bair 2008: 352).

This set of so-called ‘turn-key’ suppliers is able to provide their clients with full-service outsourcing solutions:

To meet the growing demand for full-service out-sourcing solutions, suppliers have in many cases had to add entirely new competence areas, increasing their scope of activities while improving quality, delivery and cost performance. I call such firms “turn-key” suppliers because their deep capabilities and independent stance vis-à-vis their customers allows them to provide a full range of services without a great deal of assistance from, or dependence on lead firms. Increased outsourcing has also, in many instances, vastly increased the scale of suppliers’ operations. Thus, outsourcing has led to a deepening of competence and an increase in scale at supplier firms (Sturgeon 2002: 455).

Sturgeon (2002) argues that many American electronics companies are adapting to the pressures of a volatile market by following what he terms the ‘modular production network.’ This network takes into consideration electronics manufacturing (namely for consumer electronics) where in-house manufacturing has shifted to outsourced manufacturing over the last couple of decades, allowing for speed, flexibility and the easy flow of information between firms (Sturgeon 2002).

An excellent example of the modular production network employed by Sturgeon (2002) is Apple Computer, which sold its largest US personal computer manufacturing facility to SCI Systems in 1996. At face value, it appeared that Apple was trying to avoid bankruptcy (it had posted the largest quarterly loss in its history the year before—\$740 million—and narrowly avoided being acquired by Sun Microsystems) but this was not at all the case. In fact, Apple was having trouble *meeting* consumer demand, not attaining it:

According to Apple’s CEO, the company’s strategy was to outsource production to companies like SCI and other contract manufactures in order to reduce Apple’s manufacturing overhead and inventory carrying costs while concentrating its resources more intensively on product design and marketing. As Apple’s Director of Operations put it, Apple was moving to a ‘variable cost position’ vis-à-vis its

manufacturing operations. This meant that more of the company's manufacturing assets were to be held by outside companies: contract manufacturers. The sale provided Apple with the ability to alter the volume of its production upward or downward on very short notice without installing or idling any of its own plants and equipment. Of particular interest to Apple's management was the improved 'upside flexibility'—the ability to quickly ramp production volumes upward to meet unexpected surges in demand—that the deal with SCI provided (Sturgeon 2002: 456).

Given Apple's success in the consumer electronics industry today, it is safe to say that this strategy paid off in a big way—and not only for Apple. Many electronic companies followed suit in what Sturgeon terms a “wave of outsourcing” (2002: 457). Electronic firms such as IBM, Nortel, Apple Computer, 3Com, Hewlett Packard, Maxtor and Lucent sold off much of their domestic and offshore production facilities to contract manufacturing giants. Other electronics companies (such as Sun Microsystems, Silicon Graphics, EMC, Juniper Networks, Sycamore Networks, Cisco Systems and Network Appliance) outsourced their production from the beginning, leading to remarkable levels of growth and geographic expansion for all parties involved (Sturgeon 2002). A 2001 survey conducted by investment bank Bear Stearns (later acquired by J.P. Morgan Chase in 2008) recorded that 85 percent of brand name electronics firms had the intention to continue to outsource production, with 40 percent stating that they would outsource 90-100 percent of their final product manufacturing (Sturgeon 2002). This represented an important shift in the commodity chain of consumer electronics, and inevitably, of electronic waste.

During the most recent economic downturn, the United States has struggled with high levels of unemployment, prompting the resurgence of criticism surrounding outsourcing. Many electronics producers were pressured to shift jobs back to the U.S., and one even received pressure from President Obama. In February of 2011, President Barack Obama sat down with key players in Silicon Valley, including then CEO of Apple, Steve Jobs. The President asked Jobs, “what would it take to make iPhones in the United States?” and encouraged Jobs to consider the possibility (Duhigg and Brashder 2012). In its original conception, Apple touted their American-made products; today, almost all of them (including the 10 million iPhone, 20 million iPads and 59 million other iProducts sold last year) are manufactured overseas (Duhigg and Brashder 2012). Steve Jobs was honest with the President, stating simply that, “those jobs are never coming back” (Duhigg and Brashder 2012) and cited not only manufacturing costs, but also manufacturing capabilities as the reason why:

It isn’t just that workers are cheaper abroad. Rather, Apple’s executives believe the vast scale of overseas factories as well as the flexibility, diligence and industrial skills of foreign workers have so outpaced their American counterparts that “Made in the U.S.A.” is no longer a viable option for most Apple products (Duhigg and Brashder 2012).

Apple is one of the most well-known, highest profiting companies on the planet, earning over \$400,000 in profit per employee—which was more than Goldman Sachs, Exxon Mobil or Google—and employs over 700,000 people in foreign companies in Asia, Europe and elsewhere (Duhigg and Bashder 2012). Jobs’

explanations for keeping production overseas include the speed and flexibility of Chinese manufacturing:

Apple executive say that going overseas, at this point, is their only option. One former executive described how the company relied upon a Chinese factory to revamp iPhone manufacturing just weeks before the device was due on shelves. Apple had redesigned the iPhones's screen at the last minute, forcing an assembly line overhaul. New screens began arriving at the plant near midnight. A foreman immediately roused 8,000 workers inside the company's dormitories...Each employee was given a biscuit and a cup of tea, guided to a workstation and within half an hour started a 12-hour shift fitting glass screens into beveled frames. Within 96 hours, the plant was producing over 10,000 iPhones a day (Duhigg and Bashder 2012: 1).

The flexibility and capabilities of outsourced production are obvious, but it has become common knowledge that they come at the cost of worker health, safety, and compensation. As indicated by the rash actions taken to modify the Apple iPhone, consumer demand and company profits have drastically impacted an ever-evolving commodity chain of consumer electronics over the last century.

History, Evolution and the Technological Advancements of E-Waste Products

Though it may be difficult for residents of core nations to imagine life without their everyday consumer electronics (cell phones, personal computers, high definition television, tablets, etc.) it was not so long ago that these types of conveniences did not exist—or, at least, were not available to the average consumer. Some trace the advent of the consumer electronics industry all the way back to Thomas Edison and the electric typewriter (1872), others focus on the popular products of the Radio

Corporation of America (RCA) in the 1940s and 1950s, and still others point to the International Business Machines' (IBM) personal computer development in the 1970s (Chandler 2005). While the actual origin of the consumer electronics industry may be under debate, what is indisputable is that the industry took off in the 20th century and continues to do so (without foreseeable end) in the 21st century.

The development of transportable and affordable personal electronic products has played a major role in the high volume of hazardous e-waste. Perhaps the root of the e-waste problem can be contributed to the concept of 'Moore's Law' (first observed in 1965 by Intel co-founder Gordon Moore), which suggests that computer processing power will double every 18 months for the foreseeable future (Environmental Health Perspectives 2002). Given that many of our personal electronics now rely on this form of processing in one way or another, it should be no surprise that this rate of technological advancement would eventually lead to technological waste as consumers begin to use and consistently upgrade their personal electronic devices.

Consumption Levels of E-Waste Products / Average Lifespan

According to the Consumer Electronics Association (CEA), United States consumers purchased roughly 500 million units of consumer electronics in 2008 (Electronics TakeBack Coalition 2010). U.S. consumers purchased over \$165 billion in consumer electronics, with the average U.S. household spending over \$1,300 on

consumer electronics (Electronics TakeBack Coalition). Despite a recent downturn in the U.S. economy, the industry of consumer electronics is on solid ground and is predicted to surpass \$200 billion in annual factory sales for the first time in history in 2012 (Consumer Electronics Association 2012).

Over the last decade, consumer electronics such as televisions and computers have become more common in U.S. households. In 1997, less than 30 percent of Americans had more than three televisions in their home, a number which surpassed 45 percent in 2009. As for personal computers, roughly six percent of households had one computer in 1997, compared to 76 percent of homes having at least one computer, and over 40 percent of homes having two or more computers in 2009 (U.S. Energy Information Administration 2011). In addition, roughly one third of all U.S. homes have at least four electronic devices (such as cell phones) plugged in and charging on any given day (U.S. Energy Information Administration 2011).

Worldwide, over 211 million TVs were sold in 2009, with roughly 35 million being purchased in the U.S. alone. In 2010, U.S. consumers bought 3.3 million HD TV's specifically for the Superbowl, up from 2.6 million in 2009 (Electronics TakeBack Coalition). Not only are consumers buying more televisions, they are purchasing larger televisions, with the average TV size now reaching 29.5 inches in North America, with North America accounting for 83% of the 50+ inches market, and 54% of the 40+ inches market (Electronics TakeBack Coalition 2011). These sales are even more surprising, given that they represent a two percent increase from

2008, which was not anticipated because of the downturn in both the U.S. and global economies.

Analysis of Market Structure and Trends

The “e-product” market has been expanding rapidly throughout the end of the 20th century and the start of the 21st century. The segment of the market represented by personal electronics (televisions, personal computers (PCs), and cellphones) has been aided in large part by the ever expanding production capabilities of China, which is now the world’s largest manufacturer and sourcing point for televisions, PCs, cellphones, refrigerators and air conditioners (Eugster et al. 2008). It is impossible to ignore the contributions of Chinese manufacturers to the electronics industry, just as it is impossible to ignore that the latest and most advanced products are continually bound for core nations.

Televisions are one of the more notable e-products, as they have recently undergone a transformation of sorts. The newer market for Liquid Crystal Display screens, or LCDs, has encouraged many consumers to make the switch from the older model, Cathode Ray Tube (CRT) televisions. It is likely that the FCC-mandated switch to high definition television in the U.S. in 2009 played a major role in the ‘upgrade’ to LCD televisions (Slade 2007). Production for CRT televisions, which are sold at a lower cost than LCDs, seems to be driven by lower income economies (Eugster et al. 2008). China, for example, accounts for the large majority of global

market growth in CRT television production and sales, consuming 54.5 million CRT televisions in 2006. But this growth was stunted by that of LCD television production, which is expected to entirely phase-out CRT television production within the next ten years (Eugster et al. 2008). Markets in core nations have already effectively replaced CRT televisions with LCDs (save for re-sale markets). In 2006, over 90 percent of the total LCD production in China was exported to U.S., European and Japanese markets (Eugster et al. 2008).

As with televisions, China has also become the world leader in the production of ‘information and communications technology’ (ICT), notably computers and cell phones. The nation’s role in the global e-market is also due in part to their own domestic consumption, which accounts for a majority of its ICT products. The production of PCs grew from 8 million units in 2001 to 47 million units 2006, while the production of cell phones increased from 75 million units to 340 million units concurrently (Eugster et al. 2008). Rapid growth in the laptop market increased from 100,000 units in 2001 to 55 million units in 2006, with more than 90 percent of these bound for export (Eugster et al. 2008). The U.S., EU and Japan account for 36, 34, and 20 percent of Chinese laptop exports respectively (Eugster et al. 2008). Estimates in 2008 suggested that the PC penetration in Chinese markets was roughly 15 units per 1,000 households, and less than 10 units per 1,000 households in Africa, as compared to 200-350 units per 1,000 households in OECD nations (Eugster et al. 2008). The rapid production and consumption rates for these products feed directly

into the e-waste stream. Even though China is technically export-driven, it manages high levels of end-of-life products from both internal and external consumption. Even less developed nations than China, such as African nations, primarily import their electronics (which are often used) and therefore these nations house products during the end-of-life (EOL) phase. Electronic products, when no longer functioning or usable, become 'e-waste':

e-waste is defined as any e-product that is no longer usable for its original purpose. As such, the generation of e-waste in any given region is directly correlated to regional consumption levels. E-waste has the potential to feed into either the "waste stream" or into the production stream of new products through recycling and reuse. The 'market' for e-waste recycling and reuse depends upon the nature of the materials in the e-product, the regulatory framework and the recycling/disposal capacity of any given region (Eugster et al. 2008: 11).

It is difficult to track the amount of e-waste either generated by or shipped into nations, as the trade from foreign markets is largely undocumented due to the informal atmosphere of the supply chains that supply the e-waste market (Eugster et al. 2008). Due to a lack of data on the transport of e-waste, numbers are estimated based on key variables that contribute to the e-waste stream. Therefore, estimates of electronic waste are often calculated from consumption patterns.

Planned and Perceived Obsolescence

In order to approximate the physical volume of e-waste, consumption levels, product lifespan and per-unit material volume are recorded (Eugster et al. 2008).

Technological advancement has led to an increase in consumption that has concurrently decreased the lifespan of products; much of this can be attributed to the concept of deliberate obsolescence, where products are either intentionally made to become obsolete or non-functioning (planned obsolescence) or consumers are made to think that their product has become so in light of a more recent product (perceived obsolescence):

Deliberate obsolescence in all its forms—technological, psychological, or planned—is a uniquely American invention. Not only did we invent disposable products, ranging from diapers to cameras to contact lenses, but we invented the very concept of disposability itself, as a necessary precursor to our rejection of tradition and our promotion of progress and change. As American manufacturers learned how to exploit obsolescence, American consumers increasingly accepted it in every aspect of their lives (Slade 2007: 4).

The practice of *planned* obsolescence began in the early twentieth century, when manufacturers chose production materials based upon their likelihood to fail. During the Depression, for example, planned obsolescence began to become common:

After a decade of unprecedented affluence and consumption during the 1920s, consumer demand fell radically in the onset of the Depression, and in desperation manufacturers used inferior materials to deliberately shorten the life spans of products and force consumers to purchase replacements (Slade 2007: 5).

Perceived obsolescence is not a new phenomenon, either, and was also observed in the early twentieth century in the automobile industry when consumers began to choose cars that utilized an ignition switch as opposed to a crank, rendering the old, but still functioning, models seemingly obsolete (Slade 2007). Though the vehicle the

consumers had prior to their new purchase may have still been fully functioning and adequate, the new product offered some added convenience or status that somehow proved irresistible. This added and seemingly irresistible *convenience* is a primary driving force behind the ever expanding personal electronics industry of the twenty-first century, which has a continuous output of ‘newer, faster, and better’ products.

In 1999, the Silicon Valley Toxics Coalition estimated that the amount of electronic consumer waste entering landfills in the U.S. would be around 1.8 million tons. By 2001, this figure had already jumped to five to seven million tons (Slade 2007). This rapid increase in e-waste is due in large part to intentional obsolescence. Cell phones, for example, have an average lifespan of only one year in the United States (Slade 2007). This is most likely because both producers and consumers want to have the latest technology available, and will go to great lengths to achieve it. As one of the more notable personal electronic producers, the iconic Apple brand drew hundreds of thousands from around the world to stand in line in October of 2011 for the release of the Apple iPhone 4S (Sutter and Gross 2011). This ritual is nothing new, as Apple repeatedly draws crowds (and attention) for each new product it releases. Beyond its gadgets, the people behind the product at Apple have also resonated with consumers. After the passing of Steve Jobs, CEO and Co-Founder of Apple, in October of 2011, fans created makeshift memorials with flowers, photos, iPad and iPhone boxes, and apples—as in the fruit (Sutter and Gross 2011). Clearly, Apple has attained product loyalty and has succeeded in the psychological

obsolescence described by Slade (2007). Colin Campbell (1992) views modern consumption behavior as a ‘mystery,’ as it is an insatiable and endless pursuit of wants, which cannot be attributed solely to manufacturers. Instead, Campbell focuses on the attitudes, beliefs, and behaviors of consumers and their desire for new goods, which he calls ‘neophilia,’ or the love of new things (Campbell 1992; Slade 2007). Whether it be consumer or producer, there is more to consumption than one might realize.

Changing Market Trends

As aforementioned, the contributions from China in the global market for electronics are impossible to ignore. China is the “world’s largest manufacturer and sourcing point for PCs, televisions, mobile phones, refrigerators and air conditioners” (Eugster et al. 2008: 10). As the e-market is primarily technologically driven, the lifespan¹⁸ of personal e-products is relatively short when compared with other large appliances (see Table 2). This also often leaves China as one of the main destinations for e-waste through both formal and informal markets. The e-waste reverse-supply chain consists of the collection, dismantling, recovery of materials, and finally disposal of the waste (Eugster et al. 2008). The lack of strong regulation in many

¹⁸ The lifespan of electronics is defined as the length of time between the initial purchase of the product and when it reaches its end-of-life phase or disposal phase (also known as EOL) (Office of Solid Waste 2008).

peripheral and semi-peripheral nations (such as a still-developing China) has greatly increased the volume of waste being trafficked via informal markets:

The informal e-waste supply chain is particularly important in China due to a combination of the fact that there is a general absence of strong regulatory and material infrastructure for finalizing the e-waste supply chain and the fact that the import and treatment of e-waste often fails to comply with domestic regulations (thereby creating incentives for operation outside of the formal market) (Eugster et al. 2008 12).

The informal market in the e-waste industry handles most of the collection and dismantling of the products, with a majority of e-waste in peripheral nations being ‘processed’ in roadside dumps, small workshops and backyards. The materials recovery segment of the supply chain, however, occurs more frequently in the formal market. As for the final stage of disposal, the waste is typically disposed of in the same market in which it was produced (formal or informal) (Duan and Eugster 2007; Schluep 2010). Western African nations (such as Nigeria and Ghana, which are the focus of this study) have an established informal recycling sector with limited formal recycling abilities. The informal disposal practices in the e-waste industries in these nations are triggered by both second-hand imports and the increasing volume of domestic e-waste (Schluep 2010).

Table 2: Average Lifespan for Select Electronic Products

PRODUCT	AVERAGE LIFESPAN
Desktop PC	6 years

Table 2 - continued

Laptop PC	4 years
Cell Phone	1.5 years
CRT Television	10 years
LCD Television	5 years
Washing Machine	12 years
Refrigerator	13 years
Air Conditioner	11 years

**Adapted from data from Eugster et al. 2008, United States EPA and the International Institute for Sustainable Development*

In the United States, a major exporter of e-waste, electronic products go through several phases before they reach the potential to be exported (see Figure 2). The first phase of the lifecycle includes the actual purchase of the product, and the second phase includes the gift/sale of the item to a friend or family member, or the relegating of the item to storage (Office of Solid Waste 2008). During the third phase, the item may reach its EOL and move into disposal, or it may involve a third party (such as an electronics recycler or resale shop) and reenter the electronics market either inside or outside of the United States. The fourth phase of the lifecycle delineates either the sale and purchase of a refurbished product, or the disposal of a product that could not be recycled or was deemed outdated.

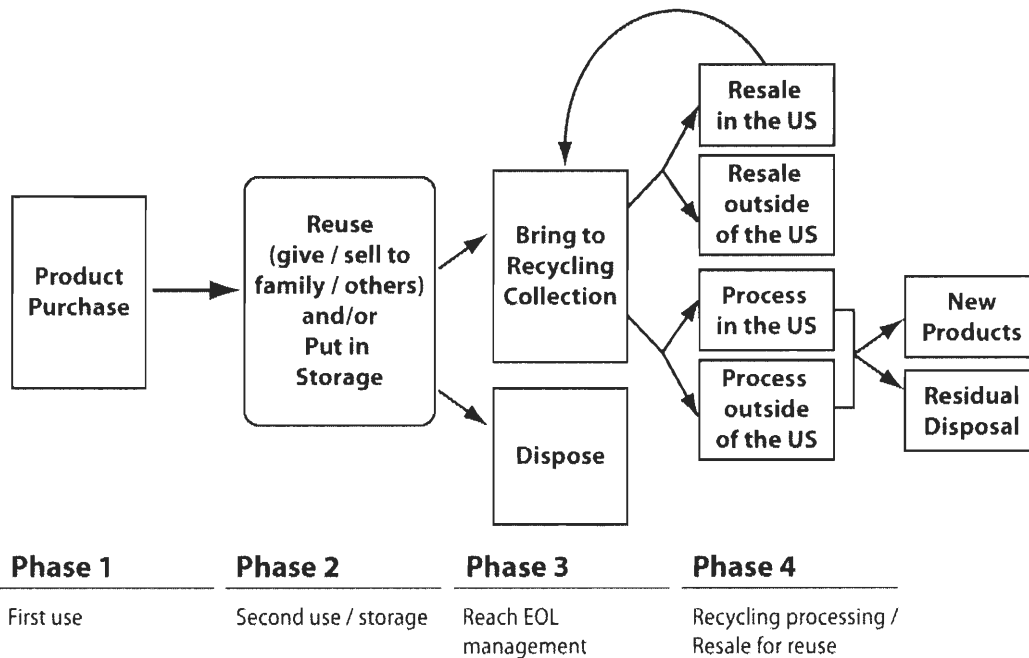


Figure 2: Electronic Product Lifecycle in the United States

Adapted from the Office of Solid Waste, US Environmental Protection Agency. 2008. Electronics Waste Management in the United States. Washington, DC.

The lifecycle of every product varies, depending upon the consumer (and how much they value the product) as well as the product itself ¹⁹(Office of Solid Waste 2008).

What has been realized is that a vast majority of the electronics ‘recycled’ in the U.S. will eventually end up overseas (Liddick 2011) in the periphery, where their initial and then subsequently end-of-life impacts are fully realized. It is during this EOL stage that the second form of externalized harm is also realized, which is the full socialization of harm (White 2011). This socialization of harm occurs when private corporations pollute (or in some form cause pollution) and the public is then liable to

¹⁹ Televisions, for example, are kept longer on average than computers; computers are kept longer than cell phones, etc. (Office of Solid Waste 2008).

clean up or at least attempt to mitigate the environmental harm (White 2011). The transference of electronic waste displaces e-waste pollution from core to peripheral regions, which are the least capable of recycling the waste responsibly. Populations in these regions must then either work to mitigate the environmental harm, or simply coexist with it (which is more often the case). As the personal electronics market continues to expand, so does the externalization of harm.

Conclusion

To summarize, the commodity chain of electronic waste follows a long and complicated path. From manufacture in the periphery, to consumption in the core, and back again for disposal in the periphery, electronic products (which will inevitably become e-waste) make their way across continents. The externalized ‘harm’ from these products occurs on two levels: first during the production process, and then again during disposal. Changing patterns of consumption have only served to increase the annual generation of e-waste, as consumers flock to markets to buy the latest technological gadget. Using the GCCSA framework, it is possible to analyze the market structure and trends as well as environmental impacts. This same framework will be applied in the following chapter to address global supply chain governance as well as policy recommendations for future regulation of the electronic waste industry.

CHAPTER VI: THE ELECTRONIC WASTE INDUSTRY

Evolution of the Industry

It may come as a surprise to some that ‘waste,’ in all its forms, functions as a profitable commodity. White (2011) suggests that the commodification of waste is linked to the growth of waste removal companies following World War II. This began predominately in Europe, as Italian organized crime families have been trafficking waste for decades, with 158 organized crime “families” trafficking 35 million tons of garbage annually around the globe (Liddick 2011). In recent years, these organizations have begun both shipping and dumping illegally trafficked toxic waste, including e-waste (Liddick 2011). In the 1980s, relaxed trade policies contributed not only to globalization, but also to transnational organized crime; the concurrent development of environmental laws triggered an increase in the costs of safe recycling practices (Liddick 2011; White 2011), creating the ideal environment for an illicit market. Feckless regulation coupled with a demand for inexpensive waste disposal services has turned the illegal waste market into a booming industry, generating over eleven billion dollars annually (Liddick 2011). This industry impacts not just the environment, but also the international economy and society as a whole:

Illegal industries distort the legitimate marketplace and undermine businesses that choose to play by the rules, and consumers are denied the opportunity to make more responsible choices. Developing nations are robbed of their natural resources, and governments denied revenues that might be used to benefit their citizens. Profits are so great they are used to finance conflict and

war, and public officials and the very entities established to police these economic sectors are systematically corrupted. Moreover, legitimate capital is applied in such a way that governments are obliged to make decisions that tend to facilitate illegal practices and maximize profits for a few elites at the expense of the environment and impoverished human populations (Liddick 2001: 6).

Participation in illegal transfer of waste is not limited to those who are considered typical ‘criminals,’ but also includes corporate polluters, corrupt public officials and informal public and private markets (Liddick 2011). It has even been suggested that the trafficking of hazard and toxic waste may rival that of the international drug trade in both its scope and profitability (Liddick 2011).

Though the trafficking of illegal waste from core nations to the periphery happens across the board, it is perhaps most notorious for originating in Italy (Liddick 2011). Renowned criminal organizations, such as the Cosa Nostra, the Camorra, and the ‘Ndrangheta engage in the trade, moving not just e-waste, but also:

...dust from smoke abatement in iron and metal industries, incinerator ashes, sludge from water treatment processes in the chemical industry, acid sludge, sludge from tanneries, transformers containing contaminated oil, de-oiled earth, and miscellaneous waste made up of plastic...authorities believe \$8.8 billion a year is earned from all environmental crimes in Italy (Liddick 2011: 16-17).

Not too far behind Italy, the United States (most notably New York and New Jersey) contributes to the illegal flow of waste as private crime organizations routinely circumvent the RCRA, and have even played a role in weakening waste regulation (Liddick 2011):

The RCRA was poorly implemented and enforced from the start—the lack of a legitimate hazardous waste industry at that time necessitated interim licensing and bred lax monitoring of the manifest system. In fact, the manipulation of manifests allowed corporate entities to “orphan” their waste, and thus escape liability. Even minus cases of public corruption and regulatory incompetence, private waste generators effectively lobbied Congress so that the RCRA would demand less of them, minimize their liability, and ultimately make the industry amenable (though perhaps not purposefully) to organized crime infiltration (Liddick 2011: 18).

Participation in the industry is not entirely consistent, as there are several levels of contributors who vary in their levels of participation. Ranging from organized crime families to local farmers, the ‘employees’ of the e-waste trade are best described as “ad hoc” (Liddick 2011: 19):

Research demonstrates that a wide range of societal players are involved, and includes “conspiracies between waste producers, collection and transport companies, storage firms, managers of dump sites, chemists, specialized laboratories, and even farmers” (Massari and Monzini, as quoted in Liddick 2011: 19)...generators, haulers, treatment specialists, storage providers and disposal players simply agree to violate regulations to save money and increase profits (Liddick 2011:19).

These profits can be enormous, generating billions of dollars annually. Recycling these products responsibly cuts down tremendously on revenue. For example, it *costs* recyclers roughly 20 dollars to responsibly recycle an average computer (Gibbs, McGarrell and Axelrod 2010). Because of this, recyclers often charge a fee to accept these items and sometimes only break even, making more of a profit off other, less toxic electronics (such as cellphones). These efforts, which generate little profit, often lead even responsible recyclers to export these products in order to generate revenue:

Once collected, legitimate and illegal operators usually transport the materials to developing nations, who welcome the “recycling” revenue. The profit comes not only from the extraction of the precious metals, but also from the large price differentials between developed and Third World countries. For example, glass-to-glass recycling of computer monitors costs 50 cents per pound in the United States, but only five cents in China—Third World recycling companies pay their workers (often children) low wages and are typically unconcerned with safety or health measures, and are not burdened by stringent environmental rules (Liddick 2011: 30).

The economic logic of exporting waste to nations which do not require safe recycling is sound, in spite of the environmental and social consequences. It is no surprise that an industry functioning on easy profit is booming.

The Externalization of Harm

From a business perspective, the decision to transfer electronic waste into an unregulated nation is perfectly cogent; not only does the shipping company avoid the costly recycling process in their home nation, but they also stand to make a profit from their sale. For example, an electronics recycler will spend on average around twenty dollars to recycle a computer (as aforementioned). However, if this recycler were instead to sell the computer to a buyer in a peripheral nation, s/he could earn roughly fifteen dollars for the unit, netting a profit of roughly thirty-five dollars (Gibbs et al. 2010). This process, however, involves the transfer of more than just electronics—it also involves the transfer of harm.

As stated earlier, White (2011) argues that the transnational movement of waste (including e-waste) is actually a process of ‘externalizing harm.’ This harm can occur in one or both of two ways, and in both instances directly affects marginalized populations. The first process in which harm is externalized is through the point of production, meaning the location in which production occurs will inevitably experience the environmental harms associated with raw material retrieval and large scale manufacture (pollution of air, water, soil, etc.) as well as the social harms (poor wages, unsafe working conditions, etc.). White (2011: 73) also articulates that waste production is inevitably associated with growth:

Built into the logic and dynamics of capitalism is the imperative to expand. Capitalism is always searching for the things which can be transformed from simple use-values (i.e. objects of need) into exchange values (i.e. commodities produced for exchange).

In a capitalistic structure, production and destruction are interlinked, as waste becomes both a by-product of production and the refuse from leftover consumption (White 2011). In this way, harm becomes a cumulative impact as the market for electronic goods and electronic waste expands.

Emerging Illegal E-Waste Markets

The market of electronic waste has only grown, and will continue to grow, over time. Feeding off ever-expanding levels of consumption, e-waste brokers consistently have “new” products to sell. However, without environmental

regulations, electronic waste would not be nearly as valuable. What had also occurred following WWII was a change in the ‘waste’ itself, as new chemicals and other toxic waste (such as persistent organics pollutants, or POPs) began to be used in products (White 2011) and were eventually regulated in core nations. The cost of recycling e-waste in developed nations is so expensive that recyclers actually have to charge when accepting products in order to make a profit when recycling or refurbishing them. This dissuades consumers from recycling their products, only hurting electronics recyclers further. Nationwide, some 2,000 U.S. electronics recycling facilities (Liddick 2011) are only operating at roughly 25 percent capacity (Luther 2010); exporting e-waste to developing nations proves much more profitable than responsibly recycling the products within U.S. borders.

Within the U.S., costs to electronics recyclers are driven up primarily by the state and federal environmental regulations they must follow. Across the U.S., many states have implemented “landfill bans” which prevent the discarding of electronic devices in landfills (GAO 2008). As aforementioned, on a federal level the RCRA governs hazardous and toxic waste treatment and provides specific criteria for the transport, treatment, storage and disposal of said waste. Although much e-waste is not specifically classified as ‘toxic’ or ‘hazardous’ in the United States,²⁰ some is. For example, the EPA stipulates specific handling procedures for CRTs and printed circuit boards, as they are deemed ‘hazardous’ by RCRA definitions (Luther 2010).

²⁰ In spite of the fact that most electronics are designated as ‘toxic’ or hazardous’ by almost all other industrialized nations.

Products containing these items cannot be disposed of in landfills and are immediately more expensive to handle and process in the United States, and thus become prime candidates for export.

What should be noted is that the United States specifically regulates the export of CRTs. An EPA rule went into effect in January of 2007, and stipulated that CRT exporters must file a notification of the export with the EPA. In addition, if the CRTs are designated for recycling purposes, the exporter must obtain consent from the importing country in order for shipment to be approved (GAO 2008). It is the responsibility of both the EPA's Office of Solid Waste and Emergency Response as well as the Office of Enforcement and Compliance Assurance to implement the CRT rule (GAO 2008). Furthermore, as an OECD member, the United States is bound to implement OECD Council decisions and therefore incorporated a 1992 decision (OECD Council 2001) of the "notice-and-consent process for hazardous waste recovery among OECD members" (GAO 2008: 3) and did so under established RCRA provisions. In spite of these regulations, CRTs are routinely illegally exported from the United States to peripheral nations in Asia and Africa (GAO 2008). Expensive recycling costs in the United States have led U.S. electronics recyclers to seek more profitable alternatives. In an undercover operation conducted by the Government Accountability Office (GAO), 64 out of 343 electronics recycling and trading companies surveyed in the US responded to solicitations for unusable electronic waste:

We posed as overseas and domestic scrap brokers with a clear intent to purchase and export untested, nonworking, or broken CRTs—items that are not likely to be recycled in an environmentally responsible manner (GAO 2008: 4-5).

What was perhaps most telling about the GAO operation was the ease with which these companies circumvent EPA regulations, and their casual or apathetic perspective on doing so. Of the 64 companies that responded to the solicitations, 43 were ready and willing to export non-working CRTs to the fictitious buyers, and only one submitted a notification to the EPA as required by the CRT rule to do so legally (GAO 2008). The following is a summary of the correspondence between the GAO's fictitious e-waste buyers and the electronics recycling agencies they communicated with:

A representative of an electronics-recycling company in Colorado told [the GAO] that the company does not export CRTs; instead, all CRTs are recycled in-house, so the CRT rule does not apply. This same person offered to sell 1,500 CRT monitors and 1,200 CRT televisions, which were ready for immediate shipment, to our fictitious broker in Hong Kong.

A representative of an electronics-recycling company in Washington State told [the GAO] that all of its CRT monitors are sent to its shredding facility in Oregon. A sales associate at the company, however, offered to sell four containers of CRT monitors (approximately 3,200 units) in April 2008 and another 20 containers (approximately 16,000 units) in June 2008 to our fictitious broker in Hong Kong.

A representative of a metal-recycling company in Illinois told us that the CRT rule does not apply to this company because it sends all of its CRT glass to a lead smelter in the United States. In response to an email inquiry to ship nonworking and untested CRT monitors to Southeast Asia, however, this

person wrote back, “What are you paying for the monitors? Let me know and I’ll give you an inventory count” (GAO 2008: 25).

This two-faced approach depending upon ‘who was doing the asking’ was common throughout the findings of the GAO study. If an interested buyer was propositioning the companies, they seemed all too eager to ship their hazardous goods; when questioned by GAO or EPA officials, strict adherence to regulations was assured—that is, if the companies admitted to being aware of the regulations at all:

A regional manager for a trading company in California stated that he was not aware of the CRT rule notification requirements, but that his company does not export CRTs. In an email to our fictitious broker in Pakistan, however, he offered to sell “as-is” CRT monitors. In addition, his company offered 900 as-is CRT monitors, some with power cords cut, on a Chinese e-commerce site.

...an electronics recycler in Utah [offered] to sell five containers of used CRTs stated in an email that he had had ‘no problems with the CRT rule so far.’ He offered to mix the broken materials at the back of the containers, which implies he is aware that it is illegal to export broken CRTs without consent. In addition, a computer wholesaler in Wisconsin offered to sell two containers (900 units per container), telling us that the CRT rule will definitely not affect shipment: “we ship these overseas all the time,” he wrote.

A sales representative for a large electronics recycler in New Jersey said that he was not aware of the CRT rule and was not the right person to speak to about this issue. This same individual, however, told our fictitious buyer from Hong Kong not to worry about U.S. laws’ holding up export of untested CRT monitors. He explained that “it’s the laws at [the port of Hong Kong] that you have to find out about.”

[The GAO] continues to receive requests from this company, including one from July 2008, seeking a buyer for 60 40-foot containers of used televisions “available now,” or around 48,000 used televisions. On a Chinese e-commerce website, this company states that it has “a continuous supply of used monitors” and currently has over 200,000 nonworking CRT monitors for

sale. On its own website, this company claims that it is a “leader in CRT recycling” and it “satisfies all state and federal requirements regarding proper disposal of toxic/hazardous electronic waste,” as well as ensuring that “100 percent of the electronic waste we receive is reused or responsibly recycled” (GAO 2008: 24-25).

The contention of electronics recycling and trading companies to be “environmentally responsible” is widespread. A handful of these electronics recyclers were even holding “Earth Day” events where they would collect electronics ‘for free,’ assumedly to then sell off to overseas brokers; others would still charge a fee to the consumer “to cover recycling expenses” (GAO 2008: 25). Almost all of the companies monitored in the GAO investigation produced ‘environmentally friendly’ proclamations in advertisements at the same time that their companies were concurrently violating U.S. environmental regulations and knowingly contributing to illegal e-waste disposal abroad (GAO 2008).

What is undoubtedly a contributing factor to these illegal exports from the United States is not the lack of awareness, but instead the lack of enforcement of EPA and RCRA regulations. For example, in 2005 it was estimated that nearly 90 percent of CRT containing products collected in the U.S. (for recycling) were in fact exported to developing countries (Gibbs et al. 2010). Even though the EPA has the authority to mete out criminal penalties of up to \$50,000 per day of violation as well as imprisonment of up to two years against individuals who knowingly violate the CRT rule, it is rarely enforced (GAO 2008). In fact, the CRT rule was in force for over 18 months before the EPA issued its first administrative penalty complaint (let alone

criminal sanction), which was only imposed as a result of the Government

Accountability Office investigation:

EPA has taken few steps to enforce the CRT rules. [Between] January 2007 [and August 2008] Hong Kong has intercepted and returned to the United States 26 shipping containers of used CRT monitors because these exports violated Hong Kong's hazardous waste import laws, Hong Kong officials said. Under the CRT rule, these shipments are considered illegal hazardous waste exports because the U.S. exporter did not notify EPA (GAO 2008: 7).

In a more egregious example, three containers filled with broken CRT monitors were shipped from Los Angeles, California across the Pacific Ocean four times before the U.S. EPA initiated enforcement action (Basel Action Network 2012; GAO 2008). The same containers were intercepted on two different occasions by Hong Kong authorities, even though the EPA had been alerted to the problem. Explanations for the mix up were that the original shipper had placed the CRT monitors in the container "by mistake" and was subsequently only able to export them a second time because he had changed the name of his business to a fictitious company (GAO 2008).

The deputy director of the EPA indicated to the GAO (2008) that the EPA's enforcement of the CRT rule relies primarily on tips and complaints and implements few investigations on its own. Even recyclers themselves, who know they are violating EPA law, suggest, "If EPA whacked some [exporters], then they would comply with the rule" (GAO 2008: 30). Clearly, more stringent enforcement is necessary if e-waste regulation is to be effective in the U.S.

The Case of Executive Recycling Inc.

In 2011, the United States filed federal charges *for the first time* against a recycler for illegally exporting toxic electronic waste. Two executives of Executive Recycling Inc. of Denver, Colorado are facing multiple criminal charges and 16 separate indictments which include wire and mail fraud, environmental crime, exportation contrary to law, and destruction, alteration, or falsification of records (BAN 2011; Gluckman 2011; United States District Court). CEO Brandon Richter and Vice President of Operations Tor Olson each face up to 52 years in prison (Gluckman 2011).

The U.S. Immigration and Customs Enforcement (ICE), Homeland Security Investigations (HIS) and the EPA Criminal Investigation Division handed down the charges on September 17, 2011 following widely publicized (and award winning) reports by the combined efforts of both the Basel Action Network and CBS's 60 Minutes. It took 30 months of investigations, but the cooperating entities linked Executive Recycling Inc. to over 300 exports, including the shipment of more than 100,000 toxic CRTs (which generated \$1.8 million in profit for the company) (BAN 2011).

In 2007 and 2008, BAN photographed 21 containers at Executive Recycling's loading docks and tracked them across the ocean, most of them landing in China (BAN 2011). The e-waste was subsequently processed in "deadly, highly polluting operations" in the Chinese e-waste market (BAN 2011: 1). These actions violated the

RCRA, as Executive Recycling Inc. failed to file the notification of intent to export with the EPA, and also failed to obtain the consent of the receiving country.

According to the indictment, Richter and Olson “knowingly devised and intended to devise a scheme to defraud various business and government entities who wanted to dispose of their e-waste” and “falsely advertised to customers that they would dispose of e-waste in compliance with all local, state and federal laws and regulations”

(Gluckman 2011: 1). The indictment further contended that Executive Recycling Inc. “falsely represented that they would not send the e-waste overseas and falsified records to thwart investigators” (Gluckman 2011: 1). Executive Recycling Inc., which is registered with the Colorado Department of Public Health and Environment, is still operating in the Denver areas and maintains contracts with the cities of Denver, Boulder and Broomfield, as well as with the El Paso County and Jefferson County governments (BAN 2011).

Electronic waste activists rejoiced at the decision of the federal prosecutor to file charges—one that many believe is long overdue in the industry—but acknowledge that “it is just the tip of the iceberg” (Gluckman 2011). Jim Puckett, BAN Executive Director stated:

They are but one of hundreds of fake recyclers who sell greenness and responsibility but in fact practice global dumping. This is why we must pass federal legislation prohibiting this activity (Gluckman 2011: 1).

To emphasize this point, many point to laundry lists of allegations against illegal e-waste exporters that simply go answered. Environmental organizations use bad press

and denial of ‘environmental steward’ awards in order to combat the illegal practice. For example, Intercon Solutions Inc. of Chicago Heights, Illinois was denied its e-Steward certification²¹ because of “compelling evidence that [the company] has been engaged in exporting hazardous electronic waste to China” (Davidson 2011). The Basel Action Network alleges that on two separate occasions investigators photographed and tracked shipping containers of electronic waste leaving the property of Intercon Solutions and heading for the port of Hong Kong in China (Davidson 2011). If the allegations prove true, the company will have violated Illinois state law, the RCRA, and Hong Kong law (which prohibits the import of hazardous wastes such as CRTs and batteries) (Davidson 2011). In rebuttal, Interncon Solutions Inc. stated that

While Intercon Solutions has the highest respect for BAN’s mission, Intercon Solutions has reviewed BAN’s findings and the evidence in no way justifies BAN’s conclusion that Intercon Solutions exported the alleged hazardous waste...Intercon Solutions did not own the ocean containers, did not load them with hazardous waste and did not ship anything in them nor cause them to be transported...Intercon Solutions maintains that such action could have only been accomplished by trespass on its property... (Davidson 2011: 1).

Perhaps companies such as Executive Recycling Inc. and Intercon Solutions Inc. feel little obligation to abide by environmental statutes as they bear little pressure from

²¹ The e-Stewards Certification Program was established by the Basel Action Network, and in order to be certified corporations must abide by a rigorous set of requirements and must not export hazardous e-waste to developing countries, or allow toxic materials to be disposed of in municipal landfills, and must ensure that industry workers are protected from occupational hazards (BAN Media Release 2011).

regulatory agencies to do so. Indeed, the Federal Government has taken criticism for exporting e-waste itself:

According to the most recent data available, 25 percent of the U.S. government's 2.1 million computers are replaced annually, which adds up to more than 500,000 each year. The U.S. government is believed to be the largest source of electronic waste on earth today (BAN Media Release 2011: 1).

A Presidential Proclamation in November of 2010 established the creation of a new Interagency Task Force on Electronics Stewardship, which is to be led by the Council for Environmental Quality (CEQ):

President Obama stated that he wanted to ensure the federal government leads as a responsible consumer...and people might be shocked to know that currently any federal employee's computer can end up being auctioned off, then exported and dumped in countries like China, Vietnam, Ghana and Nigeria (BAN Media Release 2011: 2).

Investigations by Frontline found that U.S. government data has already been retrieved from internationally transported e-waste; indeed, confidential government TSA contracts were pulled from a hard-drive found in Accra, Ghana (Frontline 2009). What irresponsible electronics recyclers seem to respond to more than federal regulations is bad press, suggesting that the development of a governmental program for e-Stewardship could prove more effective than actual environmental legislation. Pressure from environmental organizations and even consumers for responsible recycling seem to be more effective at curtailing illegal shipment of e-waste through consumer purchasing practices than is the entire EPA.

Lobbying for E-Waste: The Political Economy of the Industry

Given that most other industrialized nations have adopted take-back and producer-responsibility programs for discarded electronics, it is important to consider why the United States is so far behind in its practices. It has been suggested that government regulation of illegal e-waste shipments is lacking because of powerful lobbying groups that seek to dissuade increased legislation—mainly from producers and stakeholders (Atasu and Van Wassenhove 2012). While twenty-three individual states have adopted their own take-policies, the U.S. lacks one federal, unified practice for the organized collection and recycling of e-waste (Atasu and Van Wassenhove 2012). According to Frontline (2009) the closest the U.S. has come to passing comprehensive e-waste legislation “came and went during the Clinton administration...” and is just now being brought to the attention of Congress again:

‘We need to have one standard across the country as to how we deal with e-waste, instead of 50 different ones,’ [Mike Thompson (D-California)] told Frontline (2009). But first, the bill must ‘restrict how we export e-waste out of our country, where it goes, how it goes, and what’s done with it,’ [Thompson] said...But the legislation he is proposing is already coming under fire from environmental groups and industry lobbyists (Frontline 2009).²²

Barbara Kyle of the Electronics TakeBack Coalition believes a bill would do nothing to close the “huge loophole” that already exists in the industry, permitting recyclers to export e-waste illegally (Frontline 2009):

Rick Goss, with the Information Technology Industry Council (ITI), a powerful lobbying group representing the high tech industry, doubts that any

²² The bill Thompson (D – California) is trying to pass is the aforementioned Responsible Electronics Recycling Act of 2011, which if passed, will ban the export of e-waste from the United States.

federal law on e-waste will pass this year. He told the electronics trade association IPC in February [2011] that there is little accord between computer and electronics companies or retailers and recyclers about how to shape legislation. “Members of Congress are clear that they don’t have the appetite or the time to try to negotiate an outcome,” Goss said (Bennion 2011: 1).

Perhaps this lack of “appetite” stems from hundreds of thousands of dollars spent on Congress from influential lobbying groups. For example, the Institute of Scrap Recycling Industries (ISRI) spent \$120,000 to hire the Podesta Group in the fourth quarter of 2011 (which is the same lobbying firm it had hired in the previous quarter for \$110,000) to “push back against the Responsible Electronics Recycling Act” (Resource Recycling 2012). The Institute of Scrap Recycling Industries was not only lobbying against the Responsible Electronics Recycling Act, but also provisions of the RCRA and TSCA. Scott Horne, the president of ISRI, made contact with federal officials to discuss EPA regulations on CFCs as well as the “application of voluntary operational standards for electronics recyclers” (Responsible Recycling 2012).

The Waste Management Corporation of Houston, Texas spent \$30,000 on lobbying firm Bracewell & Giuliani, LLP to influence not only e-waste legislation, but also other policies on taxes, climate change, and waste-to-energy (Resource Recycling 2012). The Glass Packaging Institute shelled out over \$30,000 for Pace, LLP lobbying firm in order to lobby congress on energy issues, greenhouse gas emissions regulations, and extender producer responsibility programs for producers (Resource Recycling 2012). Lobbying against international e-waste trade restrictions,

the National Solid Wastes Management Association spent \$10,000 to employ lobbyist Richard Goodstein, whom it had also employed for the same amount in the previous quarter (Resource Recycling 2012). And lastly, the Consumer Electronics Association spent over \$200,000 in the second half of 2011 on multiple lobbying firms focusing on the Responsible Electronics Recycling Act (Resource Recycling 2012). All tallied, over \$630,000 was spent on lobbyists for the purpose of deflecting the Responsible Electronics Recycling Act in the second half of 2011 alone. It is clear that there is a lot of money at stake should the Act pass, and these corporations are willing spend now in order to profit later. Thus far, the wheels of government seem to have been effectively slowed by the political economy of the industry.

Extended Producer Responsibility: Comparison between the U.S. and the EU

As previously discussed in the review of e-waste legislation, the United States trails far behind other core nations in its regulation of disposed electronics in multiple ways. One of the major differences between the U.S. and EU that merits another look are the ‘take-back’ policies that require electronics producers to “take back” their products when consumers are done with them. The European Union has implemented the Waste from Electrical and Electronic Equipment (WEEE) ²³ directive which established the producer take-back policies across Europe. These policies are based on the idea of Extended Producer Responsibility (EPR), which holds producers liable

²³ See Chapter IV: Legislation and Policy

for the post-use collection, recycling and disposal of their products (Gui, Atasu, Ergun and Toktay 2012). The objective of these policies is to:

...promote environmental impact reduction at end of life by (i) making manufacturers internalize the end-of-life costs of their products so as to incentivize the design of products that are more recyclable and have lower toxicity; and (ii) to ensure there is sufficient and stable financing for running a collection and recycling system for post-use products (Gui et al. 2012: 2).

The intention of such an initiative is twofold, as it seeks to both encourage more environmentally friendly products, as well as to provide for their responsible recycling when no longer in use. While EPR policies are used and enforced on not just national but international levels in other core nations, the U.S. has no unified federal EPR policies, and practices producer take-back in only half of its states. As of August, 2012, twenty five states have adopted e-waste regulatory laws (Gui et al. 2012), of which 22 are based on EPR policies (Atasu and Van Wassenhove 2012).

As evidenced in the previous section, players in the electronics industry are spending hundreds of thousands of dollars to prevent policies that would force them to both produce more responsibly and then to provide for the safe recycling of their products. State laws across the U.S. on EPR are already more narrow than both the EU's WEEE directive and similar programs in Japan. In the U.S., regulations are limited to TVs, monitors and IT products, and are more 'flexible' in both production and disposal practices than international laws (Gui et al. 2012). To make matters more confusing, individual state policies vary across the nation, with some charging both the consumer and the producer during the take-back phase, and others "building

in” the take-back cost during the production process through state taxes. Furthermore, most states do not implement a “market share” for the take-back of products as the EU does—instead, they use return-share values based upon how many of “their” products were returned:

A dominant policy choice in the U.S. appears to be mandating producer responsibility (with the exception of California). Although producers are technically allowed to operate individual producer operated systems, collection systems are common in the US, where producers pay average collection and recycling costs per volume of e-waste to a state-operated plan. An important difference is that producer cost sharing based on return shares is more common in the US, while in Europe market share based cost allocation models are favored. Unlike market share models, producers under the return share models do not pay proportional to their sales volume but rather proportional to their collected product volumes....while the choice between return share and market share based cost allocations seems to be trivial, this is one of the most crucial issues in practice. Companies with lower return volumes do not want to share costs with companies that have higher return volumes (Gui et al. 2012: 12).

Not only are current take-back practices in the U.S. jumbled and confusing, but they also seem to favor big businesses over smaller ones. It is no surprise that corporations would want to push back against legislation that may cost them money, but it is even less surprising that they would be opposed to the legislation if it disproportionately affects their bottom line. Multiple, conflicting stakeholder perspectives have impacted the implementation and shape of current EPR policies in the United States (Gui et.al 2012), and have also played a role in preventing a unified federal policy.

Tracking the Environmental Impacts of Transboundary E-Waste

As identified, environmental policies governing e-waste in the U.S. both present financial burdens to the electronics industry and are easily circumvented, therefore it is no surprise that much of the e-waste generated in the United States finds its way to other shores. Tracking exported e-waste out of the U.S. is particularly difficult as the nation has failed to implement the classification system established by OECD regulations that were put in place to coordinate and monitor e-waste shipments across the globe (GAO 2008). The Basel Convention classifies and works to control the international transboundary shipment of electronic waste, but has (albeit unintentionally) added to the increase of illegally transported waste. In China as well as in many African nations, “substantially and growing amounts of e-waste” continue to enter these regions illegally (Eugster et al. 2008). What cannot be disputed is that the illegal waste in these nations constitutes the majority of waste being dismantled and disposed of, and that this waste is a source of highly toxic chemicals that present a threat to the populations working and living among the waste (Eugster et al. 2008).

Analysis of Social and Environmental Impacts of the E-Waste Industry

The single most significant environmental impact associated with electronics is the energy use associated throughout the lifespan of these products. Both the manufacturing and consumer stages of electronic products involve high levels of energy consumption (Eugster, et al. 2008). These products therefore inevitably lead to

increasing demands for energy around the globe, as well as to a parallel growth in air pollution and greenhouse gases (Eugster et al. 2008). Starting with the production stage for electronics, the extraction of the raw materials (metals, raw oil, natural gas, etc.) must be considered in the commodity chain. During the manufacturing phase, resource extraction and emissions into the air, water, and soil and the processing and use of metals can account for around 70 percent of the product's environmental impact during this stage (Eugster et al. 2008) constituting an externalization of harm.

Distribution also plays a major role in the environmental impact of electronics, as they are most often shipped to other parts of the globe for consumption. Therefore, electronics consumed outside of the country of production can have up to five times the environmental impact of electronics consumed in their country of origin, simply due to the fossil fuels used for transportation (Eugster et al. 2008). Widespread distribution of these products is a result of "several decades of neo-liberal ideology and free-market politics" (White 2011: 78) that permits the transfer of both 'goods' and 'harms' from the core to the periphery. Once distributed, these products continue to impact the environment through actual use; their individual environmental impacts vary based upon energy required for use by the owner. Once finished with these electronic products, a small percentage of consumers recycle them, but the vast majority end up in landfills or shipped around the world for disposal. The toxic substances contained within electronic products are an

environmental concern during manufacture, distribution, and consumption, but are of primary concern during the disposal or ‘end of life’ (EOL) phase.

While there are some benefits to EOL for electronics—such as the recovery of precious metals—most impacts are negative. Chemicals are both used and released during the dismantling and extraction processes, heavy metals (such as lead, chromium, mercury and cadmium) are released into the air, soil and/or water supply, additional energy is used to collect and transport e-waste to suppliers and markets, and non-recyclable materials are improperly disposed of on roadsides or in landfills (Eugster et al. 2008). In an ideal situation, products are disposed of in a proper manner, minimizing the harmful effects to the environment. But in developing nations where much illegally transferred e-waste ends up, this is often not the case:

Given the fact that imported e-waste is illegal in the first place, the treatment, dismantling and recovery process, operating within the black market, also remains largely unregulated (Eugster et al. 2008: 25).

Though it should be noted that this waste stream does generate both jobs and income for residents in receiving nations, the ‘employment’ is less than desirable. Working conditions include the handling of toxic materials and exposure to dangerous vapors in both formal and informal sectors (see Table 3).

Table 3: Harmful Chemicals Released during Dismantling and Recovery of E-Waste Materials

CHEMICAL	USES	ENVIRONMENTAL AND HEALTH IMPACTS
Lead	Found in glass panels, solder and printed circuit boards.	Causes damage to endocrine system, blood system, kidney and reproductive systems in humans.
Cadmium	Found in semiconductor chips and infrared devices.	Can cause irreversible damage to kidneys.
Mercury	Found in batteries, flat panels, printed circuit boards, switches, thermostats etc.	Causes damage to the brain and kidneys and is easily transmitted through the food chain.
Hexavalent Chromium	Used as a decorative hardener in some e-products.	Causes DNA damage to exposed cells.
Brominated Flame Retardants (BFRs)	Used in plastics to reduce fire hazard.	Have been shown to be mutagenic in the past. Newer formulations have been shown to have negative impacts on animals.
Barium	Used in CRT screens to reduce radiation exposure.	Causes heart, liver and spleen damage in humans.
Beryllium	Used in printed circuit boards for its conductive properties.	Classified as a carcinogen and has been linked to lung cancer when the dust is inhaled.
Toners	Used in printer cartridges.	Dust is a Class 2(b) carcinogen which can cause lung irritation and damage if inhaled.
Phosphor	Used in CRT screens.	Classified as highly toxic to humans.
Plastics	Used in the housings of most e-products.	Can release dioxins and other hazardous materials when burned.

**Adapted from Eugster et al. 2008*

Studies have indicated that employees in the electronic industry (both manufacture and disposal) have increased rates of cancer as well as higher rates of miscarriages among women (LaDou 2006). In the formal sector, this is attributed to the lapse in development of the recycling facilities which cannot compare to the capabilities of facilities in core nations. Clearly, the impacts of e-waste are significant and are disproportionately impacting citizens in the periphery who most likely have not contributed to the ever increasing stream of electronic waste.

Conclusion

The advent of waste as a commodity is not new—indeed, waste (in many forms) has been trafficked for profit for decades. The seemingly endless supply of e-waste has made for a booming industry that spans the globe. The transference of harm occurs both at the point of production of electronic products as well as during the end-of-life phase in peripheral nations. Legislation in most core nations has been relatively successful at curbing the illegal transport of e-waste, but United States legislation is lacking, allowing electronics recyclers to circumvent both federal EPA regulations as well as state EPR regulations. Big business has responded to proposed e-waste recycling and monitoring programs with powerful lobbyists that seek to prevent the passing of regulation. Disproportionately affecting the marginalized populations of the world, the environmental impacts of e-waste are devastating, and are only increasing with time. Though the e-waste industry is heavily concentrated in

Asian regions (primarily China), it has recently shifted to include coastal nations in Africa. Case studies in both Nigeria and Ghana will further illuminate the externalization of harm and the overwhelming impacts of the electronic waste industry.

CHAPTER VII: CASE STUDIES

For those who reside in core nations, it is difficult to imagine the impact one can have on another halfway across the globe. What has been demonstrated by the transfer of electronic waste is the opposite—consumption levels in core nations directly impact those who reside in the periphery. In order to add a ‘personal element’ to the data, case studies of two nations in Africa will be reviewed: Nigeria and Ghana. General demographic information, patterns of e-waste disposal, and environmental and social impacts will be examined in port cities in these nations. The purpose of these case studies is not only to compare and contrast the implementation and effectiveness of national and international legislation, but also to understand on a human level the lasting impact of globalization.

Case Study: Lagos, Nigeria

The transfer of electronic waste from core nations to the periphery is nothing new—indeed, it has been occurring for decades in China, India and several other developing nations. But what is becoming more commonplace over the last decade is the transfer of e-waste to African nations. This is of particular concern as most African nations lack the infrastructure for recycling electronics, and most products entering into these nations are irreparable and therefore become waste within a few months of shipment (BAN 2005):

[A]ccording to Professor Osibanjo, director of the Basel Convention Regional Coordinating Center in Africa for Training and Technology at Ibadan, Nigeria, the vast majority of African countries have no electronic waste collection, public awareness or waste management programs in place of any kind. That is certainly true of Nigeria (BAN 2005: 10).

Nigeria, the first case study in focus, is a prime example of an African nation that exemplifies the growing trends in the used electronics trade on the continent. Lagos, the most populous city in Nigeria (and all of Africa), has become a booming port in the trade and transfer of electronic waste:

Lagos...[is] an excellent example, in microcosm, of all that is taking place in Africa. The phenomenal growth in the IT sector now experienced in Nigeria is likely indicative of what is, or will soon, take place in all of Africa (BAN 2005: 10).

Nigeria has seen a sharp increase in the use of electronics among its population over the last decade. Cell phone usage has increased from 35,000 users in 2000 to over nine million users in 2004, and to over 99 million users in 2012 (BAN 2005; Nigerian Communication Commission 2012). It should be noted that the population of Nigeria (according to the most recent census in 2006) has now surpassed 140 million, with roughly 40 percent under the age of 14 (Yin 2007). These figures are no less than staggering, but not surprising considering that in some nations (like the United States) there are more cell phones in use than there are people, as some users have multiple phones for personal and/or occupational use.

As for the internet, usage has increased from just over 100,000 users in 2000, to over 45 million users in 2012 (Nigerian Communications Commission 2012),

making Nigeria eleventh in world internet usage. Clearly, the increase in the demand for electronic products has made Nigeria (and, most notably, the port of Lagos) an important player in the trade of e-waste. Herein lies the problem: increased legislation banning the illegal disposal of e-waste in core nations promotes the transfer of this waste to other (usually developing) nations. The need for cheap electronics in these peripheral nations has actually created an industry of affordable second-hand goods (that otherwise would have been thrown away or recycled at high cost) that are purchased by the very nations that will bear the burden of the e-waste toxins via eventual improper disposal.

Lagos is a trade port not just for Nigeria, but also for much of western Africa. As aforementioned, there are no accurate statistics of the trade of used electronics, as they are not accounted for under the Harmonized Tariff Codes, but ethnographic research in the field as well as estimates from the ports themselves offer an idea of the volume of e-waste being shipped into Lagos. According to the manager of the largest computer warehouse in Lagos, an estimated 500 containers per month of second-hand computer-related electronics enter through the port, with each container holding roughly 800 monitors or CPUs, equating to about 400,000 second-hand or scrap units each month, and over five million units each year (BAN 2005: 12; Nnorom and Osibanjo 2008). In total, Lagos is importing somewhere between “15,000—45,000 tons of scrap recyclable electronic components, which may contain as much as 1,000-3,600 tons of lead” (Nnorom and Osibanjo 2008: 1475). Between the period of 2005

– 2010, it was assumed that the e-waste trade would expand by at least ten percent annually, shipping 40 million units of PCs or monitors (and subsequently 77,000 tons of e-scrap per year) through the port of Lagos (Nnorom and Osibanjo 2008).

Estimates in 2012 now suggest that over 540,000 tons of e-waste are filtered through Lagos annually, with over 100,000 tons entering illegally (Ogungbuyi, Nnorom, Osibanjo and Schluep 2012):

Tons of toxic waste collected from British municipal dumps is being sent illegally to Africa in flagrant breach of [the United Kingdom's] obligation to ensure its rapidly growing mountain of defunct televisions, computers and gadgets are disposed of safely...in a joint investigation by The Independent, Sky New and Greenpeace, a television that had been broken beyond repair was tracked to an electronics market in Lagos, Nigeria, after being left at a civic amenity site...under environmental protection laws it was classified as hazardous and should never have left the UK (Milmo 2009: 1).

A majority of these products enter the country via the Apapa container port in Lagos, crammed into containers with a variety of miscellaneous computer parts and items, music and entertainment systems, televisions and other large electronic items.

Significant quantities of these products are either “non-functional or not economically repairable” (BAN 2005: 13):

Mr. John Oboro, Assistant General Secretary of the Computer and Allied Products Dealers Association of Nigeria (CAPDAN), estimated that about 75 percent of the imported material is “junk” – useless and ends up being discarded before any re-use takes place, or is stockpiled in warehouses indefinitely (BAN 2005: 13).

In order to determine the origin of these electronics, researchers record identifiable source tags and asset tags from the products themselves. Estimates indicate that

roughly 45 percent of imports were originally from European nations, another 45 percent from the United States, and roughly 10 percent coming from nations such as Japan and Israel (BAN 2005; Nnorom and Osibanjo 2008). Unlike these developed nations, this is a major problem for Nigeria, as the nation has virtually no capacity for material recovery operations for e-waste, leading to the disposal of these items in local dumps (Nnorom and Osibanjo 2008). What is particularly ironic about these shipments of waste arriving in Nigeria is the fact that even though a reported 750,408 metric tons of waste moved from OECD nations to non-OECD nations between 2001 and 2009, Nigeria did not report any imports to the Basel Secretariat for this time period (Basel Convention Online Reporting Database 2012). What is even more disturbing is that upwards of 750 million metric tons were reported—there are arguably hundreds of thousands or more metric tons that have crossed international waters illegally and undocumented.

Once the shipping containers have cleared customs in the Apapa container port, the e-waste is taken to warehouse yards near the port itself. Larger yards include the Iijeshu and Ibru warehouses which are located in the Westminster area of Lagos, where e-waste is stored in fenced-in yards, or in underground warehouses (BAN 2005). These warehouses are multi-purpose, and often double as wholesale or retail outlets, or even repair and refurbishment shops. Some warehouse owners lease out sections of the facility for consumer sales on location, much like flea markets you may find in the United States. What is also notable about these warehouses is the fact

that much of the material is unusable or obsolete. In 2005, the Basel Action Network coordinated a study on e-waste in Nigeria, and found mounds of irreparable electronic waste:

At the warehouses, BAN discovered surprisingly large quantities of imported second-hand electronics in corners and against back walls. Many thousands of computers, printers, monitors, scanners, copy machines, etc., could be found stacked in piles, gathering dust. It became abundantly clear that much of the materials were obsolete, too old for use, even for Africa, with little interest to buyers (BAN 2005: 15).

Usable materials are quickly sold or transported to other major electronics markets throughout Lagos, such as the Ikeja Computer Village or the Alaba market on the outskirts of the city (BAN 2005), but non-functioning products quickly become a burden on the environment, and the population. The Basel Action Network (BAN) interviewed Mr. Ovie Oghenekaro, the General Manager of the Ibru Warehouse, who had the following to say about the importing of e-waste:

Definitely I want the exporting countries to at least give developing nations working items. We shouldn't be classed as a dumping nation...can't bring just about anything here and throw it away in Nigeria, no. I want them to give us working [equipment], what they're using in their country should be what they export to other countries. At the temptation of being bribed or given something to make sure they load junk, they should resist that temptation. They should treat us like human beings and give us good items like the ones they have in their country. I implore the governments of these countries where they export from to kindly monitor their items and let us as well be happy (BAN 2005: 14).

Mr. Oghenekaro has just cause to be concerned, as these products have nowhere to go but the common dump. A lack of regulation of e-waste disposal has led to much of the waste (which is often obsolete upon its arrival) landing in standard dumpsites,

which are unlined, unmonitored, and lack leachate recovery systems of any kind (BAN 2005). These dumpsites, which are at least government-established, are a step up from informal dumps which exist randomly throughout the area. According to BAN (2005), it is a very common practice to adopt an unused patch of ground or wetlands for use as a dumpsite. This quickly becomes a major issue in Lagos, due to the fact that the water table is extremely high, allowing the waste and toxic contaminants to easily leach into the local water supply. Compounding this is the practice of burning the piles of e-waste in order to reduce volume, which occurs in both formal and informal dumpsites. This allows for the releasing of dangerous and toxic chemicals into the air (BAN 2005):

Government officials admit that even though they understand the dangers of burning the waste and producing extremely hazardous brominated and chlorinated dioxins, polycyclic aromatic hydrocarbons and heavy metal emissions, dump managers claim that the dumps catch fire spontaneously, and dump managers resist efforts to eliminate this practice. BAN witnessed these fires on numerous occasions and in areas near residences (BAN 2005: 22).

A lack of government involvement and monitoring is evidenced by the piles of dumped waste on the sides of roadways, in area swamps, between homes and buildings, and encroaching on environments of wildlife. Even domesticated animals are found grazing amidst the mounds of burning e-waste, leading to ingestion of harmful materials that can then be passed on to humans who may consume these cows, chickens, goats etc. and/or their byproducts. In one Alaba dump, old computers

and monitors are being routinely pushed into a swamp in order to create a road over what is quickly becoming a pile of burning debris (BAN 2005):

Apart from the severe hazardous emissions expected from the burning of the electronics waste, the dumps are observed to be extremely hazardous with toxic ash, broken CRT glass, dead animals, medical wastes, used chemical containers, food scraps, etc., all mingled together. And yet, on the dumps, both informal and formal, children, scavengers and livestock, such as goats and chickens, routinely pick over or play on the sites, creating dangerous probabilities for contamination and infection (BAN 2005: 23).

Visual images such as these are not the exception, but instead are quickly becoming the norm in these areas. The increase of toxic waste into nations such as Nigeria is of great concern, especially as the list of exporters of waste to this nation almost exclusively contains core nations. The Basel Action Network (2005) has identified the following nations as contributors to the e-waste stream in Nigeria: Belgium, Finland, Germany, Israel, Italy, Japan, Korea, the Netherlands, Norway, Singapore, the United Kingdom and the United States. Legally, these nations are required to test their exports to determine if the materials being shipped were subject to national or international regulations (or both) of transboundary movements of hazardous and electronic waste. Failure to do so violates provisions of both the Basel Convention and OECD regulations, of which the aforementioned nations are all a party to at least one (if not both). It is not solely a lack of regulation and enforcement of legislation from exporting countries, but also a lack of both from importing nations as well.

Toxic Waste Legislation in Nigeria

The “Koko” Incident: In perhaps one of the earliest and more notorious cases of hazardous waste disposal, Italian nationals (Gianfranco Raffaeli and Renato Pent of the waste broker firms Ecomar and Jelly Wax, respectively) used a product import license to ship several thousand tons of highly toxic and radioactive wastes, including 150 tons of polychlorinated biphenyls (PCBs) into Koko, Nigeria in 1987 (Lipman 2012; Echefu and Akpofure 1998). Raffaeli and Pent signed an agreement with a Nigerian businessman, Sunday Nana, who permitted the waste to be stored on his property for roughly \$100/month. The wastes were “imported as substances ‘relating to the building trade, and as residual and allied chemicals’” (Nigeria 1999). Investigations (prompted by Nigerian students studying in Italy who had heard of the scandal) revealed that 3,800 tons of these wastes were being stored, some of which were damaged and had already begun leaking. Upon this discovery, over 100 workers from the Nigerian Port Authority were dispatched to remove the waste and prepare it to be returned to Italy. Although the Nigerian government supplied protective clothing, equipment and gas masks, many workers required hospitalization for chemical burns, nausea, and even paralysis (Nigeria 1999). After the waste was removed, land within a 500 meter radius of the dump site was declared unsafe and there is still concern about surface and groundwater contamination to this day (Lipman 2012).

In direct response to the Koko Incident, the Nigerian Government promulgated the Harmful Wastes Decree which provides the legal framework for the control of the disposal of hazardous and toxic wastes in the nation (Echefu and Akpofure 1998). Under the Harmful Waste (Special Criminal Provisions, etc.) Decree of this Act, it is classified as a criminal offense for any person to “carry, deposit, dump, or be in possession, for the purpose of carrying, depositing or dumping, any harmful waste anywhere on Nigerian soil, inland waters or seas” (Harmful Wastes Decree 1988; Kalu 2006). It is also a criminal act to: transport or cause to be transported, or be in possession for the purpose of transporting harmful waste; or to import or cause to be imported or negotiate for the purpose of importing any harmful waste; or to sell, offer for sale, buy or otherwise deals in any harmful waste (Harmful Wastes Decree 1988).²⁴ Punishment for the violation of the Decree is to be handed down by the Federal High Court, which will also have jurisdiction to try the crimes specified in the Decree (Harmful Wastes Decree 1988).

Immediately following the Decree, Nigeria passed the Federal Environmental Protection Agency Act in 1988 which established the first Federal Environmental Protection Agency for the nation (Federal Environmental Protection Agency Act

²⁴ Harmful waste is defined in the Act as “any injurious, poisonous, toxic, or noxious substance...as to subject any person to the risk of death, fatal injury, or incurable impairment of physical and mental health; the fact that the harmful waste is placed in a container shall not by itself be taken to exclude any risk which might be expected to arise from the harmful waste” (Harmful Wastes Decree 1988: 209).

(FEPA) 1988). This Act charged the FEPA with carrying out many tasks, including but not limited to the following:

Enter into agreements with public or private organizations and individuals to develop, utilize, co-ordinate and share environmental monitoring programs, research effects, basic data on chemical, physical and biological effects of various activities on the environment and other environmentally related activities as appropriate;

Establish advisory bodies composed of administrative, technical or other experts in such environmental areas as the Agency may consider useful and appropriate to assist it in carrying out the purposes and provisions of this Act;

Establish such environmental criteria, guidelines, specifications or standards for the protection of the nation's air and inter-State waters as may be necessary to protect the health and welfare of the population from environmental degradation;

Establish such procedures for industrial or agricultural activities in order to minimize damage to the environment from such activities;

Maintain a program of technical assistance to bodies (public or private) concerning implementation of environmental criteria, guidelines, regulations and standards and monitoring enforcement of the regulations and standards thereof (FEPA 1988).

Following FEPA, a National Policy on the Environment (NPE) was developed, largely becoming the working document for environmental protection and preservation in Nigeria. In addition, state and local governments were encouraged to establish individual environmental regulatory bodies in order to maintain environmental quality as it pertains to their specific ecosystems and topographies (Echefu and Akpofure 1998). In 1992, the Environmental Impact Assessment (EIA) Decree No. 86 was developed. Again, this Decree sought to protect the environment,

but was specifically directed towards the regulation of the industrialization process. Similar to regulations in the United States, the Decree stated that no industrial plan/development/activity falling under the FEPA's mandatory list could be executed without the successful completion of an EIA (Echefu and Akpofure 1998; Kalu 2006).

Unfortunately, even with significant legislation governing the general protection of the environment as well as the regulation of harmful and hazardous waste, Nigeria is plagued by the illegal importation and disposal of electronic waste. First and foremost, various regulatory statutes and the framework for the EIA process in particular are "very much at variance with intentions, especially as they affect the execution of function" (Echefu and Akpofure 1998: 64):

There is duplication of functions and overlapping responsibilities in the processes and procedures guiding the execution of the various impact assessment tasks. Consequently, serious bottlenecks and bureaucratic confusion are created in the process. The result is a waste of resources, financially and materially (Echefu and Akpofure 1998: 64).

Related inadequacies and misinterpretations of the statutes lead to further confusion, and, inevitably, to pollution and degradation. To compound this, regulations are in some instances entirely overlooked in the case of burgeoning markets. For example, while the famous 'computer village' in Lagos serves as a booming industry of second-hand electronics, it is also a breeding ground for dangerous disposal practices for Nigeria and other developing African nations to which electronic products may eventually be diverted. Like other peripheral nations, Nigeria lacks a well-established

system for the separation, storage, collection, transportation and disposal of e-waste as well as an effective system of enforcement of regulations for hazardous waste management (Mundada, Kumar, and Shekdar 2004; Nnorom and Osibanjo 2008).

There is no specific legislation governing the handling of electronic waste, and most legislation available is outdated, poorly enforced, or both:

As a result electronic wastes are managed through various low-end management alternatives such as disposal in open dumps, backyard recycling and disposal into surface water bodies. Similarly, there is no integrated framework regarding the monitoring and management of toxic and hazardous materials and wastes in these countries (Nnorom and Osibanjo 2008: 1475).

Limited funding is another major impediment to the effective management of toxic wastes in nations like Nigeria. In a recent assessment of Nigerian environmental policies, UNEP officials called for funds to be made available to the secretariat, lest they “become exposed to monetary inducements leaving compliance in the hands of the proponent” (Echefu and Akpofure 1998: 71). While the awareness of the need for environmental protection is growing worldwide, environmental concern has yet to sway the distribution of government funding priorities in many nations, including Nigeria. The continued dumping of e-waste without regulation in Nigeria has dire consequences:

In summary, toxic wastes in Nigeria do not only cause loss of lives, they also have the effect of crippling the economic and social lives of the people directly affected. Marine and biotic life forms are also not spared, while the degrading effect on the environment is generally incalculable (Kalu 2006: 6).

National and international forces need to act in order to slow and eventually halt the importation of e-waste into Nigeria's ports before these consequences are realized.

Case Study: Accra, Ghana

Like Nigeria, Ghana has also seen a startling increase in the volume of electronic goods being shipped into the country. Also located on the coast of West Africa, Ghana is home to nearly 25 million people, with nearly three million living in the capital city of Accra (UN Data 2012). Though smaller and less developed than Nigeria, Ghana is quickly moving into the 21st century, aided in part by electronics arriving from abroad via the port of Accra. Though some of these electronics are still in working condition and are quickly absorbed into the population for use, most are not:

Ghana is increasingly becoming a dumping ground for waste from Europe and the US. We are talking about several tons of obsolete discarded computers, monitors etc. We don't have the mechanisms or the system in place in this country to recycle these wastes. Some of these items come in under the guise of donations, but when you examine the items they don't work (Mike Anane, Director of the League of Environmental Journalists in Ghana, quoted in Consumers International 2008: 2).

While a significant portion of these shipments is waste, there are some usable pieces that are quickly absorbed by Ghanaians, such as cell phones. The rate of cell phone subscribers has increased by more than five times the rate in 2000 (UN Data 2012), with now more than 70 percent of the population subscribing for cell phone service. As recently as 2002, cell phones were so valuable in Ghana that they could be traded

for land (Farrar 2008). The increase in demand for cell phones led to importation of the devices from industrialized nations, often through the electronic waste stream. Up from a couple hundred thousand in 2000, there are now nearly 18 million cell phones in the nation (Farrar 2008; UN Data 2012). To put this into perspective, other comparable nations such as the Democratic Republic of Congo (which has a population of 60 million) had only one million cell phone subscribers in 2008²⁵ (Farrar 2008). The accessibility of the port of Accra is a likely explanation for the expanding availability of the product in Ghana.

Along with cell phones, numerous other electronics are transported into Ghana via the port of Accra. Lumped in with televisions, fax machines, refrigerators, MP3 players, air conditioners etc. are another popular commodity—personal computers. The Agbogbloshie dumpsite in Accra is a modern “computer graveyard” (Ross 2008: 1), though ‘graveyard’ may be an overstatement as it implies that these discarded devices are being buried. On the contrary, they are disposed of the same way in Agbogbloshie as in many other e-waste dumpsites—simply abandoned in piles, often on the side of the road (Kuper and Hosjik 2008). Ibrahim Adams, a 15 year old resident of Accra, was found by journalists as he was picking through one of these dumpsites:

...Adams picks up a rock and smashes an old computer screen to smithereens. He then tears off the mesh behind the glass, and after a couple of minutes he is squashing the screen’s metal casing under foot. If he collects five of them he

²⁵ It should also be noted that, at this same time, there were only 10,000 landline telephones in use in the Democratic Republic of Congo (Farrar 2008).

might be able to trade them in for about 20 cents. “My headmaster sent me home last week because I hadn’t paid the school fees. I’m looking in the computers for copper and iron which I can sell to pay the [school] fees,” [he says] as his eyes dart around the dump in search of more treasure. To gain an idea of how people in the richer countries sometimes provide inappropriate gifts, you only need to take a look at Ibrahim’s footwear, which he found abandoned on the same rubbish heap. He is wearing a pair of red moon boots that once graced European ski resorts. No, it has not started snowing in steamy Ghana. But this seemingly out-of-place attire provides good protection as Ibrahim trudges through the toxic sludge, smashing screens in search of scrap (Ross 2008: 1).

Residents such as Ibrahim will have no shortage of computers to sort through, as Ghana reportedly receives an estimated 215,000 tons of electronics each year, with a majority of this tonnage containing computers and monitors (Amoyaw-Osei, Agyekum, Pwamang, Mueller, Fasko and Schluep 2011). Again, even though a recorded 750,408 metric tons of waste moved from OECD to non-OECD nations between 2001 and 2009, Ghana failed to report the import of any waste to the Basel Secretariat (Basel Convention Online Reporting Database 2012). It is estimated that only around 25 percent of the shipments received in Ghana contain working electronic products that can be resold to local communities (Kone 2010). When searching through these piles of broken and discarded computers, one National Geographic reporter found a monitor with a price tag from a chain of Goodwill stores in Frederick, Maryland, highlighting that even when there are good intentions behind them, these products really do come from everywhere (Carroll 2008). Not dissimilar to other ports receiving e-waste, a vast majority of these shipments contain products that are no longer workable or repairable. While usable products are quickly absorbed

into the consumer market, broken electronics even more quickly fill the waste sites.

Women and children are frequently found ‘working’ in the waste sites, retrieving valuable metals from circuit boards:

All these old mother boards and other types of circuit boards are being cooked day in and day out, mostly by women, sitting there, breathing the lead tin solders. It’s just quite devastating (Frontline 2009: 2).

Surrounding these women are piles of waste either pushed into the nearby wetlands, or burning in open areas. One National Geographic reporter offers a vivid description of his experience traversing the e-waste dumps near Accra:

Choking, I pull my shirt over my nose and approach a boy of about 15, his thin frame wreathed in smoke. Karim says he has been tending such fires for two years. He pokes at one meditatively, and then his top half disappears as he bends into the billowing soot. He hoists a tangle of copper wire off the old tire he’s been using for fuel and douses the hissing mass in a puddle. With the flame retardant insulation burned away—a process that has released a bouquet of carcinogens and other toxics—the wire may fetch a dollar from a scrap-metal buyer (Carroll 2008: 1).

Repeated accounts describe these areas as covered in waste, with images of women, young children and even livestock perusing the remnants of western electronics (BAN 2005; Kuper and Hojsik 2008): “In large areas of this dump the ground is no longer brown earth, it is a carpet of broken glass. But what is not so visible poses a greater danger” (Ross 2008). A recent study completed in 2008 by Greenpeace found numerous hazardous chemicals and very high levels of toxicity in soil and water samples taken in Accra, Ghana (Kuper and Hojsik 2008):

In large areas of this dump the ground is no longer brown earth, it is a carpet of broken glass. But what is not so visible poses a greater danger.

Environmental campaign group Greenpeace took soil and water samples from the scrap market and found high concentrations of leads, phthalates or plastic softeners and dioxins that are known to promote cancer. “Chemicals like lead are very dangerous especially for children. They affect the brain when it is developing and therefore cause a lower IQ when they group up,” Greenpeace’s Kim Schoppink says. “Other chemicals we found cause cancer or disrupt your hormone system” (Ross 2008: 2).

Most toxic substances found in the samples are either used in electronic goods, or are formed when some hazardous materials in the products are burned. In some cases certain metals were present at concentrations over one hundred times higher than typical background levels for soils, including the highly toxic metal lead. Contamination with other toxic metals, such as cadmium and antimony, was also detected (Kuper and Hojsik 2008: 8).

The study also identified two plastic softeners (phthalates) which are toxic to the reproductive system, as they often interfere with sexual development in mammals, particularly in males (Kuper and Hojsik 2008). The phthalates are released in the environment when PVC wire covers and cables are burned in order for individuals to gain access to the valuable copper inside. In addition, there was widespread presence of PBDEs, which are found in chemicals used as flame retardants. Some of the chemicals found in Accra are now banned in Europe and the United States because of their ability to accumulate in the environment and because of their link to slowed brain development in mammals (Kuper and Hojsik 2008). Other samples taken in Accra contained chlorinated dioxins (which are toxic chemicals that are known to cause cancer) at levels “just below the threshold defined as being ‘indicative of serious contamination’” (Kuper and Hojsik 2008: 8):

The lead, the mercury and all the other toxins bio-accumulate. That is to say, they stay in the food chain. The people that break open these CRT-monitors

tell me that they suffer from nausea, headaches and chest- and respiratory problems. As a result of breaking these things and burning the wires they inhale a lot of fumes. Sometimes you even find children breaking these cathode ray tubes apart just to get the wires and other metals to sell (Mike Anane, Director of the League of Environmental Journalists in Ghana, quoted in Consumers International 2008: 3-4).

At one site on the outskirts of Accra, clouds of black smoke rose from several fires, as boys, some as young as ten years old, ignored the toxic fumes to get to the precious metal scraps beneath the melting e-waste (Consumers International 2008: 3).

Severe contamination such as this is of particular concern because these dumpsites are frequented by residents of Accra, namely children. While in Ghana, Greenpeace documented dumpsite workers at the Agbogbloshie scrap market as mostly children between the ages of 11-18, but some were as young as five years old. A majority of the workers were male, and had been sent to the dumps by their parents to earn money for the household (Kuper and Hojsik 2008). The Agbogbloshie market and surrounding areas are even more vulnerable to environmental degradation because of the location of the dumpsites: the market is on flat ground by the Densu River and frequently floods after heavy rainfall. The flooding then carries the contaminated surface dusts and soils into surrounding lagoons and ultimately back into the Densu River itself (Kuper and Hojsik 2008) which supplies half the drinking water to the capital city of Accra.

The products which are polluting the soils, waters and air in Accra and surrounding areas are from U.S., Japanese and European brands such as Phillips, Sony, Microsoft, Nokia, Dell, Canon and Siemens. Labels retrieved by Greenpeace

have traced these electronics back to the Danish Royal Guard and (ironically) the United States Environmental Protection Agency (Kuper and Hojsik 2008). While in Ghana, Greenpeace noted shipping containers filled with e-waste coming from Germany, Korea, Switzerland and the Netherlands arriving in Tema Harbor, the largest port in Ghana (Kuper and Hojsik 2008). Again, all of these nations have standing policies under the Basel Convention, the EU, the OECD (or some combination thereof) to prohibit the shipment of e-waste to peripheral nations. These policies are often circumvented under the guise of recycling “reusable” goods to developing nations. For example, the EU allows the exportation of “second-hand goods” so long as they are tested for use, properly packed, and labeled for resale. However, an EU Commission official estimates that up to 75 percent of these “second-hand goods” are broken and inoperative (Kuper and Hojsik 2008). Mike Anane, an environmental campaigner, told Greenpeace: “People in developed countries bring [electronic equipment] here ostensibly to bridge the digital gap; but in actual fact they are creating a digital dump” (Kuper and Hojsik 2008: 10).

Toxic Waste Legislation in Ghana

The ports of Ghana are perhaps even more attractive to e-waste brokers than those of Nigeria because the nation lacks environmental legislation specifically targeted at e-waste itself. Even the Ghanaian EPA agrees that national guidelines are needed in order to regulate the importation of used electronics into the country, along

with additional controls monitoring the safe recycling of e-waste. (Kuper and Hojsik 2008). Current regulations in Ghana date back to 1992, when the most recent Constitution of the Republic of Ghana was drafted. The Constitution provided protection for the environment under the section on economic development, Articles 36(9) and 36(10):

Article 36(9): The State shall take appropriate measures needed to protect and safeguard the national environment for posterity; and shall seek co-operation with other states and bodies for the purposes of protecting the wider international environment for mankind.

Article 36(10): The State shall safeguard health, safety and welfare of all persons in employment, and shall establish the basis for the full deployment of the creative potential of all Ghanaians (Amoyaw-Osei et al. 2011: 20).

Under Article 41(k), it is also stated that it is the duty of every citizen to protect the environment, and that the exercise and enjoyment of rights and freedoms is inseparable from their obligation to do so (Amoyaw-Osei et al.. 2011).

The National Environmental Action Plan (NEAP), was first developed in Ghana in 1991 under the National Environmental Policy. The goal of this policy is to improve environmental surroundings and living conditions for citizens. The Plan requires the State to take “appropriate measures to control pollution and the importation and use of potentially toxic substances (which include EEE)” (Amoyaw-Osei et al.. 2011). In addition, the Plan seeks to:

Ensure sound management of natural resources and the environment against harmful impacts and destructive practices;

Guide development in accordance with quality requirements to prevent, reduce, and as far as possible, eliminate pollution and nuisances;

Integrate environmental considerations at all levels of development; and

Seek common solutions to environmental problems in West Africa, Africa and the world at large (Amoyaw-Osei et al., 2011: 20).

While specific regulation is still lacking, Ghana's efforts towards the management of hazardous substances and waste has been on the rise since the UN Conference on Environment and Development in Rio de Janeiro, Brazil in 1992 (Amoyaw-Osei et al., 2011). Though Ghana has numerous laws and regulations that have some relevance to the control and management of hazardous wastes, these statutes fail to address the hazards presented by such waste to humans and the environment (Anoyaw-Osei et al., 2011).

The Environmental Protection Agency Act (ACT 490) that was developed in 1994 requires the EPA to:

Prescribe standards and guidelines relating to the pollutions and the discharge of toxic wastes and control of toxic substances;

Coordinate activities and control the generation, treatment, storage, transportation and disposal of industrial wastes; and

Control the volumes, types, constituents and effects of waste discharges, emissions, deposits or other sources of pollutants and/or substances which are hazardous or potentially dangerous to the quality of life, human health and the environment (Anoyaw-Osei et al., 2011: 21-22).

Section 10 of the EPA Act establishes the Hazardous Chemicals Committee that is required to monitor the use of hazardous chemicals by collecting information on the

importation, exportation, manufacture, distribution, sale, use and disposal of such chemicals (Anoyaw-Osei et al. 2011: 22). Again, there is no specific regulation of reference to e-waste, but certainly these regulations would be applicable. In addition, there are several other environmental policies that pertain to the problem of e-waste dumping, even if they were not intended to do so. For example, The Draft Policy and Bill on Occupational Safety and Health (2000) which seeks to protect occupational safety and health; the Mercury Act (1989) which offers protection against the illegal disposal of mercury; the Merchant Shipping Dangerous Goods Rules (1974), which maintains regulations on the shipment of hazardous and dangerous products, the Export and Import Act (1995), which provides regulations governing imports and exports, and the LI 1932 Energy Efficiency Regulations (2008), which prohibit the manufacture, sale, or import of used refrigerators, freezers, or air-conditioners that contain many harmful and toxic substances. (Anoyaw-Osei et al. 2011). Despite the intentions of these regulations, there is currently no enforcement (Anoyaw-Osei et al. 2011).

There is a Chemicals Control and Management Center (CCMC) in Ghana under the EPA, that is designed to manage the disposal or destruction of unwanted or obsolete hazardous and toxic wastes, but this has proved a great challenge for Ghana. The landfill sites where much of the dumping is carried out are not designed to hold toxic and hazardous waste, and incinerators for the disposal of particular wastes are simply not available in the nation (Anotaw-Osei et al. 2011). Though good intentions

exist behind the regulatory framework of hazardous substances in Ghana, it is an understatement to say that these policies are ineffective. A lack of legislation governing e-waste specifically is of concern, but it is likely that, even if such legislation were to be established, it would go without enforcement as do so many other environmental regulations in Ghana. Furthermore, the infrastructure of proper recycling and disposal for hazardous and toxic materials is more or less nonexistent in the state, which presents perhaps the largest problem. Ghana, much like Nigeria, cannot effectively manage the electronic waste flow that is flooding across its borders.

Comparison of Case Studies

Located on the western coast of Africa, Nigeria and Ghana have more than geographical location in common. Both nations are currently experiencing a wave of imported electronic equipment, much of which is nonfunctioning upon arrival. Lagos, Nigeria's main port for e-waste, has a population of nearly ten million, in comparison to Accra (Ghana's main port), with a population of roughly three million. Both areas have experienced a sharp increase in the use of electronics over the past decade, most notably cell phones and personal computers. In order to supply this growing market for electronics, e-waste from the European Union, the United States and even nations in Asia has been shipped into the bustling ports. Annual estimates for the port of Lagos have now reached 540,000 tons annually, and Accra is importing over 215,000

tons annually. Electronic waste arrives in much the same way at both ports, carried in shipping containers with a mixture of working and non-working materials, and even sometimes mixed with miscellaneous products (Ross 2008).

Upon arrival, products are then transported to “computer villages” where they are repaired, sold, or disposed of along the wayside if deemed irreparable. Lagos, Nigeria has two major computer villages: the smaller Ikeja computer village, and the more popular Alaba computer village. In Alaba, products find their way into underground storage units, where they sometimes are kept indefinitely; others are sold within minutes of their arrival. This market is a major player in the distribution of electronic good across Nigeria as well as all of western Africa. In Ghana, the Tema Harbor port in Accra funnels in the e-waste, until it ultimately ends up either in the hands of a consumer, or on its way to the Agbogbloshie dumpsite. In both nations, the markets and dumpsites become interchangeable, as unwanted products are discarded on the wayside, only to become functional once again as potential profit for scavengers.

The concern over the environmental impact of these e-waste dumps is trumped in both locations by a lack of awareness of the harms they present, a lack of enforcement of proper disposal practices, and/or the potential profit to be made from the sale of the precious metals inside the e-waste. The dumping, burying and burning of this waste causes massive environmental damage in both Accra and Lagos that

affects the entire ecosystem. Products that are dumped and buried contain chemicals that leach into the soil and inevitably into the water supply of these cities:

[O]n a similar ash heap above an inlet that flushes to the Atlantic after a downpour, Israel Mensah, an incongruously stylish young man of about 20, adjusts his designer glasses and explains how he makes his living. Each day scrap sellers bring loads of old electronics—from where he doesn't know. Mensah and his partners—friends and family, including two shoeless boys raptly listening to us talk—buy a few computers or TVs. They break copper yokes off picture tubes, littering the ground with shards containing lead, a neurotoxin, and cadmium, a carcinogen that damages lungs and kidneys. They strip resalable parts such as drives and memory chips. Then they rip out wiring and burn the plastic. He sells copper stripped from one scrap load to buy another. The key to making money is speed, not safety. “The gas goes into your nose and you feel something in your head,” Mensah says, knocking his fist against the back of his skull for effect. “Then you get sick in your head and your chest.” Nearby, hulls of broken monitors float in the lagoon. Tomorrow the rain will wash them into the ocean (Carroll 2008: 1).

In Lagos, the high water table allows for quick and easy water contamination; in Accra, the frequent flooding of the Densu River provides for the transportation of these chemicals into the water supply for millions of people. Aside from water contamination, the burning of the e-waste in both areas promotes air pollution across the city. In Accra, an air pollution study conducted over 22 months found that the particulate matter (PM) found in the air in four poorer neighborhoods in Accra had concentrations substantially higher than the World Health Organization (WHO) Air Quality Guidelines, with the highest pollution in the poorest neighborhood near the dumpsite (Dionisio, Arku, Hughes, Vallario, Carmichael, Spengler, Agyei-Mensah and Ezzati 2010). In Lagos, air pollution is an even more serious problem, with PM levels reaching 500 percent over the guidelines established by WHO, and causing

about 14,7000 deaths annually (WHO 2007). The burning of e-waste does not alone cause such high levels of particulate matter in the air, but it is certainly a contributing (and disconcerting) factor.

As aforementioned, legislation governing toxic waste was prompted in Nigeria by the Koko Incident. Soon after this egregious scandal, the government of Nigeria established the Harmful Wastes Decree, making it a crime to deal in the sale, transport or disposal of illegal waste. The punishment for violating this law varies greatly, ranging from a small fine, to the restoration of the polluted environment, all the way up to life imprisonment (Ogbodo 2010). The criminalization of this form of environmental harm is itself important, as several industrialized nations do not have criminal sanctions for similar offenses. In addition, Nigerian police officers have the authority to enforce the Harmful Wastes Decree, which is another unique attribute of this legislation (Ogbodo 2010). While Nigeria has several other environmental acts and regulations, the Harmful Wastes Decree is by far the most relevant to environmental degradation caused by e-waste. In spite of this targeted legislation, many other environmental policies in the state are disorganized, overlapping, or simply not enforced. Furthermore, Nigeria lacks the infrastructure for the proper disposal of toxic and hazardous wastes, as well as the funding to develop such capabilities in the future.

Ghana has yet to have a major event such as the Koko Incident, but one can argue that the constant accumulation of e-waste has the potential to be just as, if not

more, harmful. Perhaps because of this, environmental legislation has had a slow start in Ghana, beginning with the updated Constitution²⁶ in 1992.²⁷ As previously discussed, there are a handful of other environmental regulatory structures but none that are specific to the control of e-waste. Indeed, these provisions are so generalized that they do not seem to be geared specifically to any one aspect of environmental protection. This generalization, coupled with a lack of enforcement and infrastructure, leaves Ghana in the same position as Nigeria despite their regulatory differences.

Challenges and Solutions in Nigeria and Ghana

One major challenge facing both Nigeria and Ghana is the avoidance of the import of e-waste and other electronic products that are near-end-of-life without harming or hampering the socio-economically valuable trade of functioning used electronics (Amoyaw-Osei et al. 2011; Ogunbayo et al. 2012). The import of electronic products has catapulted West African nations into the digital age, but it has also transformed their environments. Therefore, the increasing volume of imported and domestically generated e-waste also requires well-functioning local and national take-back and recycling systems in both nations (Amoyaw-Osei et al. 2011; Ogunbayo et al. 2012) if both human health and the environment are to be protected:

²⁶ What is interesting about this constitutional provision is that it exists in the section under the 'benefit of the economy' and does not have its own subsection for protection of the environment.

²⁷ Nigeria's Constitution did not include a section on the environment until 1999 (Ogbodo 2010).

Technical capacity, infrastructure and institutions are needed for the effective management of hazardous waste, especially in the importing state where the waste will finally be disposed. To a large extent, developing countries lack the technical capability and the infrastructure to dispose of hazardous wastes in an environmentally sound way. As a result, hazardous wastes have been deposited illegally and in a way that is often damaging to human health and the environment. In order to forestall illegal waste movements in both the transit and final disposal sites, knowledge about hazardous wastes and sound institutional capacity must exist to ensure proper identification, monitoring and control of such wastes, especially at border posts (Dayo, Alo and Ojo 2010: 8).

Not only must systems of collection be established, but the items gathered must then be transported to appropriate treatment facilities that have the technology to disassemble and dispose of them properly. This ‘formal’ recycling system must also encompass the ‘informal’ systems of disposal which currently exist in both nations—unregulated dumping. By connecting buyers of used electronics to recycling systems, the states could greatly diminish the volume of waste being left in landfills and dumps along wetlands, waterways and populated areas. In 2008 during the waste conference “WasteCon” in Durban, South Africa, it was agreed that every country was in need of a ‘roadmap’ for e-waste management, leading to the “Durban Declaration on e-Waste Management in Africa” (Schluep 2010). It was from this conference that a general ‘roadmap’ was established covering multiple levels of management (see Figure 3).

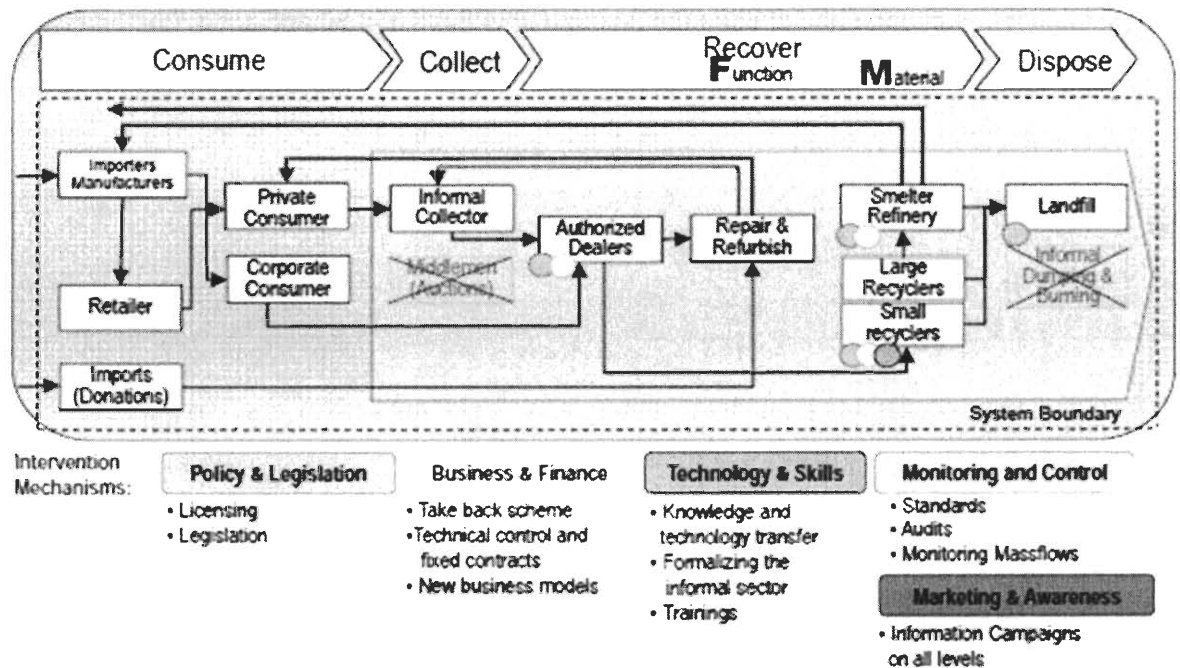


Figure 3: Successful E-Waste Management in African Nations

*Taken from Schluep, M. 2010. E-Waste Management in Developing Countries with a Focus on Africa. ITU Symposium on ICTs and the Environment & Climate Change. Cairo, Egypt.

The chart for the successful management of e-waste eliminates the “middlemen” the collection process of e-waste and aims instead to streamline products directly to authorized dealers who can refurbish and/or repair the items for resale. When the products are ready for disposal, they should be directed away from informal dumping and burning (as is too often the case in these regions now) and instead directed to a landfill that has been properly lined to prevent the leaching of toxic substances into the soil or water tables. In order to ensure the process is followed, it would call for

the implementation of licenses to approved collectors and dealers, training on proper disposal practices, and audits to confirm said disposal practices. It is anticipated that the development of such a program would also benefit the local economy by generating new jobs.

Both Accra and Lagos are heavily populated areas, and thus have an abundant labor force. It is suggested that this labor force be put to work sorting and disassembling the electronic waste, in place of expensive shredding and sorting machinery²⁸ (Ogungboyo et al. 2012). It is also suggested that these nations pair up with international recycling companies in order to maximize their return on secondary raw materials retrieved from the e-waste (Ogungboyo et al. 2012). Furthermore, it is thought that Nigeria and Ghana could both benefit from adopting take-back policies used in OECD countries with the principle of Extended Producer Responsibility (Amoyaw-Osei et al. 2011; Ogungboyo et al. 2012) in order to lessen the burden on the recycling industry.

As far as environmental legislation is concerned, Ghana is severely lacking in e-waste regulation. A national e-waste strategy for policy management of Waste Electronic and Electrical Equipment (WEEE) was developed for Ghana under the

²⁸ It should be noted that Ghana currently has a burgeoning market in non-functioning electronics. Consumers, once finished with a product (or when the product is no longer functional) sell the item to informal collectors. These 'collectors' are then able to repair the item for resale, or simply extract the valuable materials from the item for resale, disposing of the remnants at the dumpsites. This well established and flexible 'miniature market' would likely present problems for the common method of recycling and would have to be circumvented (Amoyaw-Osei et al. 2011).

direction of the Basel Convention and the European Commission. The objectives of this national strategy call for the following:

Establish an institutional framework for collaboration in controlling importation of used Electronic and Electrical Equipment (EEE);

Create awareness on the dangers of the current handling process, the new hand-in/take back systems and on recycling centers at all levels of governance and the public;

Develop a policy on general importation and management of WEEE and on hazardous substances;

Adapt a business model (acceptable to the WEEE-scrap Dealers Association) for ease of ownership by the Association eventually;

Develop a legal framework for EEE importation, introduction of EEE levies, mandatory licensing, EEE management fund and for control of WEEE management;

Establish a formal and efficient WEEE recycling industry, nation-wide;

Strengthen the capacity of the WEEE-scrap Dealers' Association and the training of the membership in safe and efficient handling and good business practices;

Establishment of regional associations to ensure national integration in the WEEE recycling industry;

Develop an enforcement mechanism centered around EPA's Compliance and Enforcement Network (Amoyaw-Osei et al. 2011: xi-xii).

In addition to developing this infrastructure to manage the waste, the report also recommends the implementation of the Basel Convention, which Ghana has signed and ratified, but has not yet incorporated into its own legislation. Enforcement of these statutes, as well as other statutes already in place in the nation, would be

beneficial, as could be the development of specific regulations designed to protect human health from e-waste.

Though Ghana and Nigeria differ most in legislation specifically governing electronic waste within their borders, both nations suffer from the difficulties of enforcing what legislation they do have. National assessments on the state of these nations' issues with e-waste concluded that, without enforcement, the e-waste trade would continue with 'business as usual' (Amoyaw-Osei et al. 2011; Ogungboyo et al. 2012). In Ghana, more legislation pertaining specifically to EEE and e-waste needs to be developed, with more power of enforcement being handed to local law officials, as opposed to only federal officials. In addition, the informal markets of e-waste need to be monitored in order to thwart improper disposal via this marketplace (Amoyaw-Osei et al. 2011). In Nigeria, the strict liability nature of the Harmful Wastes Act should facilitate the enforcement powers within the Act, empowering agencies to employ these penalties aggressively (Ogbodo 2010). Under the EIA Act, it is recommended that the administrative sanctions (such as loss of license, fines, plant closures, etc.) be implemented in order to encourage compliance (Ogbodo 2010). Lastly, there is a call in both Nigeria and Ghana for individuals and non-governmental organizations (NGOs) to join in environmental protection and enforcement. In both national constitutions, it is the right of the people to enjoy their environment, and it is their obligation to protect it. As it is around the globe,

awareness and involvement are two key components in the fight for environmental protection.

Summary and Conclusion

The international transfer of electronic waste is harming nations in regions all over the world. Current transnational shipment trends map the movement of e-waste from core nations to peripheral nations, which lack the capabilities and technology to properly dispose of the waste. While nations such as China and India receive the highest volume of e-waste, the transfer of e-waste to West African nations is on the rise. The demand in these nations for information technology coupled with their limited ability to provide it makes for a dangerous combination. Each year, Nigeria and Ghana receive over 540,000 tons and 215,000 tons of e-waste respectively, figures that are rapidly increasing. Presently international law, namely the Basel Convention, seeks to prevent the transfer of e-waste from OECD nations to non-OECD nations, which it manages to do to some extent. Despite these regulations, over 750 million metric tons of waste was transferred from OECD nations to non-OECD nations, whether it be well intended (via 'donations') or as an illegal shipment:

[s]everal aid groups and organizations are encouraging people to donate their old electronics for African schools and hospitals. Although the idea is noble and the donations are usually given in good faith, the negative effects of waste increase are tangible (Kone 2010: 2)

Once this e-waste arrives, both Nigeria and Ghana struggle to manage it properly and have simultaneously become dependent upon it for affordable technological growth among the general population. In many ways, the trade in toxic waste has become a human rights issue. The development of sufficient legislation for the management of the proper transfer and handling of e-waste, and the ability to successfully enforce such regulations are imperative in order to protect the people and the environment in the receiving ports in Nigeria and Ghana.

CHAPTER VII: DISCUSSION AND CONCLUSION

Electronic waste is a product of consumption as well as a consequence of globalization. An extensive study of the global electronic waste industry has indicated that, in spite of both national and international legislation, the transfer of e-waste from core nations to the periphery is more than prevalent—it is the norm. Lack of enforcement is a major component in the failure of e-waste regulation, as both OECD and non-OECD nations struggle with implementing and putting into force environmental legislation. The import of e-waste into these developing nations, such as Nigeria and Ghana, is economically viable for both the shipping and receiving nations; however, the environmental harms are relegated to the country of import. This is particularly ironic, as these nations are the least equipped to manage the proper repairing, recycling and ultimate disposal of discarded electronics. In order to develop conclusions on the international issue of e-waste, a review of the research is warranted.

At the beginning of the study, three research questions were identified and subsequently used to develop and map the study:

1. Identify transnational regulation of electronic waste (e-waste) dumping and/or disposal. Are these regulations enforced? Followed?
2. Describe the current state of the industry of e-waste disposal. What are the state and organizational interests in e-waste disposal? Are there spaces between the laws?

3. Are there any deficiencies and/or inconsistencies in transnational e-waste disposal regulation between country of origin and country of disposal?

A brief review of the research will better clarify the answers to these questions, as well as illuminate the central arguments of this study.

Electronic Waste Regulation

To answer the first question, an extensive review of current legislation governing electronic waste was conducted. This review revealed differences in practices of regulating transboundary shipments of e-waste between the core and periphery. Perhaps most notably, it illuminated some key differences between European Union regulations and United States regulations. For example, the EU has multiple policies and regulatory bodies governing the movement of e-waste. The European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL) is an overarching agency that plays a major role in monitoring and enforcing such e-waste directives as the Waste Electrical and Electronic Equipment (WEEE) which establishes producer take-back policies, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive which calls for a reduction in the use of hazardous and toxic chemicals within electronic devices. Furthermore, the EU recognizes not only the Basel Convention, which requires that importing countries approve the shipment and that it be reported to allow for tracking of the e-waste, but also the Basel Ban and the OECD

e-waste directive, which ban the shipment of e-waste from OECD nations to non-OECD nations.

To date, the United States has unfortunately failed to ratify, develop, or abide by all of the above legislation. The U.S. has yet to ratify the Basel Convention, placing it alongside Haiti and Afghanistan as the only three nations in the world to fail to do so. This failure to ratify the treaty, which would indeed criminalize current waste shipment practices in the U.S., is perhaps a strategic move to avoid such a label (Michalowski and Bitten 2005). In addition, signers of the Basel Convention (namely nations in the periphery) *do violate* the treaty by accepting waste from the U.S. (as they are not to accept it from any non-ratified nations). The United States has also not yet passed legislation that would require both the responsible use of materials and chemicals during production of electronics, or legislation to establish a nationwide take-back policy once products have reached the EOL stage. Furthermore, while the U.S. is not technically a party to the Basel Ban, it has failed to comply with the OECD directive, even though it ‘agrees’ to follow all OECD approved programs simply by being a member. In its failure to effectively develop and/or implement e-waste legislation, the United States stands alone when compared to other core nations.

The failure of the United States to actively regulate (or at least attempt to enforce) the transboundary movement of electronic waste indicates that a larger, structural framework is at play here, and one that is arguably criminal. As White (2011) suggests, the movement of waste from one nation to another constitutes an

externalization of harm, one that is becoming more and more pervasive because of weak regulatory structure, particularly in the U.S.:

In the United States, disposing of E-waste criminally is made easy by weak oversight. In other words, non-credible domestic and transnational oversight is criminogenic. Structural asymmetries and inequalities in the law (as well as in politics and culture) increase motivation and opportunity and decrease the ability to control transnational activities (Gibbs et al. 2010).

The failure of the U.S. to recognize the transference of harm and to work actively to prevent it can inductively be argued to be a crime of omission,²⁹ in that the United States is failing to act even though it has a substantial body of evidence to suggest it needs to better regulate e-waste shipments.

Lack of Enforcement

Perhaps the most glaring issue with electronic waste regulation is the fact that it suffers tremendously from lack of effective enforcement; this is an issue for both the EU as well as the United States. The Basel Convention, the most prominent legislation governing e-waste, is unfortunately easily circumvented; the extensive levels of e-waste arriving in the periphery annually are indicative of this. Liddick (2011) and Clapp (1994a) reference the ambiguous rules and obligations for ratified partners:

“Environmentally sound management” is defined as “taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner

²⁹ A crime of omission is defined by Kauzlarich, Mullins and Matthews (2003) as the failure to act, thus allowing harmful activities to continue. For further reading as well as a theoretical model of state crime, see Michalowski and Kramer (2006).

which will protect human health and the environment against the adverse effects which may result from such wastes” (Clapp 1994a: 31; Liddick 2011: 23).

Such vague language presents many challenges when trying to enforce the Basel Convention, which is already a challenge in itself. In addition, the principle of submitting letters of ‘prior informed consent’ for waste-receiving nations is almost entirely ineffective. The convention does not require copies of the letters to be sent to the Basel Secretariat for inspection, and even lacks the power to sanction parties that violate this provision (Clapp 1994a; Liddick 2011).

The Basel Secretariat has no power to monitor Parties or apply sanctions, the Convention lacks provisions for liability and compensation, and there is an absence of incentives to eliminate hazardous waste generation. Moreover, bilateral waste trade agreements are permitted between Parties and non-Parties (Liddick 2011: 23).

Several of the peripheral nations that receive international e-waste fail to report their imports to the Basel Secretariat, quite possibly because the government is unaware of the shipments. For example, both Nigeria and Ghana have either 1) not responded to Basel Secretariat requests for information, or 2) have failed to report information on their imports for recording years 2001 – 2009 (Basel Convention Online Reporting Database 2012). During this same time period, the Basel Secretariat recorded over 750 million metric tons of wastes being transferred from OECD nations to non-OECD nations (Basel Convention Online Reporting 2012). Because of data retrieved by independent research, we know that some of this waste ended up in Ghana and Nigeria, even if these nations have not reported it to the Basel Secretariat (Amoyaw-

Osei et al. 2011; BAN 2005; Frontline 2009; GAO 2008; Kuper and Hojsik 2008; Nnorom and Osibanjo 2008; Ogungbuyi et al. 2012 and Ros 2008). These reporting policies were designed to be effective, but seem to lack the teeth to encourage both shipping and receiving parties to comply.

Compliance may also be related to the separation that occurs between consumption and disposal. Both world-systems theory and green criminological perspectives would support that the transnational shipment of e-waste actually functions as disconnecting process from country of consumption to country of disposal through the capitalistic system:

The nature of capitalist production and consumption tends to sever the connection between consumption and waste. The commodity appears as outside human agency, as alienated from production as such. This is evident in a culture of disconnection that marks the relationship between consumer and producer. This refers to the dissociation between the harm derived from the production and later disposal of a commodity, and the act of consumption... (White 2011: 79).

The disconnect between consumption and waste is clearly evident in core nations, which experience very little of the disposal process. Instead, the 'waste' phase of the product is never tangible to the original consumer; the product is returned to the producer, recycled, or simply given away and/or discarded before disposal begins. Peripheral nations are just as disconnected from the consumption process, as it these nations that will inevitably absorb the harmful effects of the e-waste.

Inconsistencies in Regulations and Sanctions

Furthermore, there are inconsistencies across legislation; the Basel Ban regulates e-waste based on types and levels of toxins, and the OECD directive regulates e-waste based on perceived ‘risk’ of the toxins (Liddick 2011). A lack of consistency across legislation may lead some to believe that enforcement of the legislation is disorganized—in which they would be correct—and therefore be less persuasive in convincing these parties to comply.

Lack of compliance is also likely directly related to the lack of sanctions handed down for environmental infractions (dare we say “crimes”?). A major issue with much e-waste legislation is the lack of “teeth” it has to persuade individuals to comply. When legislation *does* afford “teeth” (as is the case of the \$50,000 fine that the U.S. EPA has the authority to hand down), and the regulatory bodies fail to use it, it only further sends the message that environmental crimes are not taken seriously.

Because of the financial and structural inability of many peripheral nations to provide proper and effective enforcement, it should primarily be the responsibility of core nations (the ‘shipping’ nations) to enforce both domestic and international legislation governing e-waste:

It is clear that exporting countries need tougher monitoring to ensure donated electronics are in meaningful working order. Obsolete electrical equipment should be disposed or recycled in the country of origin using environmentally sustainable methods. Electronics manufacturers and retailers also have a responsibility to stop using hazardous material in the production of electronic equipment. In many cases, safer alternatives currently exist and these should be actively sourced. Furthermore, consumers should not be expected to bear

the cost of recycling old electrical goods. Manufacturers should take full life cycle responsibility for their products and, once they reach the end of their useful life, take their products back for re-use, safe recycling or disposal. Consumers should be able to trust manufacturers and government legislation to ensure that, when they do the right thing and hand in used electronic equipment, it is not dumped in the developing world (Consumers International 2008: 4-5).

Because of the advanced capabilities of the industrialized world, all elements of e-waste regulation (production, consumption, recycling and disposal) should be managed by core nations. An argument can also be made for this because it is generally core nations which experience the “good” from these products during consumption, and therefore should also be liable to at least regulate the “bads” as well.

Another criticism of the Basel Convention (as well as most e-waste regulation) is that it may actually increase the levels of exported waste. Increasing legislation in core nations (while good in some respects) has created an issue of diversion – e-waste is now being shipped somewhere else where it will inevitably cause harm to the surrounding environments and populations, rather than being recycled and disposed of responsibly, as it should have been in the first place:

Despite the existence of the Basel Convention, designed to prevent precisely this type of economically motivated toxic waste exportation from rich to poorer countries, there is real concern that the economic pressures and incentives to export are greater than ever before. This is largely due to increased awareness of the hazards involved in disposing of e-waste in solid waste systems and the consequent rise in disposal prices and disposal prohibitions. This reality, combined with poor enforcement at the customs level in countries that are supposed to be controlling e-waste exports, as in the European Union or Japan, or a complete lack of controls in the United States

and Canada, leaves us in a situation where the “carrot” promotes export and few “sticks” prevent it (BAN 2005: 9).

This diversion is the result of a “Catch 22” – increasingly strict regulation only drives up the cost of electronic waste disposal, making illegal (and cost effective) disposal practices even more enticing. This is (in part) responsible for a healthy, profitable e-waste industry, as well as the displacement of ‘harm.’

The State of the Industry

To answer the second research question, it is clearly evident that the electronic waste industry is booming, generating over \$11 billion annually. In spite of national and international legislation, both legal and illegal shipments of e-waste make their way around the globe to land in peripheral nations. There are multiple parties involved in the e-waste trade, spanning from production to consumption to disposal. Major corporations as well as small, local dealers who engage in the illegal shipment, sale and disposal of the waste have been identified by the research. State organizations benefit from e-waste in two ways: exporting nations no longer have to be concerned with the proper storage and/or disposal of the hazardous and toxic products, and importing nations (that are often behind in technological development) receive imports that can substantially increase and develop their communications markets. But what importing nations also receive is the responsibility of managing the hazardous and toxic waste.

Several national and international organizations have vested interests in the e-waste industry, as they have more or less built a commodity out of what was originally waste. With historical roots in organized crime, electronics recyclers in industrialized nations continue to traffic their products around the world, circumventing laws designed to restrict or stop the transfer of e-waste altogether. Organizations seeking to prevent further regulation that might implement take-back policies spend hundreds of thousands of dollars to lobby against such legislation as the Responsible Electronics Recycling Act in the United States. Both new laws and increased enforcement could cause a substantial impact to the bottom line of all parties involved.

Also identified by the research are the weaknesses of e-waste legislation, or, the “spaces between laws.” Even the more stringent e-waste policies (such as the Basel Ban) permit the transfer of electronics if they are intended to be used or “recycled” in the receiving nations. What is perhaps most egregious is the complacency of core exporters to ship broken and irreparable e-waste to the periphery under the guise of ‘recycling’:

Exporters are able to ship e-waste by exploiting a loophole in European legislation which allows ‘end-of-life’ electronics goods to be exported as working products. Even NGOs are sometimes unwillingly involved in the trade, when large quantities of mobile phones and computers are donated to help schools and institutions” (Consumers International 2008: 4)

This seems to mitigate any obligation of these Parties to monitor their exports in order to prevent illegal shipments:

Notorious examples of Basel circumvention are plentiful. Western and Central Europe, Latin America, and Asia are increasingly targeted by Western “recycling” export schemes. Waste exports to the African countries of Sierra Leone, Namibia, and Angola under “waste-to-energy” schemes are also common. Importing countries are offered aid packages for roads, health care, education, and incinerators if they agree to accept hazardous wastes... (Liddick 2011: 24).

Inspections of European seaports in 2005 found that 47 percent of waste (including e-waste) destined for export was illegal (Liddick 2011). When presented with challenges, e-waste exporters have historically adapted their trade to continue with illegal export. In the 1980s, e-waste traffickers had to shift trade routes from Central Europe to Asia and Africa after European regulators began cracking down on the industry; when the Bamako Convention banned the import of hazardous waste into African, Caribbean and Pacific nations, routes were switched to China and Eastern Europe (Liddick 2011). Continued evasion of regulation and consistent movement of shipments to nations with cheap labor and loose regulations drives industry profits even higher, and further expands the scope of trafficked electronic waste.

What has been realized in answering this question is that the capitalist political economy is central to the problem of harm caused by the electronic waste industry. The commodity chain of electronic waste follows the ever-increasing desire inherent to capitalism: expansion. This has been revealed to externalize harm during early and EOL stages of the electronic product lifecycle. What has also been recognized is the inability of corporation to “self-regulate” their activities, especially when expected to comply with environmental regulations. The failure of all parties to

either report shipments for export, report shipments for import, or report annual estimations of total exports and imports with proper regulating authorities is blatant. In addition, several corporations have deliberately (and unashamedly) violated environmental regulations and treaties in order to maximize profits. As evidenced in this research, to date, only one of those corporations has been criminally sanctioned in the United States. Only by acknowledging the ‘real world’ of corporate activity and liability can environmental regulations be expected to be observed and obeyed.

Exporting and Importing Nations

To answer the third and final question, inconsistencies in regulation of transnational electronic waste differ from country of origin to country of import, creating even more difficulties when it comes to regulating the industry. For example, the United States is not a ratified party of the Basel Convention, therefore when any of the ratified parties accept shipments from the U.S. they are violating the Basel Convention as well as the Basel Ban. In addition, some core nations ban the shipment of any “non-functioning” products, while others allow for these products to be transferred if they can be “refurbished.” In the same vein, some peripheral nations accept “donations” of products for repair and refurbishment, while others will not take non-working products (at least, they are technically not supposed to under their legislation). Furthermore, the environmental regulations governing recycling practices of e-waste (as well as environmental recycling infrastructures) differ

drastically between the core and the periphery. The transfer of e-waste between the two almost assuredly will end in improper and dangerous disposal practices in peripheral nations. The results of these disposal practices inherently violate national and international perceptions of environmental justice through the externalization of harm (during both production and disposal) in peripheral nations.

Conclusions

What can be stated about electronic waste without hesitation is that it is a global issue—a very important and imperative global issue. An extensive review of the literature has illuminated a need for further study of e-waste in the fields of both environmental justice and green criminology. The use of world-systems theory research has also proved effective in tracking the path of e-waste around the globe. In order to discuss future direction for research, the implications of these findings are highlighted in this section.

Environmental Justice

Electronic waste is clearly an issue of environmental justice, as it disproportionately affects already marginalized populations in the periphery. Shipments leave the core, bound for nations such as Nigeria and Ghana, and are often filled with a majority of unusable, toxic products. Disposal of these products in the periphery is often informal and unregulated, which leads to serious problems of

pollution and degradation to human health. Residents living near and around dump sites and burn sites face exposure to hazardous and toxic materials on multiple levels. Their air is polluted by the intentional “cooking” of circuit boards to retrieve valuable precious metals, or the mass burning of giant piles of waste. Their waterways and soils are polluted when dumped waste begins to leach into the water table as well as the soil where local crops are grown for consumption. Their bodies are polluted when they ingest crops or animals and animal byproducts from livestock have grazed on polluted crops from these soils. Research has indicated serious health concerns, problems and defects in these individuals, but these practices continue on a daily basis. Consumers in core nations feel little or no responsibility for these devastating impacts, if they are aware of them at all. Legislative bodies have at least recognized the impacts as well as the obligation of the industrialized world to prevent the transboundary movement of hazardous waste into already impoverished areas, but a solution has yet to be found. Halting all transfer of e-waste would dramatically impact the ability of peripheral nations to obtain affordable electronics, and would indeed impact the international economy. However, it must be acknowledged that continued import of these electronics will inevitably impact the environment as well as local populations in a very negative way.

Green Criminology

Merging with an environmental justice perspective, green criminology centers around the study of environmental harm, environment laws and environmental regulation, as well as victimization and justice issues. Using this definition, it is clear that the electronic waste industry constitutes environmental harm in multiple ways:

The recent emergence of ‘environmental criminology’ has been marked by efforts to reconceptualize the nature of ‘harm’ more inclusively, to expose instances of substantive environmental injustice and ecological injustice, and to critique the actions of nation-states and transnational capital for fostering particular types of harm and for failing to adequately address or regulate harmful activity. Drawing upon a wide range of ideas and empirical materials, recent work on environmental harm has documented the existence of law-breaking with respect to pollution, the disposal of toxic waste, and misuse of environmental resources. It has raised questions related to the destruction of specific environmental resources, in ways that are “legal” but ecologically disastrous. It has emphasized the dynamic links between the distribution of environmental “risk” (particularly as it affects poor and minority populations) and the claims of nonhuman nature to ecological justice. Moreover, it has criticized the inadequacies of environmental regulation in philosophical and practical terms. Environmental criminology has focused on aspects of offending and criminalization, as well as the nature of victimization including social and governmental responses to this victimization (White 2002: 83-84).

The e-waste industry alone encompasses all of these elements and some particularly well. Harm is externalized during the production phase via natural resource extraction, pollution, and poor working conditions for employees; it occurs during the consumption phase while core nations are profiting from the labor and resource exploitation of the periphery, and it occurs during disposal, as once again the core can actually profit from selling not only broken and discarded electronics, but also from “selling” the environmental burden of disposing of electronic waste. Lax and

improperly enforced regulations permit the continuation of this process on multiple levels.

The e-waste industry also perpetrates harm against consumers through the practice of “greenwashing.” Companies market their products as “green” or environmentally responsible, which is attractive to an ever-increasingly environmentally conscious market. Consumers not only are deceived when purchasing “green” products, but are also misled when recycling said products, because many electronics recyclers advertise responsible (or at least domestic) recycling through their company. In actuality, large percentages of e-waste are shipped out of the nation unbeknownst to the consumer. The social and environmental harm perpetrated by the e-waste industry will only continue to increase as production and consumption in the industrialized world increase.

This path of production, consumption and disposal in the electronic waste industry has been carefully tracked using world-systems theory, and indicates that the capitalist world economy has drawn a clear line of spatial hierarchy between core and peripheral nations. As suggested by Ciccantell and Bunker (1998), this integrated system of transport has unequally distributed commodities (as well as waste) and is therefore contributing to the international inequalities of the world system. The role of the political economy within the e-waste industry and within its legislation is undeniable.

World-Systems Theory

The commodity chain of e-waste has been tracked using the Global Commodity Chain (GCC) suggested by Bair (2009) and has illuminated the sociological and political implications of the chain. The social impacts of the environmental injustice caused by e-waste were discussed above, but the political implications also need to be explored. As aforementioned, these buyer-driven commodity chains function as capital-intensive industries wherein power lies with (often vertically integrated) manufacturers. These manufacturers share a vested interest in controlling the regulation of their industry, and therefore seek to manipulate it with powerful lobbying practices. Furthermore, a delicate balance in the international political economy exists in the *laissez-faire* approach to enforcing environmental regulation and the acceptance on the part of the periphery to receive waste in order to obtain technology.

The GCC approach has therefore also illuminated the weaknesses in national and international regulation and highlighted the responsibility of core nations to do something about it. If "Moore's Law" continues to prove accurate, and if 'planned' and 'perceived' obsolescence persist, it can be comfortably stated that the problem of e-waste will not be going away any time soon. With this in mind, Global Commodity Chain Sustainability Analysis (GCCSA), has also helped to serve as a framework for policy recommendations in the context of a global supply chain.

Global Commodity Chain Sustainability Analysis (GCCSA). White (2002) called for more extensive research on the lifecycle of commodities, which is what this research has accomplished. Electronic waste has been tracked from its roots (resource extraction), to its production and manufacture in high-capacity, low-wage facilities in the periphery, to its sale and consumption in the core, and, lastly, to its export and disposal back in the periphery. It is clear that the core consumes the vast majority of new electronic products, and that the periphery disproportionately must shoulder the burden of its disposal. While early stages of the commodity chain are efficient, the end stages are not. To revisit a quote from a report on the difficulties of regulating the e-waste industry:

The supply chain for making and selling electronics is a model of efficiency managed with electronic data interchange, electronic manifests, radio-frequency tags on pallets and cartons, and UPC codes on every single package. In stark contrast, the end-of-life supply chain is managed almost entirely by hand with little recordkeeping or even potential for monitoring or oversight. That the results have included unsafe, polluting, and illegal activities at the end-of-life should not be a surprise (US House of Representatives 2009: 16).

Though not surprising, these practices should be cause for alarm. In order to improve upon current regulations of the e-waste industry, GCCSA has illuminated the need for the following:

1. Increased enforcement on the behalf of core nations in regulating the illegal shipment of electronic waste. This enforcement should include checking and/or verifying that shipments permitted under the “recycling” loophole actually contain working/reparable products.

2. Established and enforced management of production materials used in electronics that will continually work to phase out unnecessary toxic/hazardous elements.
3. Established and enforced “take-back” policies for producers and/or extended producer responsibilities (EPR) in core nations.
4. Fees/taxes for exporting nations to be allocated towards the development of safe and responsible recycling facilities in importing nations.
5. Public campaigns for increased awareness of the dangers of exposure to electronic waste toxins in both importing and exporting nations.
6. Development of an international e-Steward program that would alert consumers to verified environmentally responsible companies.

Though these provisions may seem ambitious, they are all in progress (in various stages) throughout the core as well as the periphery. Unified international policies governing these provisions may prove to be more effective than the disjointed legislative policies currently in practice. Of course, it is highly unlikely that all nation-states will sign onto one agreement, but as in the case of the Basel Ban, a vast majority may.

In sum, the problem of electronic waste is a pervasive social, political, and economic issue that is global in its scope. Both national and international legislation have proved ineffective at stemming the continued transboundary shipment of e-waste. Failure to acknowledge this issue—and soon—will only increase the severity of the situation. The anthropocentric nature of a capitalist economy has exacerbated the problem of e-waste, driving up levels of production, consumption and disposal. Patterns of consumption and regulation cannot be

discussed without considering neoliberalism and the overarching structure of corporate capitalism (White 2002), which has clearly developed a systematic process for the disposal of e-waste that is criminogenic in nature. The externalization of harm from the core to the periphery is an obvious violation of national and international law and is likely the result of powerful interests at work. Changes need to be made at multiple levels of the e-waste industry to halt what is rapidly becoming a form of toxic waste colonialism. To mitigate this harm, the United States should take responsibility for its high levels of consumption and responsibly manage its waste “in house.” As a race, humans need to confront the realities of environmental justice and serious harm that we are inflicting upon one another through our consumptive, anthropocentric, and apathetic practices. This study concludes with a quote from Slade (2007: 7) to highlight this point:

A few years back, as I was visiting a touring exhibit called “Eternal Egypt” with my ten-year-old son, it occurred to me that while the ancient Egyptians built great monuments to endure for countless generations, just about everything we produce in North America is made to break. If human history reserves a privileged place for the Egyptians because of their rich conception of the afterlife, what place will it reserve for a people who, in their seeming worship of convenience and greed, left behind mountains of electronic debris? What can be said of a culture whose legacies to the future are mounds of hazardous materials and a poisoned water supply? Will America’s pyramids be pyramids of waste?

Future Research

As always, the scope of any body of research is limited, and the possibilities of future research in the field of electronic waste are extensive. Environmental justice perspectives could be furthered, especially through an ethnographic study of the impacts of e-waste on Nigerian and Ghanaian communities. A particularly interesting angle would be to examine the role of women and children in the e-waste trade, as they seem to be the primary actors once waste has been dumped in importing regions. Therefore a gender- or age-specific approach may illuminate particular externalized harms associated with the trade.

It is also clear that the commodity chain of electronic waste could be explored in further detail, perhaps to illuminate industry-specific producers and buyers that are regularly involved in the e-waste trade. This could also be expanded to include the larger political economy of the e-waste industry, further encompassing the lobbying of regulation surrounding electronic waste transfer. Some of these connections go even deeper, with state governments offering cash and development aid to developing nations that agree to accept their hazardous waste.³⁰ Coupled with criminological theory, it is likely that a state, corporate or state-corporate crime connection could be revealed, perhaps through the forming of agreements of various international parties.

³⁰ For example, the Government of Benin signed an agreement with France to accept hazardous and radioactive waste in exchange for US\$1.6 million and 30 years of development aid (Kone 2010).

And lastly, not yet discussed in this work, the crimes that occur after e-waste has been dumped and disposed of could also be examined. For example, there is a rapidly growing problem with cybercrime in Ghana, largely as a result of computer motherboards being retrieved by those with criminal intentions. Sensitive data (bank accounts, credit card information, addresses and telephone numbers, etc.) remains on these computers and is easily retrieved by purchasers of these discarded computers. An analysis into the problem of cybercrime in Ghana as a result of e-waste could suggest further implications of the electronic waste industry beyond the dumpsite.

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