Electronic Waste (e-waste) Science and Advocacy at Agbogbloshie: The Making and Effects of "The World's Largest E-waste Dump."

By

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Abstract

Over the last two decades, e-waste has become a crisis, receiving significant attention from activist, environmental groups, policymakers, news media, and academics. E-waste processing hubs in Africa and Asia pejoratively labelled "digital dumps" are at the center of the so-called crisis. This dissertation is about Agbogbloshie, a site in Accra, the capital of Ghana, ostensibly "the world's largest e-waste dump." I examine the making of this iconic imaginary of Agbogbloshie, the grounds on which it is built, and the effects of its circulation. Broadly, I investigate the knowledge-making practices central to representations of Agbogbloshie as "problem space" in need of interventions. I explore how advocacy groups, institutions (academic scholars), and individuals frame the content and relevance of knowledge about the site to elicit certain forms of interventions and how within this context, the knowledge they produce itself becomes a site of struggle around which contentious politics take place. I demonstrate that although the intention is to make visible the environmental and health effects of e-waste processing, the imaginaries produced about Agbogbloshie within e-waste science and advocacy do certain kinds of harm. Imaginaries of Agbogbloshie such as it is "the world's largest e-waste dump" are not just representations; they do work, including adding to the harms experienced by those who live and work at the site. Questioning imaginaries of e-waste at Agbogbloshie, I open spaces where the tensions of Agbogbloshie as a site of/for e-waste science and advocacy can be more carefully thought through and done differently.

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List of Abbreviations

AMA	Accra Metropolitan Assembly
AMP	Agbogbloshie Makerspace Platform
ASR	Automobile Shredder Residue
BAN	Basel Action Network
BBC	British Broadcasting Corporation
BBS	Braun Blanquet Scale
CBD	Central Business District
CEO	Chief Executive Officer
CHRAJ	Commission on Human Rights and Administrative Justice
CLEAR	Civic Laboratory for Environmental Action Research
CNN	Cable News Network
COHRE	Centre for Housing Rights and Eviction
DDT	Dichloro Diphenyl Trichloroethene
DIY	Do-It-Yourself
DIWO	Do-It-With-Others
EJ	Environmental Justice
ENGO	Environmental Non-Governmental Organization
EPA	Environmental Protection Agency
E-Waste	Electronic Waste
GaN	Globe at Night
GASDA	Greater Accra Scrap Dealers Association
GBC	Ghana Broadcasting Corporation

GEOIP	Geolocation Internet Protocol
GDP	Gross Domestic Product
GOIL	Ghana Oil Company Limited
GPS	Global Positioning System
GTV	Ghana Television
ICEHR	Interdisciplinary Committee on Ethics and Human Research
IPEN	International Persistent Organic Pollutants Elimination Network
IMF	International Monetary Fund
INTERPOL	International Criminal Police Organization
IRB	Institutional Review Board
KIWC	Keywords in Context
KLERP	Korle Lagoon Ecological Restoration Project
MIT	Massachusetts Institute of Technology
NAM	Non-Aligned Movement
NGO	Non-Governmental Organization
NPR	National Public Radio
OECD	Organization for Economic Co-operation and Development
OFA	Old Fadama–Agbogbloshie
OPEC	Organization of Petroleum Exporting Countries
PCBs	Polychlorinated Biphenyls
PBS	Public Broadcasting Service
PHH	Pollution Haven Hypothesis
QUANGO	Quasi Autonomous non-Governmental Organization

R2	Responsible Recycling
SAP	Structural Adjustment Program
STS	Science and Technology Studies
StEP	Solving the E-waste Problem
TEU	Twenty-foot Equivalent Units
TV	Television
UK	United Kingdom
UNEP	United Nations Environmental Program
URL	Uniform Resource Locator
US	United States
USB	Universal Serial Bus
USD	United States Dollars

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Chapter One: Introduction

It is not just the disproportionate distribution of waste that causes harm, how we talk about addressing the harm too can itself be a source of harm.

The questions: Agbogbloshie within electronic waste (e-waste) science and advocacy

Over the last two decades, e-waste has become a crisis, drawing the attention of activist and environmental groups (Greenpeace International 2008a; Coalition and Network 2002; Basel Action Network (BAN) 2007), policymakers (UNEP 2017; Lundgren 2012; Elisha 2010), news media (Vidal 2013; US News and World Report 2013) and academics (Pinto 2008; Osibanjo and Nnorom 2007). Although ignited by broader issues of production and overconsumption of digital technologies, the overwhelming majority of discussions of this crisis have revolved around the proliferation of e-waste processing hubs, which the crisis literature is quick to label pejoratively as informal and in so-called "developing" countries.[1] Dubbed "digital dumps," with grave environmental and human health consequences, the e-waste processing hubs in Africa and Asia have become the epicentres of research and advocacy work addressing the e-waste crisis. International media houses and environmental NGOs visit these so-called "digital dumps" to report on and document the hazardous conditions under which the marginalized poor process what is generally perceived as the waste of the world. Informal e-waste processing hubs have become iconic imaginaries representing the e-waste crisis. These hubs make visible and knowable all that is problematic about e-waste. Or so the story goes.

[1] There is a great deal of discourse on whether to use the terms "developed" and "developing" versus high/low GDP, minority/majority world, Global south/Global north, etc. (Fernholz 2016; Silver 2015). Here, I reference the terms "developed" and "developing countries" in the contexts of their use within the e-waste literature.

This dissertation is about Agbogbloshie, a site in Accra, the capital of Ghana, ostensibly "the world's largest e-waste dump" (*The Guardian* 2014). My research investigates the making of this iconic imaginary of Agbogbloshie, the grounds on which it is built, and the effects of its circulation. I investigate the dominant storyline[2] (Hajer 1995) of Agbogbloshie within e-waste discourse as a way of understanding the politics (O'Brien 1993) of doing e-waste science and advocacy.[3] The science and advocacy work on e-waste has significantly increased in the last two decades (see Daum, Stoler, and Grant 2017 for a review of e-waste research at Agbogbloshie in particular). Importantly, the knowledge is now multi-faceted, with diverse interests articulating the Agbogbloshie site as a dumping ground and ecology of toxicities (Caravanos et al. 2011, 2013; Hosoda et al. 2014; Wittsiepe et al. 2015), but also as an urban mine (Grant 2015; Grant and Oteng-Ababio 2016; Grant and Oteng-Ababio 2012), an industrial cluster sustaining local livelihoods (Oteng-Ababio 2012; Oteng-Ababio and Amankwaa 2014; Amankwaa 2013), and an innovation hub (Oteng-Ababio, Owusu, and Chama 2015; Osseo-Asare and Abbas 2015).

Broadly, I investigate the knowledge-making practices central to representations of informal e-waste hubs such as Agbogbloshie as "problem spaces" in need of interventions. I explore how advocacy groups, institutions (academic scholars), and individuals frame the content and relevance of knowledge about informal e-waste sites to elicit certain forms of

[2] As evoked by Hajer (1995), the notion of storylines captures the hegemonic discourses that emerge around particular phenomena often in the forms of metaphors, analogies, and clichés and which are crucial to framing and approaching environmental problems. Storylines are unavoidably partial, as they emphasize certain aspects of the issue while silencing others.

[3] By "politics" I mean what is at stake in how we do science. O'Brien (1993) clearly shows that politics and science are never separable. The very act of asking a question, using a particular measurement, or even adopting a particular methodology frames and includes some things while excluding others. As such, the ways we create knowledge are and have always being political acts. She notes, "As soon as you systematically ask questions about the universe, you take a political side" (706). The decision to ask any question means not asking other questions. I develop these points more fully below and in Chapter Two.

interventions and how within this context, the knowledge they produce itself becomes a site of struggle around which contentious politics take place. I draw on the politics of science that biologist Mary O'Brien writes about in the context of pollution studies in her seminal article "Being a scientist means taking sides." O'Brien distinguishes between "alternative assessment" and "risk assessment" of pollution impacts and demonstrates what is at stake in each assessment (1993, 706). To ask questions about "risk assessment" is to frame questions within the dominant narrative; for example, what are the risks of cancer in residents who live close to an incinerator? Asking such a question, although important, does nothing to challenge the status quo. Rather, it puts scientists who might think they are not taking sides on the side of business as usual. Alternative assessment frames questions differently. It places questions outside the domain of the dominant approach. For instance, it might ask what alternatives we have to incineration, rather than asking how much dioxin is safe in the body of a pregnant woman who lives near the incinerator. In my reading of her work, O'Brien (1993) asks us to pay critical attention to the political stakes involved in pursuing any scientific endeavour. In my own analysis, informed by O'Brien's (1993) notion of politics and grounded in the case of Agbogbloshie, I open the "black box" of e-waste science and advocacy. I dive into what is at stake in how various forms of knowledge (including my own) are crafted and mobilized in the doing of e-waste science and advocacy.

As the epicentre of e-waste research and advocacy, Agbogbloshie is an important site for this undertaking. One of the key knowledge claims that "stages" Agbogbloshie within e-waste science and advocacy is the claim that the site is "the world's largest e-waste dump" (*The Guardian* 2014). I write more fully about the history and relevance of this claim in Chapter Four. I draw attention to the fact that interests in Agbogbloshie as a problematic space of e-

waste and thus in need of interventions rest on imaginaries of the site as a spectacular dumpsite overflowing with e-waste abandoned by the West. Yet as I discuss in Chapter Four, these iconic representations are "urban legends" or "academic urban legends" (Rekdal 2014) in the scholarly literature—claims (or a set of claims) so often cited and recited that they become a known "truth". The attainment of truth is not because the claim has been proven as such. Instead, the appearance and status of truth emanate from repeated citations in multiple text sources and the claim's gradual insertion in ways that often render it the desired point of replication for future studies. The body of work on e-waste at Agbogbloshie stages iconic representations such as "the world's largest e-waste dump" as justificatory moves, often acting as a warrant for research on, writing about, and representation of the site. For example, a recent documentary, "Welcome to Sodom," opens with the statement:

> Sometimes you kill the Beast. Sometimes the Beast kills you." *Mohammed.* Agbogbloshie, Accra is proven to be one of most poisonous places. It is the largest electronic waste dump in the world. About 6000 women, men and children live and work here. They call it SODOM. Every year about 250,000 tons of sorted out computers, smartphones, air conditions tanks and other devices from a faraway electrified and digitalized world end up here. Shipped to Ghana illegally. (Weigensamer and Krönes 2018, emphasis in the original)

In Chapter Four, I examine iconic representations (like that captured in the quotation above) of Agbogbloshie within e-waste science and advocacy. However, I flag the claims of the documentary to make a related point about the empirical basis for the widely circulated claim that Agbogbloshie is the largest electronic waste dump in the world. Despite many empirical studies of the site, none systematically quantifies e-waste as it compares to other types of waste

or compares the quantity of e-waste at the site to other hubs, so there is no concrete evidence that Agbogbloshie is indeed "the world's largest e-waste dump." Yet this claim is often used as a simplified context for e-waste research and advocacy at Agbogbloshie and other e-waste hotspots elsewhere.

Using the example above as illustrative, in this dissertation, I ask questions about how the science and advocacy of e-waste are done and to what particular effects. My overall research question is the following: What politics are engendered in the ways Agbogbloshie is framed and represented as a problem space in need of science and advocacy attention, as well as policy intervention? Within this broad framework, I explore three interrelated lines of inquiry.

(1) First, I examine the spatial and temporal history of Agbogbloshie from the pre-colonial era to its current imaginary as ground zero for the crisis of e-waste, nearly always to the exclusion of other representations of the site. I set this line of enquiry against a background where "representation of e-waste is characterized by portrayals of e-waste dumping grounds as strange, alien spaces… with no clear and comprehensive histories" (Andersson 2017, 2). The specific questions I ask are the following. What is the broader history of Agbogbloshie? How does this history matter (or not) for the site's current idiosyncratic imaginary as emblematic of the crisis of e-waste?

(2) Second, I consider the empirical scale of e-waste processing at Agbogbloshie. I draw on empirical data from a participatory citizen science discard survey[4] conducted with workers at Agbogbloshie over a period of 5 months from September 2016 to January 2017 to shed light on two questions that ground a contestation of the scaling work

[4] I will say more later about my deliberate use of "discard" instead of "waste".

central to the dominant representation of Agbogbloshie as "the world's largest e-waste dump". The discard survey seeks to answer two questions.

a. To what extent is Agbogbloshie a site for processing e-waste compared to discards from other materials (e.g., car waste, heavy mining machinery, waste lead-acid batteries, oil and gas barrels, and general household scraps)? That is, given that the site is a hub for processing discards from a variety of sources, what is the relative importance of discards from these other sources when compared to electronics? The key parameter is the proportion of electronic discards (e-discards) to other waste streams.

b. To what extent is Agbogbloshie a direct dumping ground for foreign e-discards? That is, what is the relative importance of e-discards from domestic (Ghanaian) consumption versus those that are directly imported and dumped? Here, the focus is on measuring the proportion of domestic to directly imported e-discards.

(3) Third, I explore iconic representations of Agbogbloshie within e-waste science and advocacy. I map out the corpus of the literature on e-waste at the site to trace key patterns of such statements as it is "the world's largest e-waste dump." In doing so, I ask five questions.

a. What is the broad topography of e-waste texts at Agbogbloshie, and what do these texts tell us about the issues being centred in conversations about the site?

b. What are the patterns of iconic statements of and about Agbogbloshie as an e-waste site, and from where and from whom do these iconic statements emerge?

c. What geographical imaginaries are built into these statements?

d. How have the statements and thus geographical imaginaries been taken up within broader e-waste science and advocacy?

e. What are the implications of the take-up? That is, what are some of the material and sensuous effects of the geographical imaginaries? For example, what kinds of living, projects, and interventions do the imaginaries in iconic statements of Agbogbloshie inspire, enable, and disable?

The end of Agbogbloshie (as we knew it)? A journey to the research questions

I ask the above questions for a variety of reasons. These reasons cut across my personal experiences of being Ghanaian and knowing Agbogbloshie before its recent rise to notoriety as an e-waste hotspot and my intellectual training in the geographies of e-waste and discard studies that take the spatialities of waste seriously.[5] That researchers bring particular subjectivities and histories (personal and intellectual) to their research is now acknowledged in some quarters of the social sciences, particularly by Science and Technology Studies (STS) scholars (Haraway 1990; Mol 2002) and feminist geographers (Rose 1997; England 1994; DeLuca and Maddox 2016). In what follows, I sketch my interlocking personal and intellectual journeys to the questions I explore in the dissertation.

My interest in Agbogbloshie predates my research career. Before my first fieldwork experience at the site in 2010, I lived in Accra, beginning in 2006 while attending the University of Ghana for my undergraduate program in Geography and Resource Development. At the time, Agbogbloshie was primarily known for its vibrant wholesale food market (especially for

[5] In Chapter Two, I show that waste and space are not separate entities. Geographies are constituted in and through waste.

yams, onions, and tomatoes) and the informal settlement Old Fadama that had grown hand-in-hand with the increasing informal commerce in rapidly urbanizing Accra (Grant 2006). Through the exposé and advocacy work of environmental non-governmental organizations (ENGOs)[6] such as Greenpeace International and Basel Action Network (BAN) on the global flows of e-waste (BAN 2009; Greenpeace International 2008b), the scrapyard adjacent to the food market and informal settlement quickly became of interest to environmental health scientists, slum tourists, international journalists, photographers, and social scientists. In less than a decade, the scrapyard achieved global notoriety as an "electronics graveyard" (NPR 2015), "a digital dumping ground" (PBS 2009), "a high-tech hell" (Mongambay 2012), and more recently "one of the ten most polluted places in the world" (WorstPolluted.org 2013), to name a few of the popular narratives. In addition to work on Agbogbloshie appearing in the international print media, the work of renowned photographers advanced the site's notoriety. Peter Essick (Carroll and Essik 2008), Pieter Hugo (Hugo 2011; Rabinowitz 2012), Kevin McElvaney (T*he Guardian* 2014), and Edward Burtynsky (Burtynsky 2018) are worth mentioning here as their work placed Agbogbloshie in *National Geographic*, VICE, *The Guardian*, and galleries in London respectively.

The need to ask questions about the representation of Agbogbloshie within e-waste discourse stems from the new identity of the site, especially within the international media and advocacy circles, and the subsequent arrival of researchers, artists, and photographers at the site. In many ways, the overwhelming attention to Agbogbloshie evokes what others have called "ruin porn" (DeSilvey and Edensor 2013; Edensor 2005). Ruin porn refers to the aestheticizing of decay, abandonment, and death in photographic documentations of

[6] An ENGO is a non-governmental organization dedicated to environmental and ecological issues.

landscapes. What can be problematic about ruin porn is the foregrounding of aesthetics in such a way that histories and causalities of ruination are, ironically, wiped clean from the imaginaries produced (Wanenchak 2012; Liboiron 2015a). What initially intrigued me about seeing Agbogbloshie as ruin porn was how the imaginaries and narratives produced by diverse interests seemed indifferent to the geohistory of the site and erased it from view (I discuss these and other erasures in Chapter Two). I asked how Agbogbloshie came to be called "the world's largest e-waste dump." And what did this storyline mean in light of the history of the site in Ghana's urban environmental politics? These questions became even more pressing as the site continued to attract international attention, attaining iconic status in global e-waste science and advocacy.

Because I am Ghanaian and a PhD researcher, journalists and other researchers often contact me. For reasons best known to them, but which I can only glean from correspondence, it seems people are drawn to Agbogbloshie because of the imagery of the site they have encountered in the popular media. For example, in 2015, I was invited to the annual E-scrap conference, a gathering of the scrap industry in mostly North America to discuss the representation of Agbogbloshie. The panel was titled "On the ground in Ghana: the realities of an e-scrap hotspot." The gathering of this panel was partly a response to discussions within scrap businesses in North America, as well as certification schemes (mainly E-stewards and Responsible Recycling (R2)) within the e-scrap industry (see Pickren 2014 on certification governance of e-waste chains). In theory, certified e-scrap businesses commit to not "dumping" e-waste on so-called developing countries in the name of exporting materials for reuse and repair. As such, certified scrap businesses are invested in monitoring their commodity chains to avoid being implicated in the creation of toxic conditions should a

product from their facility end up in a place like Agbogbloshie. It is within this environment of "blame game" and "clean hands" of recyclers in North America creating a toxic landscape and poisoning the poor that the E-scrap panel aimed to shed light on conditions at Agbogbloshie. The panel was to offer a thoughtful perspective on what was happening in Ghana, given that "Agbogbloshie is easily the most popular and controversial example of what some view as the crisis of e-waste, yet there are differing opinions as to what's happening on the ground."[7] During the discussions, it became clear that the imagery of a huge dumpsite overflowing with e-waste is widespread and has real-world material effects, including recyclers' decisions to trade with African business who depend on used and second-hand electronics. Experiences such as the revelation of the material and sensuous effects of representations (Gregory 1994) at the E-scrap conference pushed me to consider conditions under which Agbogbloshie is framed as a site of interest to a wide variety of audiences, including businesses in North America and beyond.

As already noted, for over a decade, ENGOs and media reports have popularized claims that each year, "millions of tons of e-waste" (*The Guardian* 2014; PBS 2009) from developed countries are directly dumped in developing countries, and Ghana is "among the largest recipients in Africa" (UNEP 2015b p.8). Such stories about Agbogbloshie circulate widely in the North American and European Anglophone media and academic literature, with Agbogbloshie variously described as "the world's largest e-waste dump" (*The Guardian* 2014), an "electronics graveyard" (NPR 2015), and "the hellscape where our computers go to die"

[7] Personal communication with conference organizers. The full description of the plenary reads: "Agbogbloshie is easily the most popular and controversial example of what some view as the crisis of e-waste, yet there are differing opinions as to what's happening on the ground. Which is why we've invited this group of speakers here to offer a thoughtful perspective on what is happening in Ghana."

(WIRED 2015). Recently, however, the extent to which Agbogbloshie is a site for dumping foreign e-waste and the scope and scale of e-waste activities have been questioned (Minter 2016; E-scrap News 2015; *Al Jazeera* 2015; Lepawsky 2015c; SciDev.Net 2015). Some have questioned the ruin and poverty porn aesthetics of some of the iconic imaginaries of Agbogbloshie, pointing to their deliberate staging (Rams 2015; Agyepong 2014). Others have suggested the isolated focus on Agbogbloshie leaves out the extensive economies of repair and reuse, whereby used electronics circulate within Accra before they end up at the site (Burrell 2016; Minter 2015; Grant and Oteng-Ababio 2012; Grant and Oteng-Ababio 2016). In addition, emerging collectives, such as the Agbogbloshie Makerspace Platform (AMP),[8] have argued for acknowledging the broader ecosystem of creativity and diverse material transformations at Agbogbloshie. Within these emerging narratives, although Agbogbloshie is still notoriously framed as an e-waste hotspot, it is recognized that the site is also a hub for processing and trading discards from other sources, such as car waste, heavy mining machinery, waste lead-acid batteries, oil and gas barrels, and general household scraps. As I discuss in detail in Chapters Two and Three, these other sources strongly relate to Agbogbloshie's "origins," long before its association with e-waste. Importantly, the diversity of discards processed at Agbogbloshie raises questions about why electronics should be singled out as of particular relevance to the site.

The Agbogbloshie scrapyard began as a vehicle repair and general scrapyard, yet there have not been similar concerns over the processing of car waste at the site, nor have these other waste types attracted the significant attention that e-waste has. Of course, different

[8] Agbogbloshie Makerspace Platform (AMP) is a collaborative initiative aimed at creating an innovation hub at Agbogbloshie by bringing together researchers, the workers, and students in the field of science and technology (Osseo-Asare and Abbas 2015).

wastes matter differently, and each raises particular kinds of problems (Liboiron 2015b). Yet at Agbogbloshie, e-waste assumes a charismatic status (Liboiron 2015b) reducing other discard types and the issues they represent to invisibility. By charismatic, I am referring to a conscious rendering of an issue so as to speak directly to certain pre-identified values and morals (Pine and Liboiron 2015). An example of what is left out of focus in the charismatic role of e-waste at Agbogbloshie is the open landfill in the middle and on the fringes of the scrapyard. This landfill is not acknowledged for the immediate public health risks it poses to workers at the site and adjoining residences. Another dimension of invisibility is the source of the e-waste processed at Agbogbloshie. The role of historical domestic consumption of e-discards in Ghana has rarely been considered. Yet my research (Akese 2014) and that of others (see, for example, Amoyaw-Osei et al. 2011 on Ghana; Yu et al. 2010; Lepawsky 2015a) suggest domestic sources of e-discards are more important in terms of sheer mass than are imports.

Ghanaians have been consumers of electronics in many forms for decades. As far back as the 1930s, the British colonial administration introduced public radio as an instrument for grounding colonial policy in what was then the Gold Coast. Public broadcasting through radio and television (TV) grew significantly after the country gained independence in 1957 (Karikari 1994). The national public broadcaster, Ghana Broadcasting Corporation (GBC) introduced Ghana Television (GTV) in 1965. Since then, the number of private TV stations and TV consumption in the country as a whole has grown significantly, especially at the turn of the millennium. As of 2003, for instance, only 26% of Ghanaian households had television. This changed drastically with a recorded 47% in 2009 and 93.1% in 2017 (EconStats 2018; Tradingeconomics 2018). These electronics eventually reach their end-of-life. Thus, the rise in consumption of electronics in Ghana has grown hand in hand with informal recycling of these

e-discards in places like Agbogbloshie. Yet the conventional narrative about Agbogbloshie typically ignores domestic generation of waste, tending to treat the presence of discarded electronics as an index of symbolic and material pollution of biblical proportions from outside sources. As I discuss in Chapter Four, in some cases, the representations of Agbogbloshie invoke biblical scenography such as "hell." Another telling example is the recently halted "Project Eden" run by the International Criminal Police Organization (INTERPOL). It is within this context that I probe the iconic representations of Agbogbloshie as a global symbol of the crisis of e-waste and the implications thereof.

Approaching nuanced geographies of e-waste

A growing amount of research focuses on issues of e-waste volumes and global flows. The central question of how much e-waste is produced globally (Robinson 2009; Kumar, Holuszko, and Espinosa 2017; Yu et al. 2010; Breivik et al. 2014) and allied questions about how much of this waste circulates to other places are central in e-waste studies (Lepawsky 2015a; Kahhat and Williams 2012; Lepawsky and McNabb 2010; Grant and Oteng-Ababio 2012; Furniss 2015). Quantification of e-waste, such as volumes generated, where it is generated, and its subsequent circulation, plays an important role in how e-waste is viewed as a problem. It is argued that there is an "e-waste crisis" because as of 2018, 50 million metric tonnes of this heterogenous material stuff were produced annually (UNEP 2015a). It is further alleged that anywhere between 60 and 90% of this global production of e-waste makes its way to "developing countries," to places such as Agbogbloshie, a site reported to be one of the largest recipients of global e-waste flows into Africa (UNEP 2015a).

When e-waste is cast as a numerical problem, the numbers themselves become problematic within e-waste science and advocacy, not least because of how they are arrived at (Davis and Garb 2018). That is, the numbers on how much e-waste is produced in one place and how much travels to other places become "matters of concern" (Lepawsky 2014; Latour 2004), warranting an examination of how they are built and to what effects (see, for example, Lepawsky, Goldstein, and Schulz 2015), as well as the stakes in privileging one measurement over the other (c.f O'Brien 1993). For example, in an interrogation of UNEP's Waste Crimes-Waste Risks report (UNEP 2015a), which estimates e-waste exports to Ghana, Lepawsky, Goldstein, and Schulz offer this assessment:

> The *Waste Crime* report states 40,000 tons are imported into Ghana annually. On one hand, 40,000 tons is an order of magnitude *less* than what 300-600 40-foot containers are physically capable of carrying. But, the more important point here is that it is *physically impossible* for 300-600 containers per month to deliver "hundreds of millions of tons" of e-waste per year to Ghana. To deliver hundreds of millions of tons, one would need about 300,000 containers arriving per month (which would result in 109,728,000 metric tons annually). Yet, World Bank data on container shipments for Ghana suggest the possibility of 300,000 containers arriving per month to be a risible assumption: the latest data available show Ghana's ports moved a total of 793,312 TEU (20-foot equivalent units) in 2013. 300,000 40-foot containers amount to 600,000 TEUs per month–or 7.2 *million* TEUs annually, nearly 10 times the TEUs recorded for Ghana in 2013 for all commodities shipped to/from the country in that year. In no sense, then, are claims of "hundreds of millions" of tons of e-waste arriving annually in Agbogbloshie credible claims (2015; emphasis in the original).

Others have pointed out similar issues of estimates of export in e-waste research. Breivik et al. (2014) question whether the global estimates that define e-waste as a problem add up, arguing there are significant uncertainties in how these estimates are generated in the first place. Davis and Garb also make a compelling case for robust and systematic quantification of material processing at informal e-waste hubs in the global south, arguing that "data gaps are too often filled with opaque descriptions, narrow or convenience samples, anecdotal interviews, unsubstantiated media reports, or unreliable international trade data" (2018, 4).

One importance of empirical (re)assessments of e-waste estimates is that, at the very least, they reveal the exaggerations and at times poorly built figures perpetuated in the midst of the difficulties involved in quantifying e-waste flows (Kahhat and Williams 2012; see Lepawsky 2015a for a discussion of challenges in mapping e-waste flows). They remind those interested in these estimates to approach them as "matters of concern" rather than "matters of fact." How we define, measure, and analyse e-waste is inseparable from how e-waste as a problem is perceived, framed, and tackled (Liboiron 2014b, 2015b; Lepawsky 2018). In this dissertation, then, I take on the task of opening up the politics of quantification in exploring Agbogbloshie's representation as "the world's largest e-waste dump."

A discard studies sensibility

The emerging interdisciplinary field of discard studies also informs the kinds of questions I ask. Broadly, the field of discard studies takes a critical approach to the study of 21st-century waste. Scholars in this field "question the premises—the assumptions of what seems natural, normal, logical, and inevitable—of waste to investigate the wider systems that allow things to seem natural, normal, logical, and inevitable in the first place" (Liboiron 2018).

Put simply, discard studies open the black box of discards, revealing that underlying what are often perceived as just material waste and thus often prescribed technical fixes (i.e., via waste management) are complex histories, geographies, and politics which must be grounded to reveal and tackle the systematic presence of 21st century waste. Discard studies can be thought of as an epistemological/critical sensibility to the study of the stuff considered waste. Thus, to embrace a discard studies sensibility means to approach and study waste in a particular way. In what follows, I highlight two discard studies provocations influencing the kinds of questions animating the dissertation: (1) attention to the materiality of e-waste and its geographies; (2) the politics of measurement that is part of doing e-waste science and advocacy.

Although ubiquitous, waste is mostly invisible (Liboiron 2014a), partly because the majority of waste (constituting about 97% in the US and Canada) is industrial and thus unfamiliar to the average person (MacBride 2011; Liboiron 2018). Municipal waste, with which most people are familiar, only accounts for about 3% of all waste generated. In the case of waste from digital technologies, carbon emissions released over the lifetime of these technologies predominately occurs during the mining of materials and production (see Lepawsky 2018, 143). For Apple's iPhone 7, for instance, 78% of the total greenhouse emissions in the product's lifespan occur in production (Lepawsky 2018). In contrast, 18% and 3% are released in its use and transportation respectively. The uneven scale and location of discards arising from electronics mean that although consumer waste is often targeted in waste policies and interventions, there is a wider system of waste that is not always visible. By wider system, I am gesturing to not just the material stuff of waste, specifically municipal waste, but also the social, cultural economic, and political infrastructures within which the material stuff of waste is produced.

A discard studies analysis pays attention to this often-hidden wider system of waste. Importantly, it takes waste as infrastructure, thus accounting for the geographies constituted in and through it and what they make besides waste. For example, the politics of waste is a key aspect of discard studies, eliciting such questions as the following: as waste is ubiquitous yet unevenly distributed, who benefits and who is harmed?

As the dissertation is informed by such a sensibility, the material stuff of e-waste is not my sole focus. I am not so much interested in e-waste as a primary object of study (hence my use of e-discard instead of e-waste), although the material properties of this waste, such as its heterogeneity and toxicity, cannot be disentangled from its geographies and politics. Rather, what interests me are the wider systems, such as the economies, forms of harm, and the ways of life, in which this material is immersed, and which constitute it in particular places. That is, for me and like others who take a critical approach to discards, accounting for the wider system of waste means examining histories, geographies, and politics of e-waste at Agbogbloshie because there is more at stake than the material stuff of waste itself.

Specifically, and as will become increasingly clear through the rest of the dissertation, e-waste is not just a material of technical nature being "managed" at Agbogbloshie. Rather, the geographies and lived experiences called into being through e-waste processing and its narratives reveal sedimented colonial histories and present in very different yet concrete and immediate ways. Here, I echo discard scholars such as Gregson, Metcalfe, and Crewe (2007), Hetherington (2004), and Evans (2012) who have long argued that more is produced in the acts of discarding than the material being tossed out or moved along. In their study of discarding practices in UK households, Gregson, Metcalfe, and Crewe (2007) found that when people rid themselves of things either through the rubbish bin or donations, they create and

perform identities, such as those around good citizenship, care, and responsibility. They write that "it is through practices of divestment that we continually re/constitute social orders, using what we do with and to things—including how and where we place them—to constitute narratives of us, of others and our relations to them" (Gregson, Metcalfe, and Crewe 2007, 198).

In the dissertation, I gesture to other instances of discarding making more than waste. Specifically, I show that at Agbogbloshie, e-waste is as much about waste as it is about a broader political economy of land struggles. Yet this struggle is barely acknowledged in the dominant narrative of e-waste at the site. In Chapter Two, I detail a broader geohistory of Agbogbloshie and show its relevance in understanding the contemporary landscape of e-waste processing. I argue that more often than not, the geo-history of the site is taken for granted in how e-waste science and advocacy are done at Agbogbloshie. At the very least, such erasure is problematic because it does not allow a nuanced understanding of why e-waste processing emerged at Agbogbloshie in the first place or the scaled interventions that may be prudent (Akese and Little 2018; Davis, Akese, and Garb 2018). In Chapter Four, a closer examination of iconic representations within e-waste texts on Agbogbloshie reveals that the continued take-up of certain statements in e-waste advocacy and science have effects, including contributing to certain forms of harm experienced by people living and working at the site (Lepawsky and Akese 2015).

The second discard studies sensibility that informs the questions I ask has to do with the politics of measurement or quantification. Measurement, the act of quantifying something, is fundamental in many critical social studies of waste. Prominent discard studies scholar Liboiron (2013) argues measurements have social and political implications. By this, she means

that "what is selected for measurement and what is not, how measurements are standardized, what counts as an important unit of measure, and how measurements are used all have stakes for the systems of which they are part" (Liboiron 2013) because measurement and the quantitative work implied with it "enact" (Mol 2002) things into being. For example, measures of waste such as per capita waste generation (i.e., Canadians generate 777 kg per capita of waste) inadvertently suggest individuals make waste. Again, the measurement of per capita waste suggests individual behavioral changes will reduce waste (see Liboiron 2013 for a detailed discussion). Yet as I have already pointed out, a significantly higher proportion of waste is produced before individual consumption. Measurement is, therefore, not a neutral task devoid of interests. Nor are the results of measurements free from potentially misaligning actions and interventions (see Pine and Liboiron 2015 for a review of this literature; MacKenzie 2003; MacBride 2011; Robertson 2012). The choice of what to measure, how to measure, and the result of the measurement are all political acts.

Informed by this notion of the politics of measurement, I examine how the quantified work (or lack of) in representations of Agbogbloshie is done. I open up the black box of quantification in several ways. First, in Chapter Three, I describe how, using a participatory method, I did a survey with workers at Agbogbloshie to understand the quantities of e-waste compared to the other scraps processed at the site. I question the taken for granted assumption that Agbogbloshie is "the world's largest e-waste dump." Second, in Chapter Four, I examine what work claiming Agbogbloshie is "the world's largest e-waste site" does and to what effects.

Methods

To answer the questions raised above, I took a mixed methods approach. This entailed three approaches working in concert: a participatory citizen science execution of a discard survey, ethnographic interviews at the Agbogbloshie scrapyard, and the use of controversy mapping tools and techniques to trace patterns of statements within e-waste texts. Elliott's proposition that "the question shall determine the method" (2004, 240) informed my decision to take this mixed approach. Rather than having an overall method for the entire dissertation, I chose appropriate methods in relation to the specificity of each of the research questions. As the questions evolved in response to conditions in and out of the field, I evaluated the appropriateness of methods to emerging issues, questions, and contexts. For example, in the participatory citizen science design, it was important for me to be open to revisiting and amending the research questions in relation to the citizen scientists with whom I researched at Agbogbloshie. As will be seen later in the individual empirical chapters, while the research questions in themselves did not change drastically, certain methods had to be altered to suit the field conditions. Partly because of this strategy, I discuss individual methods in much more detail in the chapters that take on each research question. Here, I simply sketch a broader overview of key methodological sensitivities that were crucial to how I framed the research questions and how I selected the methods to answer them.

A participatory citizen science approach: a discard survey

A participatory citizen science approach informed my fieldwork at Agbogbloshie. Citizen science, or the participation of lay people in the processes of scientific inquiry, has become a popular research tool with an expanding range of practices (Silvertown 2009; Conrad

and Hilchey 2010; Bonney et al. 2009). Broadly, the context within which citizen science research is flourishing includes the democratization of science, declining state funding for research, growth in information technology, and the big data revolution (Silvertown 2009). Within the field of discard studies, citizen science has gained currency for its potential to engender citizen monitoring of pollution (Conde 2014; Toxic News 2017; Gabrys 2014; Liboiron et al. 2016; Hyder et al. 2017). With the growth of civic media in the form of low-tech sensing devices, Do-It-Yourself (DIY) or Do-It-With-Others (DIWO) tools[9] are now available for citizens to investigate and seek out interventions in various forms of pollution in their communities and elsewhere, either on their own or in partnership with university-affiliated researchers who share their concerns (CLEAR lab, n.d.; MIT Media Lab, n.d.) For example, in the aftermath of the Deepwater Horizon oil spill in 2010, citizen scientists using balloon-mounted cameras were crucial to documenting the impact of the oil spill on the landscape (McCormick 2012). The Globe at Night (GaN) project is another citizen science initiative where lay people use their cell phones to collect and geo-tag data to track light pollution. Another example from my own department at Memorial University is the Civic Laboratory for Environmental Action Research (CLEAR). Its Monitoring Marine Plastics Project (CLEAR lab, n.d.) makes protocols and DIY technologies available so that people who lack credentialed expertise can track and document marine plastics.

The benefits and pitfalls of citizen science are well documented (Dickinson, Zuckerberg, and Bonter 2010; Riesch and Potter 2014; Toogood 2013). The benefits include the ability to do broader scale research with large longitudinal data and to engage citizens' knowledge of the scientific process; the pitfalls include the quality of data, along with the

[9] An example is a helium-filled balloon with a mounted camera for areal mapping.

coordination of data from volunteers with variable educational and professional skills and ethical questions around data ownership and participation (Bonney et al. 2009; Purdam 2014). Despite these challenges, there is enormous potential for citizen scientists to engage in scientific pursuits, either on their own or in collaboration with research institutions.

Within the interdisciplinary field of discard studies, citizen science research is on the rise. In many ways, citizen science aligns with the "participatory" and "interventionist" methodologies and orientations of discard studies. Discard studies is driven by an imperative to intervene in the wider systems of waste and wasting (Liboiron 2018). As noted above, rather than just study waste, discard studies scholars question the state of affairs. More importantly, recognizing that waste has uneven material consequences for different people in different places, scholars often work with those people who bear a disproportionate burden. Such collaborative alliances not only document waste; they also intervene in the consequences of waste, thus pursuing "justice" in various forms, be it environmental, economic, political, anti-colonial, or some combination thereof (Roberts 2015; Dillon 2013; Liboiron 2015b).

Citizen science methods within discard studies, however, tend to favour research in marine environments, the collection of long-term environmental monitoring data, and Environmental Justice (EJ) mobilizations (Conrad and Hilchey 2010; see Dhillon 2017 for a review of this literature). In doing so, particular notions of citizenship are privileged—those to do with environmental stewardship (Conde 2014)—at the expense of other modes of civic engagement, such as economic or social justice (for an example, see Araujo 2016). In addition, specific placed-based and small-scale studies, as well as experimental studies, are rare. As recently argued by Hyder et al. (2017), even in the area of documenting marine pollution (where

arguably we have witnessed the most use of citizen science methods in discard studies), there are rare instances of mobilizing citizen science to document small scale spills.

These absences partly informed my interest in using citizen science as a research tool in pursuing a non-monitoring study within a scrapyard environment. More specifically, I was interested in whether and how citizen science could be used to study discards when issues of environmental pollution are not necessarily at stake and the environment is not a marine one. What potential does citizen science hold for quantifying discards at Agbogbloshie, not for environmental monitoring per se, but for probing questions into how e-waste science and advocacy is done at the site? As I show in Chapter Three, the participatory citizen science discard survey made it evident that the allure of Agbogbloshie as a key site for global e-waste science and advocacy has resulted in workers experiencing over-research and research fatigue. Yet precisely because of the focus and design of engagements, whether research, journalism, or advocacy, workers are seldom allowed to voice their perceptions and concerns.

The second rationale for using a citizen science framework relates to the nature of prior research and advocacy engagements at the site. To explain my concern, it is important to briefly touch on the various knowledge-making actors who converge around issues of e-waste at Agbogbloshie. In addition to academic fieldwork, a plethora of interests, including developmental organizations, international ENGOs, local and international news media, artists (i.e., photographers and musicians)[10], international recycling businesses and advocates, and slum tourists, converge at Agbogbloshie. As I elaborate in Chapter Three, Agbogbloshie is currently over-researched, and workers make claims of research fatigue. As documented in

[10] An example is the recent shooting of the UK band Placebo's "Life is what you make it" music video at the site *(The Independent* 2017).

other over-researched communities, it is the intersection of the diverse interests at those locations (Sukarieh and Tannock 2013; Neal et al. 2016; Mandel 2003; Pascucci 2017), whether on-the-ground fieldwork, project execution, touring, or on-location media reporting, that accumulate to produce research fatigue. Hence, it is crucial to consider the diverse "searches" for information while also identifying the diversity in how each group creates its knowledge and with what effects. I elaborate on these issues in Chapter Four.

Furthermore, participatory community engagement processes that draw on the skills and knowledge of workers at the site in the research process is curiously absent. I do not claim a complete lack of community awareness or research and advocacy engagement. Indeed, workers at the Agbogbloshie site have an organized group, the Greater Accra Scrap Dealers Association (GASDA) whose principal role is to protect the interest of workers. Increasingly, and in the wake of the influx of interest in the site, GASDA advocates for workers to city authorities, to Ghana's Environmental Protection Agency (EPA), and to NGOs while also taking on the primary role of regulating access to the site for research purposes. It is now impossible for a visible outsider, particularly a white person, to visit Agbogbloshie for research purposes without seeking permission from the executives of the association. A "go-ahead" for research by the leadership of the association, however, does not necessarily mean community engagement or participation. Motivated by the historical research practices at the site and current community resistance, I experimented with a different model of community-engaged research. I wanted to enroll the skills of workers at the site in the data collection by using participatory citizen science in my discard survey.[11] Simply stated, in this participatory citizen

[11] It important to note that at the time of my fieldwork a participatory research space was evolving at the site in the form of the Agbogbloshie Makerspace Platform (AMP) (Osseo-Asare and Abbas 2015), a collaborative project aimed at creating an innovation hub at Agbogbloshie by bringing together researchers, workers, and

science model, instead of researching workers and their activities, I engaged them as co-researchers.

In Chapter Three, I discuss the initial planning and execution of the citizen science discard survey in more detail. Within the interdisciplinary domain of citizen science research, a fuller diversity of citizen science practices is only recently being documented. In this vein, Pettibone, Vohland, and Ziegler provocatively suggest the need to "understand citizen science participants beyond the categories of scientist and volunteer" (2017, 10). As I demonstrate in Chapter Three, the participatory citizen science discard survey did not show contributions by eager laypersons to a particular knowledge domain. Instead, acting as co-researchers, the participants co-opted the processes of data collection to address fundamental questions relevant to their daily life as scrapyard workers in a heavily researched space.

Within this domain of becoming attuned to workers' concerns about research fatigue, ethnographic conversational interviews became another important method in this research. Silverman (2013) suggests research is an unfolding story**.** Within this unfolding story, the researcher makes sense not only of the data he/she/they collects but also of the total experience of which the data are artefacts. The total experience of the participatory citizen science at Agbogbloshie revealed more than the survey results, as I show in Chapter Three. Some workers at the site who were approached by the survey team refused to engage, preferring to voice concerns about what they perceived as overwhelming research attention. I used ethnographic conversational interviewing to document such concerns, recognizing their

students in the field of science and technology. My own decision to use citizen science was informed by my conversations with the project leads of AMP and my strong desire to contribute to expanding this emerging space.

relevance to what it means to "participate" in this research context. Conversational interviewing often emerges informally and conversationally in discussions of a specific topic with research participants (Roulston 2008).

Tools and techniques for controversy mapping

In letting the questions determine the method, I also drew on a suite of tools and techniques used by STS scholars to investigate controversies. In a process called controversy mapping, these tools and techniques allow scholars to navigate the uncertain terrain of knowledge claims about a given phenomenon and the public(s)[12] that emerge around it (Venturini 2012, 2010). Contemporary versions of controversy mapping tools and techniques have turned to digital platforms, where the workings of those platforms are about tracing the social (See Rogers, Sánchez-Querubín, and Kil 2015; Rogers 2019). In short, what controversy mapping does is to turn digital tools into indicators of underlying social patterns of understanding. In Chapter Four, I apply these tools and techniques to written texts about Agbogbloshie as an e-waste site. Specifically, I trace these written texts about Agbogbloshie as the appear on Google Canada. For STS scholars interested in the fate of knowledge claims such as particular statements or recurring patterns of statements, mathematical predictions, or even textural imageries, the examination of written texts is a useful methodological opening (O'Reilly, Oreskes, and Oppenheimer 2012; Mahony 2015; Lepawsky et al. 2019; O'Reilly

[12] I use public(s) in the sense of Marres' (2005) argument that issues spark publics into being. That is, the public does not pre-exist. Rather, it gels around issues of concern.

2015). I consider this approach to be an exercise in "studying up"[13] (Nader 1972; Stryker and González 2014; Biruk 2016) the knowledge systems of e-waste science and advocacy.

Substantive alignment of the dissertation

The arguments in this dissertation centre on the politics of e-waste science and advocacy. E-waste emerged as a public concern in the early 2000s through the important exposé and advocacy work of ENGOs (Coalition and Network 2002; BAN 2007; Greenpeace International 2008a, 2008b). In the intervening years, academics have taken a keen interest in many areas of this global phenomenon. Yet important questions remain, and, more importantly, much of the earlier understandings of this phenomenon are being re-examined (Lepawsky 2015a; Reddy 2015; Tong et al. 2014; Davis, Akese, and Garb 2018; Lawhon 2013; Akese and Little 2018). My dissertation aligns with studies attempting to both empirically document the uneven geographies of e-waste and reflexively examine the premises and effects of doing so. I critically engage with how e-waste science and advocacy are done in Agbogbloshie, notably how the site has been popularized as an e-waste hotspot and has become a recurrent site of e-waste science and advocacy.

Questions of space and place run through much of the burgeoning scholarship on e-waste. The dominant narrative within which the public or publics (Marres 2005) came to know e-waste centres on the popularized "problem" of a unilateral flow of such waste from wealthy developed countries to poor developing countries (Coalition and Network 2002; BAN 2007). As noted earlier, beginning in the early 2000s, ENGOs and prominent media drew attention

[13] To "study up" as originally invoked by (Nader 1972) entails refocusing research attention from marginalized people and places to the systems, places, and people of power. My attention to the knowledge practices of researchers and other knowledge producers as they circulate claims as part of doing e-waste science and advocacy is an example of studying up.

to e-waste flows and the hazards associated with the export of discarded electronics to developing countries. These ENGOs followed the "trails" of used electronics from "developed countries" to "developing countries" and exposed the dark side of the information economy, publishing images of men, women, and especially children without any protective gear burning polyvinyl chloride (PVC) wires and dwelling in clouds of toxic fumes from e-waste.

Two key issues are prominent in these early studies of e-waste. The first is attention to the scale and locations of waste flows. One ENGO asserted that between 50 and 80% of used electronics collected for domestic recycling in the US was shipped to informal e-waste sites in the developing world, mostly to China (Puckett et al. 2002). Despite the lack of empirical data, this assertion became a defining metric casting e-waste as a particular problem (Lepawsky 2018). The second is the development of an overriding storyline. Following the problematization of e-waste as predominantly a unilateral flow, marginalized populations living and working in e-waste hotspots in places like Guiyu in China, Lagos in Nigeria, and Agbogbloshie in Ghana became emblematic of a contemporary global crisis.

Yet there is more to these sites of cottage industry recycling than is reported in early studies. For example, what happens to e-waste when it gets to locations in the developing world? Informed by the Pollution Haven Hypothesis (PHH), early accounts suggest discarded electronics end up at dumpsites in developing countries (Höges 2009; 60 Minutes 2008; PBS 2009). However, emerging geographical scholarship interested in the spatialities of e-waste is asking where e-waste travels, who works with it, and in what conditions. Detailed ethnographic studies find more nuance in these locations; they are not just dumpsites. For example, Lepawsky and Billah's (2011; see also Lepawsky and Mather 2011; Reddy 2015; Tong et al.

2014) research on the e-waste industry in Bangladesh shows that instead of trails of e-waste leading to dumpsites overflowing with debris, the paths of discarded electronics lead to production sites where electronics are transformed and recirculated through reuse, repair, repurposing, and remanufacturing activities. Similarly, in Agbogbloshie, Grant and Oteng-Ababio (2012) detail the diverse worlds of work that horizontally and vertically integrate and connect e-waste within urbanizing Accra and beyond, such as the scavenging for parts or the repair and repurposing of discarded electronics. Thus, although e-waste eventually gets to sites such as Agbogbloshie, this is only after they have gone through rounds of reuse in the rapidly growing city of Accra. Crucially, even at Agbogbloshie, e-waste is not merely "dumped" but processed (at times in unhealthy ways) and redirected into further rounds of production activities inside and outside Accra.

Among other things, what has become clear from the emerging studies on the geographies of e-waste is that rather than taking the influential well-known storylines of e-waste as given, we need to engage in a critical assessment of what we know about e-waste (Lepawsky 2015a; Reddy 2015; Tong et al. 2014) and rethink its dominant narratives. Lepawsky recently made the provocative statement that we need to "think differently about the past, present, and likely future patterns of international trade and traffic of e-waste" (2014b, 1). Lepawsky makes this claim because, as noted earlier, many of the basic premises about the scale and patterns of e-waste flows remain unquestioned despite emerging evidence. For example, it is widely thought that e-waste unilaterally flows from developed to developing countries. Yet actual trade data augmented by ethnographic research show that flows of e-waste are much more complex; e-waste trade is highly regionalized within Europe and North America, and growing amounts also flow between "developing" countries themselves

(Lepawsky 2015a; Yu et al. 2010; Kahhat and Williams 2012; Kirby and Lora-Wainwright 2015). Overall, the emerging scholarship on the geographies of e-waste suggests the prevailing narratives on e-waste need to be carefully reconsidered.

The dissertation's approach and arguments align analytically with calls to rethink the dominant narratives, taking the case of the popular e-waste narrative of and about Agbogbloshie in e-waste science and advocacy. I consider the specific conditions of possibilities and limits that underwrite the myopic narratives of Agbogbloshie. In doing so, I demonstrate what is at stake in how we do e-waste science and advocacy and the implications for particular places and peoples. In my engagement of the rethinking literature, I argue for the need to pay attention to the geographies (specific places like Agbogbloshie) that underwrite the dominant narratives.

Specifically, I examine the e-waste science and advocacy on and about Agbogbloshie to argue that certain ways of doing them are not useful and can even cause harm. Although the intention is to make visible the environmental and health effects of e-waste, the narratives produced are not just about representations; they do work, including adding to the harms experienced by those who live and work at Agbogbloshie. As I demonstrate throughout this dissertation, certain kinds of reporting in the e-waste science and advocacy at Agbogbloshie mis-specify the problems at the site; as a result, their goals or recommendations are guaranteed to fail even on their own terms. For example, if eradicating toxicity at Agbogbloshie is the goal, banning exports to Ghana (or non-OECD countries) of electronics discarded in Europe (or OECD countries) will not solve the problem. More troubling, however, and as I show throughout the dissertation, beyond mis-specifying the problem, certain representations do several forms of harm to people who live and work at Agbogbloshie. For example, they

increase their vilification by Ghanaian elites with interests in the land; they reinforce the idea that end-of-pipe solutions to electronic discards like recycling will work; they offer solutions, such as stopping flows of discarded electronics from the OECD countries to Accra, that won't work. They also make it difficult to turn the analyses to where they need to look: upstream in the design and production of electronics long before they become waste.

Chapter synopses and outline

Following this introductory chapter (Chapter One), which articulates the research questions and motivations driving the dissertation, the rest of the dissertation is organized into three main empirically-focused chapters. This is followed by a concluding chapter (Chapter Five) tying the key arguments together and discussing possibilities for future undertakings.

Chapter Two, "Post-colonial Agbogbloshie: accounting for the urban political economy of the site in e-waste advocacy and science" introduces the political economy of Accra, particularly the emergence of Agbogbloshie as a scrapyard and informal space of prominence within Accra. Few studies on e-waste at Agbogbloshie directly engage with the site's broader local political economy as worthy of note or even relevant to understanding e-waste politics. Andersson underscores this neglect when he notes that "representation of e-waste is characterized by portrayals of e-waste dumping grounds as strange, alien spaces… with no clear and comprehensive histories" (2017, 2). Herein lies the purpose of Chapter Two: the familiar imagery and textual representation of Agbogbloshie hardly ever account for the urban political economy of land struggles at the site. Yet as I show, these struggles are important to gain a deeper and more nuanced understanding of e-waste politics and reveal the implications of how e-waste scientist and advocacy organizations typically frame the site. I make a claim

that is revisited throughout the rest of the dissertation: the socio-spatial history of Agbogbloshie matters if we are to not only appreciate the emergence of the informal e-waste industry and associated politics but also to more carefully think through what is arguably a decade of failed attempts to address some of the environmental and health challenges at the scrapyard.

Chapter Three, "Where is the e-waste? A participatory citizen science survey of discards at Agbogbloshie," presents the process and result of a participatory citizen science discard survey done with workers at the Agbogbloshie scrapyard. This participatory discard survey ascertained the relative proportion of e-waste to the other forms of waste processed at the site. The chapter situates the survey within recent quantification efforts in e-waste research and sets the results within the representational work on Agbogbloshie as an overflowing e-waste dumpsite. As noted earlier, the claim that Agbogbloshie is "the world's largest e-waste dump" is now an urban legend or academic urban legend (Rekdal 2014). To the best of my knowledge, there have been limited efforts to inventory and systematically characterize the e-waste or general scraps processed at the site. Yet claims about the size and dominance of e-waste processed there are central to the narrative produced and used by environmental journalists, ENGOs, and academics. This chapter presents data on the types and quantities of discards processed at Agbogbloshie. Contrary to popular representations, my systematic methods of data collection find e-waste represents a modest amount of the total mass of scrap materials processed at the site. The results of the survey show that the most salient category of materials is automobile discards. Automobile scraps appeared in 35 out of 43 plots, showing a relative frequency of about 81%. Electronics appeared in 22 plots, representing a relative frequency of 51%. This result has important implications for proposed solutions and the

current interventions aimed at addressing the environmental challenges at Agbogbloshie. Specifically, the relative amount of electronics scraps reveals what I argue is a "sectorial mismatch" (c.f MacBride 2011) in the proposed solutions and interventions; the specific actions implemented do not target the relevant waste sector to achieve any meaningful impact.

Chapter Three also develops and demonstrates an innovative waste survey method that combines a quantitative discard survey and qualitative landscape ethnography. While waste characterization and quantifications methods (e.g., discard surveys, waste assessments or audits, waste composition analysis, waste diaries, or more generally, "garbology"; see Rathje and Murphy 2001) are well developed in waste and discard studies in general, very few methods are amenable to all types of waste. Different wastes behave and matter differently in diverse environments (Liboiron 2015b, 2014a). Surveys for sampling marine plastics on a sandy beach, for instance, should work for a rocky beach, but this is often not the case. Survey methods must change with the context because standards assume a particular set of environmental conditions. For example, a survey of plastic debris at a beach might not work for a scrapyard setting. In addition to the environmental conditions, surveys must account for different animations of waste in the sense of wastes' ability to act (Bennett 2010; Gregson and Crang 2010; Gregson, Watkins, and Calestani 2010; Gregson 2011).[14]

For e-waste, in particular, quantification methods are even more limited, as it is challenging to quantify this waste and its flows for a number of reasons, including the inability to clearly designate what constitutes e-waste, the ubiquity of illicit flows, and a general absence

[14] Here, I am invoking the affordances of waste that are richly explored in the discard studies literature, from waste's transgressive presence to order (Laporte 1978 (2000); Douglas 1966) to its ability to "become" in practices and thus surprise and bite back (Gille 2007; Gregson 2011; Gregson, Watkins, and Calestani 2010) and disturb systems of containment (Muecke and Hawkins 2003).

of formal trade data (see Lepawsky 2015a; Lepawsky and Mcnabb 2010; Kahhat and Williams 2012). There are even fewer methods to quantify place-specific instances of e-waste within "e-waste hotspots" (see Davis and Garb 2018 for a recent innovative method). This is surprising, as such hotspots are popular sites for identifying e-waste as a problem of numbers (too much is produced) and as a problem of quantity with too much in the "wrong" places. In executing a participatory survey with co-researchers at the site, I experimented with and developed a quantification method amenable to a scrapyard landscape.

Chapter Three's revelation of the exact quantities of e-waste processed at Agbogbloshie and how these fit into the widely circulating representations of the site as "the world's largest e-waste dump" raise a set of fundamental questions. These questions form the basis for Chapter Four. While knowing the proportion of e-waste processed at the site vis-a-vis other types of waste is crucial, it is even more important to consider the questions this quantification raises and what effects these numbers have. That is, I recognize the need for "critical quantification" to probe the processes, issues, and questions raised by the absence or presence of data and the patterns within certain data sets (Kwan and Schwanen 2009; Moore et al. 2017; Blue and Brierley, 2016). Chapter Four, "Diving into e-waste texts: geographic imaginaries in e-waste science and advocacy at Agbogbloshie," embarks on such an exercise. It confronts some of the key questions triggered by the quantified data in Chapter Three. From where and from whom did the claim about Agbogbloshie as "the world's largest e-waste dump" emerge, given that e-waste is not a significant waste at the site? How has this claim been taken up and with what consequences or effects within e-waste discourse in the scholarly and grey literature, as well as within e-waste advocacy and interventions at Agbogbloshie and beyond?

In answering these questions, Chapter Four explores iconic representations of Agbogbloshie within e-waste science and advocacy. I map out the corpus of text on e-waste at the site from 2008 to 2018 to trace key patterns of such statements as "the world's largest e-waste dump site" (*The Guardian* 2014b; McElvaney 2014). For example, as I show, the imaginary of size invoked in the statement "Agbogbloshie is the world's largest e-waste dump" and its variants persists in many texts on e-waste at Agbogbloshie. These statements gesturing to Agbogbloshie's size are often staged as justificatory moves for the author(s) of these texts, acting as a warrant for research on, writing about, and representation of the site. For those who write about the site, making such a move may seem banal. It may be an intentional move to tell a compelling story or an inadvertent one, as the author simply restates and perpetuates an academic urban legend (c.f Rekdal 2014). However, as I show, such statements and their continued use e-waste discourse and practice have effects, including the contribution to certain forms of harm experienced by people living and working at the site (Lepawsky and Akese 2015). That is, the patterns of statements and geographical imaginaries they evoke are not simply representations of Agbogbloshie. They have real material consequences (c.f Gregory 2009). To think critically about the so-called e-waste problem at Agbogbloshie and more broadly within e-waste science and advocacy, I consider these material consequences.

Chapter Five, "Redoing e-waste science and advocacy at Agbogbloshie," offers some concluding remarks, taking a step into the politics of the questions explored in the dissertation. As I noted earlier, there are politics to all knowledge endeavours, in that asking certain questions means not asking others, and there are stakes in pursuing any line of inquiry (O'Brien 1993). In the concluding chapter, I engage in a more careful interrogation of how we might do e-waste science and advocacy given the spaces opened by the dissertation. Put differently, I

ask and answer the question: as the representations of Agbogbloshie clearly matter and have implications for the lives of the people who live and work there, how might we do e-waste science and advocacy at the site in ways that are cognizant of the generative consequences of knowledge creation?

Chapter Two

Post-colonial Agbogbloshie: accounting for the urban political economy of the site in e-waste advocacy and science.

Representations of e-waste is characterized by portrayals of e-waste dumping grounds as strange, alien spaces… with no clear and comprehensive histories. (Andersson 2017, 2)

Introduction

On June 3, 2015, Ghana was in the international news *(*BBC 2015; CNN 2015*; The Guardian* 2015). Accra, the capital city, had flooded. The torrential rains that pour on the city in the peak rainy season of June-July started on Monday, June 1. By Wednesday, the rains had submerged several parts of the city. This was nothing unusual. Ghanaians are used to the wet season. The lived experience of the city's inhabitants is that when it rains, Accra floods (DailyGraphic 2015; Amoako and Boamah 2015; UN-Habitat 2011). The June 3 flood left more in its wake than anticipated, however. By late Wednesday, the Kwame Nkrumah Circle was submerged, resulting in heavy traffic within the city, bringing commercial activities to a halt, and trapping commuters. At a nearby Ghana Oil Company Limited (GOIL) fuel station, the flood waters began to displace fuel from an underground tank. The water carried the fuel until it was ignited by a naked flame 300 metres from the fuel station. This flame subsequently travelled to the source of the leak at the GOIL station resulting in an explosion that claimed the lives of over 150 people. Many of those killed were seeking shelter at the fuel station because of the closure of roads and public transport services. In the days following what is now remembered as the twin disaster of flood and fire, the President announced three days of

national mourning (BBC News 2015; CNN 2015; NewsGhana 2015). Ghanaians mourned the dead while engaging in post-event conversations of whom to blame for the disaster (Roxburgh 2015).

Old Fadama and the Agbogbloshie scrapyard, informal settlements on the banks of the Odaw River and Korle Lagoon, featured prominently in the national conversation on the cause of the flooding (Amoako 2016; Amoako and Inkoom 2018; Amoako 2016). Korle Lagoon is the primary runoff water receptacle for the city of Accra. Most of the major drainage channels in the city connect to the lagoon, which drains into the Atlantic Ocean at the Gulf of Guinea. According to the local city authority, the Accra Metropolitan Assembly (AMA), the existence of the two settlements resulted in the inability of the lagoon to properly absorb and channel the flood waters of Accra (MyJoyOnline.com 2015). The residents, AMA contended, had polluted and clogged the lagoon to such an extent that it pushed the rainwater back into the city rather than channelling it into the sea as the natural hydrology of Accra would otherwise have it. Thus, on Saturday, June 20, 2015, under the direction of the AMA chief executive, armed military and police personnel entered Old Fadama/Agbogbloshie and violently tore down structures with bulldozers and cranes (Citifmonline 2015). June 20 constituted a second disaster as over 20,000 residents of the two communities, mostly women and children, were rendered homeless and had to face the harsh rainy conditions in the open. Ghanaian citizens became internally displaced persons. Both local and international organizations, including Ghana's Commission on Human Rights and Administrative Justices (CHRAJ) and the United Nations country representatives, quickly condemned this forced eviction of a vulnerable population (GhanaWeb 2015a).

Other events erupted in its wake. Unhappy with the actions of the AMA, the youth of Old Fadama/Agbogbloshie took to the streets of Accra. They made their way to their elected lawmakers in Ghana's parliament to protest the curtailing of their entitlement to occupy these urban spaces and participate in decision-making on them. In essence, they protested the lack of recognition of their "right to the city" (Harvey 2008; Bhan 2009; Gillespie 2016). The protest turned violent when the protestors clashed with security forces. This resulted in the destruction of various properties and arrest of some of the protestors (Modern Ghana 2015). On the heels of the violent protest and in response to condemnation from the international community, some members of the legislature visited the displaced residents with relief items and assured them that the demolition was over.

The assurance and the relief items did very little for the homelessness and loss of livelihoods of those evicted. With no prior consultation or arrangements for relocation, the Ministry of Local Government and Rural Development pleaded with residents and provided free buses to transport the evictees to their hometowns in the northern part of the country (GhanaWeb 2015b; Nyabor 2015).[15]

[15] A substantial number of Old Fadama/Agbogbloshie residents are economic migrants from the Northern part of the country (Afenah 2012; Farouk and Owusu 2012; Prakash and Manhart 2010).

Figure 2.1: Police and military men enter Old Fadama/Agbogbloshie at dawn displacing over 20,000 residents. Source: Abdalla, Alhassan (@AbdallahIbn). June 2015. Tweet. https://twitter.com/AbdallaIbn/status/612164155064324096/photo/1 https://twitter.com/AbdallaIbn/status/612300680473219072/photo/1

The series of events in June 2015 was the most recent iteration of a much longer "intractable issue" (Afenah 2012) on land and housing rights in urbanizing Accra, relevant to the history and geography of Old Fadama and Agbogbloshie (Grant 2006; Plessis 2005; Sackeyfio 2012; Gillespie 2016). The land on which Old Fadama/Agbogbloshie sits has been a contested space since the pre-independence era when Accra was a colonial city of significance for commerce and colonial administration. This important history, as I will show, despite being directly relevant to the site today, is rarely mentioned in accounts of the economies of waste that have emerged there. Herein lies the purpose of this chapter: I make a crucial intervention to foreground the questions I explore in the rest of the dissertation. Specifically, I argue for an examination of Agbogbloshie's e-waste politics that refuses to collapse the complex, even intractable, issues about land at the site into facile images of "the world's largest e-waste

dump." It is essential, I argue, to consider the broader, highly contested issues of land rights, urban citizenship, and economic exclusions of post-colonial Accra within which the e-waste industry at Agbogbloshie emerged and continues to persist at the site.

Geographies constituted in and through waste

The literature on the politics of waste and the role of waste pickers in cities of the Global South have long drawn attention to how waste is not merely a technical or organizational problem to be "managed." Waste brings to the fore crucial issues of access to livelihoods, urban commons and citizenship rights, marginalization, and social justice, among other issues (Nzeadibe 2013; Moore 2008; Baabereyir, Jewitt, and O'Hara 2012; Cornea, Véron, and Zimmer 2017; Fredericks 2013; Gutberlet 2012; Lane 2011). One insight from these studies is that the political economy of cities matters when we are looking at how waste politics play out, and, conversely, waste is often a matter of politics in how modern cities are lived and governed (Melosi 2005; 2008; Gandy 1994; Benidickson 2007). For example, waste pickers' source of livelihood and access to public land within the urban space are increasingly contested by city authorities (Samson 2015; Parizeau 2015b, 2015a). Yet waste workers resist their stigmatization and marginalization through various avenues, including the formation of organized groups such as cooperatives, trade unions, trade networks, and associations (Fergutz, Dias, and Mitlin 2011; Chikarmane 2012; Dias 2012). Thus, in the last two decades, the history of waste work has been marked by struggles of resistance and mobilization in pursuit of resources, be they land, waste itself, or the right to the city.

Despite the relevance of diverse forms of struggles in waste work, and with few exceptions, writings on informal e-waste work at Agbogbloshie are divorced from engagements with questions of how the site's history, specifically the local realities of land,

housing, and resource struggles, shape the emergence of the site and its continued existence within the informal urban milieu. Even among emerging studies that employ a political economy and ecology lens to look at e-waste at the site, few directly engage with the site's broader political economy as worthy of note or relevant to contextualizing its current form (for exceptions, see Grant and Oteng-Ababio 2012; Akese and Little 2018; Amuzu 2018).

My goal in what follows is to offer a more in-depth history of Agbogbloshie. I do so with some caveats. This act of situating Agbogbloshie is not an instance of "this is some background information about Agbogbloshie worth knowing." Instead, I aim to demonstrate that the familiar imagery of Agbogbloshie through e-waste hardly ever accounts for the urban political economy of land struggles at the site. Yet as I show, these struggles are pertinent to gain a deeper and nuanced knowledge of e-waste politics and also to understand the implications of the claims made about Agbogbloshie within e-waste science and advocacy. In doing so, I make a point that will be revisited throughout the dissertation. The socio-spatial history of Agbogbloshie matters if we are to appreciate the emergence of the informal e-waste industry and associated politics, carefully think through a decade of e-waste science and advocacy, and deliberate the kinds of solutions that might actually work for the people who live and work at the site.

The wider space economy of Agbogbloshie

The Agbogbloshie scrap processing site is part of a vibrant informal space economy where commercial, industrial, and residential zones overlap. This wider space economy consists of relationships between four sites in the area: (1) the Agbogbloshie scrap market hosts e-waste processing activities; (2) the biggest fresh food market in Accra, the Agbogbloshie market, is located adjacent to the scrap market; (3) Old Fadama, an informal

settlement, sits east of the scrap market with the Odaw drain and headwaters of Korle Lagoon separating the two settlements; and (4) a light industrial zone, including a paint factory, a brewery, and branches of various banks and commercial business, lies opposite the scrap market and along the Abossey Okai road (Figure 2.2). Within this space economy, the Agbogbloshie scrapyard and Old Fadama function as an extended settlement: about 90% of the 4500-6500 estimated workers at the scrapyard make Old Fadama their home (Prakash and Manhart 2010).

The names Agbogbloshie and Old Fadama are often used interchangeably. For example, some use Agbogbloshie to capture the entire space economy described above, including old Fadama. Others separate Old Fadama from the wider space economy, identifying it as the slum/squatter settlement while considering the rest of the area under the name Agbogbloshie as a commercial space recognized and regulated by the local metropolitan city government (Grant 2006). Still for others, the distinction of Agbogbloshie from Old Fadama is irrelevant, as the whole space consists of informal economies along the upper reaches of Korle Lagoon, and the communities have shared vulnerabilities including flooding and land struggles (Amoako 2015; Plessis 2005).

The naming and identification of this community itself is a political act. Those who vehemently protest the diverse communities call them "Sodom and Gomorrah", a reference to the biblical city and an invocation of impending destruction (Grant 2006; Afenah 2012). For my purposes, I take seriously the functional interlinkages within this space economy because as I subsequently make clear, Old Fadama and the Agbogbloshie scrapyard have different but overlapping origins. The people who live and work at these sites share a united struggle to resist the state's attempt to evict the community from the land around the lagoon. Importantly,

my experience and interviews show they see it as an extended community. In this dissertation, therefore, I consider old Fadama and Agbogbloshie as one unit, hereafter Old Fadama-Agbogbloshie (OFA), because of their close social and economic ties and symbiotic relationship.

In what follows, I trace the socio-spatial history of OFA's space economy, taking Korle Lagoon as the point of entry. Specifically, I take Korle Lagoon as an environmental artefact and social relic (Cornea, Véron, and Zimmer 2017) fundamental to how land politics and urban environmental governance have developed around OFA from the colonial era until now.

As a settlement, OFA is fairly recent, gaining prominence only since the late 1980s. Therefore, I anchor my analysis in the upper reaches of the Korle Lagoon, the land on which the two communities currently sit, while grounding them in a much longer history of Accra. The history of OFA—via the Korle Lagoon environs—is one of struggles around citizenship rights, marginalization, and social justice grounded in post-coloniality (Akese and Little 2018). The crux of my argument in this chapter is this: tracing the emergence and subsequent development of informal e-waste processing at OFA within the historical processes that have shaped the city—particularly the land struggles around Korle Lagoon—provides an alternative reading of OFA, one not normally part of the narrative of the site as the "world's largest e-waste dump."

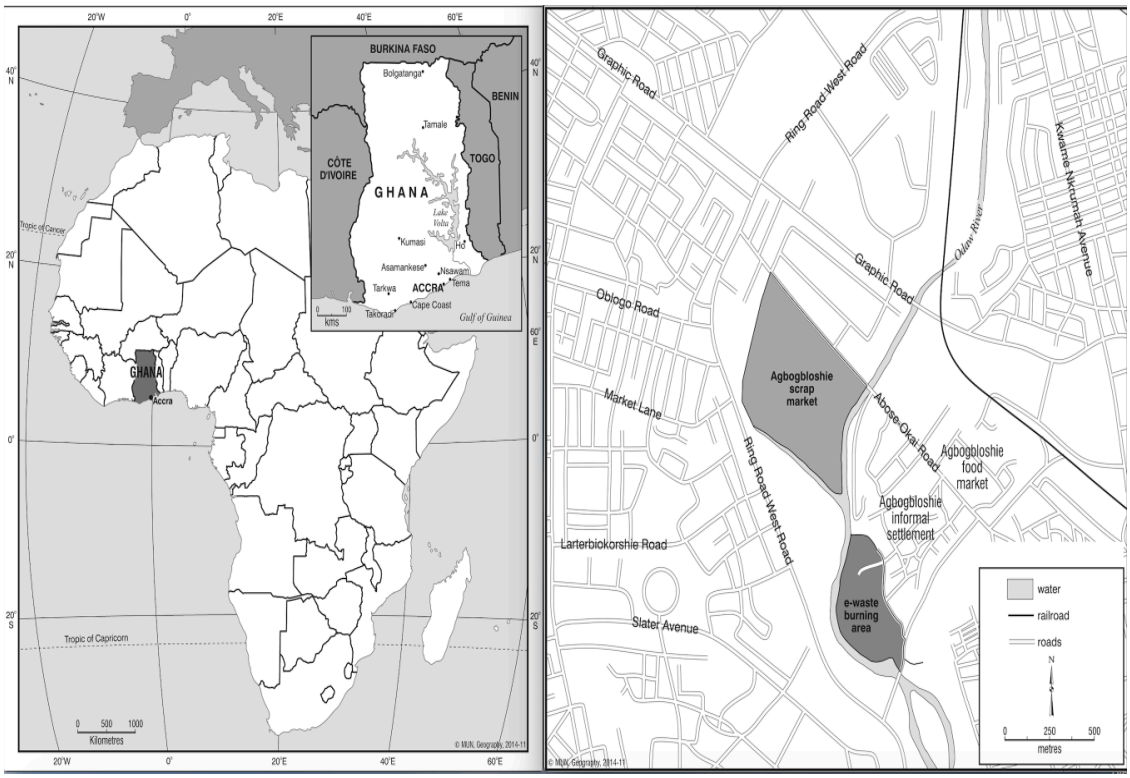


Figure 2.2: Map of Ghana showing Agbogbloshie scrapyard and Old Fadama (noted in the map as Agbogbloshie informal settlement). Map by Charlie Conway, Department of Geography, Memorial University of Newfoundland.

Old Fadama-Agbogbloshie: the land history of a site of colonial and post-colonial struggles

Korle Lagoon at the center of it all

Within the growing academic and advocacy work on e-waste at OFA, Korle Lagoon is often engaged as an afterthought. If recognised at all, it is seen as a tainted sink[16] (Gabrys 2009; Keeling 2005; Tarr 1996) that bears the burden of toxicity from e-waste processing. Environmental health studies of the OFA scrapyard usually highlight the contamination of

[16] Sink is a broad term capturing that which stores environmental burdens, including water bodies (Gabrys 2009, 677 for an elaboration)

Korle Lagoon and the Odaw River as a result of e-waste processing, such as the burning of electrical cables to extract copper (Huang et al. 2014; Hosoda et al. 2014; Chama, Amankwa, and Oteng-Ababio 2014). For example, Chama, Amankwa, and Oteng-Ababio (2014) identify high concentrations of trace metals, including copper, cadmium, lead, iron, chromium, and nickel, as well as organic pollutants, in portions of the Odaw river that run adjacent to the burning sites in the scrapyard.

Although recent toxicological studies of the lagoon attribute the high level of contaminants to e-waste activities, sources of pollution abound. Breweries and paint and textile factories located within the light industrial zone that is part of the OFA space economy discharge their waste into the lagoon (Boadi and Kuitunen 2002; Abraham, 2011; Karikari, Asante, and Biney, 2006). Mortuary wastes from the nearby Korle Bu Teaching Hospital[17] also discharge into the lagoon (Boadi and Kuitunen 2002). Studies have not quantified the pollution load of the e-waste industry relative to that of the other industries located in the area. Yet the toxicological e-waste literature suggests e-waste processing is the primary polluter, supposedly rendering the lagoon one of the most toxic water bodies on earth (Aglanu and Appiah 2014; Lundgren 2012). This situation raises questions about "the conditions in which a science of e-waste toxicity is produced" given the proliferation of pollution sources (Schulz 2016).

Korle Lagoon is more than a space marked by recent e-waste pollution. It occupies a central place in the history of Accra as an indigenous Ga settlement (Grant 2009; Dakubu 1997; Roberts 2010; Quayson 2014). As a Ga fishing village at beginning of the 16th century,

[17]Built in 1923, Korle Bu (translates to lowland besides the Korle) is the foremost healthcare facility in Ghana.

early residents of Accra settled around the lagoon.[18] Historian Jonathan Roberts writes that the Korle Lagoon is "an important node in the topography of Accra, both geographically and spiritually" (2010, 346). Geographically, although the size and path of the lagoon have changed over time, in the past, Korle's watershed delineated the boundaries of the indigenous Ga speaking areas of Accra.[19] Historians note that on their migration route to the Gold Coast, the Gas travelled along the headwaters of the tributaries of the main rivers flowing into Korle Lagoon (Dakubu 1997). Spiritually, Korle Lagoon is revered as a deity by the indigenous Ga communities in the area. Indigenous Gas recognize three founding deities. Nia, goddess of the sea, Sakumono, god of war, and Korle, the daughter of Nia (Dakubu 1997). These deities are pivotal in the socio-cultural functioning of Ga communities. It is believed that they regulate the relationship between members of the community and their physical and spiritual environment. The Korle Lagoon deity, Naa Korle Aboyoo, is revered as the spiritual head of the land, and she rewards or punishes the community for its behaviour. Korle We, the shrine to the goddess, maintains a good relationship with the deity to ensure that the community flourishes. The lagoon goddess, in turn, provides fish and adequate rainfall for the nourishment of the people. It is believed that the "natural" breaking of the connecting sand bars to allow water flow from the lagoon into the sea is an indication that the goddess is informing her

[18] This history is contested. Some suggest the Guans preceded the Gas in settling along the coast of Accra. Others claim the Gas were the first to make old Accra their home. See (Henderson-Quartey (2002) for an extended discussion.

[19] The indigenous Ga people have historically resided in the coastal parts of Accra. During colonization, they were the dominant ethnic group in the city. Today the city is multi-ethnic. As indigenous residents, the Gas "own" land in Accra as stool lands (commonly called Ga Stool Land) they acquired through conquest and occupation before colonization. Among them, land ownership is tied to sacred objects called stools. These stools are symbolic of people's lineage. Thus, the chief of each stool within the Ga community is given authority to hold the land in trust for members of his stool house.

people of the beginning of the corn planting season. Thus, when the bars break, the priest acknowledges the good tidings of the goddess with a ceremony on the banks of the lagoon (Roberts 2010).

Because of its geographical and spiritual relevance, Korle Lagoon has occupied a central place in Accra's environmental history. In a rare account of the lagoon, Roberts (2010) notes that Korle was of particular interest to the early colonial administration of the Gold Coast when the capital of the colony was moved from Cape Coast to Accra in 1877. By the 19th-century, the British had established colonial rule in present-day Ghana in what was then part of the British West African Colonies. Through conquest and purchase, they took over most of the forts and castles along the coast as the slave trade ended and they re-appropriated[20] these spaces for trade in the form of cash crops of cocoa and coffee, as well as gold (Macgonagle 2006; DeCorse 1993; Palmie and Palmié 1995). As in the transatlantic slave trade, coastal towns played an influential role in the new economies of colonies. On the Gold Coast, the coastal towns (Cape Coast, Elmina, Accra, and Sekondi) became the commercial and administrative centres of the colony. Accra became the capital of the Gold Coast colony in the latter half of the 19th century (Songsore 2010; Adarkwa 2012).

Like the rest of British West Africa, the British ruled the Gold Coast indirectly. As part of this rule, they had colonial officials, missionaries, and traders who were not permanent settlers but took temporary residence in various positions within the administration (Dalton 1961; Killingray 1986). As their rule deepened in the colony, they began establishing European settlements for the colonial administrators and merchants and took control of urban planning in the colony (Grant and Yankson 2003). In Accra, these European residential settlements

[20] The castles and forts were used for both the commodity trade and the slave trade.

were segregated from areas where the local population lived (known as native towns). Of critical concern for the colonial administration was the perceived unsanitary conditions of the colonized and the lack of order within their spaces; thus, as Grant and Yankson argue, "zoning and building codes were strictly enforced to maintain an orderly European character and ambience in the district" (2003, 69).

The administration took the sanitation of domestic spaces through segregation and surveillance very seriously. Indeed, the colonial state exerted its power in and through the everyday ordering of the colonized bodies and spaces in practices such as residential segregation and administrative surveillance of households (e.g., Town Council Ordinance Legislation; see Gale 1980; Butchart 1998; Greene 2002). The ultimate goal of the segregation was to safeguard the health of the colonial officials who temporarily made the Gold Coast a home (Dickson 1969; see also Hess 2000; Grant and Yankson 2003; Grant 2009).

Korle Lagoon was frightening for the colonizers, as it was thought of as a large reservoir for miasmatic gases that could unleash dangerous tropical fevers. One reason for this fear was Korle's proximity to a native town in old Accra populated by the indigenous Ga people. Also, as a body of water of spiritual significance to "disordered" bodies, Korle Lagoon was perceived as unclean by association. Thus, Korle was an epitome of the "native reservoir," the original place of disease (Roberts 2010). Scholars of colonial history have underscored how backed by beliefs of racial difference and superiority and importantly relying on Western medical theories, the British constituted colonized populations as not only other but also as carriers of disease, disorder, and vice (Bala 2018; Vaughan 1991; Butchart 1998). Informed by racialized concerns, even at a time when the area was less developed than it is today, Korle Lagoon was entangled in a dirt and contamination discourse. This history has a colonial present

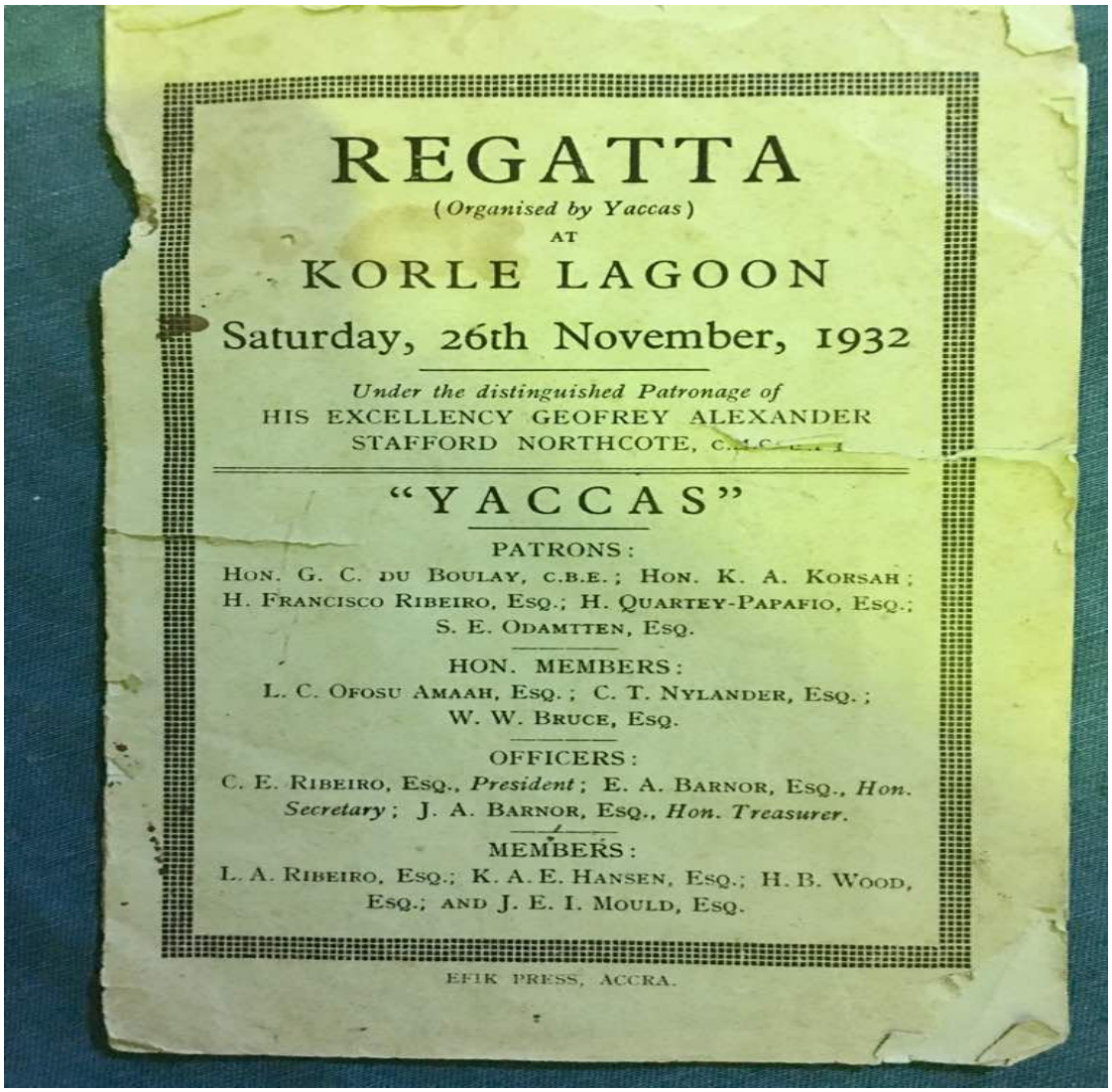
(Gregory 2004) yet remains largely invisible and unaccounted for in the current e-waste narrative of and about the area.

As the colonial administration deepened its economic and administrative grip on the colony, the fear of contamination from Korle Lagoon persisted. In its pursuit of empire, the administration sought to sanitize the lagoon, to co-opt it, and to turn it into an economic resource. The aftermath of the First World War saw a boom in cocoa exports. This created congestion at the port in old Accra (Milburn 1977; Kay 1992). Korle was not far from the old port of Ussher and the James Fort, so the administration quickly sought to transform the lagoon into a deep-water harbour to handle some of the overflow (Roberts 2010). The new-found economic potential of the lagoon did not last long, as the administration ran into difficulties with the local Ga custodians of the land not least because of their reverence for the lagoon as a sacred space. As it was the home of their deity, the Gas vehemently resisted attempts by the colonial administration to denigrate the site by constructing a harbour (Grant 2006). The harbour project never materialized, killing the colonial administration's dream to once and for all "sanitize" Accra while expanding the empire by turning the lagoon into a harbour to facilitate cocoa export (Roberts 2010).

At the same time, the rising Ghanaian elites including intellectuals, local political elites, and indigenous merchants, the emerging bourgeoisie who played prominent roles in the colonial economy, targeted the Korle for leisure purposes. For example, the local elites hosted a regatta on Korle in 1932 (see Figure 2.3). For these new elites in the colony, Korle Lagoon had a new possibility that was not entirely frowned upon by the Ga stool heads.[21] There are

[21] Boat races are a common practice in communities along the coast of Ghana. Traditional warriors known as Asafo groups participate in boat races as part of the annual Homowo festival of the Gas (Clarke-Ekong, 1997).

no records to show that the Ga stool resisted the occasional hosting of regattas, and Ga youth actively participated in these events (Reuters 1977).



REGATTA

(*Organised by Yaccas*)

AT

KORLE LAGOON

Saturday, 26th November, 1932

Under the distinguished Patronage of
HIS EXCELLENCY GEOFREY ALEXANDER
STAFFORD NORTHCOTE, C.[illegible]

"YACCAS"

PATRONS:
HON. G. C. DU BOULAY, C.B.E.; HON. K. A. KORSAH;
H. FRANCISCO RIBEIRO, ESQ.; H. QUARTEY-PAPAFIO, ESQ.;
S. E. ODAMTTEN, ESQ.

HON. MEMBERS:
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Figure 2.3: Korle Lagoon hosts a regatta in 1931. Source: Accradotalt (@ Accradotalt) https://twitter.com/Accradotalt/status/1009142802939371525). June 2018. Tweet.

Korle Lagoon gained prominence in another encounter between the colonial administration and the Ga communities in the early 1940s. This time, it centred on the anti-malaria campaign during the Second World War. Malaria had always presented a unique problem for the empire in British West Africa (Webb 2009; Frenkel and Western 1988; Macfie

and Ingram 1917). But it became a bigger problem in the Second World War period. At the time, Accra was a staging area for Allied troops who were recruited in the colonies. The city was also a station for the refuelling and maintenance of aircraft as it was an important transit point for the British and American Air Forces. Malaria was a serious concern for the troops, especially among the white forces who had a morbidity rate of over 50 percent per year in Accra (see Roberts 2010). The British did not just have to contend with the war; they had to fight malaria to do so. Korle Lagoon was a key target in the fight against malaria. The administration quickly designated the lagoon a "Malaria Control Area" whose management would rid the city of the female Anopheles mosquitos as the vector for malaria plaguing the Allied forces (Roberts 2010). Importantly, at a time when the colonial purse was being emptied by the economic impact of the war, the "management" of the Korle Lagoon represented a financial burden for the administration. As Roberts comments, "Malaria was not only a threat to the health of servicemen; it was a financial drain on the war efforts" (2010, 251) The immediate management plan included housing the Allied troops far away from native populations following the already existing patterns of racial segregation in place for the British administrative staff.

With the help of the colonial administration, British Army Engineers built mosquito traps along the lagoon's banks. The traps were designed as part of a study by a leading British entomologist to track and monitor the flight of mosquito populations in Accra. In a grim example of the exertion of colonial power and the marginalization of the northern territories of the Gold Coast and its people, the study recruited migrants from the northern territories as human subjects (i.e., hosts) to act as bait for mosquitos (Roberts 2010). The mosquito study concluded Korle was a major breeding ground for mosquitos. The colonial administration

immediately sprayed the lagoon with DDT (dichloro diphenyl trichloroethane) to kill mosquito larvae (for more on coloniality and DDT see Dumett 1968; Strother 2016; Strahorn 2009).

The designation of Korle as a malaria larvae cesspool did not sit well with the traditional sentiments of the Ga to whom the lagoon remained a sacred site. The Gas, therefore, vehemently protested the DDT spraying exercises, considering it a desecration of the lagoon (Roberts 2010). The administration, however, considered the spraying a short-term measure to relieve the draining efforts of malaria on the war efforts. In the long term, the establishment of the lagoon as a source of disease convinced the British that re-engineering Korle was inevitable. With a strong desire to sanitize the native populations and their spaces, the British administration committed to a project of re-engineering the lagoon. However, their American allies who were contributing about 65% of the cost of the anti-malaria campaign (compared to 25% by the British Armed Forces) objected to funding a sanitation project in a place they would eventually abandon (Roberts 2010).

The socio-spatial history of Korle Lagoon during Ghana's colonial era demonstrates that the lagoon has long been a strategic location of historical significance for conflicted land rights and use in Accra. Visions of urban health advocated by the colonial administration clashed with spiritual practices and beliefs of the local Ga populations for whom the lagoon was a sacred place (Roberts 2010). These tensions continue to shape how Agbogbloshie functions today. At the moment, in addition to the Korle Lagoon Ecological Restoration Project (about which I will say more later), OFA is a target for international NGOs as they view the site primarily as an environment inundated with toxic pollutants. Colonial continuities continue to manifest in "green" e-waste interventions, such as those undertaken by the solutions-based organization Pure Earth (formerly Blacksmith Institute) (Sim 2015; Little

2016). Entanglements of toxicity, power, filth, and colonial (or white) intervention remain salient.

Post-independence urban development and Korle Lagoon

In 1957, the Gold Coast gained independence from British rule with Dr. Kwame Nkrumah as its first Prime Minister. Even though Dr. Nkrumah directed considerable energy to the liberation of other African countries in the early days of his prime ministerial position, he was quick to delineate a vision for his own country and the city of Accra. In 1958, with the help of two architects, B. A. W Trevaillion and Allan G Hood, he released "The Master Plan of Accra" (Quayson 2014). A fundamental part of the plan was to meticulously catalogue the existing and future development of Accra. Informed by an Afro-socialist and modernist vision, as well as nationalism, the plan envisaged a massive redesign of the city (Quayson 2014; Grant and Yankson 2003; Grant 2009). Nkrumah's plans for a livable capital city imagined Accra as a functioning city with open green spaces and parks accessible to the public. The plan specifically envisioned Korle Lagoon and its surrounding lands as a green wedge to be appropriated into communal town parks mainly for leisure and tourism.[22] The plan provided that:

> In the north-west, the area west of Hanson Road bounded on the north and west by harbor railway line. This area includes an old disused Mohammedan cemetery, the boundaries of which are not defined. The total area is 30 acres. Subject to the agreement of the Mohammedan authorities it is proposed that the more level south-eastern corner of this land should be used for school purposes and the steeper north

[22] A whole chapter is dedicated to an inventory of open spaces in the city and plans for their redesign. Then known as "green wedges," these are lands separating residential areas with opportunities for recreation.

> and west sides as a public park overlooking the Odaw Valley. Open space has a special importance in this area in view of the very large number of people living in the old residential areas of James Town and Usser Town.
>
> In the east, the open land surrounding that portion of the Kwali[23] Lagoon south of the Guggisberg Bridge (43 acres). It is proposed that this portion of the Lagoon should be dredge in due course and that after the sea outlet has been enlarged the lagoon should be kept in a clean state fit for boating and swimming. This also depends on the implementation of the long overdue measure of drainage of the Odaw Valley and also upon carrying out of the foul drainage scheme for Accra. The banks of the Lagoon could be suitably graded and planted with palms and other trees to give shade. (Government of Ghana, Ministry of Housing 1958, 28)

This post-independence plan explicitly targeted Korle and its environs as a site to be held by the government for public use. The government, therefore, acquired the land surrounding the lagoon in 1961 from the Korle and Gbese stools (the custodians at the time) through compulsory acquisition[24], extinguishing all existing rights and interests (Grant 2006).

Nkrumah's vision for Korle Lagoon as a beautified green wedge never materialized. The failure of the green space agenda renewed tensions in the post-independence era, ushering in a second wave of struggle over this space. The failure of Korle as a designated and functioning green wedge can be traced to a shift in national priorities. In the early days of his presidency, Nkrumah had modernist visions for Accra, centring on urban development for the

[23] I retain the original spelling in the "Master Plan."
[24] Most land in the capital city post-independence was acquired under such conditions (Larbi, Antwi, and Olomolaiye 2004; Yeboah 2008)

well-being of the citizenry. However, his agenda gradually moved from socialist urban development to socio-economic development of the nation-state as a whole (Fält 2016; Quayson 2014; Yeboah 2008). As such, the initial attempts to mold a city that enhanced the well-being of the populace—of which green wedges were to be an indispensable part—was quickly replaced by setting Accra up as a centre propelling the economic development of the nation and Africa as a whole. In pursuit of economic development, the country rolled out a modernization strategy which entailed creating import-substitution industries to replace the colonial export economy and its associated foreign dependency (Aryeetey, Harrigan, and Nissanke 2000; Steel 1972; Rimmer 1966). Although most of the industrial developments occurred in the newly minted city of Tema, Accra received a sizeable number of industrial enclaves. Accra's industrial enclaves, in particular, saw the government building on land designated for purposes other than industry. The Korle-Odaw green wedge was a casualty of this shift in the planning regime. Invoking the Accra Industrial Estate Ordinance, part of the Korle-Odaw green wedge (not including the current location of OFA) was designated as a light industrial zone hosting a prominent brewery, paint plants, and food processing plants that remain in operation today (Grant 2006).

The rapid urbanization of Accra immediately after independence also contributed to the non-realization of the Korle-Odaw as a green wedge. Due to rural-urban and urban-urban migration, Accra's population exploded. The city grew from 388,396 in 1960 to 636,667 in 1970 and 969,195 in 1984 (Yankson and Bertrand 2012) The urban-biased industrial development strategies vigorously pursued by the government made Accra economically and socially attractive. Migrants flooded into the city in search of opportunities in the industrial enclaves. Informal commerce also grew (Aryeetey, Harrigan, and Nissanke 2000; Grant and

Yankson 2003; Yankson and Bertrand 2012). Importantly, the migrants had to contend with a housing crisis, specifically affordable and centrally located housing within the Central Business District (CBD) of Accra. Although state-owned housing by the State Housing Corporation and Tema Development Corporation had been tasked with providing public housing, state housing could not keep up with the demands (Grant and Yankson 2003; Fält 2016; Tipple and Korboe 1998; Konadu-Agyemang 2001). Crucially, state housing targeted public sector workers, and housing costs in these schemes were too high for migrants new to the city (Konadu-Agyemang 2001; Tipple and Korboe 1998; Arku 2009). As a result of the housing shortage, migrant communities gravitated towards building informal housing outside the formal regulatory and planning systems on the fringes of the CBD. This was seen as a natural solution to the scarcity of low-cost housing and commercial space in the growing city (Arku 2009). This marked the beginning of OFA settlements as migrant destinations and the start of another phase of tension.

The industrial and migrant settlement developments in Korle Lagoon did not appeal to the Ga stools, who saw their lands expropriated and not used for their intended purposes. Thus, in the years of civilian and military rule in Ghana (1966-1992), Korle Lagoon was again contested. This time, the bone of contention was that the state acquired land from the local Ga stools in the name of public interest. The state also put these lands on the open market for rental and capital value and allowed migrants to squat on them. For the Ga communities, the state was subverting the rationale of the acquisition and, as noted by (Grant 2006), this paved the way for the local stools to renew their opposition to what they understood as the usurpation of their land by the state. Today, some local Ga factions claim ethnic disenfranchisement by past and present governments (Yeboah 2008; Sackeyfio 2012;

Quarcoopome 1992). Korle Lagoon is a main feature of the national conversation on urban land claims in Ghana.

Structural adjustment and a new wave of Korle Lagoon developments

The immediate post-independence political and economic life of Ghana was turbulent, especially in the late 1970s and early 1980s when the country experienced a number of economic and political downturns. Between 1966 and 1983, the country had six coups d'état, five of which were successful (Owusu 1989). The succession of military coups plunged the country into chaos and instability. The economic struggles persisted as well. The country experienced budget deficits, a worsening balance of payments, high inflation, and an infrastructural decline in what Konadu-Agyemang (2000) characterizes the "worst of times."

Like many African countries, Ghana sought help from the World Bank and the International Monetary Fund's (IMF) Structural Adjustment Program (SAP). With neoliberal policy prescriptions seen as the only remedy for the crisis, the SAP called for cuts in government budgets and subsidies, the privatization of public services, increased interest, and the opening of the national economy to imports. The SAP era also saw an infusion of foreign aid to rescue the ailing economy while the national government neglected local industrialization, subsistence provision, and state enterprises that Nkrumah had started (Konadu-Agyemang 2000). The SAP fundamentally altered the economy of Ghana as a whole but Accra in particular through massive urban development projects, the explosion of private residential developments at the city's outskirts, and visible informal economies manifesting in street and petty trading (Konadu-Agyemang 2000; Yeboah 2003; Grant 2009; Briggs and Yeboah 2001). In doing so, SAP compounded the historical struggles that characterize the Korle Lagoon and its environs.

The SAP had an undeniable impact on the urban form in Ghana (Grant and Yankson 2003; Konadu-Agyemang 2000). The state significantly retreated from the public sphere as part of the condition for the bailout. Of particular note here is the privatization of public utilities and housing in rapidly urbanizing Accra. The housing sector quickly became privatized, geared towards high-end housing at the expense of social housing, with rents beyond the means of the average resident (Yeboah 2003; Konadu-Agyemang 2000). The removal of agricultural subsidies pushed rural agricultural populations to urban Accra in search of waged employment, further compounding the housing problem. Within this period of market-based developments, Accra expanded rapidly (Konadu-Agyemang 2001). Although most of the expansion of Accra happened in the peri-urban areas, central Accra saw considerable growth in the "unplanned and spontaneous" infilling of areas closer to the CBD, especially the existing green spaces/wedges that had been dormant for designated future urban planning purposes (Yeboah 2008, 70). Informal settlements proliferated in Accra and OFA burgeoned as an informal space economy.

Though both are part of OFA, Old Fadama and the Agbogbloshie scrapyard have somewhat different origins (Grant 2006). Old Fadama's immediate origins can be traced to the urbanization process that began immediately after independence in the 1960s and 1970s when migrants from the more impoverished northern territories begun to move to Accra in search of waged urban labour and established migrants' enclaves within the city (Farouk and Owusu 2012). These migrants built informal housing on the unused land by Korle Lagoon. The Agbogbloshie scrapyard dates back to processes in the aftermath of the SAP in the 1980s as a result of overflows from informal sector commerce in the already overcrowded CBD.

In September 1991, Accra hosted the tenth ministerial conference of the Non-Aligned Movement (NAM) conference. Because Ghana's first prime minister, Dr. Kwame Nkrumah, was one of the founding members, the government took the conference seriously and sought to present an image of Accra worthy of Nkrumah's ideals and legacy. The city authority embarked on a decongestion exercise, relocating street traders and hawkers from the CBD to the land on the upper reaches of Korle Lagoon (Grant 2006). In the view of the authorities, the relocation would be temporary, aimed to ease the traffic congestion in the CBD and to reduce the "hawker menace" that hurt the city's beauty (Jorgensen 2012; Bob-Milliar and Obeng-Odoom 2011; Gillespie 2016). The CBD hawkers were relocated to a portion of the green wedge that was left unused after the re-designation to light industrial activities in the 1960s. The hawkers were absorbed into the growing population and informal commerce at the site as no arrangements were made for their return to the CBD or elsewhere.

Having already started a pattern of decongestion as official policy, in 1993, the city authorities again relocated a yam market to the area. The establishment of the yam market attracted agricultural traders from northern Ghana, mainly Konkomba traders, and they settled in the area. The yam market eventually led to the development of a larger unofficial wholesale food market[25] serving the wider and growing urban population of Accra (Grant 2006). The growth of the food market at the site triggered the need for labour to provide security for the food products at night, as well as loading personnel and service needs for the food transport trucks (Grant 2006). Thus, to service these needs and as a result of rippling effects from informal sector growth in urbanizing Accra, a cluster of supporting activities sprouted at the

[25] This food market is different from the adjacent market stalls (Agbogbloshie food market) constructed in the 1980s after the bombing of the Makola market in 1979 (Quayson 2014).

site. Vehicle repair, automobile spare parts trading, welding, and tire servicing are prominent examples. In addition, between 1994 and 2000, intertribal conflicts in Northern Ghana, particularly between the Nanumba and the Kokomba, pushed more migrants to settle in the area. These ancillary services and migrant influx constituted the early beginnings of the Agbogbloshie scrapyard (Grant and Oteng-Ababio 2016; Grant and Oteng-Ababio 2012).

Most OFA residents do not have statutory rights to the land although some have lived on the land for over four decades and thus have "a collective property claim over urban space through sustained use and appropriation" (Grant 2006; Gillespie 2016, 69). The government considers them as squatters who should be evicted (Afenah 2012; Grant 2006; Plessis 2005; Gillespie, 2016). On May 2002, the city authority served the entire community notice of eviction (Afenah 2012; Grant 2006; Farouk and Owusu 2012; Stacey and Lund 2016). This eviction notice was long anticipated as the city authority makes it clear that OFA is not only unwanted but is also detrimental to the functioning of the city. The site, AMA officials contend, is too strategic to house a slum, hinting at the real estate values likely to be accrued as the CBD expands (Afenah 2012). Furthermore, the city authority believed OFA impedes the successful completion of the Korle Lagoon Ecological Restoration Project (KLERP) aimed at restoring the lagoon to its natural hydrology.

Starting a strong tradition of community grassroots activism and resistance, the residents, with the help of Centre for Public Law and Centre for Housing Rights and Eviction (COHRE), challenged the 2002 eviction notice in court arguing that it was unlawful and requesting the Accra High Court to overturn the eviction (Plessis 2005). First, the residents claimed a lack of consultation before the eviction notice. In a city with inadequate housing for the urban poor, two weeks' eviction notice is woefully inadequate, they argued. The authorities

had not made any reasonable alternative relocation arrangement; nor had they provided compensation of any form. These three reasons formed the basis of the contestation of the eviction notice at the Accra High Court. Unfortunately, OFA residents lost the appeal, and the Accra High court gave the AMA the go-ahead to evict them. In 2009, the city authority served the community another eviction notice (Farouk and Owusu 2012; Afenah 2012). The eviction order still stands, allowing the AMA to withhold formal support and certain infrastructural needs (Stacey 2018). It also explains the ongoing threat of eviction and demolition that community has lived under and continue to face.

The resistance to and challenge of the eviction in court in 2002 initiated a progressive network of local and international NGOs and community-led activists who initially focused on fighting for residents' rights to stay but began to address broader issues of exclusion and marginalization within the community while building alliances with other urban poor in urbanizing Ghana (Grant 2009; Afenah 2012; Stacey 2018). OFA now hosts a variety of local, national, and increasingly international NGOs and civil society groups providing legal counsel, social support to sexually assaulted children, microfinance schemes, etc. (Stacey and Lund 2016).

Of course, there are politics in NGO interventions in the global south (Mohan 2002; Townsend, Porter, and Mawdsley 2004), and the case of OFA is no different. However, the point is that OFA is riddled with complex environmental, social, and economic frictions with long histories beyond the narrow focus on the hyper-visible harms of e-waste processing. Moreover, the people who live and work at Agbogbloshie have been and are strong advocates for the improvement of their own conditions (see Lepawsky and Akese 2015). This does not diminish the environmental risks from scrap processing (particularly from e-waste). Instead,

and as I have argued elsewhere (Akese and Little 2018), e-waste processing is only a small part of the broader post-colonial context of plural injustices.

Korle Lagoon Ecological Restoration Project (KLERP) and the economies and ecologies of waste along the lagoon.

Korle Lagoon lies in the south-west of the central business district of Accra. With its major tributary, the Korle-Odaw Basin, the lagoon drains about 60% of the Accra metropolis with a 400 km 2 catchment area (Karikari, Asante, and Biney 2006; Boadi and Kuitunen 2002). In the 1990s, the Korle Lagoon Ecological Restoration Project (KLERP) reignited the colonial administration's plan to reengineer the lagoon. Launched in 1991, KLERP was scheduled to be completed in 2008; plans included building new wastewater disposal systems, treatment plants, and pumping stations, clearing and dredging the lagoon to remove silt, installing an outlet pipe to aid in rapid discharge of the lagoon into the sea, rehabilitating polluted shore areas, and reintroducing marine life into the lagoon. With these activities, KLERP would "restore the lagoon to its natural hydrology and …. finally develop it into a major tourist attraction" (Owusu Boadi and Kuitunen 2002, 308).

KLERP was and continues to be an expensive undertaking. The government of Ghana had to take up a number of loans to fund the project. Initial loan arrangements included those from the OPEC Fund for International Development (10.1 million USD), the Arab Bank for Economic Development in Africa (12 million USD), the Kuwait Fund for Arab Economic Development (23.5 million USD), the Belgium Government Supported Export Credit (37.15 million USD), and the Standard Chartered Bank of London (10.76 million USD) (Grant 2006).

KLERP aimed for environmental restoration and beautification of Korle and its immediate environs, a goal which, according to the project's environmental assessment, was

incompatible with the existence of OFA. Thus, OFA had to be removed. This removal triggered the eviction notice discussed above. That OFA still stands is often used to explain the stalling of KLERP, although some argue there is more to KLERP's failure than the presence of OFA (Jumpah 2012; GhanaWeb 2001). From the outset, KLERP faced challenges not least because of the historical tensions surrounding the lagoon.[26] Although the project completed a feasibility study and a detailed design for the restoration of the lagoon, like many infrastructural undertakings in Ghana, it was too ambitious from the onset.

Where KLERP has moved forward is in re-dredging parts of the lagoon and building drains to aid in the in-flowing river system (Abraham 2011). However, these activities have had little to no impact on the health of the lagoon. It remains very polluted (Abraham 2011; Aglanu and Appiah 2014; Boadi and Kuitunen, 2002). It is the major receptacle for runoff in the city, so gutters and sewer pipes laid to drain the city all connect to the lagoon (Boadi and Kuitunen, 2002). In the absence of regular upgrades, with increasing volumes of discharge, and coupled with the open nature of the drains, overflows and leaks from sewers have become more immediate causes of the lagoon's contamination (Onuoha 2016). Until very recently, when the Lavender Hill fecal waste treatment plant became operational, untreated fecal waste emptied directly into the ocean (Jumpah 2012). This situation, not surprisingly, compounds the pollution of the lagoon. In addition, the banks of the basin are lined with industrial activities including paint factories, breweries, textile factories, garages, and vehicle repair workshops, all of which discharge their effluent into the lagoon (Karikari, Asante, and Biney 2006). Medical effluent, including mortuary waste from the nearby Korle Bu Teaching Hospital, is also

[26] The indigenous Gas hold on to the spiritual significance of the lagoon and are averse to turning the lagoon into an economic project.

discharged into the lagoon (Boadi and Kuitunen, 2002; Boadi and Kuitunen 2003). Uncontrolled discharges, open defecation, and dumping of waste directly into the lagoon can also be traced to the ever-growing high-density low-income settlements in the vicinity, including in OFA.

Furthermore, in the absence of garbage collection services—which results from the AMA's refusal to recognize the area as politically legitimate—household and industrial waste from OFA spill into the lagoon (Aglanu and Appiah 2014). Of particular note is the practice of land reclamation along the lagoon. A large portion of OFA sits on land that is largely part of the lagoon. Over time, and as the settlement continues to grow, residents are filling in the lagoon with sawdust to reclaim land and build closer to the edge of the lagoon (Farouk and Owusu 2012). This reclaimed land frequently caves in, releasing the sawdust into the lagoon and interfering with its drainage.

It is important to acknowledge that the complexity of economies and ecologies of waste along Korle Lagoon challenges the feasibility of any form of restoration of the lagoon. What does ecological restoration even mean in this kind of post-natural environment? What exactly is being restored? Korle Lagoon will not return to some pre-developmental state, and even if it could, who gets to decide? Whose interest is centred in that decision (Cantor and Knuth 2018)? For the purposes of the thesis, I by-pass these important questions and signal that this history of pollution along the lagoon suggests the popular narratives that attribute its "death" to OFA and e-waste processing are a highly partial, even strange, curated image of the place. As I have noted, pollutants from OFA at the upper reaches of the lagoon are only a recent addition to a long and growing list of pollution sources. The sources of the lagoon's pollution are varied and predate the e-waste industry. What, then, are the implications of this

political economy of Accra for how we understand and subsequently do e-waste science and advocacy at the Agbogbloshie scrapyard?

The violence of representation

In what follows, I argue that the relative absence of the geo-historical context in the popular imaginaries of Agbogbloshie is indicative of the erasure of subaltern voices and colonial histories in e-waste research or what Roy calls the "silence of urban historiography" (2011, 228) The absence also gestures to narrator self-portraiture—the centering of the image of the narrator—(Daston 2006) and collateral damage (Law 2011; see also Fiske 2018). I engage with these ideas in much more detail in Chapter Four; here, however, I want to briefly signal some implications.

Examining the broader geo-historical political economy of Accra, particularly as it relates to the historical and socio-spatial developments of the area surrounding Korle Lagoon, foregrounds the conditions relevant for a more nuanced understanding of current and future e-waste politics at the site. We need to acknowledge the emergence of e-waste processing within a post-colonial landscape of historical and contemporary tensions. Even before the informal settlements of Old Fadama and Agbogbloshie scrapyard, Korle Lagoon and its environs had a contested history. Geo-historical processes have played an important role in producing and shaping the politics and vulnerabilities of OFA, including the processing of e-waste (see Amoako and Inkoom 2018 for a related argument on the production of flood vulnerabilities at Agbogbloshie). Although OFA now operates as an urban common, "a collective property claim over urban space through sustained use and appropriation" (Gillespie 2016, 69), socioecological frictions have been created as a result of the ongoing struggles over the land. Yet this important context is often invisible or erased from popular imaginaries of

Agbogbloshie when the site is reduced to sensationalism and the ground zero of e-waste dumping.

Elsewhere, I have argued there is an erasure of the broader post-colonial terrain of plural injustices and violence that produced Agbogbloshie as a space amenable to e-waste processing (Akese and Little 2018). I make this claim against the backdrop of conventional Environmental Justice (EJ) framings of Agbogbloshie as simply a dumping ground for the developed world's e-waste. The history of OFA matters to how we understand the site and the problematic narratives it provokes. This history also matters for how we theorize the emergence and agglomerations of informal e-waste hubs (Davis, Akese, and Garb 2018). As I recently argued with my colleagues Davis and Garb (2018), a move away from simplistic characterizations of e-waste processing zones as dumping grounds to a more nuanced understanding of their importance to local economies and ecologies is not only long overdue but crucially needed to inform relevant policy interventions.

Here, I make a related argument: witnessing practices, in the form of the dominant representations of Agbogbloshie erasing the contested history of the land, have material consequences for how harm at the site is dealt with. In her analysis of controversies surrounding accounting for harm (and discounting harm) from oil contamination in the Amazon forest in Ecuador, Fiske says, "Witnessing practices have material consequences for how toxic burdens are mitigated, or not" (2018, 399). In my own analysis, in the case of Agbogbloshie, the erasure of the site's history adds other forms of burdens to toxic burdens even if such burdens are unintended and thus are perceived as collateral damage.

Let me give one example of the harm the community is experiencing as a result of the normalized e-waste discourse that erases the important history of the site. Recall the demolition

at OFA as a result of the twin disasters of June 2015. As I have already noted, this most recent eviction was part of a long line of attempts to clear the area. Residents of OFA have lived under the threat of eviction and unplanned demolitions since 2002. In a sense then, the demolition of June 2015 was not all that surprising. However, a new dimension is how representations of Agbogbloshie as an e-waste graveyard played into these more recent justifications for clearing the site.

In its ongoing attempts to evict OFA, AMA resorts to all sorts of tactics, including calling OFA "Sodom and Gomorrah" in official documents (Grant 2006). As Afenah notes:

> In depicting the settlement as Sodom and Gomorrah, the government is openly portraying its limited lifespan, as destruction is both forthcoming and legitimate. The law does not protect outlaws, as the crimes they have committed result in the removal of their substantive citizenship rights. They are physically situated within but conceptually outside of the boundaries of Ghanaian society. Legitimizing the eviction of outlaws from a place that even god would ultimately destroy due to the vices occurring within is easily justifiable to a constituency, especially if the accompanying propaganda has resulted in the settlement being a no-go area for other residents in Accra due to fear of insecurity. (2012, 539)

Within a general atmosphere of stigmatization and name calling, the AMA finds in the e-waste discourse another opportunity to deepen its contestation of the legitimacy of OFA residents. As I will show in Chapter Four with a detailed analysis of e-waste texts, portrayals of Agbogbloshie usually cast activities at the site in negative terms. OFA residents and workers continue to express concerns about these negative portrayals because they bolster the AMA's interests and position at their expense.

The AMA makes no attempt to hide its targeting of Agbogbloshie (citifmonline.com 2017). Targeted sweeps began in 2011 when the AMA restricted the activities of scrap collectors roaming the city with pushcarts in search of scraps to buy, arguing that they constituted a traffic nuisance and safety risk (Modern Ghana 2011). The CEO of AMA, Mr. Vanderpuije, met with GASDA to formally inform them of this restriction, knowing that the ban targeted the activities of workers from Agbogbloshie. Later in a press statement about a proposed demolition in 2017, the AMA again specifically targeted workers at the scrapyard:

> The Accra Metropolitan Assembly (AMA) wishes to remind the general public especially all those who are putting up structures on government reserved lands such as along the Odaw River, Korle Lagoon, Old Fadama, the East Legon Green Belt, Mensah Guinea, Railway Station (around circle VIP Terminal), the stretch from Avenor to the Sikkens Bridge, Agbogloshie ,Glefe and Chemunaa where structures were removed last year and left fallow to enhance the ongoing dredging project to remove them immediately……All are again being reminded that it is an offence to dispose of refuse, *especially e-waste in water ways*. (Citifmonline.com 2017, emphasis added)

Although these are the only publicly documented instances of deliberate targeting of workers at the scrapyard, during my fieldwork, workers said the visits of researchers, international media, and NGOs have drawn unnecessary attention to their activities.[27] Some said the AMA officials tell them that their work at the site is giving the country a "bad name," and the site cannot be allowed to exist.

[27] I provide ethnographic vignettes of some of these encounters in Chapter Three.

The narrative of OFA as an e-waste dumpsite adds to and invigorates the AMA's privileged interests in the land around Korle Lagoon. In this fashion, the dominant narrative of OFA within e-waste discourse is weaponized and used against the very people who bear a disproportionate burden from the processing of this waste and are fighting for their right to stay on the land amidst unequal power relations (Fiske 2018; Anderson 1991; McFarlane 2008). It is in this sense that I argue the dominant narrative on e-waste at OFA enacts harm in as much as it erases important history, and the narrative produced is weaponized within the context of land and resource politics at Agbogbloshie. I am not accusing those who do research and advocacy work on e-waste at OFA of deliberately perpetuating harm. I simply point out that OFA residents suffer harm from the narrative produced (c.f O'Brien 1993) as it erases important context and is used to justify their eviction.

It is equally important to consider who else benefits from the telling of this partial narrative of the site in e-waste discourse. I engage with this question in Chapter Four. Now, however, I want to suggest the erasure of the geo-histories of OFA outlined in this chapter might have more to do with those who tell these stories than the site itself. To tease out the power dynamics at play in the way Agbogbloshie is talked about, I turn again to Fiske (2018) who documents a "politics of denunciation" in the witnessing and documenting of harm from pollution. In her account of toxic tours in the polluted oil pits in Ecuador's Amazonian forest, Fiske explores the bodily performances central to witnessing and then condemning acts of pollution. By politics of denunciation, she means the unequal power relations inherent in open condemnations of acts and processes of pollution. This is especially the case for denunciations involving corporeal knowledge. All bodily knowledges of toxicity are not equal. Some are valued more than others. Certain bodies' knowledge of harm is valued over the knowledge of

those who live more proximately to and intimately with toxicants. In her excellent example of toxic tours, Fiske shows they can make harm visible—through charisma—, but they can have other effects, one of which is valuing performances of harm by those who are distant yet in positions of power over others who intimately live with contamination. She calls us to be "observant of the appropriation of practices and knowledges borne out of environmental suffering by those in positions of power, even when seemingly used for good" (2018, 392).

In Chapter Four, I show that the erasure of the broader geohistory coupled with the imaginaries invoked in representations of Agbogbloshie in e-waste texts gestures more to the "west self-fashioning an image for and of itself, than they do about telling stories relevant to the daily life chances of Ghanaians at Old Fadama/Agbogbloshie" (Lepawsky and Akese 2015). Again, this is not to say that those who write on issues of e-waste at Agbogbloshie have an ulterior motive. Instead, I point to the harm done by the framing. Erasures matter at Agbogbloshie; they preclude a deeper and nuanced understanding of social and environmental issues at the site and the people who live there (Akese and Little 2018; Lepawsky and Akese 2015).

Chapter Three

Where is the e-waste? A participatory citizen science survey of discards at Agbogbloshie

There is little hard evidence to measure how much e-waste is dumped either globally or at Agbogbloshie. (SciDev.Net 2015).

All measurements are inherently political (Pine and Liboiron 2015, 8). They make certain things visible while erasing others. It is therefore not about right or wrong measurement. The more relevant question is the stakes in privileging one mode of measurement over others.

Introduction

In this chapter, I choose a story-telling mode to talk about the participatory citizen science survey that quantified the proportion of e-waste relative to other waste types processed at Agbogbloshie. As I argued in Chapter One, the survey establishes the empirical scale of e-waste processing at the site and offers a basis for critically interrogating dominant representations of Agbogbloshie as the world's largest e-waste dump. My decision to tell stories is deliberate. First, I present the survey narratively in keeping with the overall tone of the dissertation. Second, telling stories of and with the survey allows me to foreground rather than close off the iterative nature of the survey. The move to write narratively can be seen as science in action (Latour 1988; Latour and Woolgar 1986; O'Reilly 2017), whereby I narrate the enactments[28] of the survey and all that it entailed, including the vital roles and interventions of my co-researchers.

[28] I use this term analytically to point to the actual "doings"- actual work and instruments- that bring something into being (Mol 2002).

STS scholar Annemarie Mol writes that "attending to enactments rather than knowledge has an important effect: what we think of as a single object may appear to be more than one" (2002, 6). In my analysis, Mol's point is relevant because as we shall see, telling stories of and with the survey means making visible other realities that challenged but also conditioned the survey in practical ways. For example, by narrating the enactments of the survey, I can show how I navigated the practical problems of access—to the site, people, and information—in the course of the survey. In short, taking methodological inspiration from STS scholars like Mol (2002) and Thompson (2005), I assume a narrative tone to tell a more situated account of the survey, foregrounding particular events, practicalities, materialities, people, and interventions that mattered.

The chapter is laid out as follows. I juxtapose the planned survey to the executed method of the survey in the field. In doing so, I talk about the local contexts within which we carried out the survey, and I tease out the process of tailoring the survey to the unique circumstances at the Agbogbloshie scrapyard. Before embarking on this two-part series (the planned and executed survey), I outline the conversations to which the chapter contributes.

First, I use the stories to speak to conversations in discard studies about standard protocols for mapping waste that do not always work in new environments (McWilliams, Liboiron, and Wiersma 2018). Attempts to quantify and characterize waste are vital research efforts, given that many forms of waste are ubiquitous and accumulate, albeit unevenly. Some key concerns about waste centre on issues of quantity, material composition, and mobility (MacBride 2011). Quantifying the presence, material characteristics, and travels of waste is crucial to make waste, which is mostly invisible, visible. Liboiron (2014) writes that "most waste is invisible because it is never recorded in the first place." For example, in the United

States and Canada, most waste statistics are for municipal waste, but this represents only about 3% of all waste. The majority of waste produced, about 97%, is industrial (MacBride 2011; Liboiron 2014b; Liboiron 2018). Rendering waste visible via some sort of quantification is important because it indicates the scale at which waste is a problem in different environments and also records their uneven distribution.

Methods for empirically mapping waste types and volumes include waste surveys, audits, and diaries (for waste diaries, see Evans 2012; Gregson, Metcalfe, and Crewe 2007; for waste surveys, see Liboiron 2016a; McWilliams, Liboiron, and Wiersma 2018; Rathje and Murphy 2001; for waste audits, see Gallardo, Edo-Alcón, Carlos, and Renau 2016). The material nature of waste is unruly, and this unruliness can undermine methods that study waste, especially those that quantify it (for examples of the material properties of waste intervening in the methods used to study them, see Gregson 2011; Lepawsky and Mather 2011; Liboiron 2015b; 2016a). Waste surveys are no exception. Universalized standardized surveys are supposed to work across differences. Surveys for sampling marine plastics on a sandy beach, for instance, should work for a rocky beach. However, this is often not the case. Survey methods change with the context because a particular set of environmental conditions may be met in a particular situation. For example, a survey of plastic debris on a beach might work differently from a survey of debris in a scrapyard setting. In addition to the environmental conditions, surveys must account for different animations of waste in the sense of its ability to act (Bennett 2010; Gregson and Crang 2010; Gregson, Watkins, and Calestani 2010; Gregson 2011).[29] In juxtaposing the planned survey to the executed survey, I show the iterative process

[29] I am invoking the affordances of waste that are richly explored in the discard studies literature, from waste's transgressive presence to order (Laporte 1978 (2000); Douglas 1966) to its ability to "become" in practices and

and experimentation that was necessary, in part, because of the environmental and social conditions of the scrapyard, the affordances of the different types of waste surveyed, and the participatory design of the study (c.f Law 2004).

I also consider the possibilities and limits offered by researching with workers at Agbogbloshie as citizen scientists. "Participatory" and "interventionist" methodologies and orientations have proliferated in the growing interdisciplinary field of discard studies (Davis and Garb 2019; Dhillon 2017; Liboiron 2016b; Catherine Phillips 2017; Robinson et al. 2016; Wallerstein and Duran 2006). This proliferation, Liboiron (2016b) observes, is partly driven by an imperative to not only make waste visible but also to intervene in systems of waste. In the growth of participatory and interventionist orientations, working with lay people as citizen scientist resonates with Environmental Justice (EJ) mobilizations that have long shown citizen-led research impacts environmental politics (Conrad and Hilchey 2010; see Dhillon 2017 for a review). Not surprisingly, many of the examples of citizen science actions concerning waste centre on siting conflicts within the framing of EJ (see Dhillon 2017; Liboiron 2016a). Few studies document citizen science in actions outside "mainstream"[30] EJ conflicts to ascertain the affordances and limits of this method for community ownership in research and interventionist-driven discard studies (see Liboiron 2016a).

In recounting a citizen science project in action outside mainstream EJ, I show how workers can co-opt the research process to draw attention to and centre issues of importance to them—here, how Agbogbloshie is scrutinized as a research site. Importantly, the survey

thus surprise and bite back (Gille 2007; Gregson 2011; Gregson, Watkins, and Calestani 2010) and disturb systems of containment (Muecke and Hawkins 2003).

[30] By mainstream EJ, I refer to the more popularized understandings around issues of inequitable distribution of environmental harms.

process highlights the complex relations of outside researchers negotiating access to workplaces for research and interventions, something rarely acknowledged. In this case, rather than strictly reproducing the research agenda of the survey, the participatory citizen science approach became an arena for carefully deliberating on research interests and practice in Agbogbloshie, including my own. For example, as a researcher, I was called to be accountable for what some of the workers considered an overwhelming and exhausting research presence at the site. I was questioned and held responsible for not only my research but also that of others.

I acknowledge the frustrations of navigating such queries in the field amidst the desire to execute the survey. However, I approach such moments of questioning as generative. By generative, I echo critical work in Indigenous Studies and Anthropology, especially McGranahan (2016), Simpson (2007), and Tuck and Yang (2014b), who demonstrate that people's refusals are ethnographically and theoretically generative. These authors argue for an "ethnography that can both refuse and also take up refusal in generative ways" (Simpson 2007, 78) and thus result in new research types and pathways. In the context of data collection, for instance, Tuck and Yang (2014b) show that a community or its members' refusal to answer questions or participate in any form of research is revelatory of more than just a "no." Rather, "refusal is not just a no; it is a performance of that no [and] a redirection to ideas otherwise unacknowledged or unquestioned" (Tuck and Yang 2014b, 814). In this instance, refusals clearly revealed the claims of research fatigue by workers at Agbogbloshie.

The more targeted quantitative data from the survey are equally telling. According to popular accounts, "millions of tons of e-waste" (*The Guardian* 2014; PBS 2009) from developed countries are dumped in developing countries; Ghana is "among the largest recipients in

Africa"(UNEP 2015, 8), and Agbogbloshie is "the world's largest e-waste dump" (*The Guardian* 2014). Yet the survey data show that e-waste constitutes a modest amount of the total volume of scrap materials processed at the site. The most salient category of materials at the site is automobile scraps.[31] This result has important implications for proposed solutions and the current interventions aimed at addressing the environmental challenges of scrap processing at Agbogbloshie. Specifically, the relative amount of electronics scraps compared to the other types of waste reveals a "sectorial mismatch" (c.f MacBride 2011) in the proposed solutions and interventions; by this, I mean the imagined solutions do not target the relevant waste sector to achieve any meaningful impact.

In search of methods for surveying discards at Agbogbloshie

I am standing with two people, my supervisor Dr. Josh Lepawsky, and a potential thesis committee member, Dr. Carissa Brown. A Google Earth map of Agbogbloshie is pulled up on a MacBook desktop screen in front of us. Dr. Lepawsky has visited Agbogbloshie before. Dr. Brown has not. She needs an introduction to the site. I briefly introduce the site to her with the help of the Google Earth map, and she sees the boundaries of the infamous scrapyard marked on the map as a triangle. Dr. Brown is a biogeographer in the Department of Geography at Memorial University. Dr. Lepawsky and I have asked for her expertise on a proposed discard survey at Agbogbloshie.

I pitched the idea of the survey to her along these lines:

[31] In this chapter, I intentionally use the language of "scraps" to refer to the materials surveyed to accurately reflect the language my co-researchers and the other workers I encountered at the site used to describe the materials they trade. For example, there are various iterations of the term e-waste (i.e., "e-discard," "e-scrap"). I have noted my preference for e-discard elsewhere in the dissertation. For the survey, however, both e-waste and e-discard seemed far removed from how the workers related to the materials traded. They did not use such language. Hence, my decision to use "scraps" in this context.

> Agbogbloshie is a scrapyard in Accra Ghana that is notoriously known as the world's largest e-waste dump. However, the site is a general scrapyard for processing and trading all sorts of scraps. Despite many empirical studies of the site, none systematically quantifies e-waste compared to other types of waste, or the quantity of e-waste at the site compared to other hubs, meaning there is no concrete evidence for the claim the site is the world's largest e-waste dump. An important knowledge gap remains. I want to undertake empirical research that will measure the proportion of e-waste relative to other types of waste at Agbogbloshie. I imagined that biogeography methods of sampling plant communities to characterize and quantify species might be helpful for my purpose. What do you think?

Dr. Brown answered in the affirmative: "Oh yes, you can sample portions of the scrapyard either as quadrats or even along transects and then do a count of the scraps within the quadrats. You will need to devise a sampling strategy that will tease out certain details of the procedure. For example, how will you select quadrats? Will you do a random sampling? Purposive? How many quadrats will you sample? What size of quadrat will be appropriate?" She invited me to take part in a field session of a third-year Biogeography (GEOG 3140) class where students learned some of the methods for sampling plant communities. I took part in the field session and observed students creating quadrats and counting stems of different plant species to map out their occurrences and distribution. I read more about methods to sample plant communities beyond those I observed with the class. The methods I observed were not entirely new to me. I later realized that marine plastic research, for instance, uses similar survey techniques and protocols. Informed by these experiences, I proposed a sampling protocol for surveying the discards at Agbogbloshie.

The planned discard survey: counting scraps at Agbogbloshie

Samples are used to represent a wider field when it is impossible to survey an entire site due to limited time and resources. Before going into the field, I sketched out a tentative protocol to systematically sample portions of the scrapyard for empirical assessment. The sampling protocol drew from plot-based methods of ecological sampling commonly used in plant community surveys to determine species types and their abundance (Barbour, Burk, Pitts, Gilliam, and Schwartz 1998; Elzinga, Salzer, and Willoughby 2015; Phillips et al. 2003). The design protocol was as follows:

1. Recruit workers and or residents of OFA as citizen scientists. This involves getting in touch with existing community contacts to distribute information about the project to workers and residents. Contact interested individuals and assemble a research team. The team will deliberate and finalize the survey protocol and roles.
2. Undertake a reconnaissance survey of the scrapyard with co-researchers. The reconnaissance survey will achieve the following: (a) determine the boundaries of the scrapyard;[32] (b) observe and note any structures on the ground that may impede or be an obstacle should they be found in a sample plot; and (c) determine how many plots can potentially be covered within the span of the fieldwork.

[32] The Agbogbloshie scrapyard is a fluid space with shifting boundaries. First, part of Agbogbloshie scrapyard sits on land reclaimed from Korle Lagoon. Over time, and as the scrapyard grows, residents have resorted to filling in the lagoon with sawdust to build further (Farouk and Owusu 2012). This reclaimed land caves in, changing the occupiable sections in the yard. Second, demolitions affect the boundaries of scrapping activities. For instance, the 2015 demolition resulted in changes in the landscape, and most of these changes are not yet captured in any of the base maps. The June 2015 demolition also affected the volume of residential units at Old Fadama and pushed residents to reclaim land on the edges of the scrapyard as living spaces. Third, while the scrap activities define much of the scrapyard landscape, a diverse group of activities merge at the site. The onion market sits right in front of the yard. All these factors mean the boundaries of the Agbogbloshie scrapyard are in flux. By mapping the boundaries of the scrap activities (areas of high concentration of scrap activities), I hoped to determine a more accurate "area of interest" for the survey.

3. Based on the reconnaissance survey, establish an appropriate size for a sample plot. No size is inherently better than another. It all depends on the purpose of the study and the environment. The rule of thumb is to select a plot size large enough to capture the variability in the area, but not so large that it is impractical to survey. Given the citizen science approach to this discard survey, target a plot size that can be completed in a day's work and will not require more than three people.
4. Design and overlay a grid on a map of the scrapyard. The size of the grid will depend on the chosen plot sizes (see Figure 3.1).
5. Use a random number generator to select plots from the generated grid randomly and mark them on the map. The exact number of plots will be determined on an on-going basis. Select an initial set of plots; as the survey progresses and as time, effort, and the number of co-researchers afford, further plots will be randomly added[33].
6. In the field, locate the boundaries of a selected plot using GPS. Mark the plot's four corners with poles to establish its boundaries. Ideally, source poles from the scrapyard itself.
7. Sort, count, and record data for scraps within the selected plot. First, sort the different types of scraps into identifiable categories (i.e., electronics, automobile, construction and demolition, heavy industrial material). Second, isolate and note scraps that are not

[33] In plant ecology, the rule of thumb is to select enough samples that capture the diversity of species in the community. To avoid over-sampling (time and energy are limited), ecologists use the species-area curve. The idea of the species-area curve resonates with theoretical saturation in qualitative research where the researcher stops sampling when no new data appear. As the cumulative area of a study site sampled increases, the number of species detected increases and then begins to gradually plateau. Once a plateau is reached, the researcher can be confident that an appropriate number of plots has been sampled.

readily identifiable, if any. Manually count and record each piece of scrap within the plot (see Appendix 3.1).

8. Record data on identifiable asset tags for e-scraps. After counting for each category, isolate all the electronics, and carefully look for identifiable traces such as source tags or asset tags affixed to them to help determine their origin. Record and photograph these tags.

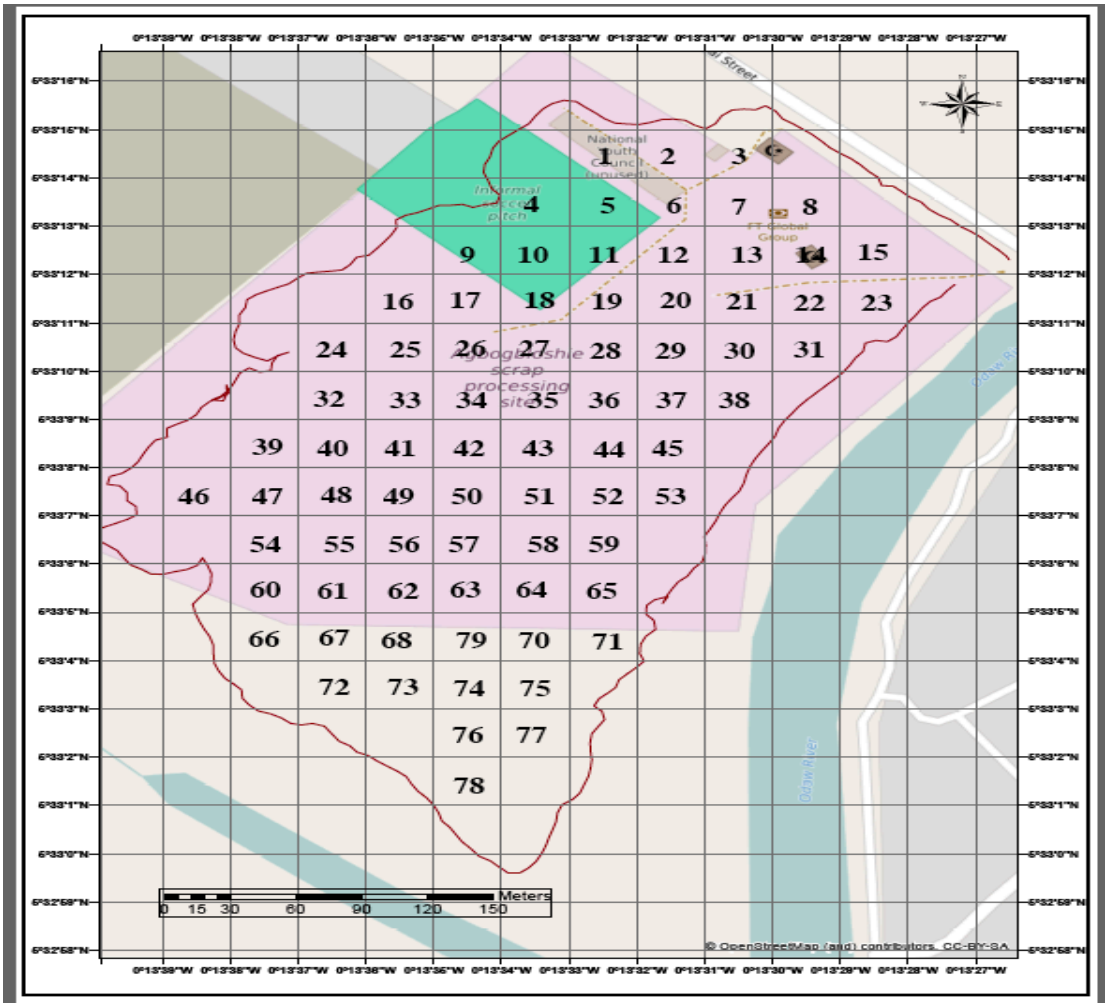

Figure 3.1: A Numbered grid map of the area to be sampled at Agbogbloshie scrapyard.

Unanticipated considerations

As is common in field-based research, the survey protocol outlined above had to be substantially modified in the field. The modifications, I argue, should not be taken as a case of things not going as planned, as events were more generative than adaptive. First, the modifications attest to the extent to which generalized sampling protocols are amenable to scraps in a scrapyard context. They demonstrate the possibilities but also the limits to using survey sampling methods to quantify waste in a scrapyard setting like Agbogbloshie. Second, the modifications were partly a function of the participatory citizen science design. By this, I refer to the skills, knowledge, and emergent concerns of citizen scientists and the broader Agbogbloshie community in shaping not only the outcomes of the survey but the process itself.

Before I narrate the execution of the survey, I will briefly introduce three distinct roles that emerged for the various individuals who participated in the survey: collaborator, co-researcher, and facilitator. Appendix 3.2 offers a more detailed profile of each of these roles. Collaborators included local experts, and researchers, as well as community leaders who play gatekeeping roles at the site. I had three collaborators, two of whom helped to broker a meeting with the executives of the Greater Accra Scrap Dealers Association (GASDA). Other collaborators led the initial preliminary survey of the site, deliberated on research ideas, and helped to recruit co-researchers for the survey. Co-researchers undertook the actual survey. All 17 men[34] recruited as co-researchers were scrapyard workers who engaged in the daily task of sorting, counting, and weighing scraps. These skills and experiences were harnessed for the discard survey. I took on the role of project facilitator, leading deliberations on the survey

[34] Men dominate in the scrap related business. The women usually engage in food or other service-related activities.

design, running the logistics for the day to day execution of the survey, and maintaining a research collective. These roles are not ideal types but capture main categories of activities; people moved in and out of them in the course of the fieldwork.

Equipped with the protocol outlined above, my three collaborators and I recruited our initial set of co-researchers. Together with them, we undertook a preliminary survey of the scrapyard, mapping its boundaries, determining the size of quadrats, and randomly selecting the plots to be sampled. These initial activities constituted steps 1 to 4 of the protocol. The next steps involved getting access to the sampled plots to establish its boundaries and sorting and counting the scraps in the plot; this became a challenge, necessitating some rethinking of the protocol.

The first consideration was the structural organization of the scrapyard. As noted in Chapter Two, Agbogbloshie is more than a scrapyard, although scrap activities predominate. Over the years, it has grown to include a landfill, football field, a goat and cattle pasture, a vegetable garden, and a mosque (see Figure 3.1). These activities intermingle, although there are isolated areas of concentrated scrap activities. Clusters of stalls and makeshift structures mark areas of dedicated individual scrap dealers; the distribution of scraps is mediated to a large extent by these structures. At times, a randomly selected sample plot to be surveyed was occupied by a structure not dedicated to scrap activities. Even in instances where a randomly selected plot contained scraps and thus was readily available for sampling, the presence of built-up structures challenged access and the ability to validate boundaries in the strict sense of their Global Positioning System (GPS) locations identified on the map.

The second consideration was the level of activities within the scrapyard. I had imagined, via the planned protocol, that the scrapyard was an accessible study area amenable

to a grid. However, because it is a living, working, built up space, using a field protocol designed for open fields proved challenging if not impossible. The imaginary of an open and accessible site is a fantasy of survey protocols, especially in places like Ghana. The scrapyard was a living and working space with people going about their daily activities; scraps were being consolidated and traded at any moment in time. Given the constant movement, isolating a sample plot for the time it took to count scraps became a challenge even when owners of those scraps were accommodating.

The third consideration that shaped the execution of the survey was the ability of the team to randomly sample plots. In the original random sampling design, we underestimated the level of workers' refusals to participate. Following research ethics, scraps within a selected plot were to be sampled only after obtaining informed consent from their owners. While most of the scrap dealers were sympathetic to the objectives of the survey and willing to be interviewed about their scrap content, the majority of those approached with the idea of physically sorting and counting their scraps raised concerns about the exercise revealing business secrets. To address this concern, I deliberated with the collaborators and the initial set of co-researchers. We decided that instead of the pre-selected co-researchers surveying every sampled plot as planned, we would offer scrap owners who raised concerns about privacy the option to select their own workers to sort and count. This meant we would maintain a fluid set of co-researchers in addition to those already recruited for the study.

Given the above considerations, we made two modifications. We replaced random sampling of plots with accessible sampling along the driving and walking paths within the scrapyard. We also substituted the activities of sorting and counting scraps with visual estimates of cover, where cover refers to the ground area obscured by scraps when viewed

from above. The visual estimates of cover drew heavily from the Braun Blanquet (BB) scale in phytosociology, which I discuss below (Braun-Blanquet, Fuller, and Conard 1932; Damgaard 2014; Podani 2006; Poore 1955b, 1955a; Wikum and Shanholtzer 1978). [35]

Executed discard survey: visual estimates of scraps using Braun Blanquet (BB) scale

1. An accessible sampling of scrap piles. Rather than the random location of plots, we surveyed accessible stalls along a transect of paths already existing within the scrapyard. We realized that notwithstanding the built structures within the scrapyard, naturally occurring paths demarcated major areas of scrap activities, and scrap dealers mostly had their tents, stalls, kiosk or containers along these major paths. We approached these paths as transects and sampled along them (based on the consent of scrap dealers). Furthermore, instead of an established plot of a specific size (e.g., 10X10 metre quadrats, we used stalls or accumulated piles of scraps within stalls as sample units[36]. This meant sampled units differed in size based on how much a particular scrap dealer had accumulated at the time of the survey.
2. A visual estimate of cover/abundance using the Braun Blanquet Scale. Following the decision to visually estimate cover instead of sorting and counting and to avoid the problem of different unit sizes, we decided on the BB scale. The scale is an alternative method for estimating relative abundance in plant ecology. The BB scale, named after plant ecologist Braun-Blanquet, is a schematic for visually estimating the relative abundance of plant species within a community through cover that allows for a count

[35] Phytosociology is the study of vegetation composition, structure, and distribution (Poore 1955).
[36] Note that in some locations, dealers keep their scraps in a tent or stall. Others keep theirs in the open with no sheltering.

amenable to different sizes of plants via relative abundance rather than absolute abundance (Braun-Blanquet, Fuller, and Conard 1932; Poore 1955b, 1955a). The cover is mostly measured as a percentage of the total sample area and is among the most widely used measures of relative abundance (Floyd and Anderson 1987). The Braun-Blanquet scale[37] designates the amount of relative space a class of plant species occupies and includes a scale of 1-5, + and r. The 1-5 scale is used for cover classes of species ranging from 5% to 100% cover. The scales + and r are abundance scales of species with less than 5% cover (see Table 3.1 below).

Table 3.1: Braun-Blanquet cover-abundance scale. Developed from Poore (1955b).

Cover Class	Percent Cover	Definition
r	< 5%	Assigned where there is only a single individual of a scrap type, and it covers less than 5% of the sample plot area.
+	< 5%	Assigned where there are only a few (approximately 2-20) individuals of the scrap type and those individuals collectively cover less than 5% of the sample plot area
1	< 5%	Assigned where there are numerous individuals of the scrap type, but those individuals collectively cover less than 5% of the sample plot area
2	5% - 25%	Assigned where the cover of a scrap type is between 5% and 25% of the sample plot area.
3	25% - 50%	Assigned where the cover of a scrap type is between 25% and 50% of the sample plot area.
4	50% - 75%	Assigned where the cover of a scrap type is between 50% and 75% of the sample plot area.
5	75% - 100%	Assigned where the cover of a scrap type is between 75% and 100% of the sample plot area.

[37] I only discuss facets of the BB scale that are relevant to the present study. For a more detailed account of the methods see Braun-Blanquet, Fuller, and Conard (1932), Podani (2006), and Poore (1955b, 1955a).

The reason for designating a cover class rather than assigning a figure straight away (i.e., species X covers 16% or 48% of an area) is that most people would not select the same number if they were looking at the same plot. However, research has shown that most of the time, people will likely select the same cover class when looking at the same sample plot (Wikum and Shanholtzer 1978). Thus, instead of making direct estimates, attributing a cover class makes a more reliable and valid measure of relative abundance. Furthermore, given a time constraint, cover classes offer one of the most efficient ways of estimating the relative abundances of dominant species because the method is less likely to be biased by the distribution of individual species (Floyd and Anderson 1987).

Drawing on the cover classes of the BB scale, the research team assigned a percentage cover class to the different scraps within each sampled plot (i.e., individualized piles of scraps in the stalls or open space). We sampled a total of 43 plots along the linear transects of six major thoroughfares within the scrapyard. The process involved the following. First, at each sampled plot, we took a photograph of the scraps if allowed. Second, we then identified all the different types of scraps within the plot. Third, viewing from above, we assigned a cover class for each scrap type present in the plot using the BB scale cover categories (see Table 3.1). To demonstrate, in plot X, after noting the different types of scrap present, we would ask what cover category best described the automobile[38] scraps in the pile according to the BB scale. After identifying all items belonging to scrap type automobile, the team deliberated

[38] Identifying scrap types required deliberations. When co-researchers could not easily identify the type, we asked scrap owners to tell us.

and assigned a percent cover class before recording the cover class in the data collection sheet (Appendix 3.3). Fourth, conversations between the scrap dealers and the research team relating to the survey were recorded in the remarks section of the data collection sheet and a field notebook. The recording of ethnographic interviews and conversation became relevant as the execution of the survey sparked conversations.

Data analysis

I used two main methods to analyze the data. First, I examined the presence and abundance of scraps within the survey data. Second, I coded the ethnographic data recorded in the course of the survey.

Presence and abundance analysis

The BB scale is ordinal, so there is a ranked order between values or various classes. The scale ranks from low cover appearance < 5% to a high of between 75-100% cover. The differences between the classes are not fixed. For example, the difference between class 1 and 2 is not the same as that between class 4 and 5. On ordinal scales, the application of conventional statistical analysis, such as the mean, is limited. For this reason, analysis of BB data often relies on the presence or absence of species (Damgaard 2014; Podani 2006). A presence/absence analysis reveals the relative frequency of occurrences of a species or, in this case, a scrap type across plots. It gives the proportion of the total sampled units which contain a given scrap type. For example, using a presence/absence analysis, scrap type X will have a 25% relative frequency if it is observed in 50 plots out of 200 sampled. In addition to relative frequency based on presence, I used the distribution of occurrences within the different cover classes to ascertain the abundance of each scrap type observed.

Overall, the following questions guided the analysis of the BB scale data: (a) What is the dominant category of scraps within the sampled plots? (b) What is the proportion of electronics compared to other scraps at Agbogbloshie? (c) Of the electronics, what is the proportion of imported to locally generated e-scraps?

Coding

I coded the ethnographic conversational data for relevant processes and themes (Emerson, Fretz, and Shaw 2011). By coding, I am referring to the process of sorting descriptive data so as to relate the content of the data to certain overarching questions to reveal emergent themes and categories. Specifically, applying open coding by hand, I first read the recorded texts line-by-line to identify any ideas, issues, or themes they suggested. I also annotated the texts identifying events, incidents, relations, interactions, and dialogues. Following these readings, I did a focused coding where I wrote memos, summaries of preliminary themes that seemed to stand out in the text. The memos were the basis for identifying, developing, modifying and reflecting on recurrent and underlying patterns of processes (Crang and Cook 2007; for more on this coding practice, see Emerson, Fretz, and Shaw 2011; Fife 2005).

Results of discard survey

Proportion and distribution of electronics compared to other scraps

The most frequently observed category of scraps processed at the site was automobile. A presence analysis revealed automobile had the highest frequency of occurrence and was found in 35 out of 43 plots, showing a relative frequency of about 81%. The category electronics was in 22 out of the 43 total plots, representing a relative frequency of 51% (see Table 3.2).

Table 3.2: Absence analysis showing relative frequencies of various scraps

Scrap type	Number of occupied plots	Total number of plots	Relative frequency %
Automobile	35	43	81
Electronics	22	43	51
Construction and demolition	9	43	21
Heavy Industry	2	43	5
Other (unclassified)	2	43	5

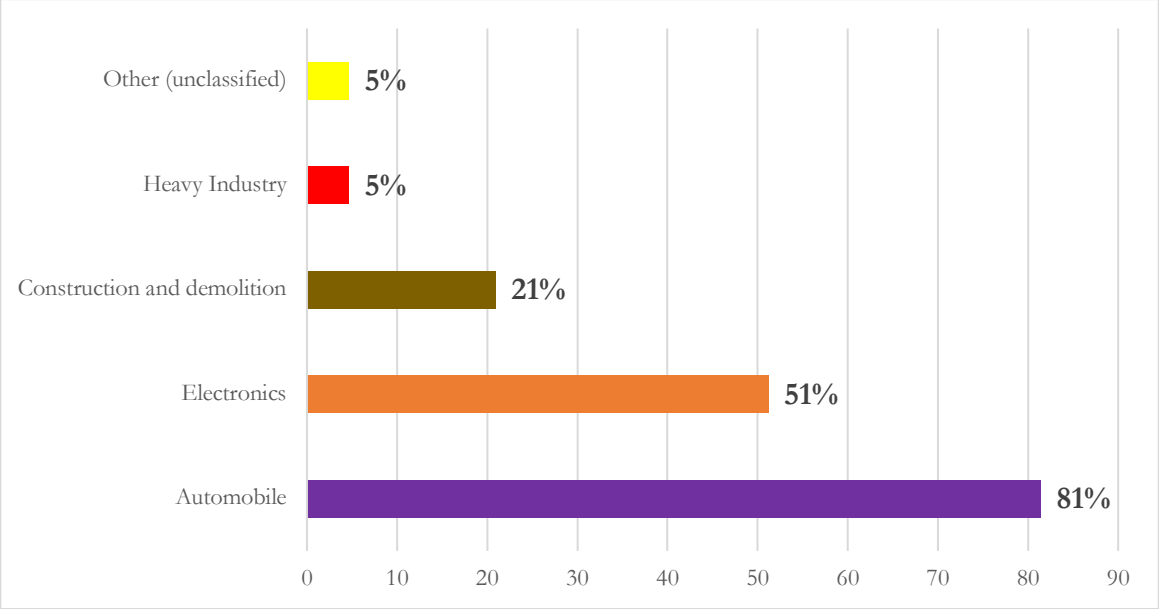

Figure 3.2: Relative frequency of various scraps

Not only was automobile scrap the most frequently found category, but it was also the most abundant, appearing mostly in the cover classes of 100-75% and 75-50%. Of the 35 occurrences of automobile scraps observed across the 43 sampled plots, 22 had a cover of 75-100%, followed by 9 with 50-75% cover (see Table 3.3).

Table 3. 3: Abundance of scrap according to Braun-Blanquet cover-abundance scale.

Scraps Data	Scale 5 (75-100%)	Scale 4 (50-75%)	Scale 3 (25-50%)	Scale 2 (5-25)	Scale 1 (<5%)	Scale +0.5 (<5%)	Scale r0.1 (<5%)	Total # of presence plots
Automobile	22	9	0	2	1	0	1	35
% of total # of presence plots	62.9	25.7	0.0	5.7	2.9	0	2.9	100
Electronics	8	1	2	8	3	0	0	22
% of total # of presence plots	36.4	4.5	9.1	36.4	13.6	0	0	100
Construction and demolition	0	0	1	3	3	2	0	9
% of total # of presence plots	0	0	11.1	33.3	33.3	22.2	0	100
Heavy Industry	2	0	0	0	0	0	0	2
% of total # of presence plots	100	0	0	0	0	0	0	100
Other (unclassified)	0	0	0	0	0	1	1	2
% of total # of presence plots	0	0	0	0	0	50	50	100

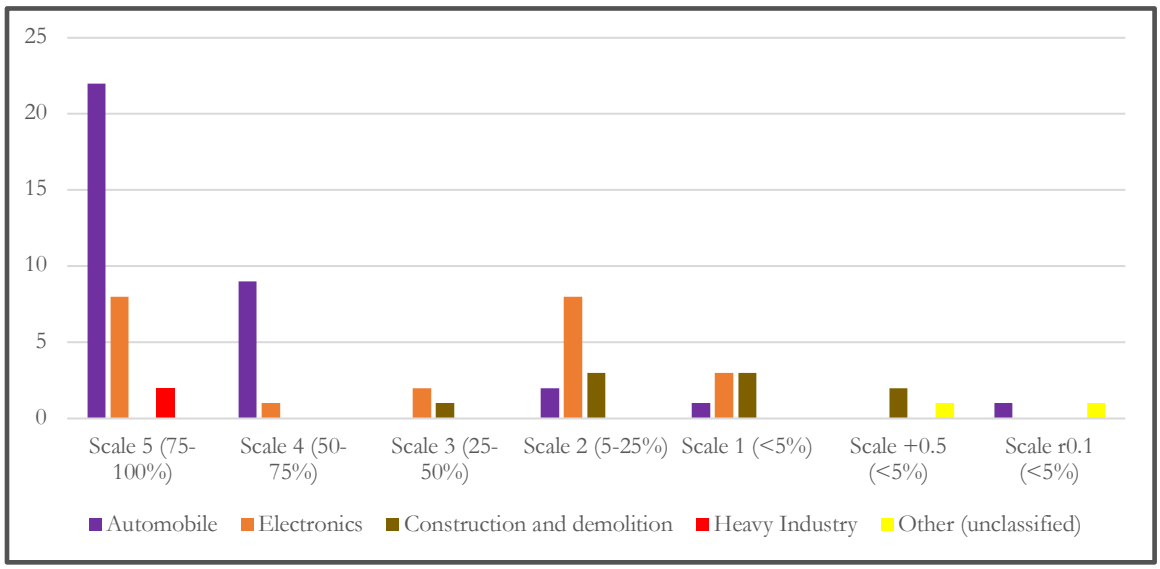

Figure 3.3: Distribution of abundance for various scraps

After automobile, electronics scrap was the next dominant type, distributed across the various cover scales as follows: eight occurrences with cover of 75-100%; 1 occurrence with cover of 75-50%; 2 occurrences with cover 50-25% and 8 with cover 25-5%. Construction and demolition scraps had low occurrences, found in only 9 of 43 plots. Items in this category included wood, iron rods gates, and aluminum roofing sheets. A surprising category of scraps in the heavy industry category was 55-gallon steel storage drums used in the chemical industry to transport or store petroleum products for export (e.g., oil, gasoline, and paint). The proportion of these scrap types was, however, relatively small and did not compare well to automobile, electronics, and construction or demolition scraps (Table 3.2). However, heavy industrial scrap is worth noting. It signals new categories of scraps emerging at Agbogbloshie as the oil and gas industry grows in Ghana. Importantly, the emerging presence of this industrial scrap points to the role scrapyards like Agbogbloshie play in the integrated network of scrap trade and flows within Ghana. The oil and gas industry is still in its infancy in Ghana. Commercial oil production began in June 2010. That we see evidence of this scrap at

Agbogbloshie underscores the role of domestic sources of scraps (be it electronics or heavy industry). I say more about the implications of sources of scraps for interventions at Agbogbloshie in Chapters Four and Five.

Proportion of imported to locally generated electronic scrap

The quantitative data from the survey did not include enough samples to accurately estimate the proportion of locally generated to imported electronic scraps. There were only isolated cases of observed asset tags on equipment such as personal computers and their peripherals. Furthermore, because the survey team was limited in sorting scraps, we were challenged in systematically documenting these tags as part of the survey. Qualitative observations at locations of significant electronics presence and conversations with the scrap owners revealed that rather than dealing with electronics directly transported from the main port of Tema, which might be indicative of imports, they mostly purchased electronics from collectors who got their supplies from households and businesses in Accra. This corroborates ethnographic findings on the networks of scrap operations within Accra (Akese 2014; Burrell 2016; Minter 2015; Oteng-Ababio, Owusu, and Chama 2015).

Other insights from the survey process

As noted earlier, the participatory citizen science nature of the survey generated conversations. While initially not designed to be part of the data collected, these conversations were central to the process of executing the survey. The conversations were a way to listen and be attuned to what workers, as well as my collaborators and co-researchers, had to say about "doing" research at Agbogbloshie. For instance, we observed that people's refusal to have their scraps surveyed was often accompanied by conversations about our particular project and the

presence of researchers at the site in general. In other cases, workers preferred telling us about the scraps they processed or traded rather than allowing us to apply the survey protocols. In what follows, I focus on some of these ethnographic engagements. First, however, I consider this emergent engagement in relation to the ethics of data collection.

The proposal for this research was approved by the Interdisciplinary Committee on Ethics and Human Research (ICEHR), my university's Institutional Review Board (IRB). I applied for ethics approval to collaborate with workers at the scrapyard in various capacities (i.e., co-researchers, association executives, and individual scrap dealers). In the field, I sought and obtained consent from both the co-researchers and scrap owners whose scraps we surveyed. In some contexts of emergent conversations, however, the process of seeking consent did not happen before the conversations. For example, I will narrate instances when some workers confronted me about my presence at the scrapyard. In such instances, while I did not obtain prior consent, in the course of the conversations, I made it clear that I am a researcher, so that those persons with whom I spoke were aware of the purpose. Some did not want to participate in the survey itself, either as co-researchers or scrap owners. They only wanted to voice their concerns about the presence of researchers (including me) at the site in general.

Navigating workers' experiences of research fatigue

It was a sunny Tuesday morning in Accra, and the research team gathered for another day of surveys at the scrapyard. Three co-researchers and I approached a scrap dealer's stall. The stall had a pile of scraps in front of it. Issah,[39] one of the co-researchers, informed the team he would lead this plot. He knew the owner of the stall. They were from the same village.

[39] Names are pseudonyms at the request of co-researchers.

Speaking in Dagbani[40], Issah explained the goals of the survey. The owner of the scrapyard carefully listened, turned to me, and said, "This [Agbogbloshie] is a place of business. You people think we are here for you, eh? You come here all the time taking pictures. Every single day, someone wants to know something. Let me tell you; we are tired." Issah attempted to respond to this query, also speaking in Dagbani. It was, however, quite evident that the question was directed at me, not him. I attempted to join the conversation, asking Issah if it was all right for me to speak. He hesitated but eventually said I could if I wanted to or we could move on. At the time, I did not want to bracket the moment and move on. But I quickly realized that the tone of the conversations, mostly in Dagbani, was tense. I heeded Issah's prompting and we left this particular stall without surveying the scraps.

Once we had taken a break, I sat with Issah and another co-researcher at a shed in Issah's brothers stall surrounded by some of his apprentices. Issah began narrating the incident to his brother. He initially spoke in Dagbani and later switched to English to include me in the conversation. His brother turned to me and said, "It is true. Every day people are here talking to us or taking pictures. They say they want to help us. That this place is dangerous! The other time we were here, some white people came asking to take blood. All these things are happening, and people do not like it."

In a session with Fuseni, we decided to survey early in the morning as it was a Friday. Friday afternoon Muslim congregational prayers, known as Jumu'ah, are important in the yard.

[40] Dagbani is the most common language spoken at the scrapyard. I mostly talked to my co-researchers in pidgin English, but among themselves and with others in the scrapyard, they mostly spoke Dagbani. Like other languages linguists categorize as "pidgin," Pidgin English is a form of English language developed in the 15th century during Afro-European contact in West Africa. It was developed to enable the Europeans to trade with the African population. It is mainly used in the West African coastal areas of Sierra Leone, Ghana, Nigeria, and Cameroon where the Europeans first made contact. It is sometimes referred to as "broken English", suggestive of attempts to bring the English language to the level of people who might not be able to speak or understand. Say I want to ask, "Will you go to the house?" Putting it "pidginly," it becomes "You go go house" (see Huber 1999)?

Most of the workers pray at Accra Central Mosque in Abosey-Okai, about eight minutes' walk from the scrapyard. On Fridays, we scheduled surveys in the mornings only, although I sometimes stayed for the whole day. On this particular Friday, having surveyed two stalls, the team bumped into another refusal, this time, a much more heated and intense encounter than the one with Issah. Even before we made it to the stall front and sought consent, a group of workers under a shed in front of the stall began shouting, instructing Fuseni, the team leader not to approach them. It was obvious that they knew I was a researcher and were not prepared to offer me an audience. This interaction was the most hostile we had encountered so far in the project. We turned around and moved on. Troubled by the nature of the ongoing refusals, I decided to pay more ethnographic attention to such encounters. In the afternoon, through a coincidental act, while leaving the scrapyard and passing by the very stall where we were refused an engagement, one of the gentlemen called me. Given the earlier hostility, I hesitated but honoured his call because it was only two people now, not a large group. The conversation went as follows:

> Alhaji Musah: Are you a journalist?
>
> G.A: No, I am a researcher.
>
> Alhaji Musah: We see you people all the time. You come here and then write bad things about us. You bring your white people to come and see us. You take pictures of the boys there [he points to the burning site at the edge of the yard]. Who permitted you to come here?
>
> G.A: I am a student and only here for research. I just want to know the scraps that you buy and sell here.

Somewhat appeased with my claim of being a student, Alhaji Musah cautioned me about whatever agenda I had roaming in the scrapyard. After this incident and later in the course of the survey, I greeted him when I passed by his stall.

These are just some of the queries the team dealt with while doing the survey. The above anecdote in many ways is indicative of Agbogbloshie workers' apprehension about research. In some cases, their responses foregrounded both their refusal to participate in the survey and their desire to make a point about their refusal. As I will discuss below, moments like these raised questions about the effects—research fatigue—of continued research at Agbogbloshie.

Discussion

So far, I have recounted the participatory discard survey done at Agbogbloshie and explained that electronics are not the most dominant scraps. Automobile scraps constitute a far more significant category. In what follows, I discuss and reflect on the implications of the findings.

On November 25, 2016, while I was still doing surveys at Agbogbloshie, a 30 million USD "state of the art e-waste facility" was commissioned at Agbogbloshie (GhanaNews 2016). In the heat of general elections in Ghana slated for December 7, 2016, the ruling government announced the construction of a new e-waste facility at the site. In a conversation about the proposed facility, Innusah, a scrapyard worker, said a planned funfair ceremony were intended to entice workers to vote for the ruling government, to make up for the government-led demolition of the site the previous year. This was not the only recent plan of this type, however, and Innusah and his colleagues might well be skeptical.

In 2014, the solution-based NGO Pure Earth unveiled a model cable grinding facility and named it the "Agbogbloshie E-waste Recycling Center". Commenting on the state of the cable grinding facility Anthropologist Peter Little writes, "Pure Earth's e-waste facility project operates under the 'progressive' idea that it can be a win-win for both workers and the environment, but many workers I have interviewed are skeptical of the efficacy and sustainability of the project" (2019, 57).[41] Little argues that Pure Earth's project is techno-optimistic, meaning it is premised on the introduction of new technology eliminating environmental harm resulting from e-waste processing at the site. The optimism, however, does not register with the workers at the site and thus speaks to the "failure" of the project to reach the environmental health goals of achieving a cleaner and safer working environment (Little 2016). Cable burners continue to burn at Agbogbloshie despite the presence of the cable grinding machine.

I go further than Little. I suggest that given the result of my research—the dominance of automobile over e-scraps—interventions at Agbogbloshie generally mis-specify the problem and thus institute solutions that constitute a sectoral mismatch (c.f. MacBride 2011).[42] The intervention geared at alleviating the e-waste challenges at Agbogbloshie does not match the dominant sector of scraps processed at the site. Discussions of the scrapyard as a problematic space are mostly framed around an e-waste narrative which, as I have argued in Chapter Two, collapses the complex, even intractable, issues about land and urban citizenship

[41] More recently, in March 2019, as part of a 25 million Euro funding from the German government, and in partnership with Ghana's Ministry of Environment, Science and Technology, a health post and an e-waste technical training centre ware inaugurated at the scrapyard (StEP Intiative 2019).

[42] In her analysis of recycling in the US, MacBride says sectoral analysis is a key "approach to asking big questions that will be indispensable if we want to make serious rather than token inroads into environmental problems that attend to solid waste" (2011, 179). This, she argues, takes away the "busy-ness" away from recycling policies that generate a lot of conversation but do less to intervene in the amount of waste produced.

at the site into facile images of the world's largest e-waste dump (Akese and Little 2018; Oteng-Ababio and Grant 2018). Framed this way, interventions end up targeting only e-waste or, at worst, rewriting complex socio-ecological issues in the broader OFA area as a waste dumping issue. In doing so, more appropriate issues are not effectively targeted. This mis-specification of problems and mismatch in interventions raises several questions. For example, what interventions will be fought for should Agbogbloshie be thought of as an automobile scrapyard or considered as a settlement with complex multiple socio-ecological issues? Automobile scraps have chemical pollution challenges of their own, including the potential release of oil into the soil, lead from batteries and airborne release of automobile shredder residue (ASR) (Lepawsky 2018; Zimring 2011). Yet this is ignored when Agbogbloshie is targeted as a site where electronics alone present problems of toxicities.

Problem mis-specification and sectorial mismatch is a problem in interventions on waste in general (Liboiron 2014c). Often waste advocacy and interventions misalign the scale of actions needed to tackle problems of waste effectively. A key example is how household recycling is touted as an intervention that will impact and undo the crisis of too much waste or even ocean plastics pollution. As I have noted already, MacBride's (2011) sectoral analysis of waste produced in the US shows that household waste or municipal waste constitute just 3% of total waste generated and the majority of the waste (97%) comes from industries (see also Liborion 2014). Yet advocacy and actions commonly centre on household or municipal recycling. The solution of household recycling does not match the problem because even if 100% recycling is achieved at this scale, it will leave untouched the 97% of industrial waste. This is the scalar issue of waste intervention: defining problems at a scale that hide dominant processes and thus obscure meaningful interventions.

At the height of a "landfill crisis" (Reno 2016) in the early 1990s, campaigns highlighting excessive wastefulness in North America targeted grocery bags, disposable diapers, and fast food packaging as emblematic of the crisis of overflowing landfills. In a pioneering methodology for the survey of landfills, drawing on archaeological excavation, Rathje and Murphy (2001) systematically document that these three types of waste accounted for less than 2% of landfills by volume in Arizona. Indeed, construction and demolition waste which accounted for 20% by volume received little mention in the discussions of overflowing landfills. In this very early work on waste, Rathje and Murphy point to a sectoral mismatch in interventions geared towards addressing the crisis of landfills. Changing consumer behaviour, for instance in buying disposable diapers, will do very little. Similarly, proposing solutions to transform Agbogbloshie based on the assumption that electronics are the main type of scraps processed at the site and thus the sole source of toxicants mis-specifies the problem. Given the significance of automobile scraps, even if e-waste allegedly arriving from the West were cut off immediately, a mere slice of the issue of toxicity would be dealt with and the overall problem of toxicants would continue.

Furthermore, beyond the local interventions at Agbogbloshie, when the site is framed as the place where the "West's e-waste goes to die," a key policy of the Basel Convention is a ban on import of used electronics into jurisdictions like Ghana (as a Non-Annex A or a "developing country").[43] This geographical imagination is no longer evident in patterns of

[43] The Basel Convention regulates transboundary shipments of hazardous wastes (including e-waste). This treaty was initially worked out by the United Nations Environmental Program in 1989 but did not enter into force until 1992. An amendment (BAN Amendment) was proposed in 1995 through the Basel Secretariat to strengthen the terms of the treaty, especially portions dealing with electronic waste. The amendment is yet to be ratified by enough signatories to prohibit the shipment of hazardous waste from "developed" (in the language of the treaty Annex A) to "developing countries" (Non-Annex A) (for an extended discussion, see Lepawsky 2015b; 2018).

trade (Breivik et al. 2014; Furniss 2015; Grant and Oteng-Ababio 2012; Lepawsky 2018; Lepawsky and McNabb 2010). Not only is the majority of global e-waste traded regionally, for example, between developed countries, but developing countries are generating significant e-waste of their own (Breivik et al. 2014; Yu et al. 2010). In addition, attempts to regulate e-waste flows through trade bans are exclusionary; they are advanced without the direct engagement of the communities that have formed economies around e-waste (Davis and Garb 2019; Khan 2018).

At Agbogbloshie, although the survey did not systematically cover this issue, ethnographic evidence suggests e-scraps are sourced from within Ghana (Akese 2014; Burrell 2016; Minter 2015). Given this, a policy prescription premised on a ban on e-waste export will do very little to address environmental challenges. And of course, as I have pointed out, the simplistic "where e-waste goes to die" narrative completely fails to account for the highly contested issues of land rights, urban citizenship, and economic exclusions of post-colonial Accra within which the e-waste processes emerged and continue to be salient.

Affordances of participatory citizen science

Despite the appeal of participatory science approaches like citizen science, researchers who mobilize these methods are increasingly called on to critically pay attention to the "forms of participation" that emerge on the ground irrespective of the intended participation envisioned prior to project execution (see Cooke and Kothari 2001 for a critique of participatory processes in development research). The meaning of participation is often created by researchers before they partner or collaborate with communities; Felt and Fochler (2008) note the contradiction. A truly participatory vision and experience should be decided by and

with the community concerned. Although reflections on the "participatory process" in the development literature are insightful, very little has been written about the forms of participation in participatory citizen science projects. While executing the discard survey with co-researchers at Agbogbloshie, I witnessed different forms of participation that were generative in important ways. For one thing, the participation uncovered the research fatigue of workers at the site.

As noted earlier, some scrap dealers and workers[44] at Agbogbloshie redirected the focus of the survey to raise important questions about what they perceived as the excessive interest of "outsiders" in their activities.[45] The presence of outsiders they said happens in ways that take for granted that Agbogbloshie is a place of private business activities. In speaking against the constant gazing (Agyepong 2014), some vehemently "refused" participation in the survey and protested my presence. Such experiences draw attention to how Agbogbloshie is often framed and actually "done" as a research site of interest to a wide variety of knowledge producers. Questions for which I do not have satisfactory answers are worth asking. For example, what is happening as Agbogbloshie becomes an "object" and "subject" of research studies, and what are the experiences of being researched in the daily life of workers? What are some of the inequalities that structure research encounters at Agbogbloshie? Drawing from discussions happening around ethical commitments to decolonize research, discard studies scholars need to pay attention to refusals. Notably, they need to engage with how refusal offers

[44] Stall owners usually employ about two to four individuals. These workers usually dismantle and sort materials for the stall owners.

[45] While the questions were directed to me as a "researcher," not all knowledge creation activities or "presence" at Agbogbloshie can be considered research in the true sense. As noted earlier, a wide of knowledge producers, including journalists, advocacy workers, NGO, development agencies, government regulatory agencies, and artists, visit the site.

an avenue to build solidarity with and to privilege the silence or concerns of those they research (McGranahan 2016; Simpson 2007; Tuck and Yang 2014a; see also Zahara 2016 for discard studies). By refusing to be surveyed, these workers resisted the gaze on their activities and instigated important discussions that I believe those who research the site need to take seriously. I reflect on some of the questions I have raised here more fully in Chapter Five.

The negotiations over access to the site for research and workers' protests through refusals also point to property relations central to scrap work at Agbogbloshie. This is not simply a dump where "things" (be they electronics or general scraps) are abandoned; rather, workers at the site operate their activities within patchworks of spatial property relations while collectively battling the city authority for legal recognition. The yard and spaces within it might appear as an urban common (Gillespie 2018, 2016), but there is a strong sense of ownership of property. This may be in part because those who own stalls pay rent through the GASDA for the spaces they occupy. As I noted, some workers actively protested the survey because as part of the general research at the site, they felt it was indifferent to the active business ventures. I take such a contestation to question the narrative and imaginary of Agbogbloshie as a dumpsite. In the next chapter, I examine the imaginaries of Agbogbloshie in more detail. Now I simply reiterate that for the workers I encountered during the field research, the scrapyard is not lived as a dump. It is a space and community lived through various relations, including that of property, where who owns and has access to land, scraps, and other resources matters.

Conclusion

In this chapter, I have narrated the process and results of a participatory citizen science survey at Agbogbloshie in which I systematically sampled the scrapyard to compare the

proportion of e-scraps to other types of scraps. I describe the winding ethnographic path my co-researchers and I took to make the survey work. The results of the survey show that contrary to the popular representation of Agbogbloshie, e-waste represents a modest amount of the total mass of scrap materials processed at the site. An important question remains: from where, when, by whom, and under what conditions did the iconic imaginary of Agbogbloshie as the world's largest e-waste dump emerge? I turn my attention to this question and others in the next chapter.

Chapter Four

Diving into e-waste texts: geographical imaginaries in e-waste science and advocacy at Agbogbloshie

> *Geographical imaginaries are more than representations or constructions of the world: they are vitally implicated in a material, sensuous process of "worlding"…..It follows that a vital critical task for human geography is the disclosure of these taken-for-granted geographical imaginaries and an examination of their (often unacknowledged) effects. (Gregory 2009, 282)*

Introduction

On September 2, 2015, about 1200 people from over 39 countries gathered at the Omni Orlando Resort at Champions gate in Orlando, Florida, for the annual E-scrap Conference and Trade Show. The conference is well-attended by e-scrap industry professionals; it is the largest and premier gathering of the industry in North America. In three days, attendees are treated to trade shows, informational sessions, and plenary discussions on a wide range of issues from industry trends to in-depth analyses of the electronics reuse and export market. I participated as a speaker in a plenary session of the 2015 conference titled "On the ground in Ghana: the realities of an e-scrap hotspot" with two other people: DK Osseo-Asare and Kevin McElvaney. DK Osseo-Asare is an architect of Ghanaian heritage who teaches at Ashesi University in Ghana. He is the co-founder of the Agbogbloshie Makerspace Platform (AMP).

Kevin McElvaney is a German photographer who documented the Agbogbloshie scrapyard in a series of highly publicized photographs and exhibitions in Europe. Appearing in *The Guardian*, and subsequently *Al Jazeera*, the photographs were captioned "Agbogbloshie:

the world's largest e-waste dump-in pictures." The following is an excerpt from the photograph's accompanying text:

> Photographer Kevin McElvaney documents Agbogbloshie, a former wetland in Accra, Ghana, which is home to the *world's largest e-waste dumping site*. Boys and young men smash devices to get to the metals, especially copper. Injuries, such as burns, untreated wounds, eye damage, lung and back problems, go hand in hand with chronic nausea, anorexia, debilitating headaches, and respiratory problems. Most workers die from cancer in their 20s. (*The Guardian 2014* emphasis added; see also McElvaney 2014)

As the title of the plenary suggests, the other panelists and I had been invited to shed light on the "realities" of e-waste at Agbogbloshie. The conference organizers made the case that such a discussion is necessary given Agbogbloshie's notoriety in the international media, especially on the heels of my co-panellist Kevin McElvaney's publication in *The Guardian* (Personal communication 2015). During the discussion, the moderator asked me to "place" Agbogbloshie within the larger picture of global e-waste flows. He posed the question in the context of McElvaney's claim that Agbogbloshie is the world's largest e-waste dump site. He asked whether Agbogbloshie is the world's largest e-waste dump according to grounded research.

In this chapter, I explore iconic representations of Agbogbloshie in e-waste science and advocacy. I map out the corpus of text on e-waste at the site from 2008 to 2018 to trace key patterns of such statements as "the world's largest e-waste dump site" (*The Guardian* 2014). I examine the following set of interrelated questions:

a) What is the broad topography of issues in e-waste texts at Agbogbloshie and what do they tell us?

b) What are the patterns of iconic statements of and about Agbogbloshie as an e-waste site? From where and from whom do these iconic statements emerge?

c) What geographical imaginaries are built into these statements?

d) How have the statements and thus geographical imaginaries been taken up within broader e-waste science and advocacy?

e) What are some of the implications of the take-up? That is, what are some of the material sensuous effects of the geographical imaginaries? For example, what kinds of living, projects, and interventions do the imaginaries in iconic statements of Agbogbloshie inspire, enable, and disable?

Assembling an approach, tools, and data

To answer these questions, I draw on a suite of tools and techniques used by scholars in STS to investigate controversies (Venturini 2012, 2010; Marres 2005; See 2015; Rogers, Sánchez-Querubín, and Kil 2015; Venturini et al. 2018). Termed controversy mapping, the tools and techniques help navigate the uncertain terrain of knowledge claims about a given phenomenon and the public(s) emerging around it (Venturini 2012, 2010). An exercise in controversy mapping entails diving into the magmatic flow of collective social life when there are disagreements over what constitutes important questions on technoscientific issues, who can answer those questions (whose expertise to trust), and what a satisfactory answer might look like or constitute (Venturini 2010). To map controversies is to enter the uncertain terrain of debates about science and technology.

In a recent paper with fellow geographers (Lepawsky et al. 2019), I experimented with controversy mapping in research on the transboundary flows of electronic waste. We argued that beyond exploring controversies in science and technology, controversy mapping could be

a useful tool for geographical research more broadly; "although controversies are good topics of research, mapping controversies can also be a useful tool for research" (Lepawsky et al. 2019, 3). As a tool for research, "controversy maps can act as assistive devices to move from a research topic to research questions and, thus, also help in the selection of method(s) that might be best suited to answering those questions" (Lepawsky et al. 2019, 3). I appropriate some of the tools and techniques in Lepawsky et al. (2019) to answer the questions outlined above.[46]

In particular, I apply these tools and techniques to written texts (a corpus) about Agbogbloshie as an e-waste site.[47] For some STS scholars interested in the fate of knowledge claims such as particular statements or recurring patterns of statements, mathematical predictions, or even textural imageries, examining written texts is a useful methodological opening (O'Reilly, Oreskes, and Oppenheimer 2012; Mahony 2015; Lepawsky et al. 2019; O'Reilly 2015). Here, my examination of e-waste texts is inspired by the work of two STS scholars. First, O'Reilly's study of how climate change science is produced; particularly her centring of "texts and documents as culturally produced, explicitly negotiated, often to the minutest detail, and encapsulating particular discursive logics" (2015, 148; see also O'Reilly, Oreskes, and Oppenheimer 2012; O'Reilly 2017). Second, Rekdal's (2014) intriguing analysis of the science of spinach's nutritional content, which follows his call to trace the development of "academic urban legends." In the scholarly literature, urban legends appear as claims (or a set of claims) so often cited and recited that they become a "truth." The attainment of truth is

[46] One of the important things about these tools for controversy mapping is that most are freely available. Readers are invited to take a second look or explore questions the data may raise for them.

[47] Although I focus on texts only, it is important to note that visual sources, such as documentary photography and film, are central in e-waste science and advocacy (for a similar analysis of visual documentation in e-waste science and advocacy, see Lepawsky 2018, 94-127).

not because the claim has been proven. Instead, the appearance and status of truth emanate from repeated citations in multiple text sources and the claim's gradual insertion in ways that often render it the desired point of replication for future studies.

I also employ search-as-research, or "the practice of repurposing an [search] engine's search capabilities for social research," to collect and analyze a corpus of texts on e-waste at Agbogbloshie (Rogers, Sánchez-Querubín, and Kil 2015; Ben-David and Huurdeman 2014; Venturini et al. 2018). Web search engines are one way to engage. For example, this morning, as I write, I have used Google [as an engine] to search for my city's bus transit website to get information on bus schedules. Put otherwise, I searched [with Google as an engine] to seek information based on which I will make roaming plans for the rest of the day. This is the social in the making, assembled through entanglements that connect to various sites and situations including the Web. To do "search as research" is to re-purpose and carefully design the information seeking capabilities of search engines for social research with the Web (not necessarily on the Web).[48]

Search engines organize knowledge of the Web through "sets of rules"—algorithms—some of which are known while others are proprietary and thus unknown to users (for detailed discussions, see Rogers, Sánchez-Querubín, and Kil 2015; Lepawsky et al. 2019). For example, a search engine like Google ranks search results by noting such factors as past searches of users, their geographies, measures on longevity and freshness, and in-link counts of websites. To a considerable extent, then, search engines curate user experiences, and to use them as

[48] As an instrument, the Web shapes how we engage. As such, we do not "do" research on the Web. Rather, we research "with" it.

instruments for social research, I need to repurpose them. In what follows, I detail the sets of query designs and decisions guiding my search as research.

My search as research protocol entailed the following steps. First, I created a clean research browser to disentangle myself (my previous browsing behaviour) provisionally, for it is not possible to be wholly disentangled (for a detailed discussion of creating a research browser for search as research, see Rogers, Sánchez-Querubín, and Kil 2015). This disentangling process simply involved creating a portable version of Firefox (any Web browser will do) on a USB drive for the sole purpose of the research query. I also configured Google to assume a particular user experience on some fronts. I assumed a Canadian user with the country domain of Google set to Canada and returned results limited to English language content only and maintained the default results of 10 individual Uniform Resource Locator (URL) links per page. These steps (as much as possible) prepared the search engine as a machine for undertaking search as research.

Second, I conducted a Boolean search on Google using the combination of keywords ""e-waste" OR "electronic waste" AND "Agbogbloshie"". For temporal analysis, I decomposed the search into yearly intervals from 2008 to 2018. That is, I did the same keyword search for each year, using Google's advanced tools to restrict results to publications organized by particular dates (January 1 to December 31, 2008, January 1 to December 31, 2009, etc.).[49] For each year, I selected the default first 10 results[50] and retrieved the URL of the Web entities into an excel spreadsheet (see Appendix 4.1). From 2008 to 2018, the entire corpus of relevant texts consisted of 110 non-duplicate URLs organized by year of publication.

[49] Click on tools>anytime>custom range to set dates.
[50] Google's default setting is 10 results per page. It can be reset to any number per page.

Third, I analyzed the corpus using Voyant. Voyant is a Web-based platform for textual analysis with tools for text mining, analysis, and visualization (Rockwell and Sinclair 2016; Lepawsky et al. 2019). My use of Voyant involved a number of moves, one of which was extracting the text from the 110 URLs. Other tools included the following: a word cloud generating the most common frequent words in a corpus; a reader showing all the underlying text extracted from URLs; a trends panel showing the relative frequency of the five most common words in a corpus; a summary panel detailing the number of individual documents in the corpus and how they compare to each other; and a keyword in context (KWIC) situating certain keywords in the text (see Figure 4.1 for Voyant's interface showing some of these tools).

Voyant automatically provides some analytical output when extracting texts from URLs. The top five most frequent words and KWIC provide a quick look at the topography of the corpus. For example, in my corpus, the most frequent words were "e-waste," "Agbogbloshie," and "dumpsite." This was expected given the search terms. Other keywords of analytical interest can be searched within the corpus to explore what their presence or absence say about ongoing conversations. For example, does the term "Basel Convention" appear? If so, in what context? Voyant's KWIC function helps with this analytical move. With KWIC, one searches for a particular keyword in the corpus and analyses its meaning in relation to the other words immediately preceding and following it. For example, given my research questions, I wanted to identify patterns of statements in the corpus and examine these statements for the geographical imaginaries built into them. For this, I had to read the entire corpus and also pay particular attention to the contexts within which certain statements appeared. For such an exercise, Voyant can be queried to extract all instances of particular

keywords or phrases while showing where (positions) they occur within the corpus. Voyant allows the navigation of a corpus of text in potentially diverse ways. Specific questions informed my analysis of the corpus. A user approaching the same corpus with a different set of questions is likely to have a different analytical interpretation.

Importantly for research purposes, the corpus can be revisited with new questions. Having identified patterns of statements, I then asked who made them and from where. How have the patterns of statements changed over time? What geographical imaginaries do these statements reflect?[51] In asking these new questions, about the produced texts (including my own) on e-waste at Agbogbloshie, my purpose was not to ascertain the truth of particular patterns of statements about the site per se (see Minter 2015; Burrell 2016; Oteng-Ababio and van der Velden 2019; Lepawsky, Goldstein, and Schulz 2015 for examples). Instead, I traced the biographies of certain statements and used illustrative examples from the corpus to show how they evoke certain geographical imaginaries and the material effects of those imaginaries.

As I show, the imaginary of size evoked in the statement "Agbogbloshie is the world's largest e-waste dump" and its variants appears in many texts on e-waste at Agbogbloshie. These statements gesturing to size are often staged as justificatory moves for the author(s) of these texts, acting as a warrant for research on, writing about, and representation of the site. For those who write about the site, making such a move may seem banal. It may be an intentional move to tell a compelling story or an inadvertent one, as the author simply restates and perpetuates an academic urban legend (c.f Rekdal 2014). However, such statements and their continued circulation in e-waste discourse and practice have effects, including the contribution to certain forms of harm experienced by people living and working at the site

[51] I used other simple tools like Excel; I introduce these in more detail in the analysis as I use them.

(Lepawsky and Akese 2015). That is, the patterns of statements and geographical imaginaries they evoke are not simply representations of Agbogbloshie. They have real material consequences (c.f Gregory 2009). To think critically about the e-waste problem at Agbogbloshie and to situate it more broadly within e-waste science and advocacy, I pay more attention to the material consequences.

Patterns of statements within the corpus of text

As I have already noted, for nearly two decades, the general narrative on e-waste has been anchored to a narrative of global injustice, pollution, and toxic exposure, where "developed" countries illegally dump waste on "developing countries" (Greenpeace International 2008a; Coalition and Network 2002; Basel Action Network (BAN) 2007; UNEP 2017; Lundgren 2012; Elisha 2010). Although such a narrative is now questioned (Lepawsky 2015b, 2014; Furniss 2015; Kirby and Lora-Wainwright 2015), it has put places like Agbogbloshie on the global e-waste map. Assuming texts produced on e-waste at Agbogbloshie is an index of how the site is positioned within this global map, what are the issues and patterns of statements that constitute Agbogbloshie as an e-waste site? To answer this question, I take a temporal look at the corpus of text on e-waste at Agbogbloshie from 2008 to 2018.

In 2008, when Agbogbloshie began receiving public attention (at least in media stories in Anglophone environmental advocacy and news reportage), the five most frequent words in the corpus of text for that year, ranked from highest to lowest occurrence were "waste", "electronic", "recycling", "Ghana" and "Greenpeace" (see Figure 4.1). These keywords indicate recycling was an important dimension of how e-waste activities at Agbogbloshie were framed at the time. As one of the most frequent words in the 2008 corpus, the word "recycling"

while telling, is not surprising. Tracing the citation trail of a widely circulated document, Basel Action Network's "Exporting Harm," Lepawsky (2019, 113) finds conversations on what to do with e-waste focuses on post-consumer recycling. As he argues, an overwhelming focus on "recycling" closes off other strategies of dealing with e-waste. For example, recycling frames the conversation on what to do with e-waste that is already produced. It says nothing about electronics before they become waste. Furthermore, recycling does little to mitigate the problem of increasing generation of e-waste (MacBride 2011; Liboiron 2014b; Lepawsky 2018). For Agbogbloshie, in particular, the salience of recycling renders invisible the repair and reuse economies that are part of the network of e-waste flows. A search through the 2008 corpus for keywords such as repair and reuse indicated limited critical attention (see Figure 4.2), but repair and reuse extend the useful life of discarded electronics at Agbogbloshie. As part of the network of activities, they also challenge characterizations of Ghanaians as victims of e-waste dumping. Workers at Agbogbloshie reuse and create value from discard electronics. This aspect of the network is absent from most texts.

Another frequently appearing word in the 2008 corpus, "Greenpeace," gestures to the role of ENGOs in drawing initial public and research attention to sites such as Agbogbloshie. As I will show later, the landscape of producers of e-waste science and advocacy at Agbogbloshie has changed over time. The international media now play a more dominant role than ENGOs. The question of which actors produce e-waste science and advocacy at Agbogbloshie is consequential: it reveals the relative positioning, privileges, and tactics of those who constitute public(s) around e-waste.

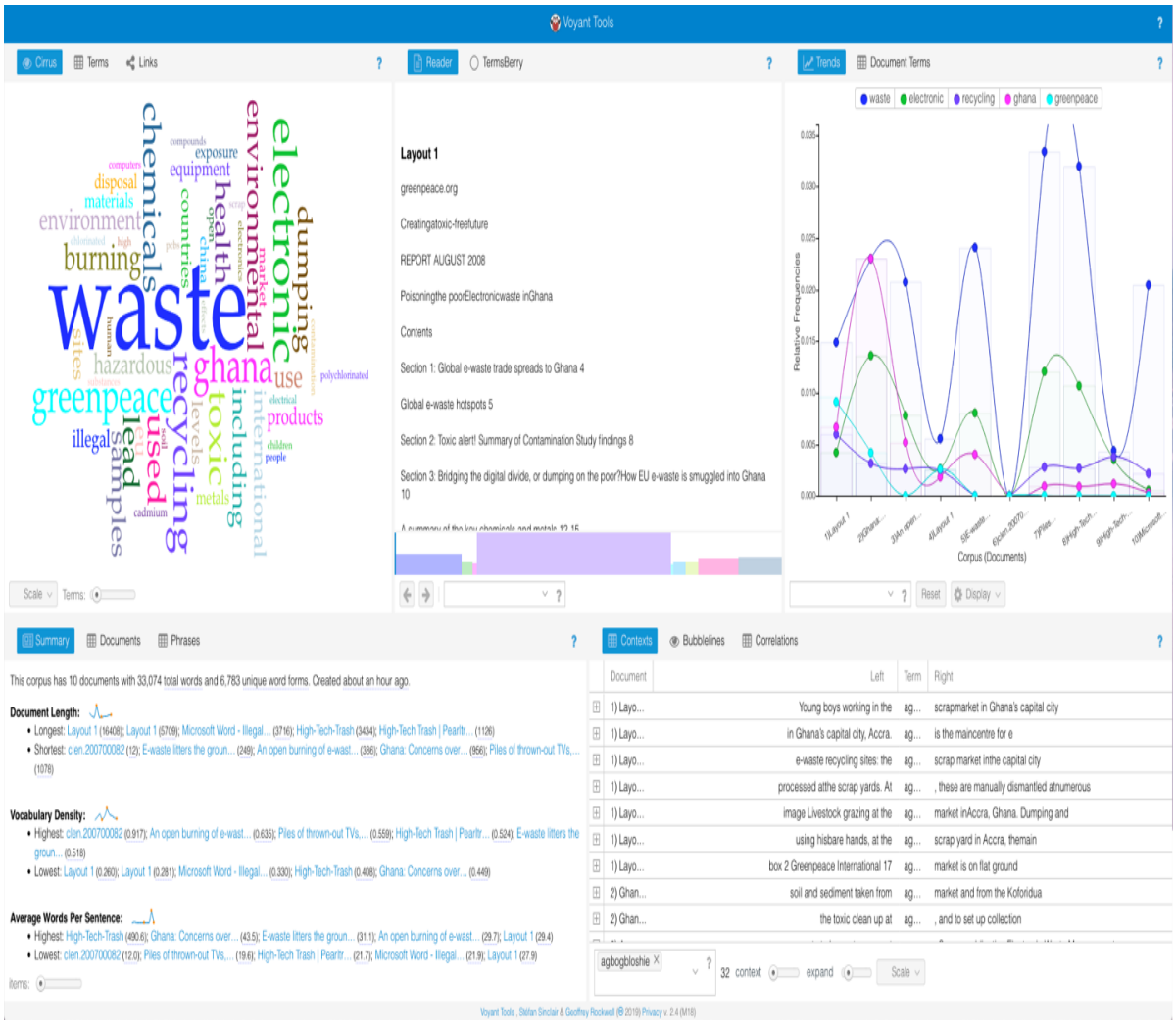

Figure 4.1: A visualization of the 2008 texts in Voyant showing: a word cloud of the most common keywords (top left panel); a reader of the accompanying text (centre panel); trends of relative frequency of the five most common words (top right); a summary of the text (bottom left panel); and KWIC of keyword "Agbogbloshie" (bottom right panel).
Note: This view of the Voyant dashboard is for illustrative purposes only. Readers interested in Voyant should consult Rockwell and Sinclair (2016). They can access the platform at https://voyant-tools.org/. A quick start to learning Voyant can be found at https://voyant-tools.org/docs/#!/guide/about.

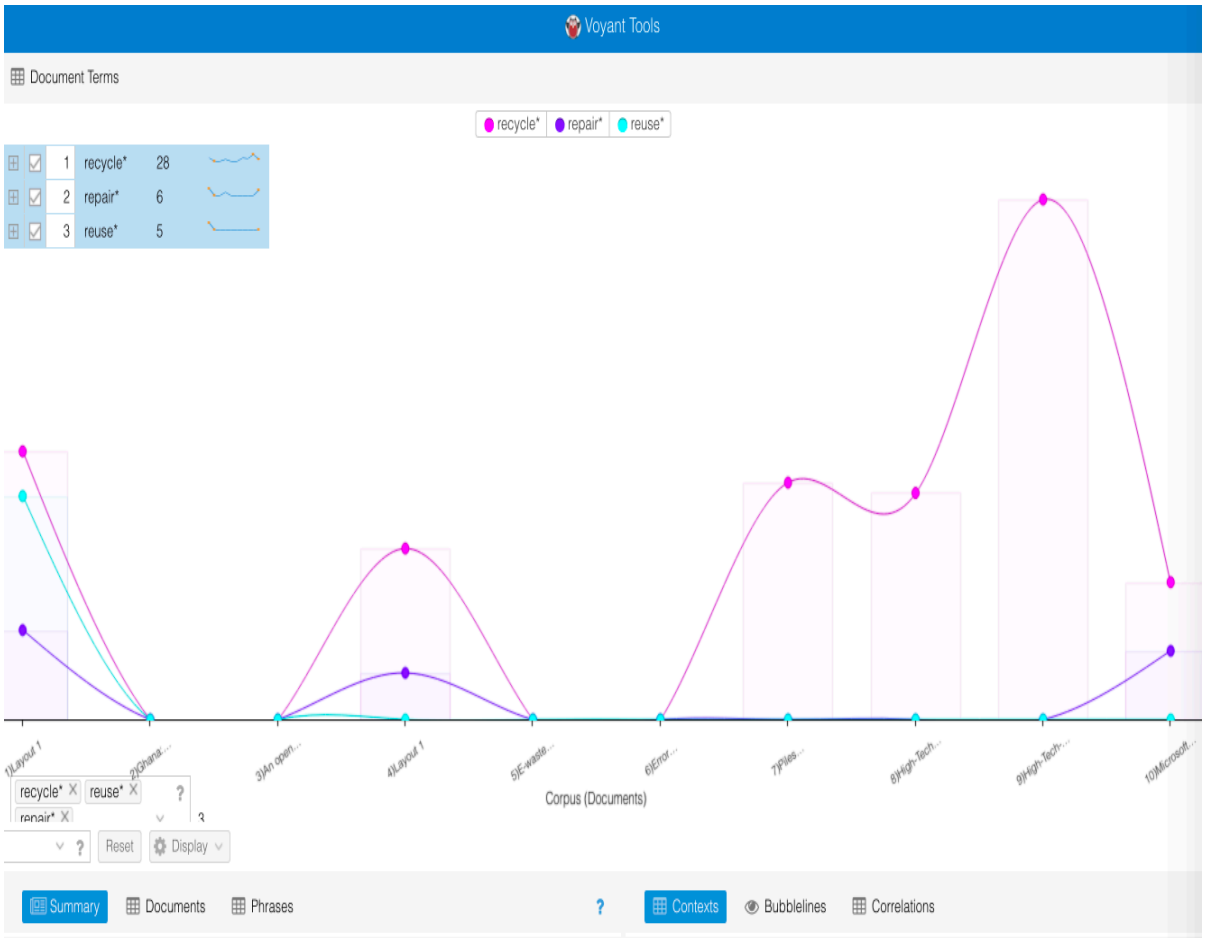

Figure 4.2: Appearance of "recycling" compared to "reuse" and "repair" in the 2008 texts.

The word "recycling" remains important in the 2010 corpus; ranked from highest to lowest, the five most frequent words are: "waste" "recycling," "Ghana," "management," and "economic." The keywords "management" and "economic" and the context in which they appear suggest another framing: solutions for e-waste are often sought in the field of waste management. As Gregson and Crang argue, discussions on waste in terms of management is "a move which ensures that waste is defined by, and discussed in terms of, policy technologies, or—more correctly—waste treatments and their connection to policy" (2010,1026) The language of "management" renders waste a purely technical problem often solvable with infrastructure and technologies (i.e., recycling, landfill, or incineration) (see also Reno 2015;

Gidwani 2012; Lepawsky 2017). Like recycling (which is one management practice), it often closes off critical questions about that which will become waste, while creating an illusion of containment and mastery of unruly materials. The management of waste, whether through recycling or other management strategies, is fundamentally an economic activity (MacBride 2011; Gregson and Crang 2015; Reno and Alexander 2012). While it costs money to manage waste, waste management also creates, rekindles, and recirculates value. The economies of waste are, therefore, more than just recycling. Yet other systems of value creation and circulations are curiously absent in discussions of the economies of waste, including the critical literature, here using the 2010 corpus as an illustrative example.

Figures 4.3 and 4.4 present the five most frequent words in each year's corpus (2008-2018) ranked from highest to lowest. A number of patterns are apparent. First, keywords like "waste" and "Ghana" dominate, which is expected. The conversations, however, take new forms. In 2011, "exposed" is one of the most frequently appearing words. The context within which the word "exposed" is used is indicative of a "toxicological turn" within e-waste science and activism, with critics focusing on questions of toxic exposure, risk, and labour conditions at Agbogbloshie. A KWIC of the word "exposed" includes the following: "workers at these sites are exposed to dust via inhalation, ingestion"; "it was reported that 80% of children are exposed to unsafe e-waste recycling"; "data from the group from Makola market who had not been exposed to e-waste was compared"; "out of the 87 participants exposed to e-waste, one (1.1%) looked pale"; "exposure to chemicals at Agbogbloshie e-waste recycling and dump".

As most frequent words, "Ghana" and "Agbogbloshie" are expected geographies and appears in almost all years. By 2014, however, quite different geographies emerged, with the most frequent words including "world" (2014), "global" (2016), and "Africa" (2017) (see

Figure 4.4). The narrative of and about e-waste has been one of charting a geography of vulnerability where one set of countries is equally vulnerable to another set. Within this "global" geography of vulnerability, Agbogbloshie is presented as exemplary: "the world's largest e-waste dump." I say more about the geographical imaginary built into the exemplary status of Agbogbloshie in the next section, but here I draw attention to the changing geographies that connect with Agbogbloshie as observed within the texts over time.

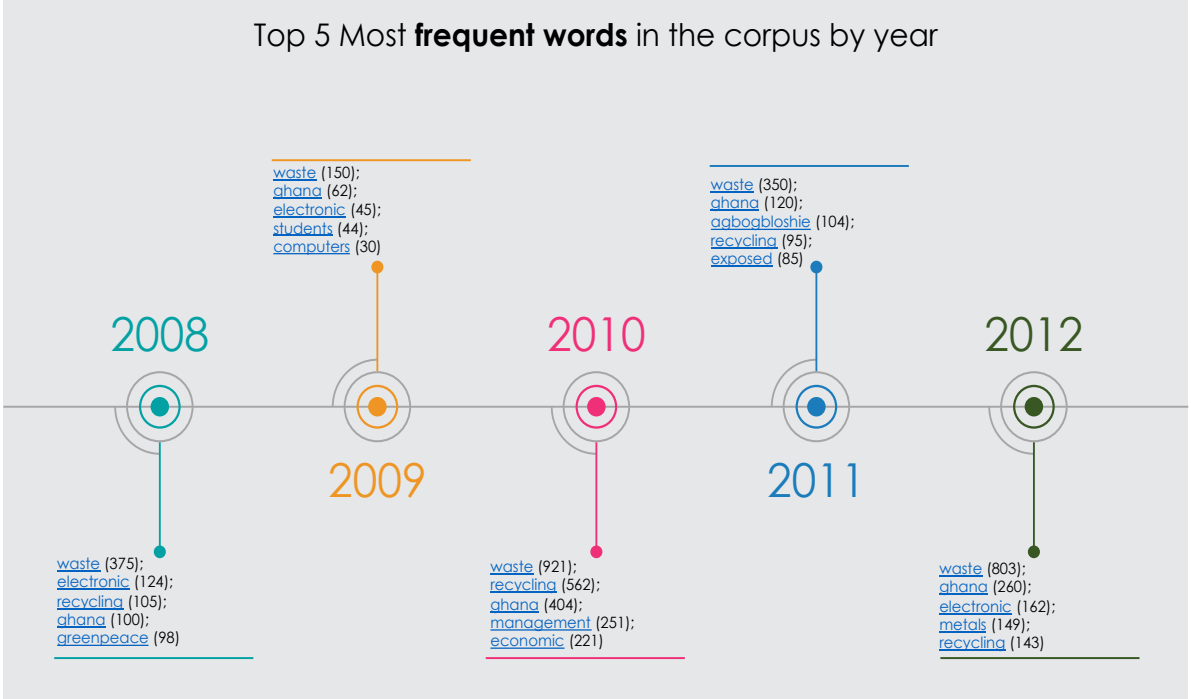

Figure 4.3: Top five most frequent words in the texts from 2008-2012

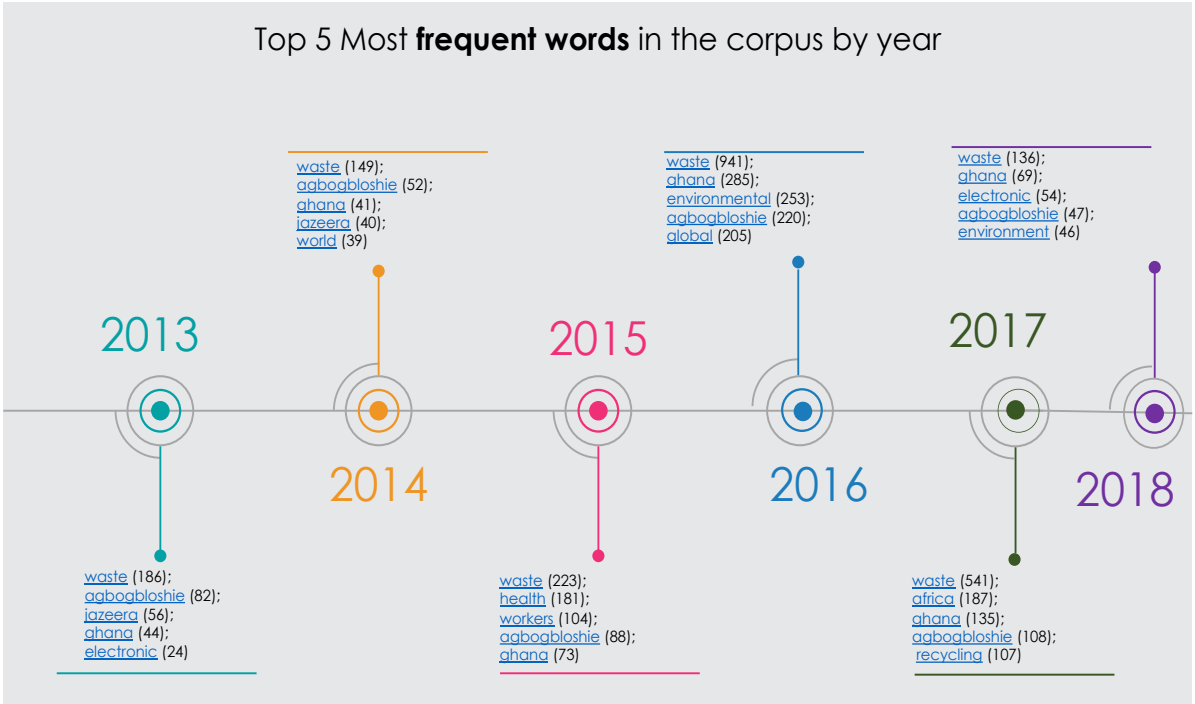

Figure 4.4: Top five most frequent words in the texts from 2013-2018

The appearance of the word "Jazeera"[52] as one of the top five most frequent words points to an important dimension: who is doing e-waste science and advocacy at Agbogbloshie and within what institutional or organization arenas are these actors found? To answer this question, I detour briefly from the analysis within Voyant to characterize the organizations and individuals associated with the URLs. For greater clarity, I coded each of the 110 source-document URLs according to 7 meta actors: journalism, not-for-profit, business, scientific community, government, QUANGO, and other (Blogs).[53] Overall, journalism (43%), scientific community (25%), and other (Blogs) (11%) were the three most prominent actors producing text on e-waste at Agbogbloshie. This was followed by not-for-profit (5%), business

[52] The full term is *Al Jazeera*. I have stop words such as "et al." excluded from the results.
[53] Here, I draw on existing characterizations of actors (see Lepawsky et al. 2019). QUANGO is an acronym for Quasi-Autonomous Non-Governmental Organizations. Such organizations are usually funded but not directly controlled by governments. Examples include United Nations Public Administration Network (UPAN) and United Nations Environment.

(5%), and QUANGO (2%). The absence of government (0%) is surprising, but it tells us something about the actors driving the e-waste agenda.

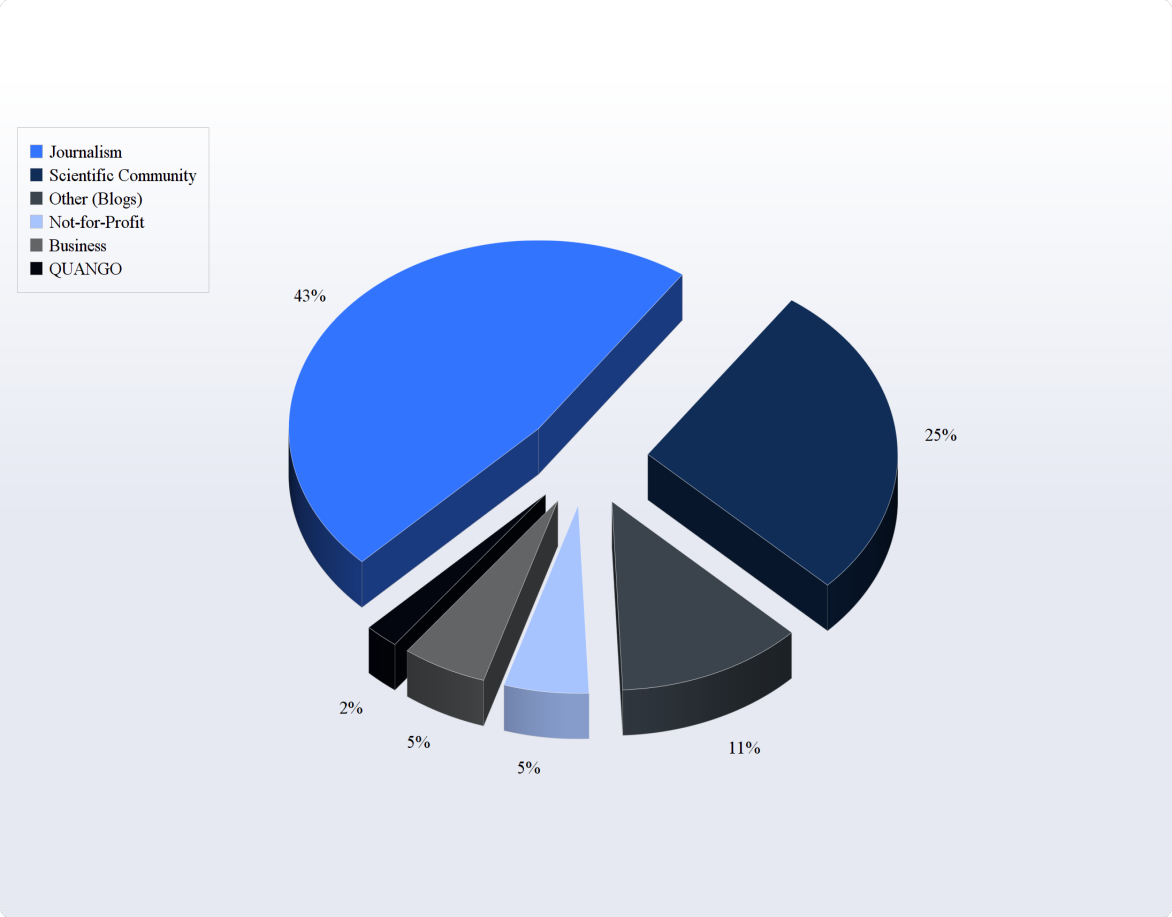

Figure 4.5: Distribution of source documents' URLs.

The prominence of journalism as a meta actor is not surprising when we consider the growth of environmental journalism in the past two decades (Senecah 2004). Broadly speaking, journalistic work on e-waste takes investigative and advocacy approaches, reporting on issues requiring urgent public and policy attention. Journalistic ways of knowing e-waste impact how e-waste is framed as a problem. Environmental journalism, in particular, makes use of what DeLuca (2005) calls "image events," or the use of charismatic images to appeal to audiences and gain public sympathy. In Chapter One, I introduced the concept of charismatic data (Pine

and Liboiron 2015), arguing that that e-waste is a charismatic modern waste (c.f Lepawsky 2018, 6). The dominance of journalism in this corpus gestures to a charismatic rendering not only of e-waste but of the specific places where e-waste data are often produced. Here then, Charisma has a double sense: the charisma of e-waste data is compounded by the charisma of place(s) where the data are collected.

In her analysis of the charisma of certain climate change data, O'Reilly writes that "to have charisma means to be favored, gifted or imbued with extraordinary power" (2017, 144). Agbogbloshie is a highly favoured location for e-waste science and advocacy, especially for journalists reporting on e-waste issues. It is staged as having the ability to speak for the problems of electronics more broadly. As I show later with examples, journalists often portray Agbogbloshie as a mirror reflecting all that is problematic about electronics.

Tracing (through geolocation) the geographies of the actors yields further insight. To trace the geographies, I exported the URL into the GeoIP tool provided by the digital methods initiatives for spatial analysis of Web entities[54]. Before speaking about the results, it is important to reiterate that "search as research" models a particular user experience. Because of search engines' algorithms, search results are partly curated based on the geography of the user; in my case, an Anglophone user based in Canada. That said, some of the website geolocations are notable. The majority of source document URLs are hosted in the United States (77%). The rest include Germany (8%), Canada (5%), Netherlands (4%), and France (3%), followed by the UK, Australia, Italy, and Ghana (1% each).

[54] The GeoIP (https://tools.digitalmethods.net/beta/geoIP/) tool takes a list of URLs and outputs a table indicating the city, country, country code, latitude, and longitude of the server hosting each URL. I organized the country attributed to each URL in an Excel spreadsheet to group, count, and compare identified countries. I used a free online heatmap software tool (see http://www.openheatmap.com/) to visualize the locations of source document URLs (see Figure 4.6).

There is a significant representative disparity in the locations of source documents. Earlier, I noted that the narrative of and about e-waste is inextricably linked to geographies of vulnerability. Given this imagined geography, consider that, for the most part, although Agbogbloshie remains the geography discussed in the texts, those doing the talking and their audiences are often distant from the place of interest. Of course, the observed geographies are both a reflection of the colonial history of global knowledge production and the geographies of those who produce e-waste science and advocacy. The over-representation of the "Anglophone world" on the Internet cautions against thinking the Internet perfectly mirrors "society." As Lepawsky notes, "One can trace the social with the Internet, but doing so does not produce a one-to-one map of it" (2018, 123). What I take Lepawsky to mean by this is that the social that is "traced" with the Internet is not a perfect match with reality. By the same token, the representation of e-waste at Agbogbloshie when traced using the Internet reveals some particularities that are a function of global knowledge production and its media of circulation.

Only two of the source URLs I looked up were located on the African continent. This is telling. First, it speaks to the kinds of audience actors have in mind when writing stories on e-waste at Agbogbloshie. This is not an accusation; I write this dissertation as someone in the "West." There is nothing inherently wrong with speaking to a Western audience. After all, we live in a world oriented to the hegemony of the West; we tell stories for the consumption of Western readers. Worth considering, though, are the effects of the centring Western audiences. How does this centring shape the kinds of stories told and importantly in the case of e-waste at Agbogbloshie, the kinds of solutions imagined? I reflect on this in the following sections when I examine in more detail the pattern of statements, the geographical imaginaries they

evoke, and their material effects. I show that a geographical imaginary of Agbogbloshie as hell is common in e-waste texts. Rooted in a Judeo-Christian worldview, the imaginary of hell sets up a white Euro-American experience as experience writ large. The West becomes the moral authority capable of solving whatever problem presented.[55]

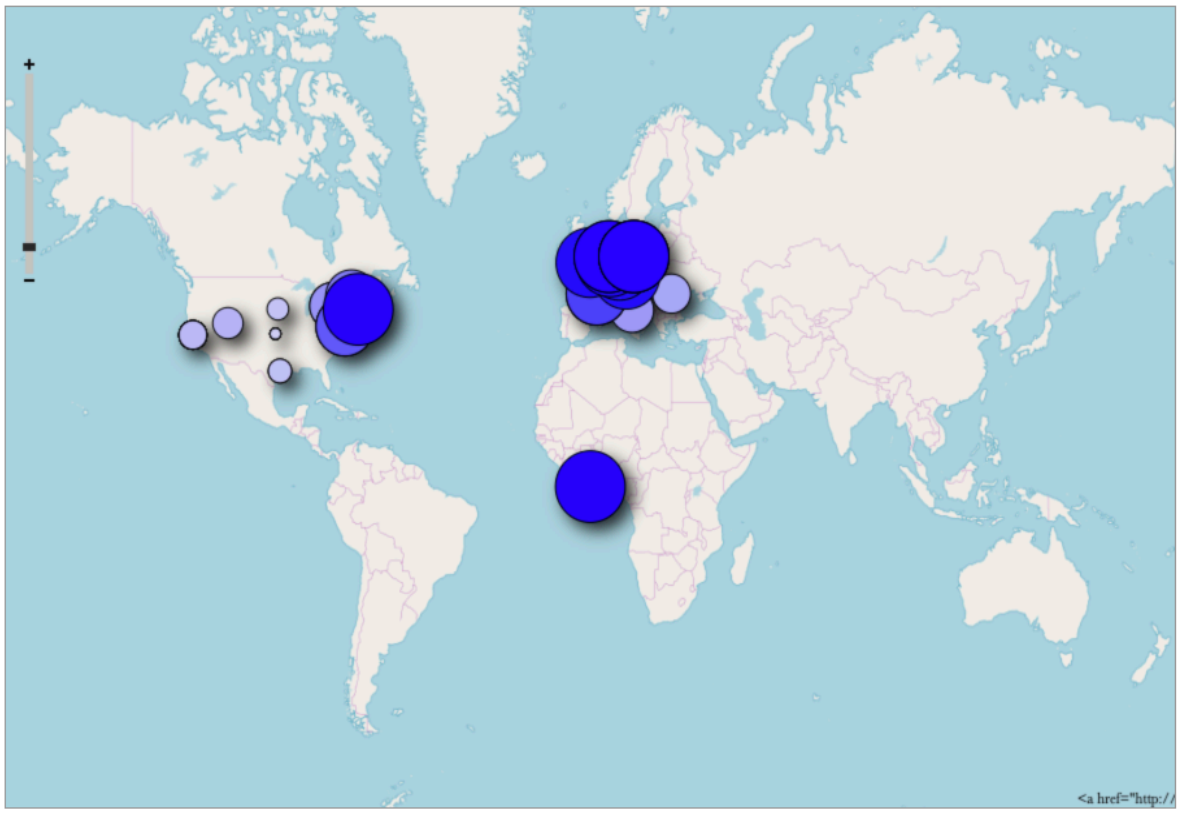

Figure 4.6: Geolocation of actors as indexed by document URLs

Portraits of Agbogbloshie: geographical imaginaries in e-waste texts and the work they do

In the previous section, I explored the body of work within the Voyant environment. In what follows, I pay attention to the geographical imaginaries within the texts. This involves

[55] I speak in due course about the White Saviour Complex as an effect of these geographies.

a much closer reading, where I trace specific patterns of statements within the texts that suggest or are indicative of such imaginaries and consider their material effects—their real-world implications.

I opened this chapter with geographer Derek Gregory's argument that geographical imaginaries are more than representations or constructions of the world: they are vitally implicated in a material process of "worlding." What then are the effects of representations of Agbogbloshie within e-waste text? In posing this question, my goal is not to vilify existing geographical imaginaries, or those in the scholarly or advocacy community who write them, including me. Instead, I consider the power and influence of representations. It is not about wrong or right but their ability or (inability) to do certain things.

As I noted previously, over time, we see changes in how Agbogbloshie is described as an e-waste site. The broad strokes of patterns include one fixated on size. Between 2008 and 2010, there was scant attention to issues of the size of Agbogbloshie or of e-waste operations there. By 2014 however, size and the status of Agbogbloshie as a spectacular case of e-waste dumping were defining imaginaries. Figures 4.7 and 4.8 show that although the waste dump narrative is a constant, few texts refer to size in 2008. The word "largest,"[56] for instance, has no contextually relevant meaning in the 2008 corpus. By 2014, however, size is an important dimension of the conversations. The statement that Agbogbloshie is "the world's largest e-waste site" now seems to underlie research on, writing about, and representation of the site (see Figure 4.9).

[56] A gesture to the size of Agbogbloshie or the amount of e-waste.

Figure 4.7: Appearance of key terms indicative of size in the 2008 texts

Figure 4.8: Appearance of key terms indicative of size in 2014 texts

The context of statements on size offers further insights into the work of this geographical imaginary. By context, I am referring to the placement of such statements in the sequence of key texts. For example, writing for Motherboard in June 2015, Maria Shibata opens with this statement: "It is a hot sunny day, but it is hard to catch rays of sunlight from the smog hanging over the world's largest digital dumping ground" (2015). Similarly, Asampong and colleagues open an academic article with the statement: "Ghana's e-waste dump at Agbogbloshie is reported to be the biggest in sub-Saharan Africa, one of the largest worldwide" (2015, 1). The section labelled "trends" and "document terms" in Figure 4.9 shows statements in the 2015 corpus that either evoke size or make claims about it. The sparkline shows the distribution of the terms within the linear segment of a document if the entire length of the document is imagined as 10 segments of equal sizes. Clearly, statements on size appear early on – in the first few lines of written texts. A KWIC reading further suggests such statements are often sweeping justificatory gestures: Agbogbloshie is or is reported to be the world's largest e-waste site and, thus, the research or advocacy is justified.

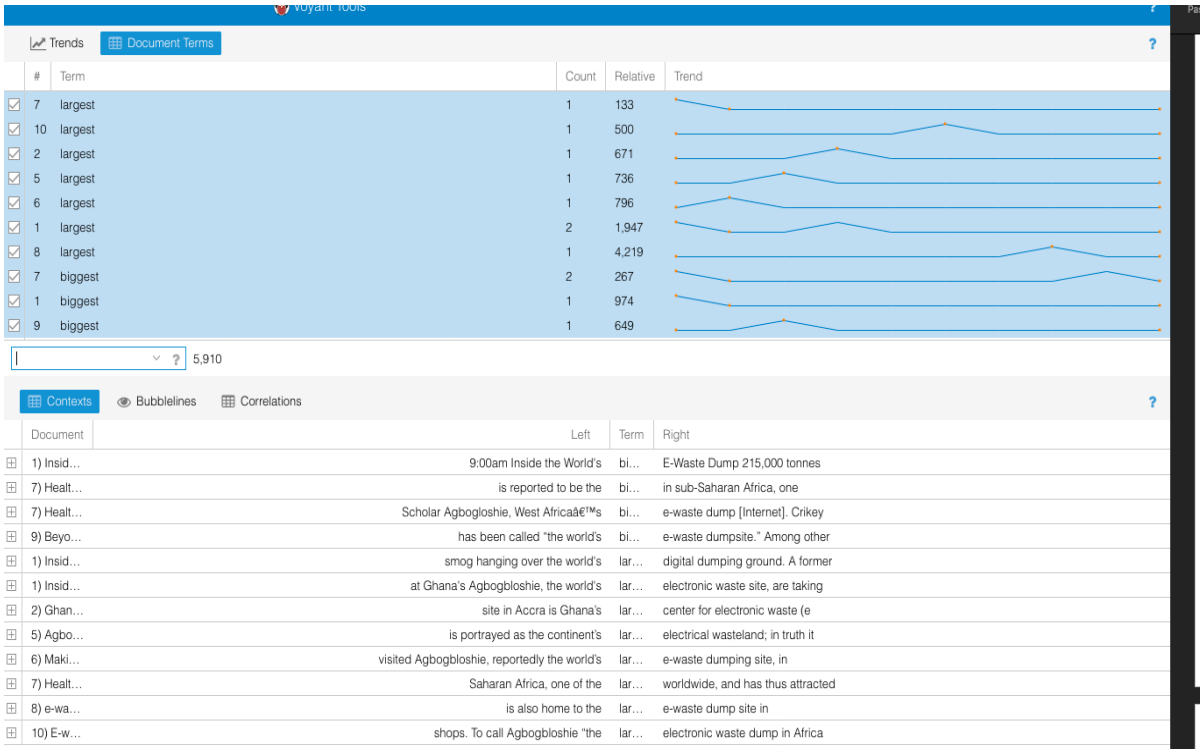

Figure 4.9: Sparkline and KWIC showing statements on size in the 2015 texts

Evocative textual imagery is another broad pattern I observed. Texts describing Agbogbloshie often paint vivid images. Consider this example from *National Geographic* reporters Carroll and Essick in their 2008 article "High-tech trash: will your discarded TV end up in a ditch in Ghana?"[7]

> June is the wet season in Ghana, but here in Accra, the capital, the morning rain has ceased. As the sun heats the humid air, pillars of black smoke begin to rise above the vast Agbogbloshie Market. I follow one plume toward its source, past lettuce and plantain vendors, past stalls of used tires, and through a clanging scrap market where hunched men bash on old alternators and engine blocks. Soon the muddy track is flanked by piles of old TVs, gutted computer cases, and smashed monitors heaped ten feet (three meters) high. Beyond lies a field of fine ash speckled with glints of amber

> and green—the sharp broken bits of circuit boards. I can see now that the smoke issues not from one fire, but from many small blazes. Dozens of indistinct figures move among the acrid haze, some stirring flames with sticks, others carrying armfuls of brightly colored computer wire. Most are children. (2008)

The opening remarks of Tash Morgan reporting for the Earthtouchnews Network in 2014 take a similar tone:

> At least a kilometre before reaching the Agbogbloshie e-waste site within Ghana's capital city, Accra, you can already begin to smell the putrid, toxic fumes emerging from the area. Agbogbloshie was once a beautiful and thriving wetland, a haven for a variety of small wildlife. Birding enthusiasts travelled here from all over the world to see the abundant birdlife in the sanctuary. An assortment of fish species could be found in its water bodies, the Densu River and Korle Lagoon, and small antelope such as duiker populated the lush grass and tree-covered surrounds. Agbogbloshie was once a beautiful and thriving wetland, a haven for wildlife. That beautiful place is gone forever ... because for nearly 15 years, industrialised countries have been offloading their unwanted electronic waste into this area. (2014)

Alexander Gobel, writing for Deutsche Welle (DW) in 2014, is similarly evocative:

> Black, poisonous smoke darkens the sky above Agbogbloshie, the final destination for electronic waste shipped from all over the globe. Some 50,000 people, including many children, live here - at one of the world's largest e-waste dumping grounds. Literally tons of old electronics burn in countless open fires, making my skin burn and itch as I walk through the grounds. There's a metallic taste in my mouth, and my head throbs.

> Meter-high, dazzling, green flames release huge wafts of black, poisonous fumes. It's like an apocalyptic painting come to life. (2014)

Texts come to life with graphic descriptions painting a grim picture of Agbogbloshie (see Appendix 4.1). Built into these descriptions are geographical imaginaries that do certain kinds of work. These imaginaries often work in conjunction with each other but for analytical purposes, I separate them.

Size imaginaries

As noted above, the geographical imaginary of territoriality, specifically, size is prominent in texts from 2008 to 2018. An example is an article in *The Guardian* titled "Life in Sodom and Gomorrah: the world's largest digital dump" (Adjei 2014). As I noted in Chapter Two, the biblical reference to Sodom and Gomorrah often pejoratively signals Agbogbloshie as a community of evil, vice, and destruction (Afenah 2012; Grant 2006). To this, the author adds claims about size. In the body of the article, Adjei writes, "Sodom and Gomorrah has also become known as one of the world's digital dumping grounds, where millions of electronic waste products from the West are legally and illegally processed each year." He cites (using a hyperlink) Blacksmith Institutes (now Pure Earth) as the source of the claim. As the cited document is part of the corpus (2013), I examined it more closely. In a similar justificatory move, the opening sentence says: "Agbogbloshie, in Accra Ghana, is the second largest e-waste processing area in West Africa." The Blacksmith Institute does not cite any study (assuming the claim emanates from somewhere else) for this claim; nor does it offer its own analysis to back it up. The article however refers to the problem of second-hand electronics imports:

> Ghana annually imports around 215,000 tons of second-hand consumer electronics from abroad, primarily from Western Europe, and generates another 129,000 tons of e-waste every year. Assuming growth continues in a linear manner, Ghana's e-waste imports will double by 2020. Approximately half of these imports can be immediately utilized or reconditioned and sold. The remainder of the material is recycled, and valuable parts are salvaged.

Evidentiary support is lacking. It is unclear how Agbogbloshie has become either the "second largest e-waste processing center in West Africa" or "the world's largest digital dump".

The lack of evidence in these two texts asks us to consider what is large in this particular context. Is it the size of Agbogbloshie itself or the volume of e-discards processed at the site? Even more importantly, under what ranking system did this largest size emerge? Compared to which sites is Agbogbloshie the largest? Such questions are not addressed in the claims on Agbogbloshie's size anywhere in the texts I examined.

The claims are not simply misrepresentations. They do things. They frame subsequent research and the solutions that they imagine and propose. For example, when Agbogbloshie is framed as the largest e-waste site, size often becomes the author's justification for research on, writing about, and representation of the site. The imaginary of size collapses all socio-ecological issues at Agbogbloshie into an e-waste problem. This is problematic because the collapse misrepresents the problems of e-waste and does not capture the specific challenges at Agbogbloshie. Nor does it tease out the challenges of the other scraps processed at the site. Even when there is specificity, such as claims of toxicological impacts, for instance, the size imaginary obscures the fact that the sources of pollution at Agbogbloshie are diverse.

As indicated by some of the most frequent words appearing in texts for the relevant decade, environmental health and toxicological consequences are an important dimension of the research and advocacy work on Agbogbloshie. The toxicological discussions take for granted that the toxicities directly come from electronics, but as I noted in Chapter Two, studies have not quantified the pollution load of the e-waste industry relative to that of the other industries in the area. Size imaginaries appear throughout the research, based on the assumption that e-waste is the sole pollutant at the site, and toxicants found come from electronics, either wholly or mostly. In doing so, research and advocacy misrepresent the problem at Agbogbloshie.

This misspecification has a ripple effect. It leads to proposed solutions that have little to do with the more relevant materials processed at the site (automobile, industrial, construction, and demolition waste, etc.)[57] and other broader socio-ecological issues, such as housing and urban citizenship rights. Consider some of the proposed solutions and ongoing interventions. One popular call in policy circles is a ban (BAN Amendment) on second-hand electronics imports to Ghana. Another is third-party certification to monitor the supply chain and deter exports. Localized efforts such as the Pure Earth's wire stripping-facility and German funded technical training center are also popular (Sim 2015; Muntaka 2009). The misspecification of the problem makes such solutions imaginable, while other possibilities disappear from imagination. Perhaps they are not even imagined in the first place. For example, what can we do about non-electronic sources of toxicants? What solutions might be imagined if Agbogbloshie was thought of as an automobile waste site? Alternatively, as Ghanaians are

[57] Recall in Chapter Three, I noted that contrary to the popular narrative, e-waste constitutes a modest amount of the electronics processed at Agbogbloshie.

increasingly consumers of electronics, what conversation would we have if Agbogbloshie was primarily a site for processing e-waste generated within Ghana?

For over a decade of e-waste research, questions of local generation have been silenced or at best sidelined. The literature rarely acknowledges the local generation of e-waste because the conversation is predominately framed by illegal imports. Electronics are presented as a foreign plague and Ghanaians are the victims. Yet this is not the case. As Burrell (2012) shows in her careful ethnography of Internet use in Ghana, although often invisible, Ghanaian youth in the 1990s and early 2000s had and continue to chart digital futures for themselves.

Agbogbloshie as exemplary

Agbogbloshie is often presented as exemplary of the crisis of e-waste, with representations drawing on the size imaginary (largest e-waste dump). It is argued that there is an "e-waste crisis" because as of 2018, 50 million metric tonnes of this substance were produced annually (UNEP 2015a). It is further alleged that anywhere between 60 and 90% of this global production of e-waste makes its way to "developing countries," to places such as Agbogbloshie, a site reported to be one of the largest recipients of global e-waste flows into Africa (UNEP 2015a). Its exemplar status gives Agbogbloshie global significance, with the site staged as a symbol for thinking about electronics consumption. In the article "Reduce, reuse, reboot: why electronic recycling must up its game," for example, Lucy Siegle says:

> Tech powers many things, including cognitive dissonance. A few years ago, I was travelling through Agbogbloshie, the commercial district in Accra, known as a graveyard for electronic waste, a hotspot for digital dumping. I tutted and shook my head in sorrow as I surveyed the charred keyboards and plumes of toxic computer smoke wafting across the landscape. My Ghanaian colleague looked with some

> amusement at the tech spilling out of my handbag. My laptop, phone, iPad – where did I think they might end up? (2017)

The rest of the article talks about the health and environmental implications of e-waste at Agbogbloshie and other locations where the UK's electronic goes. At the end of the article, Seigal suggests that the conscientious consumer of electronics should participate in recycling schemes, retailer take-back initiatives, and repair rather than upgrading his or her electronics.

Two moves in Seigal's text are worth careful consideration. First, Agbogbloshie comes across as a place of global significance because it unquestionably illustrates the environmental and health impact of electronics consumption. This causes her to have a visceral reaction when she juxtaposes Agbogbloshie with the contents of her bag. Second, the subject position she writes from presumes the electronics at Agbogbloshie could not possibly originate from users in Ghana. As a "white person," she is the default producer of the electronic discards at Agbogbloshie. This centring of whiteness is equally evident in her Ghanaian colleague's response. He affirms her "whiteness" invoking "white guilt" by asking about where she thinks the potential e-discards in her bag might end up.

These moves speak to West-centred texts on e-waste or, as historian of science Lorraine Daston argues, the tendency towards "European self-portraiture" in e-waste texts on Agbogbloshie. Daston writes, "Since the Enlightenment, the history of science has been enlisted to show the unity and distinctiveness of Europe" (2006, 523). Such white and Western-centred representations have effects. An imaginary of Agbogbloshie as exemplary suggests the e-waste problem is one of post-consumer waste and posits Western consumers (households in particular) as the sole source of electronics in Ghana. As a result, it is difficult to turn the analyses to other places where they need to look such as upstream in the design and production

of electronics long before they become waste and may be end up in a place such as Agbogbloshie.

Biblical iconographies of hell

Recurring imagery casts Agbogbloshie as an undesirable dystopic space, with references to spectacles of disorder and residents of Agbogbloshie described as victims trapped within this landscape. Evocations of hell, death, and graveyards (see the above citation from Siegal) are salient examples of such representations. This is particularly evident in the titles of texts, although sometimes references appear as metaphors in the body of texts. Table 4.1 lists some of the titles.

Table 4. 1: Titles of texts using biblical tropes

Title of Articles	**Source URL**
High-tech hell: new documentary brings Africa's e-waste slum to life (2012).[58]	https://news.mongabay.com/2012/04/high-tech-hell-new-documentary-brings-africas-e-waste-slum-to-life/
See inside the hellish e-waste dumps: where old electronics go to die (2018).	https://www.fastcompany.com/40515861/see-inside-the-hellish-e-waste-dumps-where-your-old-electronics-go-to-die
Ghana: The global graveyard for e-waste (2017). [59]	https://www.dw.com/en/ghana-the-global-graveyard-for-e-waste/av-46405273
E-hell on earth: where the West's electronics go to die (2013).	https://gizmodo.com/e-hell-on-earth-where-the-wests-electronics-go-to-die-1442576665
Welcome to hell: Photographer documents Africa's e-waste nightmare (2015).	https://www.foxnews.com/tech/welcome-to-hell-photographer-documents-africas-e-waste-nightmare
Where your electronic waste goes: a ruined city in Ghana called Agbogbloshie (2013).	http://occasionalplanet.org/2013/10/03/where-your-electronic-waste-goes-a-ruined-city-in-ghana-called-agbogbloshie/
It was like hell (2015).	https://www.washingtonpost.com/news/in-sight/wp/2015/04/15/the-children-who-make-a-

[58] "Welcome, to Agbogbloshie, where your technology goes to die."
[59] This is followed by a text that read "One of Africa's largest e-waste scrapyards is situated on the outskirts of Ghana's capital Accra. It's often been called hell on earth."

	living-in-the-toxic-world-of-discarded-electronics/?noredirect=on&utm_term=.e57c58f872a1
Life in Sodom and Gomorrah: the world's largest digital dump (2014).	https://www.theguardian.com/global-development-professionals-network/2014/apr/29/agbogbloshie-accra-ghana-largest-ewaste-dump
Agbogbloshie: hope in an apocalyptic wasteland (2017).	https://inittowingit.com/2017/02/11/__trashed-2/

Biblical references appear in the body of articles and include descriptions of "open fires," "burning," and "flames". Consider this text by Issak Kaladzi for DW tv:

> Poisonous fumes fill the air at Agbogbloshie. Ghana's capital Accra is a bustling, cosmopolitan city with a population of more than four million… Korle Lagoon, close to Agbogbloshie Market, is not somewhere to go for a pleasant stroll. Photos give an impression of what the end of the world could look like, with plumes of smoke rising from a grey, devastated landscape. (2012)

David Fedele's E-Wasteland documentary is equally telling. In the following two references, Fedele speaks about his experience at Agbogbloshie:

> It's basically 24 hours a day, seven days a week, of burning old electronics to remove the plastics, and get small amounts of metal that can be salvaged and resold, … It's in a constant state of dark toxic smoke, and the smell is unimaginable and never-ending. (Fedele cited in Schiller 2013)
>
> Filming was extremely difficult, as the conditions are appalling. The area is constantly covered in thick, toxic smoke from the burning of electrical cables that goes on all day and night. (Fedele cited in Hance 2012)

There is nothing wrong with claiming that filming at Agbogbloshie is challenging. However, he seems to be speaking from a position of privilege. Conditions are appalling for whom?

Under what conditions? At least, this filmmaker gets to "opt in" and "opt out". Who else at the site has such privilege? The filmmaker offers a representation of hellish[60] living for those who do not have the luxury of escape. While it is true that residents may not be able to leave, this imaginary is far from describing the reality and, in fact, does further harm. The problem goes beyond that of the representation; simply stated, the filmmaker does not honour the work people actually do in the scrapyard.

The geographical imaginary of hell does certain kinds of work. First, when it is used to describe the struggles surrounding land access, a real-world effect is that it informs narratives that exclude or attempt to exclude residents of OFA. As established in Chapter Two, the history of OFA is about struggles of citizenship rights, marginalization, and social justice grounded in post-coloniality (Akese and Little 2018). OFA residents are fighting for their right to stay on the land amidst unequal power relations. When portrayals of Agbogbloshie obsessively curate an image of the place as hell, they justify the removal of the residents. Within a general atmosphere of stigmatization and name calling, the AMA finds in the e-waste discourse, specifically the hell tropes, an opportunity to delegitimize the rights and concerns of OFA. During my fieldwork, workers said the visits of researchers, international media, and NGOs draw unnecessary attention to their activities.[61] Some said the AMA officials tell them that their work at the site is giving the country a "bad name," and the site cannot be allowed

[60] The trope of hell in the texts on Agbogbloshie is not surprising when considered in the context of popular narratives of African countries or "Africa is a country." A diverse scholarship traces widespread use of tropes of "darkness," "backwardness," "descent," and "crisis" grounded in racist and colonial discourses (for a review of this literature, see Scott 2017; Nothias 2018). Western media representations are implicated in this, as is Western scholarship (Mudimbe 1994; Jarosz 1992; Ferguson 2006).

[61] I provide ethnographic vignettes of some of these encounters in Chapter Three.

to exist. In this way, the hell imaginary of OFA adds to and invigorates the AMA's privileged interests in the land.

Second, the geographical imaginary of hell encourages a moral, or perhaps more accurately, a theological, response—premised on a "white saviour complex" (Spivak 1999; Spivak 1988; Daya 2014). As hell, Agbogbloshie requires not only intervention but saving. As I noted in my discussion of the texts' authors, the Ghanaian government and its various ministries and local governments are curiously absent. This is not to suggest the government does not care or participate in conversations. However, its absence potentially signals the "West-centric" nature of the conversation on Agbogbloshie as an e-waste site, as well as the kinds of solutions considered and those who are leading efforts to remediate the impacts of scrap processing at the site.

Conclusion

In this chapter, I have traced representations of e-waste at Agbogbloshie through a Web search, drawing on tools and techniques for controversy mapping. The suite of tools and techniques has allowed me to trace—mediated by the Internet—the e-waste conversation on Agbogbloshie over time. My search was curated by Google's Search Engine, but conversations on e-waste at Agbogbloshie could be traced using other media platforms, such as Twitter or even Facebook. Twitter, for instance, might be useful to study in real time some of the engagements I found in the texts, as these engagements circulate within concerned publics. There is certainly more room to leverage the tools and techniques of controversy mapping in studies of e-waste science and advocacy.

Chapter Five: Conclusion
Redoing e-waste science and advocacy at Agbogbloshie

"Power can be redone at the moment it is imagined as undone" (Ahmed 2012, 13).

Introduction

As I was finishing this dissertation, two things happened. On April 24, 2019, *The Guardian* (Beaumont 2019) published yet another article on e-waste at Agbogbloshie. Almost a month later, on May 22, 2019, I was copied on an e-mail chain from a British Broadcasting Corporation (BBC) producer looking to pitch another documentary on e-waste at Agbogbloshie (see Figure 5.1).

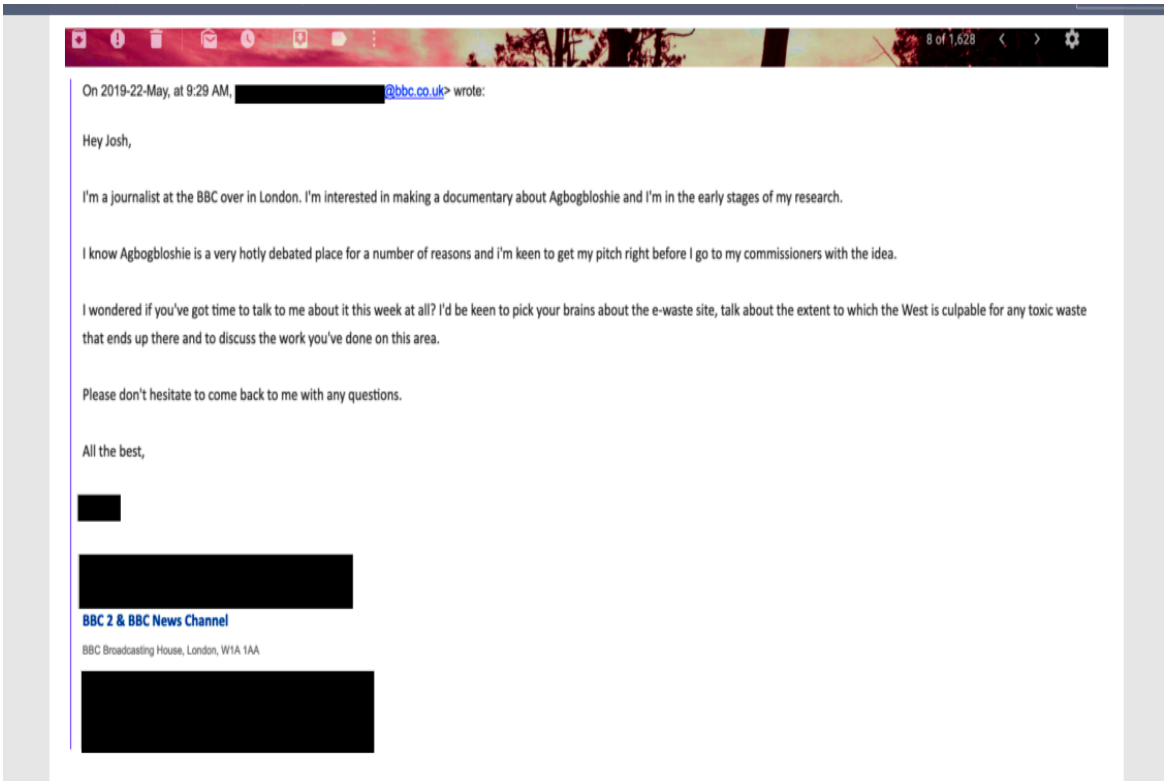

Figure 5.1: An email from a BBC producer pitching a documentary about Agbogbloshie

Titled "Rotten eggs: e-waste from Europe poisons Ghana's food chain", Peter Beaumont's article in *The Guardian* cited a report by IPEN[62] and BAN (Petrlik et al., 2019) that dioxins and polychlorinated biphenyls (PCBs) from illegally disposed of electronic waste from Europe were poisoning food chains in Accra. The original toxicological study on which the IPEN/BAN report was based analysed eggs from free-range chickens in Agbogbloshie. Referring to its findings, *The Guardian* article notes, "An adult eating just a single egg in the Agbogbloshie scrapyard and slum would exceed the European Food Safety Authority limits on chlorinated dioxins 220 times over. Other toxic chemicals were present in similarly worrying concentrations, including PCBs and fire-retardant compounds" (Beaumont 2019).

The Guardian article is relevant in as much as it affirms the presence (not source) of toxicants in and around Agbogbloshie. As noted in Chapter Two, toxicological studies suggest the fallout of airborne toxic emissions from the open burning of waste materials (including e-waste) negatively affects the safety of food prepared and consumed at the scrapyard and Old Fadama, as well as the produce sold at the adjacent Agbogbloshie food market (Chama, Amankwa, and Oteng-Ababio 2014). Other pathways of contamination at the site include the leaching of toxicants into the soil and groundwater, thus affecting vegetable growing and livestock grazing (Huang et al. 2014; Hosoda et al. 2014).

Problematically, similar to patterns observed in the corpus of texts I analysed in Chapter Four, the article encourages its audience to think that "disposed electronic waste coming from Europe" is the sole source of pollutant in the toxicity of the food chain at

[62] IPEN is a global network of over 500 public interest NGOs in over 100 countries. The goal of the network is to collaboratively work to ensure chemical and waste regulations eliminate toxicity (mainly POPs) from the environment. The organization envisions and works towards a toxic free future.

Agbogbloshie. Yet the IPEN/BAN report acknowledges automobile and electronic scraps as sources of pollutants: "The source of the POPs at Agbogbloshie is burning plastic associated with e-wastes and auto scrap to recover metals…. The reality in Agbogbloshie and many other developing country e-waste scrap yards could not be more disparate. There, television and computer monitors and electronic units from automobiles are broken with hammers, spikes and metal bars. Components that are easily accessible are then removed" (Petrlik et al., 2019, 3, 17).

Beaumont characterizes scrap processing at Agbogbloshie as harmful when he says that at Agbogbloshie "hazardous chemicals contaminate populations (especially the vulnerable) and the environment" (Beaumont 2019). Yet the original IPEN/BAN report notes other economic actions such as those involving component retrieval from electronics or auto scraps for repair, reuse, or remanufacturing (see also Grant and Oteng-Ababio 2012; Grant 2015; SciDev.Net 2015). The point I make here, echoing Lepawsky (2018) and others (Minter 2016; Grant and Oteng-Ababio 2016; Davis, Akese, and Garb 2018; Davis and Garb 2018; Lepawsky et al. 2017), is that "environmentally harmful practices occur at some points in this network. But those points are not the network," (Lepawsky 2018, 163), and Europeans are not the sole source of electronics in Ghana. In mistaking the points for the network and defining European e-waste as the sole source of toxicants at Agbogbloshie, such articles mis-specify the problem: even if all e-waste allegedly arriving from Europe were cut off immediately, very little would be resolved – the overall problem of toxicants at the site would continue to grow.

What is troubling about *The Guardian* article[63] is that although its intention is to make visible the environmental and health effects of e-waste, the narrative it produces is not just about representations; it *adds* to the harms inflicted on those who live and work at Agbogbloshie. As I have demonstrated throughout this dissertation, the kind of reporting evidenced in the article misrepresents the problem such that any goals or recommendations are guaranteed to fail even on their own terms. For example, if eradicating toxicity at Agbogbloshie is the goal, banning the export of discarded electronics from Europe (or OECD countries) to Ghana (or other non-OECD countries) will not solve the problem. More troubling, however, as I have shown throughout the dissertation, representations such as those in *The Guardian* article (and others I have referenced in this dissertation) do several forms of harm to people who live and work at Agbogbloshie beyond mis-specifying the problem. For example, they enhance their vilification by Ghanaian elites with interests in the land; they reinforce the idea that end-of-pipe solutions to electronic discards like recycling will work; they offer solutions, such as stopping flows of discarded electronics from OECD countries to Ghana that won't work; and they make it difficult to turn the analyses to where they need to look: upstream in the design and production of electronics long before they become waste.

Stories of e-waste like that told in *The Guardian* article are immensely popular. They appear in media reports, ENGO advocacy work, and academic articles. This dissertation offers a counter-narrative to an entrenched genre. My goal has been to take a closer and more critical look at e-waste science and advocacy at Agbogbloshie. Key themes include how knowledge about e-waste is made and represented and how it is deployed in public discourse around the

[63] Throughout this dissertation, it has become clear that media coverage of e-waste in Ghana constitutes a major part of e-waste advocacy and science work. For example, in Chapter Four, I show that journalism is a significant actor in Agbogbloshie.

world. To this, I add a critical consideration of the broader implication of that knowledge. When e-waste scientist and advocacy groups are seen as drawing attention to, deliberating on, or implementing solutions that impact post-consumer waste, their actions are generally understood to be doing good. I take a different point of view, arguing for the need to consider the politics of e-waste science and advocacy. Although I use Agbogbloshie as an example, my conclusions go beyond this particular site to connect with other sites and situations.

In her examination of universities' diversity policies aimed at correcting inherent injustices, feminist and post-colonial scholar Sara Ahmed writes that "power can be *redone* at the moment it is imagined as *undone*" (Ahmed 2012, 13, emphasis in the original). What I take Ahmed to mean by this is that even well-intentioned efforts, be they institutional or otherwise, to undo certain forms of harm or to seek justice for a marginalized group need critical engagement even when they are considered to do good. We need to pay critical attention to things that recede from view in the setting up and pursuit of justice.

In this chapter, I frame my concluding thoughts around Ahmed's suggestion to look into the possibilities for "redoing" at moments of imagined "undoing." I ask and answer the question: what are the possibilities enabled as well as limitations presented by the work done in this dissertation? Framed this way, the concluding thoughts align with my ongoing desire to open up rather than close down spaces for thinking and doing e-waste science and advocacy at Agbogbloshie. By questioning the dominant narrative, I have opened spaces where the tensions of Agbogbloshie as a site of/for e-waste science and advocacy, either by chance or design, can be more carefully thought through and perhaps done differently.

Possibilities for re-doing and un-doing e-waste science and advocacy

Possibilities I

Throughout the time I have been writing this dissertation and perhaps more accurately been engaged in researching on and with workers at Agbogbloshie, I have been part of a small community committed to telling more nuanced stories of and about e-waste at the site. This group has mostly been informal, constituted by people doing independent research on or engaging with Agbogbloshie who feel strongly that the dominant narrative is partial or misleading or does harm. By voicing these related concerns (and occasionally meeting and speaking at conferences), this small group has gelled around a desire to not only do research or engage in issues at Agbogbloshie, but also to seek opportunities to re-address Agbogbloshie's imagery as an e-waste site.

Throughout my research, I have deliberately spoken to "new" people, mainly journalists based in the West, who have become aware of issues at Agbogbloshie and want to speak to someone who knows the site well (see an example of such a request in Figure 5.1). My approach to them (often based on the kinds of questions they ask) is to give the context and prompt them to question certain assumptions. I situate e-waste processing at Agbogbloshie within a historical, socio-spatial context. Rather than imagining a pristine landscape of Ghanaian victims as reported in the media, I ask them to frame new questions and see the context differently.[64] I ask them to consider what kinds of problems are defined and what solutions are fought for when Agbogbloshie is framed entirely as an e-waste dump

[64] I am not suggesting that we should focus on context and ignore the harm caused by e-waste processing. I hope my dissertation corrects the negative representation of Agbogbloshie without minimizing or overlooking the real problems. The hope is to add nuance to the situation to address problems adequately and find appropriate solutions.

created by the West. Few studies on e-waste at Agbogbloshie directly engage with the site's broader local political economy. Yet as I demonstrate in Chapter Two, struggles over access to land and urban citizenship are important dimensions of the site's e-waste politics. More importantly, this history, when acknowledged, has implications for the ways e-waste science and advocacy organizations frame the site. My argument in Chapter Two, and what I hope those with whom I speak consider, is this: the socio-spatial history of Agbogbloshie matters if we are to appreciate the emergence of the informal e-waste industry and associated politics and also to more carefully think through the impact of a decade of e-waste science and advocacy and come up with the kinds of solutions that might actually work for the people who live and work there.

The engagement I reference above—my offering of a counter narrative by prompting people to see differently—has been an essential and on-going process informed and necessitated by my research. Although such engagement was not an initial research strategy, upon reflection, I think it is akin to doing the work of what Lepawsky (2018, 4) calls defamiliarization, a technique in literary studies that requires familiar processes and things to be looked at differently. Of course, there are different engagements related to defamiliarization, and Lepawsky relates some of these more broadly to geographies of digital technologies. In this dissertation, defamiliarization includes the practical act of instigating and conducting online and offline conversations that nudge audiences to consider questions like the following (though not always explicitly). What happens if presumed problems and proposed solutions to the e-waste problem at Agbogbloshie acknowledge and take seriously that people who live and work at Agbogbloshie are and have been strong advocates for the improvement of their own conditions (see Lepawsky and Akese 2015)? What other crucial socio-ecological problems are

present at Agbogbloshie when colonial geographies are foregrounded? What are the pressing problems at Agbogbloshie when we engage with postcolonial contextualization in Ghana more generally? There is room for more defamiliarization, and I hope engagement with these questions and others will displace the dominant storylines.

Possibilities II

The dissertation also argues the need to think carefully about the kinds of "justices" imagined in how e-waste advocacy and science are done at Agbogbloshie, as well as how these justices feed into interventions to ameliorate the environmental impact of e-waste processing. Elsewhere, a colleague and I have argued for what we call a "situated e-waste justice" (Akese and Little 2018). By this, we mean an analytic sensibility and a strategic language that engage the possibilities of contextualizing the environmental justice (EJ) frame to understand and act on broader justice issues in Agbogbloshie.

A contextualized EJ frame recognizes the differences and histories implicated in producing a landscape of violence and toxicity. While not explicitly mobilized in e-waste text on Agbogbloshie, an EJ framework is fundamental to the work of media reporting, academic research, and ENGO activism. The ENGOs' version of EJ, couched in the language of "toxic colonialism," underlies their critique of the export of e-waste (as hazardous waste) to developing countries, and their agenda includes the banning of these exports. ENGOs argue that companies in developed economies target the backyards of marginalized populations, rendering them pollutable, thus continuing violent colonial processes of valuing certain people and places over others. Emerging within civil rights activism in the US in the 1960s, the discourse and practice of EJ are now used to understand the unequal distribution of environmental harms and goods (Bullard 1990 1983; Pellow and Brulle 2005). In waste and

discard studies, EJ recognizes that environmental harm from waste accumulates in certain places more than others and, as such, particular groups of people, mostly marked by race and class, bear a disproportionate burden of the negative impacts.

The EJ imperative has been evolving not only for understanding but also for acting on the harmful consequences of socio-environmental change (Walker 2009b; Walker and Bulkeley 2006; Walker 2009a; Mohai, Pellow, and Roberts 2009; Pellow and Brulle 2005). The evolution features a horizontal spread to include a broader profile of environmental concerns and places and a vertical expansion into a global scale (Martinez-Alier et al. 2016; Schlosberg 2004; Agyeman 2014; Williams and Mawdsley 2006). Partly because of this evolution, there have been demonstrable expansions in and re-theorizing of concepts of environmental injustices in different places and times (Martinez-Alier et al. 2016; Martínez-Alier et al. 2014; Holifield 2001; Williams and Mawdsley 2006).

Chapters Two, Three, and Four demonstrate that the usual imaginary of Agbogbloshie as a victim of the "West" that underpins claims of environmental injustice in e-waste processing is problematic. First, as discussed in Chapter Two, such a framing neglects an important broader political economy relevant for understanding e-waste politics at the site and for devising appropriate solutions. Second, contrary to Agbogbloshie's imaginary as the ground zero of the crisis of e-waste, nearly always to the exclusion of other representations of the site, e-waste constitutes a relatively lesser amount of the total mass of discards processed at the site. Specifically, results from the participatory discard survey in Chapter Three show that the most salient category of discards is car scraps. This means there is a "sectorial mismatch" (c.f MacBride 2011) in the definition of problems, proposed solutions, and current interventions at Agbogbloshie. Recall that *The Guardian* article takes as a given that the toxicity

in eggs at Agbogbloshie comes from e-waste, even though the original toxicological study acknowledges automobile scraps are also a source of toxicants. As the article mis-specifies "the problem," any proposed solutions will not have a meaningful impact. Third, in Chapter Four, I look at the geographical imaginaries built into iconic statements on e-waste at Agbogbloshie; I show how those geographical imaginaries have been taken up within broader e-waste science and advocacy and consider some of the implications. In doing so, I map out some of the material effects of the geographical imaginaries, focusing on impacts on the community's access to land and its ability to self-define community problems requiring intervention.

In other words, I have turned conventional EJ "wisdom" about Agbogbloshie as a problematic space on its head. Most EJ framings of Agbogbloshie and the solutions they propose do not address the core waste at the site. In fact, in some instances, they do harm in that they misalign problems and solutions. As a consequence, that version of EJ fails to deal adequately with e-waste at the site and compounds the existing unequal power relations. In instances when there are competing (or multiple) versions of EJ, the issue is less about which version is "right" and which is "wrong" and more about how well is this or that version is *built* and to what effects–that is, the harm done in their composition (Dillon 2017). In my view, if in one version, the people, place, and things are merely props, this is a poorly built version of EJ. If the people, place, and things are integral, however, this is a well-built version.

It is in this spirit of composing a well-built version of EJ that I suggest a "situated e-waste justice" as both an analytic sensibility and a strategic language that engages the possibilities for contextualizing and doing justices (in their multiplicity) at Agbogbloshie. Precisely what kinds of injustice are opposed and for whom, where, when, and under what conditions when we frame e-waste as a problem(s) in specific sites and situations? These are

critical questions to ask—and answer—to generate a well-composed EJ at Agbogbloshie and other sites that process discards from electronics.

Possibilities III

The dissertation opens an expanding terrain of e-waste science and advocacy. Beyond the field site of Agbogbloshie, I centre other sites, specifically the spaces where knowledge of Agbogbloshie circulates as e-waste science and advocacy. I frame this centreing as an exercise in "studying up" (Nader 1972) and undoing extractive-colonial e-waste science and advocacy (c.f Ahmed 2012; Smith 1999; Robbins, 2006). In her well-known essay "Up the anthropologist: perspectives gained from studying up", Laura Nader urges researchers to study "the colonizer rather than the colonized, the culture of the powerful rather than the culture of powerless, the culture of affluence rather than the culture of poverty" (1972, 289). Nader's call resonates with post-colonial and Indigenous critiques of research more broadly, confronting the reproduction of relations of domination in and through research (Simpson 2007; Smith 1999; Tallbear 2013; Spivak, 1993). Geographer Paul Robbins (2006) recognizes that in field-based investigations of marginalized communities in the Global South, research is often theft.[65] What he means is researching always extracts intellectual and economic resources from subject communities, especially in the Global South. The extractive relations can take many forms, including who benefits from the knowledge and who wields the institutional power to represent the subject. Those who are researched are often materially worse off, while the researcher is rewarded for extracting knowledge from the experiences of others. The extractive

[65] Indigenous researchers in Canada, Australia, and New Zealand (whom I have cited in the dissertation) have long shown the inherently extractive histories and violent legacies of research. I draw on Robbins here because his work is in some sense closer to mine in that it is grounded in a developing country context.

process is even more acute when the knowledge does not bring any tangible benefits to and, in some cases, actually harms the communities, while the researcher enjoys the institutional power to represent them and is financially compensated.

What, then, does the extractive nature of research leave the researcher who wants to actively work towards undoing (to some extent) the relations of power that script research, including doing research that does not cause apparent harm to the communities who share their experiences? We might, for example, carefully consider if field-based research is ethically legitimate in certain places, especially when the very act of research, however well-intended, causes harm (Tuck and Yang 2014). Robbins suggests pursuing an anti-colonial science distinguished by a politics of

> exposing and interrogating the practice of scientific research and planning in the reproduction of colonial power relationships…. a possible postcolonial research path is to explore and explain how landscapes and the knowledge of landscapes are produced through colonial practice (…) critical research may proceed by bringing together important and meaningful truth claims and questions (e.g. is soil being eroded, are groundwater levels changing, or is carbon being sequestered?) with explorations of the production of truth (e.g. who is doing soil science, how is ground-water categorized and defined, or who pays for global warming?). (2006, 316)

Such politics acknowledge the inherent coloniality in research/science as an endeavour built on appropriating the knowledge of others and, as such, requiring an ethos of care to be otherwise (Ureta 2016; de la Bellacasa 2011). In essence, calls by Nadar, Tuck and Wayne, and Robbins (e.g., Stryker and González 2014; Biruk 2016) point to the fundamentally political aspects of research (c. f O'Brien 1993). When they are aware of the politics, researchers can

make better decisions on what, who, where, and how to study. To bring the ideas of Nader, Tuck and Wayne, Robbin and others specifically into the context of research at Agbogbloshie, I suggest additional questions be asked to undo the extractive nature of e-waste research and venture into spaces of anti-colonial e-waste science and advocacy. Such questions might include by whom, for whom, under what conditions, and to what ends e-waste science and advocacy are being done.

Fortunately, the field of discard studies has models for taking up these considerations. It argues that what is often perceived as only material waste and thus prescribed a technical fix (i.e., via waste management) is, in fact, part of a complex history, geography, and politics which must be grounded to reveal and then tackle 21st century waste. For scholars interested in researching e-waste as discard studies, this dissertation offers a foundation upon which to build some of these considerations, whether "studying up" or undoing colonial injustices through anti-colonial science. Going forward, particularly given the evidence of research fatigue and harm among workers at Agbogbloshie, I suggest we turn our critical gaze away from the subaltern spaces of knowledge production in e-waste science and advocacy and see the labs and other spaces of circulation (i.e., the Web, conferences, ENGO networks) as nodes in a more extensive network of knowledge systems. By doing so, we could centre spaces of knowledge creation and circulation, especially the activities of scientists, activists, and advocates. Future work in this vein might start with the question of how anti-colonial e-waste science and advocacy for Agbogbloshie could be done, including in the lab, on the Web, and within institutions.

Limitations of the research

Limitations I

In my investigation of the politics of e-waste advocacy and science, I have sought to open up new critical spaces and propose a range of questions to think about e-waste science and advocacy. Throughout the dissertation, I have shifted from describing my work with co-researchers at Agbogbloshie scrapyard to analyzing the e-waste text produced by others. Despite my intellectual commitment to centre the lives, work, skills and struggles of workers at the scrapyard, the conversations in this text, produced as a dissertation with my name on it, may inadvertently erase the essential labour of my co-researchers. I want to make it clear that even though these spaces for telling counter-narratives about Agbogbloshie have my name on it institutionally, I did not work in isolation. In one way or another, the injustices lived by others like Fatai, Fawaz, Issah, Innusah, Fuseni, Alhaji Musa, to name a few of my co-researchers and interlocutors, made it possible for me to ask these questions. Even though recognition is not enough, I recognize my own privilege in a position where I am writing and thinking about Agbogbloshie from afar. I am not directly experiencing the multiple environmental, socio-economic, and health-related challenges faced by Agbogbloshie residents.

Limitations II

Related to the inherent power relations that script research, another limitation stems from a deeper ethical consideration. I am aware that certain kinds of narratives produced by research actually cause harm. As I note in Chapter Three, the proposal for this research was approved by the Interdisciplinary Committee on Ethics and Human Research (ICEHR), my university's Institutional Review Board (IRB). Memorial University "is committed to

protecting the rights and welfare of research participants. The university strives to ensure that those conducting research under its auspices achieve an appropriate balance between respect for the dignity and welfare of participants, and the benefits of research for society and the advancement of knowledge" (Memorial University, n.d.). In principle, by applying for and being given approval for this research, I committed to adhering to principles of ethical conduct; for me, this included informing my co-researchers and those whose scraps we surveyed how the research might benefit the community. In the later stages of the research, however, it became clear to me that my project lacked a truly thoughtful engagement on what the community might actually want as an outcome. For example, despite the participatory nature of the research that centred some (not all) concerns of residents of Agbogbloshie, I did not achieve a collective deliberation with the workers at the site or even with the co-researchers on what counted as tangible benefit(s) to them.

The absence of an honest, open, and on-going discussion about what legitimate outcome(s) workers and residents of Agbogbloshie wanted from participating as interlocutors or co-researchers in this research study is a limitation I acknowledge. I will address this in future work and advise others to do so as well. It is challenging to know in advance what a robust determination of desired research outcomes might look like at Agbogbloshie. The process of determining and achieving research outcomes when centring the community, research participants, or co-researchers should be cumulative and iterative. That is, for social researchers in particular, a key first step might involve asking the community what it wants from the research engagement either before or at the beginning of fieldwork. At Agbogbloshie, there are no special written ethics protocols for researchers. However, as I have shown in this dissertation, workers at the scrapyard have strong concerns about the role of research and

advocacy in their struggle to stay on the site. Notwithstanding the absence of written ethics protocols, researchers might ask the community to tell them about any ethical concerns they have about doing particular research and advocacy at or about the site.[66]

Furthermore, the desired outcomes of the community should be taken seriously by the researcher. This might mean a process of deliberating the feasibility (or not) of achieving those outcomes. Instead of a one-time process, there should be ongoing evaluation of the outcomes, with deliberation on whether the identified outcomes are still desirable, achievable, and or achieved. This would allow changes to be made right in the field. It would also enable community members to manage their expectations about what research(ers) can or should do.

Parting Thoughts

To frame my parting thoughts, I return to the proposed documentary mentioned at the beginning of the chapter. If I had the opportunity to pitch a documentary, given the work done in this dissertation, the considerations guiding me would be the following:

- There are complex and intertwined stories of, within, and about Agbogbloshie. Tell these stories from the ground up and with care. Abandon the preconceived idea of documenting ruin porn of Agbogbloshie that aestheticizes and dramatizes the space for Euro-Americans. That storyline is enticing and popular but does harm.
- If electronic discards in Ghana are the concern, Agbogbloshie is not the entire network. Make visible the diverse and skilled network of economic actions of which Agbogbloshie is a part.

[66] See https://activistresearchmethods.wordpress.com/2016/04/12/evaluating-research-outcomes-worksheets-assignments; also see https://civiclaboratory.nl/methods/community-peer-review/

- If the toxic threats and impacts of electronic discards at Agbogbloshie are the concern, bringing attention to these risks and impacts can and should be done well. Direct questions towards the make-up of electronics—toxicity and tonnage—before they become waste with implications for the people at Agbogbloshie who will process it. Doing this may mean producing the documentary at different sites (e.g., design and manufacturing spaces in the UK).
- More broadly, end-of-pipe solutions like recycling and trade bans, whether at Agbogbloshie or elsewhere, are not enough. Stopping the import of used electronics from the UK or OECD's will not magically erase Agbogbloshie. In fact, such solutions are traps (see Lepawsky 2018). Turn the documentary gaze upstream to design and manufacturing for solutions to waste arising from electronics (see Gabrys 2011; Lepawsky 2018).

Overall, my dissertation opens up spaces for thinking and doing e-waste science and advocacy at Agbogbloshie differently. I look forward to articulating new questions and pursuing other answers to the fraught question of the right thing to do with e-waste in real circumstances, in real spaces, and with real people who live and work with the modern waste of electronic discards.

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Appendix

Appendix 3.1: Item count data collection sheet

INDIVIDUAL ITEM COUNT DATA COLLECTION SHEET
(start a new sheet for each quadrat)

QUADRAT ID# _____

CONFIRM QUADRAT COORDINATES _____

PHOTO ID# _____

DATE & TIME _____

RESEARCHER'S _____ INITIALS

SCRAP CATEGORIES*		COUNTING SYSTEM (/////)	TOTAL COUNT PER QUADRAT
Electronics	E-scrap 1: IT & Telecom & Con E		
	E-scrap 2: HH		
	E-scrap 3: Auto		
Construction and demolition (C&D)			
Automobile			

Heavy Industry		
Others (Unclassifiable scraps)		
Other (household waste, plastic debris)		

*See classifications and cover class table below

Electronics scraps:
E-scraps 1: IT & telecommunication & consumer electronics

1. Data processing electronics such as computers and their accessories such as, speakers, keyboards, printers, scanners, projectors etc.
2. Electronic devices used for entertainment like TV, DVDs, CD players, VCRs, and stereo equipment etc.
3. Telecommunication devices like mobile phones, landline phones, modems, fax machines, mast, transformers etc.

E-scraps 2: Household appliances (HH) (large and small)

- Household appliance like vacuum cleaner, microwave ovens, washing machines, air conditioners, refrigerator, rice cooker, fun, iron, toaster etc.

E-scraps 3: Automobile electronics

- automotive sensors, engine control units, GPS/navigation systems, entertainment systems (radio/audio devices, satellite radio, dashboard player, TV-DVD players), control/transmission electronic devices (gears) etc.

Construction and demolition (C&D) scraps:

- Iron rods, roofing sheets, steel pillars, copper piping/wiring,

Automobile scraps:

- Vehicles, bicycles, motorbikes, and parts such as batteries, tire rims etc.

Industrial scraps:

- heavy industrial machinery, mining equipment, oil and gas scraps (barrels) etc.

Appendix 3.2: Detailed Profile of Roles

Fatai[67] was one of my collaborators and a former scrapyard worker. Having founded the Youth and Children Foundation at Old Fadama, Fatai now works as the executive director of the foundation. He told me he was "passionate about addressing the challenges of scrapyard work at Agbogbloshie and committed to facilitating meaningful research at the site." I contacted Fatai when I arrived in Accra for fieldwork, as he was active in community mobilization in OFA and a researcher himself. In one of many check-ins where we discussed what it means to be researching Agbogbloshie in a participatory manner, Fatai talked extensively about living and working in OFA. Contrary to how the e-waste narrative has framed Agbogbloshie, Fatai informed me that for those living and working in OFA, issues of land politics and leadership amidst power struggles shape their daily lives. Yet researchers continually sideline these issues when they visit. "Everyone is interested in e-waste," he said. With another collaborator, he brokered a meeting with the executives of the GASDA at the site. The GASDA oversees the interest of scrapyard workers. With the influx of researchers and media at the site, the association has taken on the role of gatekeeping access to the site for research purposes.

Fatai also helped lead the preliminary survey of the site, deliberated on research ideas, and helped to recruit co-researchers for the survey. He helped think through the survey design and helped troubleshoot when the team encountered a roadblock. When asked what a participatory citizen science survey might look like on the ground, Fatai did not mince words:

[67] Names used here are pseudonyms at the request of co-researchers. However, given the nature of the research economy at Agbogbloshie and the roles played by certain individuals in it, it might be easy to identify them. In adherence to the ethical protocol for this project, I discussed options of confidentiality and anonymity with collaborators and co-researchers offering an opportunity to either be visibly identified in writings or not.

"The nature of the work at Agbogbloshie is very individualized. It can be challenging to get people to work together because of the many political and ethnic divisions here. Importantly, work at the scrapyard is very fluid. People can be in the yard today and be gone the next day. Agbogbloshie life is like street life. People are here today but gone tomorrow. You cannot find everybody at the same time." Given this initial heads-up, Fatai's collaborative role became crucial, especially in maintaining a fluid but a committed team of co-researchers. As the survey progressed, I worked closely with Fatai and another collaborator to revise research questions and study design.

All those recruited as co-researchers were scrapyard workers and engaged in the daily task of sorting, counting, and weighing scraps as part of their jobs; the very skills and experiences harnessed for the discard survey. Fawaz was another co-researcher. Like most of the workers, he came from the relatively impoverished northern region of Ghana. He had worked in the scrapyard for six years.

On a typical day of the survey, I arrived at the scrapyard at around 9:00 a.m. at an agreed-upon location. It usually took about 20-40 minutes to assemble the team of two or three co-researchers who would work on the survey that day. Moving away from small talk that usually characterized our meetings, we set the plan for the day, noting which areas of the scrapyard would be surveyed. At the beginning of the survey, although my specific role was unclear, I knew that I did not want to be the authority figure in the project as I would have been in a traditional research setting. Instead, I positioned myself as a student-researcher who asked and answered certain questions relevant to work at the site. At the initial meetings with collaborators and some of the co-researchers, where we discussed roles, it became evident that given the high turnover rate at the scrapyard, I needed to coordinate the recruitment of co-

researchers, facilitate the deliberation of the proposed survey design, and run the logistics for the day to day execution of the survey. As such, I played the role of facilitator in the course of the project, ensuring teams were set up for each day of the survey. I also coordinated the collection of data sheets at the end of each survey day.

Appendix 3.3: Percent cover data collection sheet

PERCENT COVER DATA COLLECTION SHEET
(start a new sheet for each quadrat)

QUADRAT ID# _____

CONFIRM QUADRAT COORDINATES _____

PHOTO ID# _____

DATE & TIME _____

RESEARCHER'S _____ INITIALS

SCRAP CATEGORIES*		**BB COVER CLASS***	**PERCENT COVER PER QUADRAT**
Electronics	E-scrap 1: IT & Telecom & Con E		
	E-scrap 2: HH		
	E-scrap 3: Auto		
Construction and demolition (C&D)			
Automobile			
Heavy Industry			

Other (unclassifiable scraps)		
Other (kiosk/tents/housing)		
Other (household waste, plastic debris)		
Other (bare ground)		

*See classifications and cover class table below

Electronics scraps:
E-scraps 1: IT & telecommunication & consumer electronics

4. Data processing electronics such as computers and their accessories such as, speakers, keyboards, printers, scanners, projectors etc.
5. Electronic devices used for entertainment like TV, DVDs, CD players, VCRs, and other stereo equipment etc.
6. Telecommunication devices like mobile phones, landline phones, modems, fax machines, mast, transformers etc.

E-scraps 2: Household appliances (HH) (large and small)

- Household appliances like vacuum cleaner, microwave ovens, washing machines, air conditioners, refrigerator, rice cooker, fun, iron, toaster etc.

E-scraps 3: Automobile electronics

- automotive sensors, engine control units, GPS/navigation systems, entertainment systems (radio/audio devices, satellite radio, dashboard player, TV-DVD players), control/transmission electronic devices (gear) etc.

Construction and demolition (C&D) scraps:

- Iron rods, roofing sheets, steel pillars, copper piping/wiring,

Automobile scraps:

- Vehicles, bicycles, motorbikes and parts such as tire rims, batteries etc.

Industrial scraps:

- heavy industrial machinery, mining equipment, oil and gas scraps (barrels) etc.

Table 3.1: Braun-Blanquet cover-abundance scale. Developed from Poore (1955b).

Cover Class	**Percent Cover**	**Definition**
r	< 5%	Assigned where there is only a single individual of a scrap type, and it covers less than 5% of the sample plot area.
+	< 5%	Assigned where there are only a few (approximately 2-20) individuals of the scrap type and those individuals collectively cover less than 5% of the sample plot area

1	< 5%	Assigned where there are numerous individuals of the scrap type, but those individuals collectively cover less than 5% of the sample plot area
2	5% - 25%	Assigned where the cover of a scrap type is between 5% and 25% of the sample plot area.
3	25% - 50%	Assigned where the cover of a scrap type is between 25% and 50% of the sample plot area.
4	50% - 75%	Assigned where the cover of a scrap type is between 50% and 75% of the sample plot area.
5	75% - 100%	Assigned where the cover of a scrap type is between 75% and 100% of the sample plot area.

Appendix 4.1: URL of the Web entities

Search Term	Year	URL	Actors	descriptive text on Agbogbloshie
"E-waste" OR "Electronic waste" AND "Agbogbloshie"	Jan 1 2008-Dec 31,	https://www.greenpeace.de/sites/www.greenpeace.de/files/GhanaEWaste_FINAL_0.pdf	Not-for Profit	Young boys working in the Agbogbloshie scrapmarket in Ghana's capital city, Accra. Agbogbloshie is the maincentre for e-waste recycling in the country.the Agbogbloshie scrap market inthe capital city, Accra, the main centre for e-waste recycling in thecountry; and from a scrapyard in the smaller city of Korforidua,thought to be typical of the numerous small-scale e-waste recyclingworkshops in Ghana. At Agbogbloshie, these are manually dismantled atnumerous small workshops within the market. Livestock grazing at the Agbogbloshie market inAccra, Ghana. Worker dismantling electric components using hisbare hands, at the Agbogbloshie scrap yard in Accra, themain centre for e-waste recycling in Ghana. Agbogbloshie market is on flat ground by theDensu River,
E-waste OR "Electronic waste" AND "Agbogbloshie"	Jan 1 2008-Dec 31,	https://www.business-humanrights.org/en/ghana-concerns-over-dumping-of-electronic-waste	Not-for Profit	Mike Anane...said Greenpeace analysis of soil and sediment taken from Agbogbloshie market and from the Koforidua electronic waste scrap yards have revealed severe contamination from toxic metals. The contamination is caused by metals that are released into the soil when scrap dealers dismantle and burn discarded computers and television sets... He also called on manufacturers like Philips, Sharp, Canon, Dell, Microsoft, Nokia, Siemens, Hewlett Packard [HP], Motorola, Samsung, Sony, Acer, Apple, IBM, Panasonic [part of Matsushita] and Toshiba to foot the bill on the toxic clean up at Agbogbloshie, and to set up collection points throughout Ghana for their obsolete and discarded products.
E-waste OR "Electronic waste" AND "Agbogbloshie"	Jan 1 2008-Dec 31,	https://www.researchgate.net/figure/An-open-burning-of-e-waste-to-harvest-copper-at-Agbogbloshie_fig5_230577515	Scientifc Community	the Agblobgloshie e-waste management site, their primary activities include manual disassembly of obsolete computers, monitors, televisions, etc to isolate metals (copper and aluminium).
Same for all	Jan 1 2008-Dec 31,	http://www.greenpeace.to/publications/chemical-contamination-at-e-wa.pdf	Not-for Profit	This study, the first to investigate workplace contamination in areas in Ghana where e-waste recycling and disposal is carried out,focussed on the main centre for this type of work, at theAgbogbloshie scrap market in Ghana's capital, Accra. Severe chemical contamination was found in ash contaminated soil samples from open burning sites at both Agbogbloshie andKorforidua, as well as in sediment from a shallow lagoon at theAgbogbloshie site. E-waste recycling within GhanaIn Ghana, the main centre for the recovery of materials from e-wastesis within the Agbogbloshie Scrap Market in Accra, the capital city ofGhana. At the Agbogbloshie Market, the main electronic wastes beingprocessed are obsolete computers, monitors and televisions. GH08002 Soil/ash Burning site (no disposal), Agbogbloshie Market. GH08003 Soil/ash Burning site (no disposal), Agbogbloshie Market. Agbogbloshie Market. Agbogbloshie Market.

Jan 1 2008-Dec 31,	https://felixfeatures.photoshelter.com/gallery-image/Ghana-Rubbish-dump-2-0-by-Andrew-McConnell/G0000QwEK6Pt0yk/I0000vCneNxKnbO0	Business	Rubish dump 2.0. E-waste litters the ground while a huge fire burns at Agbogbloshie dump, which has become a dumping ground for computers and electronic waste from all over the developed world. Hundreds of tons of e-waste end up here every month. It is broken apart, and those components that can be sold on, are salvaged. Burning creates some of the most carcinogenic and toxic substances known, including polycyclic aromatic hydrocarbons, dioxins and furans, as well as releasing toxic metals such as lead, beryllium and cadmium. At theses burning sites concentrations of toxic metals have been found at over one hundred times the normal level.
Jan 1 2008-Dec 31,	https://onlinelibrary.wiley.com/doi/abs/10.1002/clen.200700082	Scientifc Community	NA
Jan 1 2008-Dec 31,	http://www.pearltrees.com/u/10303754-1-newsela-laptops-environmental	Business	June is the wet season in Ghana, but here in Accra, the capital, the morning rain has ceased. As the sun heats the humid air, pillars of black smoke begin to rise above the vast Agbogbloshie Market.
Jan 1 2008-Dec 31,	http://www.pearltrees.com/u/10303754-7-high-tech-trash	Business	June is the wet season in Ghana, but here in Accra, the capital, the morning rain has ceased. As the sun heats the humid air, pillars of black smoke begin to rise above the vast Agbogbloshie Market.
Jan 1 2008-Dec 31,	http://www.crserecycling.com/pdf/High-	Journalism	High-Tech Trash January 2008 ByChris CarrollPhotographs byPeter EssickJune is the wet season in Ghana, but here in Accra, the capital, the morning rain has ceased. As the sun heats the humid air, pillars of black smoke begin to rise above the vast Agbogbloshie Market. I follow one plume toward its source, past lettuce and plantain vendors, past stalls of used tires, and through a clanging scrap market where hunched men bash on old alternators and engine blocks. Soon the muddy track is flanked by piles of old TVs, gutted computer cases, and smashed monitors heaped ten feet (three meters) high. Beyond lies a field of fine ash speckled with glints of amber and green—the sharp broken bits of circuit boards. I can see now that the smoke issues not from one fire, but from many small blazes. Dozens of indistinct figures move among the acrid haze, some stirring flames with sticks, others carrying armfuls of brightly colored computer wire. Most are children.
Jan 1 2008-Dec 31,	https://www.waterhealtheducator.com/upload/Illegal%20Waste%20Dumping%20Article.pdf	Journalism	Another artist, Pieter Hugo photographed the people and landscape of a dump of obsolete technology in Ghana for his project named "Permanent Error." He was at an area on the outskirts of a slum called Agbogbloshie. Hugo asked the people what they call the pit where they burn the waste and they said, "For this place, we have no name." The people of Agbogbloshie burn the e-waste to extract copper and other metals. Pollution from this contaminates their soil, rivers and lagoons.

Jan 1 2009-Dec 31,	https://www.cbc.ca/news/technology/b-c-students-buy-sensitive-u-s-defence-data-for-40-in-africa-1.803353	Journalism	The team bought seven hard drives at a bustling market in Tema, a major port near the capital city of Accra where a lot of electronic waste from Europe and North America enters Africa. Parts that work may be sold at the market, while the rest ends up in a nearby dump known as Agbogbloshie. Charred toxic wasteland. 'It's incredibly difficult to breathe' at the dump, said Blake Sifton, as up to seven fires are typically spewing 'black, sticky, acrid smoke' at any one time. ((UBC Graduate School of Journalism))"It's essentially this charred toxic wasteland," Sifton recalled Tuesday. "The ground is just scorched absolutely everywhere. Everywhere you walk, there's shards of plastic and metal and glass protruding from the ground." Separated from the dump by a toxic, lifeless river was a shantytown of metal and wood shacks. Despite the horrific living conditions, however, the residents were very generous and welcoming, Sifton recalled. People who donate their computers typically don't picture them ending up in either Agbogbloshie or the market in Tema, but put to good use. The big picture here is that there's thousands of tonnes of toxic waste — because we want the newer computer, newer TV, or the newer cellphone — being sent and poisoning children in Ghana,
Jan 1 2009-Dec 31,	https://www.nwf.org/~/media/PDFs/Eco-schools/KQED-ewaste.ashx	Not-for-profit	"ghana: Digital Dumping ground," a video clip from a Frontline World (PBS) segment; available at http://www.pbs.org/frontlineworld/. video activity Screen the Frontline World segment "ghana: Digital Dumping ground" (http://www.pbs.org/frontlineworld/stories/ghana804). Prior to their viewing, ask students to skim through a transcript of the introduction in order to gain a general idea of the issue and to predict the content in the episode. "ghana: Digital Dumping ground" (http://www.pbs.org/frontlineworld/stories/ghana804/video/video_index.html) on the outskirts of Ghana's biggest city sits a smoldering wasteland,...a slum carved into the banks of the Korle Lagoon, one of the most polluted bodies of water on Earth. The locals call it Sodom and Gomorrah..... Agbogbloshie has become one of the world's digital dumping grounds, where the West's electronic waste, or e-waste, piles up—hundreds of millions of tons of it each year. How is the slum outside Ghana's biggest city described
Jan 1 2009-Dec 31,	https://www.worstpolluted.org/projects_reports/display/107	Not-for-profit	Agbogbloshie, in Accra Ghana, is the second largest e-waste processing area in West Africa. A range of recovery activities take place in Agbogbloshie, each presenting unique occupational and ecological risks. Agbogbloshie is a vibrant informal settlement with considerable overlap between industrial, commercial, and residential zones. Heavy metals released in the burning process easily migrate into homes, food markets, and other public areas. Samples taken around the perimeter of Agbogbloshie, for instance, found a presence of lead levels as high as 18,125 ppm in soil
Jan 1 2009-Dec 31,	https://www.andrewmcconnell.com/Rubbish-Dump-2%26period=0/14	Journalism	Discarded laptops lie on the ground at Agbogbloshie dump.

Jan 1 2009-Dec 31,	https://andrewmcconnell.photoshelter.com/image/I00008Lnpbph.MlM	Journalism	Goats are herded around Agbogbloshie dump while smoke rises from burning e-waste. The open ground in the suburb of Accra used to be a place where engines where broken apart but in recent years electronic equipment has become the waste of choice as Ghana becomes a dumping ground for the Western world's obsolete electrical junk. e-waste agbogbloshie accra ghana electronic waste dump pollution
Jan 1 2009-Dec 31,	http://svtc.org/uncategorized/mike-anane	Not-for-profit	Ghanaian journalist, Mike Anane, began corresponding with SVTC in late 2008 about ewaste dumping in Accra. In our spring newsletter, Lauren Ornelas, our campaign director, interviewed Anane on the e-waste being shipped to Ghana under the guise of charity. Earlier this month, ABC TV visited the Agbogbloshie dumpsite in Ghana with Mr. Anane to document the very conditions Mr. Anane had described to lauren. With regards to the environmental problems they are many. For instance two water bodies run through the dumpsite, a lagoon and a river, both are now biologically dead and e-waste dumping in the area is a major contributoring factor as some of the e-waste is dumped directly into the lagoon and the river.
Jan 1 2009-Dec 31,	https://towardfreedom.org/archives/environment/the-globalization-of-garbage-following-the-trail-of-toxic-trash/	Journalism	Despite a near universal international ban on exporting toxic or hazardous material, Kyle says that most of electronic waste from the United States ends up in China, India, Vietnam, or in up and coming African countries, like Ghana, and Nigeria. The situation is just as bad in Ghana, where PBS's recent Frontline expose, Ghana: Digital Dumping Ground, filmed an area known as Agbogbloshie, where millions of tons of e-waste each year is pulled apart and dumped into endless fields of trashed electronics parts.
Jan 1 2009-Dec 31,	https://abcnews.go.com/story?id=8215710	Journalism	It's the wet season now in Ghana, and the heavy, daily rains have turned the vast field behind the Agbogbloshie market into a muddy swamp. With the mud so thick it can pull the shoes from your feet -- if you're lucky enough to have shoes -- the children come here to rummage and rake the mountains of electronic debris that spills across the landscape. They are scavenging for copper wiring that they can sell. On a very good day, they can extract about $2 of copper from the broken computers, telephone answering machines and televisions that have been discarded. Much of the e-waste in the Agbogbloshie dump comes from foreign countries, including the United States..... "We are looking at immense health implications," said Mike Anane, a local environmental activist who frequently visits the Agbogbloshie field to warn the children and adults of the dangers of what they are doing.
Jan 1 2009-Dec 31,	https://jaminformed.wordpress.com/tag/electronic-waste/	Journalism	On the outskirts of Ghana's largest city sits Agbogbloshie, a wasteland of the first world's electronic goods. Here also lies the Korle Lagoon, one of the most polluted bodies of water on earth, filled with old computers and their contaminants. It is reported that hundreds of millions of tons of eWaste end up here every year.
Jan 1 2009-Dec 31,	https://greenm3.typepad.com/green_m3_blog/2009/06/frontline-pbs-special-digital-dumping-ground-ewaste-documented.html	Other (Blog)	On the outskirts of Ghana's biggest city sits a smoldering wasteland, a slum carved into the banks of the Korle Lagoon, one of the most polluted bodies of water on earth. The locals call it Sodom and Gomorrah. Agbogbloshie has become one of the world's digital dumping grounds, where the West's electronic waste, or e-waste, piles up -- hundreds of millions of tons of it each year.

Jan 1 2010-Dec 31,	https://www.pinterest.ca/pin/815574432	Other (Blog)	na
Jan 1 2010-Dec 31,	https://www.pinterest.ca/GreenEcoServices/reuse-recycle-electronics/	Other (Blog)	na
Jan 1 2010-Dec 31,	https://observers.france24.com/en/20100922-using-recycled-fridges-make-kitchenware-ghana-accra	Journalism	The shantytown of Agbogbloshie, in the suburb of Accra, is used as an international dump for all kinds of electrical equipment. Our Observer followed a group of immigrants from Togo who make their living by recycling old refrigerators. Ghana has become one of the world's main receivers of e-waste (electronic waste). Every month, hundreds of tonnes of equipment arrive in the waste reception centre at Agbogbloshie. Walking through the shantytown of Agbogbloshie, I heard a huge din coming from the end of an alleyway. It was like an orchestra of hammers. I followed the sound and discovered an atelier. Around fifteen people were in the process of re-working an old sheet of metal and so I went to ask them some questions. They fled their country and settled in the shantytown of Agbogbloshie, a place that has been made famous by the activities which revolve around the electronic and electrical waste that comes from Europe and/or Africa
Jan 1 2010-Dec 31,	https://pubs.acs.org/doi/abs/10.1021/es	Scientific Community	na
Jan 1 2010-Dec 31,	https://www.wellbeing.com.au/at-home/planet/e-waste-disposal.html	Business	In Ghana, a country with no e-waste laws, eyewitnesses have observed computer parts being burnt in a waste dump next to the Agbogbloshie Market near Accra, sending a toxic plume into a neighbouring playing field administered by the Ministry of Sport. Nearby, acres of computers are stacked up in piles. The ground is poisoned, but goats feed on the waste and children play, oblivious of the danger.
Jan 1 2010-Dec 31,	http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan050298.pdf	QUANGO	It is difficult to document all e-waste recycling hubs, but popular destinations for e-waste exported from the United States (and other developed countries) are waste processing operations in Guiyu in the Shantou region of China, Delhi and Bangalore in India, and the Agbogbloshie site near Accra, Ghana.

Jan 1 2010-Dec 31,	https://www.modernghana.com/news/285238/ghana-digital-dumping-ground.html	Journalism	On the outskirts of Ghana's biggest city sits a smoldering wasteland, a slum carved into the banks of the Korle Lagoon, one of the most polluted bodies of water on earth. The locals call it Sodom and Gomorrah. Agbogbloshie has become one of the world's digital dumping grounds, where the West's electronic waste, or e-waste, piles up -- hundreds of millions of tons of it each year.
Jan 1 2010-Dec 31,	https://www.afronline.org/?p=5997	Journalism	Despite international conventions prohibiting the export of dangerous waste to developing countries, enormous quantities of outdated and destroyed electronic equipment from Europe end up in Ghana's Agbogbloshie dump each week. According to the activist groups DanWatch and Greenpeace, only about one quarter of the electronic goods are capable of being reused and end up in the stores of second-hand shops around the region. The rest, amounting to at least 450 containers each month, is pure waste and ends up in Ghana's largest waste dump Agbogbloshie. In Ghana, where regulations are somewhat stricter than in Côte d'Ivoire, the current "import hit" is electronic waste articles. At very low cost, the waste products are received in Tema, where second-hand traders pick out the best pieces. The rest is sent to Agbogbloshie for a small fee.
Jan 1 2010-Dec 31,	https://infrarati.wordpress.com/tag/e-waste/page/3/	Other (Blog)	They certainly don't go to the eternal bits and bytes fields. No, they go to places like Agbogbloshie. Have a look at this New York Times slide show. E-waste capital Agbogbloshie (c) Pieter Hugo for The New York Times. And Agbogbloshie, a slum in Accra, the capital of Ghana isn't the only place. Sher Shah, Karachi in Pakistan, Mumbai, Chennai in India, and Guiyu in China are some other electronic-waste capitals of this globe. Dangerous, toxic, poisoned places. And they all look the same
Jan 1 2010-Dec 31,	https://www.oeko.de/oekodoc/1057/2010-105-en.pdf	Not-for-profit	Such practices at the Agbogbloshie metal scrap yard have led to concentrations of copper, lead, zinc and tin in the magnitude of over one hundred times typical background levels, as confirmed by a Greenpeace study in 2008. The interviews with collectors (scavengers) and recyclers were conducted primarily at the Agbogbloshie metal scrap yard, a major hotspot for e-waste activities in Accra. Hence, Agbogbloshie has become a central location of e-waste recycling activities in Ghana. Thereby, it has to be noted that the Agbogbloshie metal scrap yard is also a hub for scrap metals from various other sources than e-waste. This also includes waste cars and waste lead-acid batteries. Agbogbloshie is also the centre of a broad network of e-waste and scrap metal collectors searching the city Accra for metal containing wastes. The most important cluster for e-waste recycling in Ghana is Agbogbloshie

Jan 1 2011-Dec 31	https://en.wikipedia.org/wiki/Agbogblos	Not-for-profit	Agbogbloshie is a nickname of a commercial district on the Korle Lagoon of the Odaw River, near the center of Accra, Ghana's capital city. Near the slum called "Old Fadama", the Agbogbloshie site became known as a destination for locally generated automobile and electronic scrap collected from across the City of Accra. he Basel Action Network, a small NGO based in Seattle, has referred to Agbogbloshie as a "digital dumping ground", where they allege millions of tons of e-waste are processed each year. Agbogbloshie is situated on the banks of the Korle Lagoon, northwest of Accra's Central Business District.
Jan 1 2011-Dec 31	https://politicadechatarra.wordpress.com/	Other (Blog)	The West African country of Ghana, currently undergoing intense economic growth, is an important centre for receiving, re-using, recovering and disposing of electronic waste. Accra, the capital, hosts a thriving second-hand market, a sprawling network of repair shops, and a range of activities which attempt to tap into the full potential of e-waste. And yet, it is also the location of an enormous and heavily polluted electronic waste dumpsite.
Jan 1 2011-Dec 31	https://news.mongabay.com/2011/09/children-on-the-frontlines-the-e-waste-epidemic-in-africa/	Journalism	A boy pushing a shopping cart load of wires going for burning in the Agbogbloshie ghetto in Accra, Ghana. Photo by: Kwei Quartey. In Agbogbloshie, a slum outside the capital city of Accra, Ghana, tons of electronic waste lies smoldering in toxic piles.
Jan 1 2011-Dec 31	https://phys.org/news/2011-10-high-toxic-levelsfound-schoolmarket-neighboringinformal.html	Journalism	The graph shows the estimated health hazard (where 1 = low / no risk) caused by contaminant levels around Ghana's Agbogbloshie metal recycling compound. Site 1) the headquarters of the International Central Gospel Church. A produce market, a church headquarters and a soccer field are likewise polluted to varying degrees, all neighbours of the Agbogbloshie scrap metal site, where electronic trash is scavenged for valuable metals - especially copper.
Jan 1 2011-Dec 31	http://www.earthtimes.org/pollution/high-toxins-school-waste-recycling-site/1566/	Journalism	Dangerous pollutants have been discovered at a school, market and church near an electronic waste recycling site in Africa, it is claimed. Tests show that pollutants from lead and other metals at the Agbogbloshie salvage yard, in Accra, the capital of Ghana, are up to 50 times above safe levels.
Jan 1 2011-Dec 31	https://sometimes-interesting.com/2011/07/17/electronic-waste-dump-of-the-world/	Other (Blog)	Na

Jan 1 2011-Dec 31	https://pdfs.semanticscholar.org/007c/e444a3c10bfd32a8912321a9dca6013726f5.pdf	scientific Community	Some initial surveys at the main dump sites in Ghana at Agbogbloshie and Galoway (in Accra) revealed that some institutions bring for disposal truck-loads full of e-waste either for free or for a token fee E-waste is dumped in the scrap metal portion of the Agbogbloshie market which is also separated into two main areas. The first area is located at the front of the market where numerous electronic and electrical items, car parts such as batteries and engines are hauled in, dismantled, sold and traded
Jan 1 2011-Dec 31	https://www.journalhealthpollution.org/doi/10.5696/jhp.v1i1.22	Scientific Community	The Agbogbloshie e-waste recycling/disposal site in Accra, Ghana revealed an area with extensive lead contamination in both ambient air and topsoil. Given the urban nature of this site e as well as the large adjacent food distribution market, the potential for human health impact is substantial both to workers and local residents.
Jan 1 2011-Dec 31	http://www.bbc.co.uk/panorama/hi/front_page/newsid_9483000/9483148.stm	Journalism	He tells me that the wounds are from the sharp copper wire that he is scavenging from the biggest digital graveyard in Africa. The Agbogbloshie dumpsite is where the poorest of nearby Accra stream in order to scrape out a living from the tons of electrical waste piled here. A confidential report obtained by Panorama suggests that 77% of e-waste from England and Wales ends up in West Africa, primarily Ghana and Nigeria. This 6.2 hectare site (15 acres) is located on the west side of the Odaw River in the city of Accra, the capital of Ghana and is adjacent to the Agbogbloshie Food Market. It is the largest center for e-waste recycling and disposal in Ghana.
Jan 1 2011-Dec 31	https://mm6301.wordpress.com/what-is-agbogbloshie/	Other (Blog)	The Agbogbloshie dump in Accra, Ghana, is the largest electrical Square in WEST AFRICA, where more than 3,000 people live in slums. They live on the legacy of the digital world. With the dismantling and recycling of computer waste, they earn their living. The Ghana made sub-economy from electronic garbage and other garbage dumping place in Accra which the locals call it "Sodom and Gomorrah" with dark clouds and noise coming from the dump which can be seen from afar within the Accra city. With the Western understanding of recycling, is quite a different thing in Accra which has not much to do with recycling but rather polluting the air and spreading of cancer. Computers, TVs and refrigerators are apart the of slum dwellers in Agbogbloshie. They remove parts and throw them into open fire to win metals such as copper and aluminium. There is a river near the place which is very black from the polluted environment, bubbles formed on the surface of the river are mainly, computer monitors, refrigerators and car parts. There is a clear hierarchy there at Agbogbloshie, the youngest must take the most dangerous jobs.

Jan 1 2012-Dec 31	https://mm6301.wordpress.com/what-is-agbogbloshie/	Other (Blog)	The Agbogbloshie dump in Accra, Ghana, is the largest electrical Square in WEST AFRICA, where more than 3,000 people live in slums. They live on the legacy of the digital world. With the dismantling and recycling of computer waste, they earn their living. The Ghana made sub-economy from electronic garbage and other garbage dumping place in Accra which the locals call it "Sodom and Gomorrah" with dark clouds and noise coming from the dump which can be seen from afar within the Accra city. There is a clear hierarchy there at Agbogbloshie, the youngest must take the most dangerous jobs. Dumping grounds and surrounding area within Agbogbloshie district, Accra, Ghana Click for google maps version
Jan 1 2012-Dec 31	https://www.intechopen.com/books/sustainable-development-authoritative-and-leading-edge-content-for-environmental-management/electronic-waste-management-in-ghana-issues-and-practices	Scientific Community	The e-waste processing sites in Ghana exemplifies the challenges Africa policy makers face with respect to e-waste and its impacts on health and the environment. The data were further updated by in-depth interviews with the key stakeholders in both public and private sectors, especially at Agblgbloshie which is the hub of e-waste activities in the country. Jim Puckett, a former Toxic Director of Greenpeace paints a glimmer picture of the main recycling site in Ghana. He writes: It [Agbogbloshie] is a place where the developed world's old techno-crash waste has been tossed up by the hidden currents of today's consumerism and commerce, and has found a strange resting place.....
Jan 1 2012-Dec 31	https://www.dw.com/en/ghana-looks-to-gain-from-eu-e-waste-revamp/a-15690370	Journalism	Poisonous fumes fill the air at Agbogbloshie. Ghana's capital Accra is a bustling, cosmopolitan city with a population of more than four million. There, as in other cities in the West African country, technical innovations are being snapped up by all who can afford them. Agbogbloshie Market is one of the biggest and busiest markets in Accra. It's not only the place where people go to find everything they need to cook a tasty meal, it also has the dubious reputation of being a place where all sorts of electronic gadgets are taken apart and burned. Large amounts of e-waste are also buried nearby, polluting the soil. Korle Lagoon, close to Agbogbloshie Market, is not somewhere to go for a pleasant stroll.

Jan 1 2012-Dec 31	https://news.mongabay.com/2012/04/high-tech-hell-new-documentary-brings-africas-e-waste-slum-to-life/	Journalism	Welcome, to Agbogbloshie, where your technology goes to die. A new film e-wasteland captures the horrors of the world's largest e-waste slum through surreal and staggering images. Shot over three weeks by one-man guerrilla filmmaker, David Fedele, e-wasteland is an entirely visual experience without dialogue or voice-over. "I wanted to visually present a particular environment, attempt to show it as truthfully as possible, and give people the responsibility to think about the issues themselves," Fedele told mongabay.com in an interview. "I believe that images can be far more powerful than words, and can have a much bigger impact and remain in your memory longer." A slum of Ghana's capital city, Accra, Agbogbloshie is home to some 40,000 people, mostly migrants from rural areas, and many eke out a living by breaking down and burning e-waste for raw materials that can be re-sold. The slum is a byproduct of what Fedele calls the western world's "obscene obsession [...] with consuming, discarding, then consuming again." "I attempted to show that these expensive 'things' that we acquire, once they get old or broken, are nothing more than bits of plastic, metal, chemicals and other waste," he explains. "That's what struck me the more time I spent at Agbogbloshie. I saw a photocopier, but all they saw was copper, metal, computer boards ... and a whole lot of plastic in the way stopping them from reaching these things! And it is ALL for money. The photocopier ONLY has value because its PARTS are valuable to someone. But as a photocopier, it is totally worthless." "Filming was extremely difficult, as the conditions are appalling. The area is constantly covered in thick, toxic smoke from the burning of electrical cables that goes on all day and night," Fedele says, noting that "Apart from the conditions, I was constantly challenged ethically and morally about the concept of filming in a slum and a dumpsite. Understandably, most people didn't want me to film them, as they were ashamed of the work that they did, and the conditions they live in."
Jan 1 2012-Dec 31	https://www.tandfonline.com/doi/abs/10.1080/09603123.2012.667795?src=recsys&journalCode=cije20	Scientific Community	In Ghana, the main centre for e-waste recycling is within the Agbogbloshie scrap market (Accra) in Greater Accra Region. There are, however, smaller sites emerging at other regions including those of Kumasi and Koforidua in Ashanti and Eastern regions, respectively (see Figure 1). In these areas, e-waste normally ends up in backyard recycling operations.
Jan 1 2012-Dec 31	https://www.ncbi.nlm.nih.gov/pubmed/?	Scientific Community	Agbogbloshie scrap market located in Accra is the main center for the recovery of materials from e-waste. Situated on the bank of the Odaw River and in the upper reaches of the Korle Lagoon, the Agbogbloshie site started as a food stuff market for onions and yam. Over the years, it grew into a slum with people dealing in all kinds of scrap on a large scale. The scrap dealers discovering the place as a good location for business later registered with the National Youth Council as the Scrap Dealers' Association of Ghana, and the land was leased to them in 1994

Jan 1 2012-Dec 31	http://ugspace.ug.edu.gh/bitstream/handle/123456789/5844/Matthew%20Kwame%20Akormedi_Working%20Conditions%20of%20Electronic%20Waste%20Workers%20at%20Agbogbloshie%2C%20Accra_2012.pdf?sequence=1&isAllowed=y	Scientific Community	It is reportedly one of the largest e-waste dumps in the world, processing millions of tons of e-waste each year.
Jan 1 2012-Dec 31	https://www.researchgate.net/publication/236545075_Assessing_the_Heavy_Metals_Contamination_of_Surface_Dust_from_Waste_Electrical_and_Electronic_Equipment_E-waste_Recycling_Site_in_Accra_Ghana	Scientific Community	The objective of this was to assess the levels of heavy metals contamination within the vicinity of the Agbogbloshie scrap market. Ghana over the years has become an e-waste destination and this phenomenon is on the increase. In Ghana, the Agbogbloshie Scrap Market in Accra is noted for dumping and recovery of materials from e-waste. Dust samples were taken from the Agbogbloshie scrap market which is widely recognized as an electronic waste dump site after the publication of the report by Greenpeace International
Jan 1 2012-Dec 31	http://science.time.com/2012/03/08/e-waste-how-the-new-ipad-adds-to-electronic-garbage/	Journalism	It's common for traders to take old computers and phones from the developed world, sell the second-hand products that are still in working condition, and send the rest of the scrap to slums. There—in places like the Agbloboshie market in the Ghanaian capital of Accra—the poor take apart the devices, burning plastic wires to get at the copper inside. The result looks bad, and feels worse, as Jack Caravanos of the Blacksmith Institute—an NGO that takes on neglected industrial pollution—described in a blog post: So whatever doesn't get into your lungs can now settle onto the food supply of Accra. Agbogbloshie is a large thriving recyclers market but has major environmental health problems. And the amount of e-waste headed to places like Accra is only likely to increase in the years to come. Pike Research estimates that by 2025, global e-waste will increase to 25 million tons. And a lot of that will be driven by Apple and its product lines.
Jan 1 2012-Dec 31	https://www.cinemapolitica.org/film/e-w	Not-for-profit	e-wasteland is set entirely at the Agbogbloshie slum in Accra, the capital of Ghana. Situated on the banks of the highly polluted Korle Lagoon, Agbogbloshie is home to over 30,000 settlers, mainly from the poorer Northern regions of Ghana. It is also home to the largest e-waste dump site in Africa. Generally uneducated and with few employable skills, many of the settlers at Agbogbloshie are forced to make a small living salvaging and recycling e-waste.

Jan 1 2013-Dec 31	https://www.theguardian.com/world/2013/dec/14/ghana-dump-electronic-waste-not-good-place-live	Journalism	This is not a good place to live': inside Ghana's dump for electronic waste. At Agbogbloshie, young people scavenge for scrap metal amid the smoke from plastics fires. The health risks are obvious – but the money is too good to ignore. The orange flesh of a papaya is like an oval gash in the landscape at Agbogbloshie, Ghana's vast dumping site for electronic waste, where everything is smeared and stained with mucky hues of brown and sooty black..... Much of it will be dumped in sites such as those in Agbogbloshie, increasing the risk of land contamination with lead, mercury, cadmium, arsenic and flame retardants. Agbogbloshie seems chaotic, apocalyptic in places, but there is an order to the large, desolate, rubbish-strewn site..... Deeper into the heart of Agbogbloshie, huge plumes of foul-smelling smoke rise up from three large fires, where the dismantled items are burned to remove traces of plastic, leaving the metal behind. The fumes are head-pounding, but the men, women and children weaving in and out of the fires seem oblivious. Goats sleep deeply beside the upturned remains of a tree, now strewn with plastic rubbish. Agbogbloshie is not just a site for trading, burning and dumping electrical waste; it's also home to thousands of people, who carry on their lives and raise their children in the midst of its filth and fumes. There are shacks dotted throughout the central area of the dump.Ghanaians have nicknamed Agbogbloshie "Sodom and Gomorrah," after two condemned Biblical cities, but its residents take a less hostile view. "This is not a good place to live. But we don't want the people in Europe and all those places to stop sending the waste
Jan 1 2013-Dec 31	https://www.scientificamerican.com/article/10-most-polluted-places-in-the-world1/	Journalism	Agbogbloshie, a neighborhood of Accra, Ghana, wasn't a pretty place in 2006, but the rising flood of e-waste had yet to completely drown the dump in the middle of town in toxic pollution. Ghana now imports some 215,000 metric tons of European computers, cell phones, microwaves, refrigerators, televisions and other electronic goods, making Agbogbloshie the second-largest site for processing such e-waste in all of west Africa. It may yet take the title as largest because e-waste imports are expected to double by 2020. And Agbogbloshie has already earned the dubious distinction of landing on the Blacksmith Institute's top 10 list of the world's most polluted sites, after failing to make the cut for the original list in 2006.
Jan 1 2013-Dec 31	https://www.ncbi.nlm.nih.gov/pubmed/2	Scientific Community	The present study discusses the result of our recent survey in Agbogbloshie market, the largest e-waste recycling site in Accra, Ghana.
Jan 1 2013-Dec 31	https://www.aljazeera.com/indepth/features/2013/10/inside-ghana-electronic-wasteland-20131030128525802 88.html	Journalism	Locals refer to the Agbogbloshie scrap yard as "Sodom and Gomorrah" [Chris Stein/Al Jazeera] Accra, Ghana - On a piece of charred land near the centre of this sprawling capital city, the detritus of modern technology is put to flame. Over the past two decades, thousands of people, primarily Ghanaians from the country's impoverished north, have flocked to the Agbogbloshie scrapyard to strip and burn waste from consumer appliances and collect the valuable metals inside. The place has become a byword for poverty and blight in Accra; locals call it "Sodom and Gomorrah", and the scrapyard's plot is widely regarded as being outside the control of the police. Mention change in Agbogbloshie, and all you'll get are shrugs. The people there have already seen the doctors come and worriedly take blood samples, the charities hand out masks and gloves that eventually fall apart, the curious researchers and journalists who visit and never come back. "They cannot help us. Because anytime they talk, it doesn't happen," says Idriss Mohammed Idriss, who breaks down refrigerators at Agbogbloshie. "This is our business, it's our life." Without it, he wouldn't have the $2.50 per-day that he can afford to spend on food. In a region where electronic waste is widespread - Nigeria and Ivory Coast also have significant e-waste dumping grounds, though none as centralised as Agbogbloshie

Jan 1 2013-Dec 31	https://www.fastcompany.com/3021758/a-look-inside-the-hellscape-of-one-of-the-worlds-largest-electronic-waste-dumps	Journalism	A Look Inside The Hellscape Of One Of The World's Largest Electronic Waste Dumps The Agbogbloshie dump in Ghana contains massive piles of toxic e-waste. This is what it's like inside Agbogbloshie was named one of the world's most polluted places in a recent report, and listening to David Fedele you can appreciate why. The Australian filmmaker spent three months at this Ghanaian mega-dump, the world's second largest graveyard for electronic waste. "It's basically 24 hours a day, seven days a week, of burning old electronics to remove the plastics, and get small amounts of metal that can be salvaged and resold," he says. "It's in a constant state of dark toxic smoke, and the smell is unimaginable and never-ending." Ghana imports 215,000 tons of e-waste from overseas, mostly from Europe, and much of it ends up at Agbogbloshie. Agbogbloshie is symbolic of modern consumption and the developed world's obliviousness to its impacts.
Jan 1 2013-Dec 31	https://www.tandfonline.com/doi/abs/10.2747/0272-3638.33.1.1	Scientific Community	We diverge from those debates by concentrating on the economic footprint of e-waste in a Ghanaian context by studying the largest and most prominent e-waste market—Agbogbloshie. This Accra site has achieved notoriety in the global media and among nongovernmental organizations (NGOS), but has received little research and policy attention.
Jan 1 2013-Dec 31	https://pubs.acs.org/doi/10.1021/es3049	Scientific Community	na
Jan 1 2013-Dec 31	https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(13)61465-8/fulltext	Scientific Community	The residents of Agbogbloshie, a town of around 40 000 people near Accra, Ghana, depend on discarded electronic equipment for their survival.
Jan 1 2013-Dec 31	https://ssir.org/articles/entry/sodom_and	scientific Community	Sodom and Gomorrah e-waste recycling in Agbogbloshie provides a livelihood for thousands of people, but it also results in a heavily polluted environment. Every year the United States, the United Kingdom, and a host of other industrialized nations ship (often illegally) cargo containers filled with unwanted electronic waste off to less developed countries for disposal. One of the places this e-waste ends up is Agbogbloshie— nicknamed Sodom and Gomorrah—a low-income suburb of Accra, the capital of Ghana. The e-waste recycling in Agbogbloshie provides a livelihood for thousands of people, but it also results in a heavily polluted environment that impacts the health of the workers and residents of Agbogbloshie, people living nearby, and the natural ecosystem.

Jan 1 2013-Dec 31	https://gizmodo.com/e-hell-on-earth-where-the-wests-electronics-go-to-die-1442576665	Other (Blog)	E-Hell on Earth: Where the West's Electronics Go to Die(Andrew Tarantola). The site is called Agbogbloshie, an illegal settlement/landfill outside of Ghana's capitol city of Accra. Roughly four acres in size and home to more than 40,000 migrants and refugees, Agbogbloshie has become one of the world's foremost "digital dumping grounds." It's a major destination for the developed world's electronic waste, processing millions of tons of unwanted electronics every year.
Jan 1 2013-Dec 31	http://occasionalplanet.org/2013/10/03/where-your-electronic-waste-goes-a-ruined-city-in-ghana-called-agbogbloshie/	Other (Blog)	Where your electronic waste goes: A ruined city in Ghana called Abogbloshie. Agbogbloshie. Does the name mean anything to you? Probably not. But it should. Agbogbloshie is hardly a household word. It doesn't exactly roll off the tongue with familiarity. But it should be as familiar to us as the names of some of the storied (and reviled) places where our high-tech toys are designed and manufactured. If there were any fairness left in the world, Agbogbloshie would be designated as a sister city to Cupertino (headquarters of Apple), Palo Alto (headquarters of Hewlett-Packard), Tucheng, Taiwan (headquarters of Foxcom), and Seoul, South Korea (headquarters of Samsung). After all, Agbogbloshie is a vital link in the chain of electronic-waste (e-waste) disposal that stretches from those first-world cities and the high-tech industries that thrive in them to the poverty-stricken African nation of Ghana. Isn't it time to be reminded that when we're seduced by the latest digital device with its fifty cool features we'll never use and dump last year's shiny new thing with the forty cool features we never used that the old stuff's got to go somewhere? That somewhere often is Agbogbloshie, a ruined city that's been called the "dirty secret of the hi-tech industry." If it's easier for you to pronounce, just call it Sodom and Gomorrah, the nickname residents have given the city in acknowledgment of the sordid living conditions and rampant crime that plague the lives of those who call the place "home." Agbogbloshie has the dubious distinction of being the world's (our) digital dumping ground. Hundreds of millions of tons of legal and illegal e-waste find their way to this single location..... The first-world compulsion to be the first to have the newest device has led to the Korle Lagoon in Agbogbloshie being designated one of the world's most polluted bodies of water.

Jan 1 2014-Dec 31	https://www.aljazeera.com/indepth/inpictures/2014/01/pictures-ghana-e-waste-mecca-201413010474097522 3.html	Journalism	Ghana's e-waste magnet. E-waste at the Agbogbloshie dumpsite near Accra has created a socio-economic and environmental disaster. As commonly done in Agbogbloshie, Adam Nasara, 25, uses Styropor from refrigerators to light a fire. [Kevin McElvaney/Al Jazeera] Agbogbloshie is the world's biggest e-waste dumpsite and is located close to Accra, Ghana. Electronic waste - TVs, PCs, HiFi systems, refrigerators - defines the landscape of this former wetland and recreation area. Here in Agbogbloshie 7- to 25-year-old boys smash stones and simple tools against TVs and PCs to get to the metals, especially copper.
Jan 1 2014-Dec 31	https://www.alternativesjournal.ca/science-and-solutions/control-act-delete	Journalism	In addition to the growing volumes of discarded computers, monitors, laptops, cellphones and other electronics in our landfills, e-waste often finds its way (by container ships) from places like Canada to places like Agbogbloshie, Ghana. In Agbogbloshie, e-waste is gold. Literally. Control-Act-Delete | A\J – Canada's Environmental Voice. Our electronics don't have to land in an African slum.
Jan 1 2014-Dec 31	http://www.bbc.com/future/story/20140218-why-your-old-tech-holds-treasure	Journalism	BBC - Future - Is e-waste an untapped treasure? Others are using e-waste to build phones. FairPhone, a company that makes phones from recycled components and conflict-free minerals, is hoping to turn one of Ghana's biggest "digital dumping grounds", a place called Agbogbloshie, into a source of parts.View image of The e-wastelands of Agbogbloshie in Ghana. (Blacksmith Institute) (Credit: Blacksmith Institute)
Jan 1 2014-Dec 31	https://www.bbc.com/news/av/technology-26239741/making-a-living-from-toxic-electronic-waste-in-ghana	Journalism	Making a living from toxic electronic waste in Ghana - BBC News. Toxic legacy of e-waste in Ghana Jump to media player David Reid travels to Agbogbloshie, Ghana to meet the people who make a living from sorting toxic e-waste.
Jan 1 2014-Dec 31	https://ejatlas.org/conflict/e-waste-in-agbogbloshie-ghana	Not-for-profit	E-waste in Agbogbloshie, Ghana | EJAtlas(EJOLT)In Agbogbloshie market, e-waste recyclers, including children, salvage copper, aluminium and other metals from electronic equipment like computers and televisions, either illegally dumped or legally exported in the form of second hand electronic and electrical equipment (EEE) from the UK, US and EU.
Jan 1 2014-Dec 31	https://www.sciencedirect.com/science/article/pii/S2214999614003208	Scientific Community	There are also e-waste recycling sites in Bengaluru and Delhi, India.22 West Africa has e-waste recycling sites in Nigeria (Lagos) and Ghana (Accra, Agbogbloshie)

Jan 1 2014-Dec 31	https://www.earthtouchnews.com/conservation/human-impact/agbogbloshie-welcome-to-the-worlds-digital-dumping-ground-part-1/	Journalism	Agbogbloshie: Welcome to the world's digital dumping ground (Part 1) | At least a kilometre before reaching the Agbogbloshie e-waste site within Ghana's capital city, Accra, you can already begin to smell the putrid, toxic fumes emerging from the area. Agbogbloshie was once a beautiful and thriving wetland, a haven for a variety of small wildlife. Birding enthusiasts travelled here from all over the world to see the abundant birdlife in the sanctuary. An assortment of fish species could be found in its water bodies, the Densu River and Korle Lagoon, and small antelope such as duiker populated the lush grass and tree-covered surrounds. "Agbogbloshie was once a beautiful and thriving wetland, a haven for wildlife." of the waste that finds its way to Agbogbloshie is set alight, releasing a deadly mixture of toxins. Image: Tash Morgan. That beautiful place is gone forever ... because for nearly 15 years, industrialised countries have been offloading their unwanted electronic waste into this area. Currently up to 80 tons of e-waste per month, from places like the USA, UK, EU and Australia, is smuggled into Ghana and dumped at Agbogbloshie. It is now one of the world's largest e-waste sites. Downstream from Agbogbloshie, egrets nest on a cluster of scraggly trees in the lagoon. Contaminated water emerging from the lagoon's mouth can be seen spreading into the ocean with the break of each new wave. This becomes pronounced with any rainfall, when pollution can be seen drifting far out to sea, some of it flowing back to stain the once-white sands of the nearby beach a sinister shade of black.
Jan 1 2014-Dec 31	https://www.dw.com/en/home-for-some-e-waste-dump-for-the-world/a-17313876	Journalism	Home for some, e-waste dump for the world. The e-waste dump Agbogbloshie exemplifies the downside of globalization: Black, poisonous smoke darkens the sky above Agbogbloshie, the final destination for electronic waste shipped from all over the globe. Some 50,000 people, including many children, live here - at one of the world's largest e-waste dumping grounds. Literally tons of old electronics burn in countless open fires, making my skin burn and itch as I walk through the grounds. There's a metallic taste in my mouth, and my head throbs. Meter-high, dazzling, green flames release huge wafts of black, poisonous fumes. It's like an apocalyptic painting come to life.

Jan 1 2014-Dec 31	https://www.foxnews.com/tech/welcome-to-hell-photographer-documents-africas-e-waste-nightmare	Journalism	Welcome to Hell: Photographer documents Africa's e-waste nightmare | Fox News. Over the course of four days, 26-year-old German photographer Kevin McElvaney met hundreds of young boys and girls, most from the northern part of Ghana, who came south to burn cables and extract the copper from them. It can be sold on the market for pennies, and other electronics burned to extract bits of precious metals -- at a terrible cost to the human body. It used to be wetlands, a recreation zone. Today the locals call it Sodom and Gomorrah. Slag heaps of rusting electronics, old refrigerators and monitors are scattered everywhere in Agbogbloshie, a dumping ground in Ghana for electronic waste from the rest of the world. On the banks of a polluted river, smoking heaps of burning junk spew bilious, black fumes into the sky. To breathe is to cede years of your life.
Jan 1 2014-Dec 31	https://www.theguardian.com/global-development-professionals-network/2014/apr/29/agbogbloshie-accra-ghana-largest-ewaste-dump	Journalism	Life in Sodom and Gomorrah: the world's largest digital dump. Life in Sodom and Gomorrah: the world's largest digital dump. Photographer Asare Adjei captures the lives of locals in Accra's slum city, where 50m tonnes of e-waste is dumped each year. Agbogbloshie's residents live off digital waste that they salvage and sell, but hope for better jobs. Photograph: Asare Adjei. No one knows when Agbogbloshie began. The slum city in south Ghana didn't exist when the capital of the Gold Coast was moved from Cape Coast to Accra. It's likely the settlement started when traders began transforming shop kiosks into makeshift homes, and soon a population of Ghanaians on low incomes established a sprawling the slum, which in known to many by its nickname, Sodom and Gomorrah. ea.

Jan 1 2015-Dec 31	https://motherboard.vice.com/en_us/article/4x3emg/inside-the-worlds-biggest-e-waste-dump	Journalism	Inside the World's Biggest E-Waste Dump - Motherboard. It is a hot sunny day, but it's hard to catch rays of sunlight from the smog hanging over the world's largest digital dumping ground. A former wetland located in the suburbs of the Ghanaian capital, Accra, this is allegedly the centre of an illegal exportation network for the dumping of outdated, broken and unusable products from Western nations. "Agbogbloshie is not a nice place," says my taxi driver, who drove me to the site last week during my week-long visit. "We nickname it Sodom and Gomorrah, the two condemned cities in the Bible. It is a very big waste site, where people work amidst black smoke and bad smell from the rubbish." Twenty miles away in Tema Port, 215,000 tonnes of second hand consumer electronics from mainly Western Europe and the United States still come through Ghana annually. These defunct products then get dumped at waste sites like Agbogbloshie, generating 129,000 tons of e-waste every year. Scrap workers at Ghana's Agbogbloshie, the world's largest electronic waste site, are taking a break from extracting copper and other sellable metals from unwanted devices. Hungry after burning a mountain of abandoned computers, photocopiers, phones, and televisions, they've just finished eating bananas delivered by the women of the site. Agbogbloshie is also a magnet for migrants across West Africa.
Jan 1 2015-Dec 31	https://www.pureearth.org/project/agbobloshie-e-waste/	Not-for-profit	The Agbogbloshie scrap metal site in Accra is Ghana's largest center for electronic waste (e-waste) recycling and disposal.GASDA has a vision to promote Agbogbloshie as a recycling knowledge centre by setting up a model e-scrap facility that protects livelihoods while minimizing the adverse health and environment risks of scavenging and exposure to toxic substances.
Jan 1 2015-Dec 31	https://www.wired.com/2015/06/infamous-e-waste-slum-needed-us-got-razed-instead/	Journalism	Agbogbloshie—a place where young men like Alhassan eke out a living mining old computers and car batteries for raw materials. For years, Western consumers have been told that 80 percent of our old electronics were being dumped and burned around the world in places like Agbogbloshie. Agbogbloshie, in particular, has been the focus of international condemnation for its bustling scrap market, where workers break down electronic waste and car parts into their base materials. There's another side of Agbogbloshie that goes completely uncatalogued: huge repair and resale markets, where Accra's 'waste' finds a second useful life. Ever since Western attention focused on Agbogbloshie, a parade of photojournalists and documentary filmmakers have visited the site. The scrap yard is just 22 acres—and journalists have photographed every centimeter of scorched silt. Most reports of the area focus on the small burn area. But there's another side of Agbogbloshie that goes completely uncatalogued: huge repair and resale markets, where Accra's "waste" finds a second useful life—recycling in the purest sense of the word. A more modern e-waste processing facility even opened in Agbogbloshie this year. But that isn't the story of Agbobloshie—of people fixing phones instead of burning them—that people want to hear. Instead, a complex community has been reduced to a symbol of Western guilt: of dumping and burning. By repeatedly criticizing Agbogbloshie, we in the western media inadvertently helped condemn its workers and their families to eviction. And to what end? The living conditions in Agbogbloshie were very bad—but removing a slums with no relocation plan won't solve the problems of the community.

Jan 1 2015-Dec 31	https://www.cultofmac.com/390495/ghana-global-problem-e-waste-consequences/	Journalism	In Ghana, the global problem of e-waste has local consequences. Ghana offers us a glimpse at some of the economic and environmental consequences of e-waste. In the West African nation's capital of Accra, particularly the slum known as Agbogbloshie, large landfills are strewn with decades' worth of discarded electronics. It's one of the most concentrated e-waste sites in the world.
Jan 1 2015-Dec 31	https://goodelectronics.org/agbogbloshie-a-functional-profit-making-recycling-network/	Not-for-profit	gbogbloshie: a functional, profit-making recycling network. Last month, we witnessed remotely, thanks to citizen reporting, the forced and violent evictions of women, children, families and workers occurring in a part of Agbogbloshie, "Old Fadama", a neighbourhood of Ghana's capital city Accra. We read estimates of 15,000-20,000 displaced and that children are now sleeping on the roadside and bus stations. Agbogbloshie is located around the banks of the Korle Lagoon and close by to Accra's Central Business District. The majority of its inhabitants are from the northern regions of Ghana who have lived, worked and built a life for themselves on the land. We feel concerned that in some way the clearance of Agbogbloshie has been made easier by its depiction in the media. Thanks to the media, Agbogbloshie became a global symbol for what is alleged to be a vast and growing environmental problem: the export of e-waste from the developed world to West Africa. Heather Agyepong speaks about the Western "gaze" here. Agbogbloshie is portrayed as the continent's largest electrical wasteland; in truth it is a functional, profit-making recycling network. The working conditions are harsh and pollution is rife but its inhabitants manage to live, work and save money for their families.
Jan 1 2015-Dec 31	https://www.washingtonpost.com/news/in-sight/wp/2015/04/15/the-children-who-make-a-living-in-the-toxic-world-of-discarded-electronics/?noredirect=on&utm_term=.5d34b2d6bed8	Journalism	Making a living in the toxic world of discarded electronics. Young men transport materials ready to be burnt at Agbobloshie in Accra, Ghana. (Valentino Bellini) The first time photographer Valentino Bellini visited an e-waste dump, he was shocked. "It was like hell," Bellini said in a phone interview. "Huge, lots of stuff everywhere. ... The air was heavy from burning plastic." Bellini's first experience with e-waste was in 2012, when he visited Agbogbloshie, reportedly the world's largest e-waste dumping site, in the middle of Ghana's capitol city, Accra. According to the Atlantic, the dump — once a lush mangrove swamp — is now a field home to thousands of tons of the world's electronics.
Jan 1 2015-Dec 31	https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-2376-z	Scientific Community	Ghanaâ€™s e-waste dump at Agbogbloshie is reported to be the biggest in sub-Saharan Africa, one of the largest worldwide, and has thus attracted the attention of many international environmental groups, researchers, and journalists [11]. The dump is currently a site for trade in products recovered from the waste stream [12, 13]

Jan 1 2015-Dec 31	https://www.dancingturtle.com/portfolio/e-wasteland/	Business	e-wasteland - documentary on e waste in Ghana. Without dialogue or narration, E-WASTELAND presents a visual portrait of unregulated e-waste recycling in Ghana, West Africa, where 200,000 tonnes of second-hand and condemned electrical goods arrive each year. It has created a situation where electronics are not seen for what they once were, but rather for what they have become. The film is set entirely at the Agbogbloshie slum in the capital Accra. Situated on the banks of the highly polluted Korle Lagoon, Agbogbloshie is home to over 30,000 settlers, mainly from the poorer Northern regions of Ghana. It is also home to the largest e-waste dump site in Africa. Generally uneducated and with few employable skills, many of the settlers at Agbogbloshie are forced to make a small living salvaging and recycling e-waste.
Jan 1 2015-Dec 31	http://theconversation.com/beyond-recycling-solving-e-waste-problems-must-include-designers-and-consumers-41719	Scientific Community	Agbogbloshie, an area in the city of Accra Ghana, is usually portrayed as an e-waste dump. A more accurate picture would include the repair and refurbishment economy. Agbogbloshie Makerspace Platform. Agbogbloshie, Ghana is in the news again. International media such as The Guardian, Al Jazeera and the Washington Post have helped turn this place into an infamous example of electronic waste (e-waste) dumping. I study global flows of discarded electronics, and that research leads me to think that such images badly misrepresent Agbogbloshie, which has been called "the world's biggest e-waste dumpsite." Among other problems, these portrayals ignore several UN reports that show the story to be much more complex. More than half of the discarded electronics in Ghana are generated by domestic consumers, driven by the growth of Ghana's middle class and its demand for electronics.
Jan 1 2015-Dec 31	https://interactive.aljazeera.com/aje/2015/ewaste/index.html	Journalism	E-waste Republic. Accra, the capital, hosts a thriving second-hand market, a sprawling network of repair shops, and a range of activities which attempt to tap into the full potential of e-waste. And yet, it is also the location of an enormous and heavily polluted electronic waste dumpsite. Agbogbloshie is a suburb of Accra with many thousands of inhabitants. The crowded, muddy streets branch out through rows of shanties and small shops. To call Agbogbloshie "the largest electronic waste dump in Africa" is - paradoxically - an understatement: it is actually a city within the city. This is where the poorest classes of Accra have spent years dismantling, recovering, weighing and reselling parts and metals extracted from the scrapped devices and from the heaps of electronic waste. This is where 'Sodom and Gomorra' stands, a slum that is well known for its high crime rates and widespread degradation. "What was once a green and fruitful landscape is now a graveyard of plastics and skeletons of abandoned appliances,

Jan 1 2016-Dec 31	https://www.ncbi.nlm.nih.gov/pubmed/?	Scientific Community	Electronic waste workers at Agbogbloshie were found to be exposed to a variety of injuries and illnesses. The Ghanaian exposure situation reflects the global context as a recent joint report by the Green Cross (Switzerland) and the Blacksmith Institute (United States) has ranked Agbogbloshie, Ghana among the top 10 most polluted places in the world (8,38). However, unlike the decentralized e-waste recycling sites in China, India, and Uruguay, the Agbogbloshie e-waste dump site is more centralized and characterized by copious toxic fumes emanating from the e-waste burning process which provides income for some of world's poorest people. For decades, Agbloboshie has been the dumping ground for electronic products imported into Ghana, from mainly North America and western Europe
Jan 1 2016-Dec 31	https://www.ncbi.nlm.nih.gov/pubmed/?	Scientific Community	Agbogbloshie is one of the world's largest electronic waste recycling sites. One of the largest e-waste sites is Agbogbloshie (Ghana). While several toxic elements have been reported in Agbogbloshie's environment, there is limited knowledge of human exposures there. One of the largest and most publicized e-waste sites in the world is located in Ghana's capital city of Accra. The site, known as Agbogbloshie, originated as a scrap metal recycling site and over the past decade has grown to serve as an important recycling site for e-waste (Amoyaw-Osei et al., 2011). In recent years Agbogbloshie has come under media scrutiny due to the negative health and safety conditions at the site. In 2013, the site was ranked among the world's top ten toxic threats by the Blacksmith Institute and Green Cross Switzerland
Jan 1 2016-Dec 31	https://www.smithsonianmag.com/science-nature/burning-truth-behind-e-waste-dump-africa-180957597/	Journalism	The Burning Truth Behind an E-Waste Dump in Africa. They are some of the most iconic photos in environmental journalism: young African men, often shirtless, standing over small fires fueled by digital detritus imported from richer countries. The toxic smoke swirls around them and over Agbogbloshie, the roughly 20-acre scrap yard in the heart of Accra, Ghana, where these men live and work. During the last decade, some of the world's most respected media organizations have transformed Agbogbloshie into a symbol of what's believed to be a growing crisis: the export—or dumping—of electronic waste from rich, developed countries into Africa. It's a concise narrative that resonates strongly in a technology-obsessed world.

Jan 1 2016-Dec 31	https://news.berkeley.edu/berkeley_blog/whats-the-real-story-with-africas-e-waste/	Scientific Community	Their imagery of e-waste and its young victims such as cable burners covered in dirt and soot in an area of Ghana's capital city called Agbogbloshie was published in National Geographic, Wired magazine, and the New York Times.Since then, Agbogbloshie, which encompasses a yam market, a mosque and football field, a scrap metal recycling yard, as well as the widely depicted dump site on the heavily polluted Korle lagoon, has been subject to a second round of even more hyperbolic media coverage. It was described inaccurately by The Guardian in 2014 as, the world's largest e-waste dump. .....Importers were described in a 2010 Frontline documentary on e-waste and Agbogbloshie as part of a shadowy industry that exploits regulatory loopholes, but there is much more to know about the people in this industry.
Jan 1 2016-Dec 31	https://yorkspace.library.yorku.ca/xmlui/bitstream/handle/10315/34648/MES MP01894.pdf?sequence=2&isAllowed=y	Scientific Community	Agbogbloshie Scrapyard, an e-waste recycling hotspot in Accra, Ghana, as a case study
Jan 1 2016-Dec 31	https://yorkspace.library.yorku.ca/xmlui/bitstream/handle/10315/34648/MES MP01894.pdf?sequence=2&isAllowed=y	Scientific Community	Agbogbloshie Scrapyard, an e-waste recycling hotspot in Accra, Ghana, as a case study
Jan 1 2016-Dec 31	https://www.engadget.com/2016/02/18/the-big-picture-e-waste/	Journalism	Sporadic coverage in the media has continued ever since, and in 2013 the town was recognised as the largest e-waste site in the world, although that undesirable title may now belong to Agbogbloshie, a suburb of Ghana's capital. Thousands of tonnes of e-waste makes its way to the dump from western countries after being illegally smuggled into the country.

Jan 1 2016-Dec 31	https://toxicnews.org/2016/11/08/on-electronic-pyropolitics-and-pure-earth-friction-in-agbogbloshie/	Not-for-profit	On Electronic Pyropolitics and Pure Earth Friction in Agbogbloshie. For scholars and activists engaged in global environmental politics of high-tech rubbish, Agbogbloshie is a familiar name. A scrap site in Accra, Ghana, Agbogbloshie has attracted numerous international environmental NGOs, engineers, environmental health scientists, slum tourists, journalists, photographers, and social scientists. Most visitors witness what they have been told about this place. Agbogbloshie is ablaze. It is a toxic postcolonial zone of intense metal recovery, a site where the burning of discarded electronic and electrical devices (DEEDs) to recover valuable metals, especially copper and aluminum, is an everyday activity. It is space of electronics toxicity, an environment of lead, mercury, cadmium, PVC, and plastics containing brominated flames retardants that present health and environmental risks (Caravanos et al 2011; Feldt et al 2014). Agbogbloshie is also a place of contentious green NGO intervention that seeks to "eliminate" burning of electronics by migrant laborers who make up the majority of workers in the scrap site.
Jan 1 2016-Dec 31	https://en.reset.org/knowledge/electronic	Not-for-profit	Agbogbloshie, a suburb of Accra in Ghana, is the site of one of the world's largest dumping grounds for e-waste, with around 215,000 tonnes of unwanted and secondhand electronic goods from around the world ending up here every year. Shops and markets are dotted around the region selling some of the secondhand goods and there is a healthy refurbishment sector and repair cafes exist yet the amount of devices that end up here make it hard to adequately deal with it all. Tests carried out in the area have shown that levels of lead in the soil are twice as high as those allowed by the US EPA while analyses of breast milk from mothers in Agbogbloshie have found higher-than-normal levels of the toxic compounds polychlorinated biphenyls (found in old electronic equipment). This interactive portal by Al Jazeera provides good insight into e-waste in Agbogbloshie
Jan 1 2016-Dec 31	https://global-recycling.info/archives/101	Business	The Agbogbloshie scrap metal site in Accra is Ghana's largest center for electronic waste (e-waste) recycling and disposal.

Jan 1 2017-Dec 31	https://www.dw.com/en/germany-supports-e-waste-disposal-in-ghana/a-38015011	Journalism	The German government has unveiled a plan to help Ghana deal with electronic waste at Agbogbloshie, a major dumping site outside of the capital, Accra. Agbogbloshie is the hub of electronic waste (e-waste) in West Africa and most of the electronics dumped at the site are hazardous. The site is notorious for the dangerous manner in which electronic waste is collected and burned. The practice pollutes not only the atmosphere but also nearby bodies of water and is dangerous for the workers.
Jan 1 2017-Dec 31	https://ejatlas.org/conflict/agbogbloshie-e-waste-landfill-ghana	Not-for-profit	Agbogbloshie e-waste landfill, Ghana | EJAtlas. A slum in the heart of Accra has achieved notoriety as one of the most polluted slums in the world by hosting one of the largest electronic waste dump in the continent. Pollution in land, waters and bodies has reached dramatic levels. Agbogbloshie is an old neighborhood in Central Accra that has become an internationally known hotspot of e-waste recycling. A large informal settlement called Old Fadama, lies adjacent to Agbogbloshie, just a few hundred meters southeast of the central waste dump where a considerable portion of recycling practices occur. While Agbogbloshie and Old Fadama are technically separated by Abose-Okai Road, they function as an extended community (the names are often used imprecisely and interchangeably) and together comprise one of Ghana's largest urban slums.
Jan 1 2017-Dec 31	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5334689/	Scientific Community	Toward a More Sustainable Trajectory for E-Waste Policy: A Review of a Decade of E-Waste Research in Accra, Ghana. Agbogbloshie, a slum in the heart of Accra, Ghana, has achieved notoriety as one of the most polluted slums in the world. The Blacksmith Institute (renamed Pure Earth in 2015) rated the Agbogbloshie e-waste site as "among the top ten most toxic sites in the world" [1].

Jan 1 2017-Dec 31	https://www.ncbi.nlm.nih.gov/pubmed/28609845	Scientific Community	Away' is a place: The impact of electronic waste recycling on blood lead levels in Ghana. In Ghana, Agbogbloshie, arguably the biggest e-waste dumpsite in Africa, is the heart of e-waste recycling. In 2013, the Blacksmith Institute ranked the site among the world's top ten toxic threats
Jan 1 2017-Dec 31	https://allafrica.com/stories/201709300031.html	Journalism	Where Do 50 Million Tonnes a Year of Toxic E-Waste Go?" The e-waste dump Agbogbloshie in Ghana, West Africa
Jan 1 2017-Dec 31	https://africatimes.com/2017/01/16/e-waste-in-africa-innovative-solutions-to-a-pressing-global-problem/	Journalism	To that end, an Accra-based entrepreneur launched the Agbogbloshie Makerspace Project, or QAMP. D.K. Osseo-Asare and his team spent months understanding the people and culture of e-waste scrapping at the site, came to accept that participants need the income, and created solutions to make that safer.
Jan 1 2017-Dec 31	https://www.theguardian.com/environment/2017/nov/20/electronic-recycling-e-waste-2017-gadgets	Journalism	A few years ago I was travelling through Agbogbloshie, the commercial district in Accra, known as a graveyard for electronic waste, a hotspot for digital dumping. I tutted and shook my head in sorrow as I surveyed the charred keyboards and plumes of toxic computer smoke wafting across the landscape. My Ghanaian colleague looked with some amusement at the tech spilling out of my handbag. My laptop, phone, iPad – where did I think they might end up?
Jan 1 2017-Dec 31	https://psmag.com/environment/threat-of-global-ewaste	Journalism	To understand—and combat—the impact of e-waste, it first helps to understand its scope. For starters, where do our unwanted cell phones end up? Many of them end up in sites like Agbogbloshie, located in Accra, Ghana, and one of the largest informal electronic waste disposal sites in the world. Discarded phones, monitors, and computers, among other products, pepper the once prosperous wetland. There, Ghana's youth break down and burn electronics to uncover rare earths and precious metals that can then be sold for school fees or other expenses—but at a dangerous cost. Negative spillover costs dwarf the increased income.

Jan 1 2017-Dec 31	https://coopnews.coop/electronic-waste-recycling/	Journalism	Incineration of waste in Agbogbloshie, Ghana. Photo from Pure Earth. Much of this waste is exported to developing countries like Ghana, Nigeria, Pakistan, and India, where it is dumped.
Jan 1 2017-Dec 31	https://jinttowingit.com/2017/02/11/trashed-2/	Other (Blog)	Agbogbloshie: Hope in an Apocalyptic Wasteland. A paint factory of uncompromising nature and a lurid Pepsi factory jut out from the jumble of shanties along the dusty street, one kilometre northwest of Agbogbloshie Market. Locals sell old car hubs refashioned into barbecues, neatly stacked cooking pots of every size, second-hand computers and television sets, piles of car tires and wooden crates. The Odaw River, once a clear, flowing tributary next to a lush wetland, has morphed into a big, grimy brook of bola that carries its toxic cocktail to the Gulf of Guinea just two kilometres away. Thirteen years ago, Agbogbloshie was a site of greener pastures. Now, a network of plastic bottles layer the surface of the river, as though a translucent brick road has been laid and grouted with an oily black substance. Either bank of the river is lined with trash, which piles up onto the surface of the ground and stretches into oblivion. The air is thick with inky, poisonous smoke billowing over the water and towards the bridge I stand on. Agbogbloshie is Ghana's main, unofficial dumping ground for local and foreign electronic waste. Discarded devices are shipped in from the United States, Western Europe, Australia, and Asia to Tema Port, about 30km away from the scrapyard. The items are then bought and sold to merchants and salesmen at the ports, who take the old devices to repair and sell second-hand. Most of the wasted devices are trucked to Agbogbloshie, the world's largest e-waste dump, where labourers strip the plastic to salvage the metal. This recovered copper, iron and aluminium will be sold to metal dealers or large companies.

Jan 1 2018-Dec 31	https://www.liebertpub.com/doi/10.1089/env.2017.0039	Scientific Community	One such place is Agbogbloshie, a scrap market in Accra, Ghana's bustling capital city that has attracted numerous international environmental nongovernmental organizations (ENGOs), engineers, environmental health scientists, slum tourists, journalists, photographers, and social scientists. Most visitors witness what they have been told about this place. They encounter a smoky scrap market zone of intense metal recovery, a site where the burning of e-waste to recover valuable metals, especially copper and aluminum, is an everyday activity. It is a space of rampant toxicity, an environment of lead, mercury, cadmium, polychlorinated biphenyls, and airborne contaminants, including polybrominated diphenyl ethers that present numerous environmental health risks.1 Agbogbloshie is also a place of contentious green nongovernmental organization (NGO) intervention that seeks to "eliminate" burning of electronics by migrant laborers who make up the majority of scrapyard workers.2
Jan 1 2018-Dec 31	https://large.stanford.edu/courses/2018/ph241/fleischer1/	Scientific Community	One such is the community of Agbogbloshie, a suburb of Accra, the capital of Ghana. Communities like Agbogbloshie, have to deal with electronic waste and the potentially radioactive waste alike with no expertise on how to handle them and governmental neglect. They are victims of the negative externalities associated with the boom of the electrical industry.
Jan 1 2018-Dec 31	https://www.unenvironment.org/news-and-stories/story/turning-e-waste-gold-untapped-potential-african-landfills	QUANGO	The Ghanaian government has taken a significant step towards the proper management of e-waste. The construction of an integrated e-waste recycling facility, at Agbogbloshie, is scheduled for October this year. One of the components of the project is the establishment of a network of collection centres to provide a continuous supply of raw materials to sustain the operations of the facility. This ambitious project is expected to create over 22,000 self-sustaining jobs for Ghanaian youth.

Jan 1 2018-Dec 31	https://ehp.niehs.nih.gov/doi/10.1289/isesisee.2018.S02.02.04	Scientific Community	A typical site in Ghana where the e-waste is received and recycled in an informal setting is the “Agbogbloshie dumpsite
Jan 1 2018-Dec 31	https://cultureandcapitalismblog.wordpress.com/2018/09/24/ghana-electronic-waste-and-the-circular-economy/	Others (Blog)	Agbogbloshie, in the city of Accra, Ghana, has become a central hub for e-waste activity. Ghana particularly became a graveyard of electronic goods after the government implemented the 'One Laptop Per Child' policy in 2004, removing the import duty on used electronic goods in order to 'bridge the digital divide' and improve computer literacy. The site has become subject to numerous economic and social failures, and Agbogbloshie is said to now be one of the most toxic places on the planet
Jan 1 2018-Dec 31	https://www.sustainable-recycling.org/ghanas-way-towards-sustainable-e-waste-recycling-first-country-in-africa-to-officially-launch-guidelines-for-environmentally-sound-e-waste-management/	Not-for-profit	n May 2017, the second draft of the guidelines was tested in five private sector recycling facilities by possible future public and private sector auditors. Especially, the active participation of the Ministry of Environment, Science, Technology and Innovation (MESTI), Manufacturing Industries Division as well as the Standards Compliance and Enforcement Division, both EPA Ghana, are to be highlighted here. In the same context, special thanks of the project team go to Blancomet Recycling Ltd., City Waste Recycling Ltd., Fidev Recycling Ltd., Presank Enterprise Ltd and Agbogbloshie Recycling Centre that all actively participated in the field tests of the recycling guidelines at hand.
Jan 1 2018-Dec 31	https://www.newframe.com/new-frontier-mineral-exploitation-ghana	Journalism	The new frontier of mineral exploitation in Ghana. White egrets move lightly across Korle's surface, which sags under the weight of plastic. In its upper reaches, the lagoon's southern bank is dominated by the Agbogbloshie shack settlement, home to nearly 100 000 people, while the world's largest electronic waste dump – the Agbogbloshie scrapyard – looms over the northern bank. If Agbogbloshie is the place technology goes to die, then it is also the place it is resurrected.On Agbogbloshie's northern fringe, an apocalyptic plane of plastic and glass stretches from a fresh onion market in the east to a meat market in the west, where goats are kept, slaughtered and sold to customers from surrounding areas. In the centre, the earth has been scorched black and is waxy to the touch. This is where the burner boys go to work.

Jan 1 2018-Dec 31	https://www.bbc.com/news/av/world-africa-46606645/ghana-s-e-waste-dumpsite-pollution-could-get-into-breast-milk	Journalism	Toxic legacy of e-waste in Ghana Jump to media player David Reid travels to Agbogbloshie, Ghana to meet the people who make a living from sorting toxic e-waste.
Jan 1 2018-Dec 31	https://www.dw.com/en/ghana-the-global-graveyard-for-e-waste/av-46405273	Journalism	Ghana: The global graveyard for e-waste. One of Africa's largest e-waste scrapyards is situated on the outskirts of Ghana's capital Accra. It's often been called "hell on earth". Tons of discarded electrical appliances, cars and scrap metal from the west are recycled by locals.
Jan 1 2018-Dec 31	https://www.fastcompany.com/40515861/see-inside-the-hellish-e-waste-dumps-where-your-old-electronics-go-to-die	Journalism	See Inside The Hellish E-Waste Dumps Where Old Electronics Go To Die. As a photographer, surrounded by electronic equipment himself, Löffelbein "started to wonder where all my stuff will end up in the future," he says. In 2011, he traveled to Agbogbloshie, a dump in the middle of Accra, Ghana, where workers break open old gadgets with their hand or rocks, and burn the coating off of copper cables, with toxic smoke drifting into a neighboring vegetable market.