UNDERSTANDING THE EMERGING E-WASTE REGIME: THE POLITICS OF CERTIFICATION AND LABELING IN THE ELECTRONICS RECYCLING INDUSTRY

by

GRAHAM PICKREN

(Under the Direction of Nik Heynen)

ABSTRACT

Recent work on the electronics recycling industry has drawn attention to the hazards associated with the export of used electronics, or e-wastes, from the U.S. to informal recycling sites in developing countries where hazardous recycling practices are often used. This dissertation seeks to understand how the geographic movement of e-waste becomes a subject of political concern and to evaluate the types of political interventions that have been developed in the U.S. to confront this growing 'e-waste problem'. My empirical work investigates the development of labeling and certification schemes for electronics recyclers designed to embed some modicum of accountability into the used electronics supply chain. In addition, extended producer responsibility (EPR) laws seek to reduce the use of toxics in electronics production by requiring producers to take financial responsibility for the end-of-life management of their products. Thus, the politics of e-waste in the U.S. revolve around attempts to mitigate hazardous 'downstream' flows of discards while also working to make 'upstream' preventative changes in production. By examining the important roles that consumers, NGO's, corporate actors, and governments play in these processes, my work speaks to the opportunities and limitations of contemporary forms of social and environmental governance. I utilized qualitative methods,

including interviews, archival work, and participation in policy workshops through the United Nations University's Solving the E-Waste Problem Initiative. My analysis of e-waste politics points to a broader critique of sustainability and of the 'greening' of capitalism more generally. Finally, this work contributes to the study of one of the more profound contradictions of the information age: although seemingly 'virtual', placeless, and predicated upon flows of information, the rise of digital technologies is grounded in particular places with particular socio-natural effects.

INDEX WORDS: E-waste, Certification, Labeling, Political Ecology, Human Geography

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Chapter 1 – Introduction

In 2011, Nissan ran an interesting advertisement for their new electric car, the Leaf. The ad was called "What if everything ran on gas?", and in it we see people using everyday appliances and electronics. The twist is that each device emits air-born effluents, and the users have to start up an engine to get the device going. We see someone yanking a chain, lawn-mower style, to start up their coffee-maker, and smoke pours out of cellphones, iPods, and computers. I say this was an interesting ad because it got my attention, no small feat considering my academic proclivity towards deconstructing narratives like the one Nissan was presenting. But it was not so much a sudden enthusiasm for an electric car that struck me; what came to mind was Marx's writings about the fetish of the commodity and the way in which the myriad relations involved in the production, circulation, and consumption of goods tend to be obscured by a focus on their commodity form. While there are of course major differences between Marx and Nissan's marketing execs, Nissan's ad visualized something significant about the electronic commodities that are nearly ubiquitous in modern American life, namely, that they are shot through with flows of energy and materials, not to mention laboring bodies[1]. It occurred to me that this recognition of 'hidden' relations was something that motivated me as a scholar; that one could start with a commodity, like a computer, and trace its production to distant mines, workplaces, corporate board rooms, and individuals' homes seems to me a great way to tell stories that reflect our current historical and geographical moment. Indeed, the kind of

[1] It is of course also true that Nissan was 're-working the fetish' (Goodman 2004) of the automobile, meaning that their narrative about the Leaf creates new imaginaries, such as being an eco-friendly consumer, that are used to sell the product. More on this later.

'geographical detective work' (Hartwick 2000) that goes along with attempts to 'defetishize' commodities strikes me as a core strength of geography as a discipline[2].

The empirical focus of this dissertation is not electric cars but waste, or more specifically electronic waste or e-waste. Waste is ripe for the sort of geographic detective work Hartwick has in mind, because just as the social, ecological, political, and economic relations that constitute the production of goods are obscured at the point of consumption, so too are these relations obscured when we discard something. If we follow e-waste, we come upon one of the more profound contradictions of the information age: although seemingly 'virtual', placeless, and predicated upon flows of information, the rise of digital technologies is grounded in particular places with particular socio-natural effects. The recent scandal surrounding Apple and its relationship to hyper-exploited assembly workers in Asia (Duhigg and Barboza 2012; see also Pellow and Park 2002) is but one manifestation of such grounding, and it undermines the notion among enthusiasts of the post-industrialism that technological development is liberating labor and making class struggle obsolete (Bell 1974). The creation of a 'smarter planet' (IBM ad campaign 2009) must be understood within the context of uneven development – wealth, health, and connectedness exist alongside poverty and poisoned landscapes and bodies.

Digital technologies also of course involve the metabolism (Foster 2009; Smith 1984; Swyngedouw and Heynen 2003) of non-human 'resources'[3], and in surprisingly intensive ways. A single silicon chip requires 1.7 kilograms of fossil fuels and chemicals and 32 kilograms of water to produce (Electronics TakeBack Coalition 2009). To manufacture one computer and monitor, it takes 530 pounds of fossil fuels, 48 pounds of chemicals, and 1.5 tons of water (ibid).

[2] Whether it is possible to reveal the 'essential' relations embedded within a commodity, is of course, another question and something that will be discussed in detail in chapter 2.

[3] There is, of course, no such as thing as 'natural resources'. Resources only exist in their relation to human processes.

In contrast with many home appliances, life cycle energy use of a computer is dominated by production (83%) as opposed to operation (17%) (Williams 2004). This energy intensity becomes even more significant when considered against the pace with which electronics become obsolete and are discarded. E-waste has become the fastest growing portion of the U.S. municipal waste-stream, with an estimated 3.5 million tons of e-waste being produced in 2010 (Dauod 2011). The EPA estimates that only 15-20% of this e-waste is recycled (EPA 2007). This represents a grave loss of critical materials – for example, while only 5 grams of gold are found per ton of primary ore, up to 200-250 grams of gold can be found in a ton of PC circuit boards (Meskers 2011). When we bury our electronics in landfills, we have to replace those materials from more environmentally damaging processes, like mining.

More than just a rising quantity of waste, e-waste is qualitatively significant as well in terms of its effects on bodies and landscapes. The computers, phones, televisions, printers, fax machines, and wires that form the basis of the post-industrial economy are produced using between 700-1000 metals, chemicals, and gases, many of them highly toxic (Puckett et al 2002). These toxic substances, including lead, chromium, mercury, polyvinyl chloride plastics (PVCs), and brominated-flame retardants (BFRs) all pose major occupational and environmental health hazards (ibid). These substances can contaminate the water, air, and ground and have effects ranging from reproductive problems, to nervous system damage, to blood, kidney, and lung diseases and cancers (ibid). Such deleterious effects are often invisible in the consumption of these products, with most of the hazards manifesting themselves in production and end-of-life disposal. Issues around e-waste recycling and disposal have been particularly well publicized.

For example, over the past decade, NGO's have followed the trail of used electrical and electronic equipment (EEE), or e-waste, collected under the auspices of recycling in the U.S. to

informal or 'backyard' recycling operations in developing countries where human and ecosystem health are often jeopardized (see Puckett et al 2002; Puckett et al 2005). Images of men and women without health protections smashing leaded glass, burning PVC-coated wire, and soaking circuit boards in acid baths in places like Guiyu, China and Agbogbloshie, Ghana have galvanized public awareness of 'sham recycling' and exposed the 'dark side' of the digital age (ibid). Prominent media outlets such as CBS's *60 minutes* and PBS' *Frontline* have also documented sham recycling and followed containers of e-waste collected from the public in the U.S. and Canada to informal sites abroad (Pelley 2008 and Klein 2009). While no clear quantitative data on the extent of the trade exists, the NGO the Basel Action Network (BAN) asserts that 50-80% of electronics collected for recycling in the U.S. are exported to these informal dump sites in developing countries (Puckett et al 2002; Puckett et al 2005). The editorial bent of these reports is that these exports, while ostensibly involving the circulation of commodities, use the pretense of sending materials for repair and re-use as a guise for dumping broken, hazardous electronics on poor populations. This 'pollution haven' hypothesis (see Clapp 1994) that underlines the majority of reports and statistics about e-waste exports, while not a comprehensive view of e-waste flows, has gone 'viral', politicizing the recycling industry by raising important questions about negative impacts on human and environmental health associated with where e-waste goes. It would appear that dropping off one's old television of computer at the county e-recycling event now carries global implications.

This research is about how such negative effects associated with digital technologies are rendered visible and become subjects of political concern. Given the near ubiquity of electronics in the U.S., and increasingly around the globe (Williams et al 2008), finding ways to deal with the detritus of the digital age will remain a significant challenge for the 21st century. What I

have just outlined is that the U.S. is not recycling much of its e-waste, and that which is being recycled is often done so in ways that are, at best, less than transparent and at worst highly unethical and unjust. I would venture to guess that most people would see the geographical movement of used electronics from the point of consumption to places like Guiyu, or to landfills, or to prisons, as, at minimum, less than desirable. Yet that process of de-fetishizing the digital age, of lifting the veil of ignorance about the material processes at the heart of high-tech developments, does not necessarily prescribe progressive political action. One of the central questions that this work deals with revolves around understanding the political interventions that might adequately confront what I am calling 'the e-waste problem'. At one level, I hope to evaluate a series of political interventions that have been developed and rolled-out in recent years in the U.S. to address the significant issues raised about the social and environmental consequences of electronics recycling.

On the other hand, I also think it critical to *not* take 'the e-waste problem' for granted and simply accept that something called 'the e-waste problem' exists for all to see. Following Braun's (2002) research, where he shows that the 'rainforest' is not a self-evident and eternal terrain through which politics occur, but rather as something that is always invested with meaning and value in *multiple* ways, another central aspect of this work is to more fully unpack the processes through which e-waste and the e-waste problem come into being. By analyzing the *particular* ways in which e-waste is politicized, it is possible to also identify what is excluded by certain framings of the e-waste problem. Thus, this work might be thought of as investigating a set of political practices on their own terms (what do they do, and how), as well as the conditions of possibility that make those practices possible (the discursive framings and flows of knowledge that are the foundation of action).

Investigating the politics of e-waste gets at a number of important issues, and I want to argue that e-waste is an important bellwether for 21st century environmental politics. While I am keenly interested in e-waste in and of itself, and of how global networks are (dis)articulated (Bair and Werner 2011), what I hope to demonstrate in this manuscript is that investigation of e-waste reveals larger lessons about how we choose to live and adapt in an age of social, economic, and environmental crisis. E-waste helps bring 'environmental' politics nearer to where most people live. Thinking about how the ubiquitous cell-phone comes into being and where it goes when it is 'wasted' is an invitation to consider environmental politics not as a project of saving wilderness (Cronon 1995), or returning to a 'simpler' time in which electronic gadgets have not yet permeated our lives, but one in which humans and non-humans are always already assembled in hybrid configurations (Braun 2002, 13). The nature-society dualism that wilderness preservation is predicated upon cannot be a foundation for radical change because it "risks leaving us wholly unprepared to imagine *how* we might responsibly inhabit our complex socioecological worlds" (Braun 2002, 10 emphasis in original). The view here is towards a politics based in 'social nature', 'hybrids', 'the production of nature', and 'assemblages', all of which are relational metaphors that allow us to "think in terms of a web of relations that encompass humans, animals, and machines simultaneously" rather than simply policing the boundaries between the human and the natural (ibid, 13). Thinking about electronics and e-waste and developing a politics based in relations, between flows of materials, ideas, technologies, class, gender, racism, and values, moves environmental politics away from technical and managerial problems to thinking more broadly about "how social natures are transformed, by which actors, for whose benefit, and with what social and ecological consequences" (Castree and Braun 1998, 4).

To summarize, this project asks pointed questions about the governance of e-waste as a way into understanding broader contemporary processes of confronting intersecting political, social, economic, and ecological concerns. As has been suggested, "[e]waste's capacity as a theoretical vehicle is immense…it is good to think with and through" (Gregson et al 2005, 2; cited in Lepawsky and Mather 2010, 190). E-waste in many ways captures important aspects of the contemporary moment; there is inequality throughout the production, consumption, and disposal of electronics, and those relations are there to uncover if we look hard enough. But electronics and the currency that it trucks in – information – have a great deal of liberating potential, as hackers (i.e. Wikileaks), the open-source movement, and DIY repair advocates are demonstrating around the world today.

While e-waste grounds our technological fantasies in the reality of uneven geographic development, technologies are fundamentally about how society collectively organizes our labor and our survival. In short, technology is a social process, rather than a kind of *deus ex machina* that is unleashed upon society (Noble 1977). Thus I see this project as part of a long lineage in social science that reflects upon ecological, social, and economic crisis through the dialectical relationship between technology and society, where technology is neither the driving force of history nor the solution to socio-natural problems. Instead, technology is a site of struggle, and the struggles over technology that I describe in the pages that follow force us to think about Braun's question of how we create an (environmental) politics that includes the complex 'web of relations' between people, machines, chemicals, labor, etc. This is not entirely new terrain of course. The industrial historian and critic David F. Noble situates the broader intellectual endeavor nicely:

> "Since those who comprise society are at the same time the human material of which technology is composed, technology must inescapably reflect the contours

> of that particular social order which has produced and sustained it. And like any human enterprise, it does not simply proceed automatically, but rather contains a subjective element which drives it, and *assumes the particular forms given it by the most powerful and forceful people in society, in struggle with others*. The development of technology, and thus the social development it implies, is as much determined by the breadth of vision that informs it, and the particular notions of social order to which it is bound, as by the mechanical relations between things and the physical laws of nature. Like all others, this historical enterprise always contains a range of possibilities as well as necessities, possibilities seized upon by particular people, for particular purposes, according to particular conceptions of social destiny" (1977, *xxii*¸ emphasis added).

Despite being highly critical of 'sustainability' in the electronics industry, I find a great deal of hope in the way that Noble leaves the fate of technological change open to contingency.

The dissertation is organized as follows: Chapter 2 provides a broad overview of the entire text, starting with some context on the politicization of e-waste in the U.S. and an introduction of the specific set of institutional 'fixes' that have been developed to corral some aspect of the e-waste problem. Following this context, chapter 2 introduces my research questions, followed by a brief description of my theoretical framework, my methodology, and empirical arguments. The subsequent chapters go into detail on each of these topics – chapter 3 deals with theory, chapter 4 with methodology, and chapters 5, 6, and 7 are empirical engagements with my research questions.

Chapter 2 – Research Context, Questions, and Project Overview

I. Practices of Governing E-waste

The catalyst for this project was a kind of 'ah-ha' moment that occurred when I first encountered images of e-waste dumps in China and Ghana. The NGO the Basel Action Network produced two reports (Puckett et al 2002; Puckett et al 2005) that I argue were instrumental in bringing the North-South trade in e-waste into public awareness. In particular, BAN's photographs of young children working and playing in and around hazardous recycling sites seemed to me to be an important counterpoint to discourses of 'post-industrialism' that permeate enthusiastic reports on the high-tech sector.

In my experience, BAN's reports had the effect of pulling back the curtain and revealing something I previously was unaware even existed; that a seemingly personal act of throwing away an old phone or television could implicate me in environmental injustice was simultaneously horrifying, and, from an academic perspective, exciting in that it seemed to be a serious problem that needed attention. I wondered what might be done and who might be responsible. Without being hyperbolic, I would place BAN's first two reports, along with others conducted by Toxics Link India (2003) and Greenpeace (Bridgen et al 2005), as significant moments in the environmental justice movement alongside activist work in the Love Canal neighborhood, Warren County, North Carolina, and Cancer Alley, Louisiana. If waste is useful for telling stories, here was a story that captured something significant about the ethical-political-geographic connections in a 'post-industrial' global economy.

As I probed further, I learned that the U.S. remains the only developed country to not have ratified the Basel Convention on the Transboundary Movement of Hazardous Waste, which is the main piece of international legislation on the waste trade. The Convention simply requires OECD countries to receive 'prior informed consent' and ensure 'environmentally sound practices' are being used when trading hazardous wastes to non-OECD countries. Nor has the U.S. signed or ratified the Basel Ban, which goes beyond the Convention in that it bans the trade in hazardous wastes entirely, which means only used electronics that are fully functional or processed into commodity-grade materials can be exported from OECD to non-OECD countries[4]. The Resource Conservation and Recovery Act (RCRA, colloquially pronounced as 'rick-rah') is the federal law that pertains to e-waste, but its export prescriptions stop short of even requiring 'prior informed consent' or 'environmentally sound management'. Even though many categories of electronic discards fit RCRA's definition of hazardous[5], electronics that are sent for recycling, either domestically or in foreign countries, are either excluded or exempt[6] from regulation so that they can be treated as commodities rather than wastes. Finally, the U.S. is also an outlier in that, unlike the European Union, it has no federally mandated electronics recycling[7]. For this reason, the EPA estimates that 82% of e-waste produced in the U.S. is sent to landfills (EPA 2009; cited in Kyle 2011)[8].

[4] The Ban Amendment has not yet been ratified by enough countries to have entered into force but has been voluntarily adopted by the countries of the European Union.
[5] Circuit boards and CRT monitors exceed the threshold for lead in the EPA's Toxic Characteristic Leachate Test.
[6] An exclusion means that an item is not a waste, and therefore not subject to hazardous waste regulations. An exemption means that something is a waste, but is not regulated as a hazardous waste in order to incentivize recycling and/or reuse.
[7] However, twenty five U.S. states now have laws requiring the collection of used electronic devices at end-of-life (see chapter 6).
[8] Electronics deemed hazardous under the Resource Conservation and Recovery Act must be disposed of in hazardous waste landfills and not municipal landfills. However, unless a state has passed a law, this only applies to hazardous wastes produced by non-households.

What that means is that with the exceptions of a few hazardous items, such as broken CRT-monitors, most used electronics can be exported from the U.S. with few restrictions. And even those restrictions are violated relatively freely. Members of the U.S. Government Accountability Office posing as e-recyclers online found numerous e-waste brokers willing to engage in illegal shipments of hazardous e-waste to developing countries (2008). Despite these blatant violations of U.S. regulatory policy, the political response to e-waste exports and 'sham recycling' has stopped well short of making changes to RCRA that might significantly alter the regulatory landscape. Suffice to say that laws targeting the production process, such as the EU's Reduction of Hazardous Substances (RoHS), which mandates the reduction or elimination of many toxic manufacturing inputs, have also not entered into U.S. federal law.

Even though no major federal legislative changes have passed in response to the troubling geographies of e-waste[9], e-waste has nevertheless penetrated high level policy discussion. The EPA recently listed improving the management of e-waste as one of its top six international priorities (press release 8/17/10). And in 2011, the Obama Administration announced a federal strategy for the voluntary promotion of 'responsible recycling' and recycling job creation in the U.S., including the recommendation that federal agencies recycle their surplus electronics through recyclers certified to a third-party standard (Interagency Taskforce on Electronics Stewardship 2011). And since 2003, twenty five U.S. states have passed legislation that implement some form of what is known as extended producer responsibility (EPR) legislation. In theory, by making producers of electronics financially responsible for their end-of-life management, EPR incentivizes the redesign of electronics to make them less toxic and easier to recycle. In effect, we might think about the e-waste regulatory regime along two axes – distribution and production. Certifications for electronics recyclers are

[9] House Resolution 2284 expands regulations on used electronics exports but has not been subject to a vote.

meant to address the former, while EPR legislation has been created to address the latter. I take these developments as my empirical jumping off point to explore the politicization of e-waste.

The R2 and e-Stewards voluntary certification standards

The Obama administration's recommendation that federal agencies use certified recyclers refers to the presence of two competing *voluntary* certification and labeling schemes for recyclers - Responsible Recycling (R2) and e-Stewards – that were created to reform the trade in used electronics by injecting transparency and accountability into the supply-chain. These standards are similar to the now familiar 'fair trade' certifications that adorn numerous products, from coffee to timber to tuna fish (Baird and Quastel 2011; Klooster 2006; Mutersbaugh 2005;). Since U.S. federal laws have not yet changed to address e-waste geographies, certifications allow consumers to work through the market and 'vote with their dollars' (Barham 2002) to try and prevent scenes like the one in Figure 2.1 from occurring. In both R2 and e-Stewards, a recycler seeking certification submits their recycling process to an audit by an accredited third-party inspector. This audit includes examination of the recyclers 'downstream' vendors[10], which are the various other actors involved in the recycling supply-chain.

After successfully meeting the requirements of the audit, a label is bestowed upon certified recyclers. This label then communicates to the marketplace that a recycler engages in socially and environmentally beneficial recycling practices, such as incorporating environmental health and management protocols and/or preventing illegal e-waste exports to informal economies in developing countries. As public awareness of the e-waste issue grows, these certified recyclers should potentially enjoy greater market share as consumers (public and private) of electronics seek to make ethical choices. Voluntary labeling schemes are thus

[10] For example, if a recycler specializes in repairing and selling whole computers, but ships non-working parts to a recycler who dismantles material into commodity-grade scrap, the latter recycler would be a part of the formers downstream. R2 and e-Stewards differ over how carefully the downstream vendors are audited.

intended to produce a 'win-win' scenario of economic gain for businesses that engage in 'green' behavior.

Certification as a tool of governance implies a strengthened role for NGO's and market actors as regulatory institutions, but rather than replace the state, third-party certification and labeling enroll the state, market institutions, NGO's, and consumers in 'hybrid' forms of governance (Lemos and Agrawal 2006). For example, the EPA funded the initial development of the R2 standard, yet much of the actual oversight of e-waste recyclers is left to auditors and certifying agencies, NGO's, recyclers, and consumers. These hybrid forms of governance imply important shifts in accountability in terms of what 'best practices' might be and how they are determined.

Furthermore, certifications work as market-making devices (Berndt and Boeckler 2011), assembling together multiple types of value (economic, moral, sustainable) into a commodity form whose purchase is meant to rectify the 'externalization' of the social and ecological costs of economic activity. Much of the scholarship on labeling invokes Polanyi in asserting that markets are embedded within a "maze of social relationships, institutions, and nonmaterial ends and means" (Klooster 2006, 544). Conceptualizing these institutional 'fixes' as *embedded* within multiple logics and relations signals the contested and political nature of what certifications do and how they are developed. More broadly, this line of thinking extends notions of politics beyond a narrow focus on policy and struggle over economic value and into the 'non-economic' realm of culture and ethics.

Voting with your dollars is not at all a straightforward process. In fact, there is a curious process of 're-working the fetish' (Goodman 2004) involved with labels in that they are intended to reveal 'hidden' relations embedded within commodities, such as 'sham recycling',

yet this revealing occurs alongside an obfuscation of other relations. Using fair trade coffee as an example, Carrier writes that the image on the coffee bag of the peasant small-holder coffee grower comes to define the 'ethicality' that consumers are looking for. What might be omitted in this imagery is the migrant labor used to harvest that fair trade coffee (2010). In short, the ethicality of the fair trade object is always partial – some aspects of the contextual relations of a product are highlighted while others are ignored (ibid, 686).

While the e-Stewards or R2 certification ostensibly forms some sort of progressive connection between children playing on e-waste and the consumer/waster of electronics elsewhere, exactly what sort of connection that is, how it is made, and what the outcome might be takes a bit more unpacking to understand. What I do in this project is think through how the boundaries are drawn around e-waste as an object of regulation/commodification, what the metrics of good governance are, who gets to decide, and what is revealed and what is obscured by processes of assembling an alternative, 'ethical' marketplace for electronics recycling. In other words, there is an important political process at work in assembling an 'ethical' regime of e-waste recycling and disposal, and the practices through which objects (electronics), places (county recycling events, informal sites), and actions (recycling) become linked and governed need to be uncovered and examined.

Key differences between e-Stewards and R2

As an example of the political tensions referred to above, while both the R2 and e-Stewards standards seek to eliminate hazardous e-recycling practices in the global commodity network, these two standards embody different normative visions of how and where e-waste recycling should be done. Specifically, they differ over when and where used electronics should

be treated as a commodity or as a (hazardous) waste. This distinction is the core empirical point of departure for the project, and it has important implications. R2, partially crafted by the scrap industry, acknowledges that a few 'bad apples' (Weiner 2008) engage in sham recycling, but the standard, or rather the way it is marketed, largely casts the export of used electronics as a process of commodity circulation and therefore seeks to use certification to reform trade. The export provisions of R2 simply state that exports 'must be legal', and R2 proponents suggest that the export of non-working material allows importers to cheaply upgrade electronic devices, thus satisfying a growing demand for affordable technology in developing countries i.e. 'bridging the digital divide'.

The auditing procedures of the e-Stewards standard are relatively similar to those of R2, but e-Stewards differs significantly over the question of exports[11]. BAN, which administers e-Stewards, argues that the shipment of material for recycling and repair remains a loophole through which dumping on developing countries occurs. In other words, labeling a shipment of used electronics as destined for repair circumvents the scrutiny this shipment would receive were it labeled 'hazardous waste'. Whether that shipment contains useable equipment, repairable equipment, and/or broken and unfixable hazardous e-waste is still unclear, according to BAN. To prevent any such confusion, the e-Stewards certification imposes a voluntary ban on the OECD to non-OECD trade in used electronics, which BAN describes unequivocally as the 'toxic trade' of hazardous wastes. But crucially, what I will demonstrate in this research is that 'hazardous recycling practices', 'resource recovery', and 'toxic trade' are not self-evident processes but rather come into being through the "sociotechnical process of policy development" (Rutland and Aylett 2008, 636). *The contested nature of what these actions mean and how they are defined*

[11] These differences will be discussed in detail in chapter 4.

literally shape the geographies of e-waste and the environments and livelihoods through which discarded electronics move.

II. Questioning the E-Waste Regime

This dissertation untangles the nuances of e-waste politics and raises important questions about the conflicts and tensions that constitute sustainability as an actual set of on-the-ground practices. My goals are to understand what sort of 'problem' e-waste is, where it comes from, and what might be done about it. Given the significance of waste/commodity distinctions in shaping political interventions, which in turn shape the geographies of e-waste, a waste-specific theoretical framework is needed. From social science literature on waste, which is now quite large (see Moore 2012 for a review), Zsuza Gille's 'waste regime' concept stands out as useful to the endeavor here. She defines a waste regime as a specific set of social institutions that "determines what wastes, and not just what resources, are considered valuable by society, and [that] these institutions regulate the production and distribution of waste in tangible ways" (2007, 34). This concept is unique in the literature in that much existing work focuses on "how wastes are regulated (modes of governance), accessed (waste citizenship), or distributed (waste networks and flows) *once they are produced*, the concept of waste regime extends attention to the very production of waste and allows us to understand the economic, social, and cultural origins of specific wastes as well as the logic of their generation" (2010, 1056, emphasis in original). Throughout the empirical chapters, the waste regime concept allows me to move between analysis of the 'becoming' or 'emergence' of waste, which avoids reifying waste as a given set of fixed materials or as purely derivative of economic logics, and the social relations

that shape how materials are transformed in particular ways. Gille argues that any given waste regime should be interrogated along three dimensions (2007, 34):

- The production of waste: What is the mode of production through which wastes are produced? But to go beyond a functionalist reading of waste production, we must also consider the material composition of waste itself not just in relation to value, but as significant in shaping social relations of production and governance. Waste as material can have agency.
- Representations of waste: What key bodies of knowledge and expertise are mobilized in dealing with e-wastes? Practices of classification are spatializing practices – where things go depends on how they are understood.
- The politics of waste: To what extent are waste issues a subject of public discourse? What are the tools of policy? Who is mobilized to deal with these issues?

Rather than map Gille's tri-partite framework directly onto my study, I explain in chapter 3 how and why I have reworked some of her categories. For now, thinking across the different but related moments of political economy, the materiality of wastes, and the importance of power/knowledge in the policy context, my research questions are aimed at unpacking the socio-natural implications associated with the changing geographies of e-waste. I began with the following set of specific questions related to the e-waste regime:

Questions

1. **How were the R2 and e-Stewards voluntary standards developed, and how have different actors shaped and contested definitions of 'best practices' actions, metrics of performance, and the delegation of responsibility?**

    - **How do materials come apart, and how can different categorizations of waste and resource be smoothed over, certified, and accounted for in a diverse global network of secondary processing?**
- **How is the implementation and adoption of these competing certifications shaping the e-waste regime?**
    - **In what ways do certifications work as market-making devices? In other words, what are the processes through which a market for 'ethical' or 'sustainable' e-waste recycling is created, made legitimate, and maintained?**
    - **What are the ambiguities, contradictions, and democratic deficits that emerge from promoting global environmental justice politics through market-driven disposal choices?**
- **What is the relationship between certification and extended producer responsibility (EPR) legislation?**
    - **How do the EPR laws in the U.S. work in terms of the scope of e-wastes covered, their financing, and their delegation of responsibility?**
    - **What alternatives to EPR might better influence democratic control over the production process?**

In researching how standards are developed and implemented and how they work (or do not work) with other regulatory processes such as EPR legislation, I became intrigued by the gaps left by these interventions. I found that what is being done about e-waste and how it is discursively framed was just as interesting as what was not being done, and what was not being discussed. Again, my aim has been to examine these institutional fixes on their own terms as well as through the gaps they leave.

Key arguments

In pursuing these research questions, my research highlights the embeddedness of e-waste governance within a contingent political process and suggests that the 'greening' of global economic networks via voting with your dollars is a limited form of progressive politics. One of the main arguments I make throughout this research is that market-led forms of e-waste governance produce several important contradictions that undermine their impact. Stated briefly, the first contradiction is that despite the way that R2 and e-Stewards market themselves, voluntary certifications only partially enable clear distinctions between wastes and resources and recycling and dumping to be made. Standards for recycling are abstractions, distilled moments of what is in practice a very complex global network that is continuously changing. While generally applicable to all forms of governance, market or otherwise, there is a very real gap between the ideal of standardization and the contingent realities of what recyclers do. I explore this contradiction in detail in chapter 5.

These issues of transparency and accountability are exacerbated by market demands. For example, R2 and e-Stewards need to be voluntarily adopted in order to affect e-waste governance at all. Recyclers must have some incentive, and as with other fair trade schemes, that incentive is the possibility of extracting greater rents from the supply-network. But greater rents require demand for the certified product, and since that demand is based on rather ephemeral qualities such as the desire for recycling consumers to 'do good', there must be a connection between recyclers, a particular problem, and its solution. *Narratives* about e-waste recycling are therefore critical to the implementation and adoption of certifications. Both R2 and e-Stewards, as competing regimes of 'ethical' e-waste governance, have used narratives like 'digital development' and 'toxic trade' to legitimize certain classifications and (voluntary) management

requirements on the supply-chain, but inevitably these black and white representations of the problem obscure the messiness and uncertainty that actually exists in terms of what sort of problem e-waste is, where e-waste goes and what happens to it[12]. In mainstreaming e-waste as a political object, simplifications occur. For example, organizations like iFixit, an electronics repair advocacy group, argue that repair and re-use in the informal sector ought to be distinguished from burning, acid-leaching, and disposal as a positive activity (Chamberlain, 26 January 2012). The e-Stewards standard does not make that distinction and requires a voluntary ban on any trade between formal and informal sectors. By using certified recyclers, are electronics consumers in the North combatting the 'race to the bottom', or depriving secondary markets of materials? Deciding just when and where e-waste recycling and trade is opportunity or exploitation is not at all simple (see Minter, 18 April 2012). These issues are the main focus of chapter 6.

The second key contradiction here is that certifications seem to simply valorize wasting rather than challenging it. While both the R2 and e-Stewards standards pay lip-service to reducing quantities of e-waste, in practice the continued viability of both certifications depends on the continued production of e-waste. Thus waste and wasting are not necessarily problematized, but rather 'wasting better' becomes the target of these regulatory fixes. As Samantha Macbride argues in a recent book on waste management, conscious consuming and recycling receive far greater enthusiasm than is warranted on material grounds (2011). While ensuring that people and environments are not harmed by electronic disposal practices is a worthy goal, the focus on disposal works firmly within an end-of-pipe framework that is only reacting to toxic production, planned obsolescence, and the unmitigated necessity for growth that Marx referred to as 'accumulation for accumulation's sake'. As one recycler interviewed for

[12] The EPA acknowledges that "reliable data on exported e-waste is not available" (EPA, n.d.).

this study remarked, "recyclers are always addressing the symptoms". I argue that certifications therefore treat the symptoms but not the disease itself.

By making producers of electronics financially responsible for their end-of-life management, EPR legislation demarcates a shift in public discourse on waste away from the dominant end-of-pipe politics that places all of the burdens of waste management on municipalities and taxpayers (see MacBride 2011). In theory, EPR legislation at the state level is meant to address the end-of-pipe shortcomings of certification. But EPR legislation is highly contested in its selection of objects/processes to be governed, which in turn shapes the geographic flow of material and impacts livelihoods and landscapes. For example, if something is not an e-waste, it is not subject to regulation. This may seem painfully simple, but consider Lepawsky's point that "computer peripherals such as keyboards and mice count as e-waste in Indiana, Connecticut, and Minnesota, but not in Illinois, Missouri, or Maryland" (2012, 6). In California, monitors smaller than four inches in diameter are not subject to legislation. Again, a focus on the political process reveals that at least partially, e-waste is not pre-given but is brought into reality by the institutional and legal configurations around it (ibid). Furthermore, getting into the details of how EPR delegates logistical and financial responsibility for objects defined under the law unfortunately demonstrates that these efforts are not producing the desired effects of 'clean' production. I take on the relations between e-waste distribution and production in detail in chapter 7.

These interrelated arguments form the core of my project. In the following section, I briefly outline the theoretical framework that informs my analysis.

III. Outline of Theoretical Framework

The central theoretical issues at hand in this work revolve around the conceptualizations of the relationship between nature, society, and politics. My goal is not simply to accept at face value that e-waste is a technical problem of management and distribution, but rather to look beyond the immediate understanding of the problem in search of 'deeper' causes. This is, of course, a project that is fraught from the outset. To imagine that social scientists have a privileged position from which to uncover 'hidden' relations and causes that no one else can see is perhaps absurd (Latour 2004). Nevertheless, the *attempt* to understand how socio-natural relations occur, to participate in those transformations, but critically (Robbins 2012), and to rethink alternative ways of being is a hallmark of political ecology as a critical approach. Social scientists abandon these imperfect attempts at our own peril. But as Robbins states, political ecology is not a theory or a method, but a 'community of practice' with a common set of analytical targets, namely, the untangling of the interwoven political, economic, social, and ecological processes that continually shape the landscape. Initially based in critical approaches to 'Third World' development projects (Blaikie and Brookfield 1987), political ecology has expanded beyond those still important empirical concerns to engage with a number of contemporary processes of socio-natural change. In particular, a focus on the subsumption of all manner of human and non-human processes within market relations has generated a rich body of highly critical empirical work (Bakker 2005; Bridge and Jonas 2002; Castree 2008; Heynen 2003; Mansfield 2004; McCarthy 2005; Prudham 2003). A unifying theme in this community of practice is a commitment to understanding power, (in)equality, and justice, albeit in often different ways, in the mutual production of nature and society.

Political ecology provides a rich foundation for developing a critique of 'ethical' consumption practices, certification, and labeling, but conceptualizing the development of an 'ethical' market for disposal and recycling requires reading political ecology through the social science literature on waste. To date, political ecology's engagement with waste has mostly been driven by case studies on environmental justice, and while I share the normative commitments of environmental justice work, it historically tends toward a reified view of waste as static material (cf Holifield 2009). Gille's waste regime, with the tri-partite analytical framing of modes of production, practices of representation, and politics, resonates with political ecology's analytical engagement with regimes of accumulation and symbolic and discursive practices but takes waste as material very seriously. So at the broadest level, I identify my work as political ecology informed and enhanced by Gille's waste regime concept.

In order to think through the interwoven social, economic, political, and ecological processes through which a waste regime is composed, I draw primarily on Marxist geography, actor-network theory (ANT), and Foucauldian studies of governmentality in order to theorize precisely how I understand the production, representation, and politics of waste. In inquiring into how the mode of production produces waste in particular ways, Marxist analysis can demonstrate how, for example, the tendencies of capitalism towards overproduction make continual wasting and consuming a necessity in order for surplus to be realized (Gould, Pellow, and Schnaiberg 2008). I understand these tendencies as unfolding in contingent ways, rather than as a set of determinist logics.

From ANT, I am able to attend to wastes' becoming and its emergence as an unstable category. Doing so avoids reifying waste as a static set of materials that are simply functional to the mode of production. By taking (e)waste and materiality seriously, I have found that the

ability to influence the shaping of socio-natural networks is not simply the purview of human agents or 'capitalism', but extends, in this case, to waste itself.

Finally, I draw on Foucauldian approaches that emphasize the significance of knowledge as a form of facilitative power that shapes processes of environmental governance. By facilitative power I am expressing a definition of power that moves away from seeing power as *only* the ability to *repress* others from doing something. Power is also productive, but it is never neutral. The 'e-waste problem' is not preformed and given, but is made legible by certain forms of knowledge. Knowledge about e-waste defines the object of governance but also prescribes certain actions and not others (Agrawal 2005; Bryant and MK MK Goodman 2004; Carrier 2010; Rutland and Aylett 2008).

My own theoretical approach is slightly different from Gille's, and I re-work her three categories in the next chapter. With this foundation in place, I now turn to a brief description of my empirical analysis and the methods employed in addressing my questions.

IV. Methodology and Outline of the Text

Chapter 4 provides a detailed description of my methodological approach. In short, I have drawn on twenty formal interviews, extensive archival work, and participation in policy development through the United Nations University Solving the E-waste Problem (StEP) initiative in Western Europe. I also developed and implemented an e-recycling event in my local area of Athens, Georgia. The value of this participant observation at both the local and international level was two-fold. First, the local recycling event and my work at StEP enabled me to gain access to recycling facilities and collection sites to see what actually happens in the process of recycling electronics. Although I was still an 'outsider', I was able to learn a great

deal about the technical processes of recycling. Second, working with StEP gave me a 'top-down' view of how recycling networks are governed because I was able to meet with policy-makers from the EU, managers from manufacturing firms, and recyclers engaged in the logistics of collecting and recycling material within certain regulatory regimes. But my work in Athens gave me more of a 'bottom-up' perspective in that being on the ground actually arranging a recycling event showed me the significance of trust and personal relationships in managing material.

An important note about data: There is a paucity of quantitative data available on e-waste flows because no single category of trade data exists (Lepawsky and McNabb 2010, 182). These authors note that both new computer monitors and old ones are counted in the same category. Likewise, whole used computers are often exported under the same category as scrap metal, which includes many other kinds of materials other than electronics (ibid). The mapping of e-waste flows that Lepawsky and McNabb conducted used proxy measures such as scrap batteries and electric accumulators to make their estimates. In spring of 2013, the U.S. International Trade Commission completed analysis of a survey of over 5,000 electronics recyclers regarding export practices (U.S. ITC 2013). Although this the most comprehensive data collected to date, given that the report relies on a survey, it most likely does not capture illegal practices. Until a single category of used electronics is created in the Harmonized Tariff System, detailed and accurate maps of e-waste flows remain elusive. The slipperiness of e-waste as a discrete category of objects is taken up as the subject of the first empirical chapter.

Chapter 5: Waste or resource?: Materiality and agency in e-waste recycling networks

Chapter 5 specifically deals with the first of my research questions[13]. In seeking to understand the political process through which voluntary standards for electronics recyclers were developed, I draw on archival data as well as interviews with various actors involved. The R2 standard was initially proposed as the single voluntary standard for electronics recyclers, but stakeholders in the process, which included recyclers, state and federal regulators, manufacturers, trade group representatives, and environmental NGO's, disagreed over what constituted 'best practices'. The specific divisive issues were the use of prison labor for recycling, allowances for landfilling of used electronics, and most significantly, whether exports of used electronics should be voluntarily banned or simply reformed. Certain proponents within the R2 process opposed a trade ban and sought to clarify rules that allowed exports of used electronics that were 'tested' and had 'key functions' i.e. not working but possible to repair. The discursive construction of e-waste as primarily a commodity, rather than a hazardous waste, entailed a more expansive definition of exports that could be considered as 'responsible'. Environmental NGO's disagreed with the 'tested, key functions' export rules on the basis that allowing for the export of non-working electronics opened the door for 'toxic trade' to proceed under the guise of 'export for repair' i.e. that a shipment of junk electronics could be labeled as a commodity when it was really a waste. These environmental NGO's left the standards development process and created their own standard, which became e-Stewards.

My analysis of these political processes identifies important ideological differences among actors as driving disagreement over standards. Furthermore, historical trends that had weakened the ability of the Environmental Protection Agency, which housed the R2 development process, to expand its regulatory reach over electronic exports came into play. The

[13] Of course, given that the research questions overlap, each chapter speaks to the entire set of questions.

EPA could have simply expanded its regulatory authority over e-waste and obviated the need for voluntary standards, but interviews revealed an unwillingness to take on such an endeavor because of the political fight with Congress that it would entail. This analysis gets at the *processes* of environmental governance: how are certain political priorities and targets established and not others? The literatures on global production networks, where the primary focus is to trace the "globally coordinated inter-organizational relationships that underpin the production of goods and services, and the power and value dynamics therein" (Coe 2012, 390), speak to many of the relevant issues in how e-waste is governed across a diverse global space. Whereas much of the focus on GPN's and governance has been on lead firms and institutions, I use insights from actor-network theory and a growing social scientific investigation of waste and its shifting ontologies, to highlight the ways in which non-human objects – wastes themselves – play a more active role in these networks than GPN scholarship has allowed.

E-waste is a complex end-of-life product (Crang et al 2012), and I argue that the material heterogeneity of discarded electronics, the sheer diversity of what e-waste is and what its properties are, disrupts processes of standardizing 'best practices' in electronics recycling in ways that are often overlooked by GPN analysis and that of mainstream political economy more broadly. The political disputes among various institutions about what should be done with e-waste are still critical, but the attention to the properties of e-waste – what Rivoli calls the 'snowflake factor' (2005) – provides a more thorough analysis of the specificities of governing waste as opposed to other types of objects. Finally, I argue that the agency of e-waste in disrupting processes of standardization stems largely from issues in production. Specifically, planned obsolescence, toxic design, and the political disconnect between production and disposal makes the end-of-pipe management of e-waste more difficult that it would were there more

connectivity between how things are made and how they come apart. Thus Chapter 5 establishes how boundaries are draw around e-waste as a political object, unpacks the processes of environmental governance across global production networks via discussion of standards development, and brings complexity to these processes by drawing on waste scholarship and ANT's widened conception of agency.

Chapter 6: Political ecologies of electronic waste: Uncertainty and legitimacy in the governance of e-waste geographies

After examining how the R2 and e-Stewards standards were developed, Chapter 6 begins the process of understanding how a market for 'sustainably' recycled electronics is created, made legitimate, and maintained. Political ecologists have critically engaged with the development of 'fair trade' networks and have highlighted how various objects, from coffee to timber to tuna, are made amenable to consumer action. This chapter extends lessons learned from these critical analyses of consumer politics to ongoing debates about e-waste, trade, and recycling. As market-devices, R2 and e-Stewards can only reform the global circulation of used electronics if they are taken up in the marketplace; in other words, there must be demand for certifications. I analyze the practices of representation through which NGO's and institutions produce 'ethical' e-waste recycling as an object of regulation/commodification that can be consumed.
Like other fair trade schemes, certifications for ethical electronics recyclers rely upon narratives, such as environmental justice, that construct the e-waste problem in ways that render it governable, or 'legible' in Scott's sense (1998).

However, given the complexity of global commodity-networks like those for used electronics, these governing narratives rely on abstractions that over-simplify and re-work the

fetish of what e-waste is, where it goes, and how it should be managed. Used electronics are traded through a diverse global network that includes formal and informal sectors, hazardous recycling practices and responsible ones, and all manner of sites and practices in between. But these grey areas, which emerge once again from the indeterminacy of e-waste as either commodity or hazardous waste, are difficult to encapsulate in a label. Therefore, administrators of both R2 and e-Stewards gloss over these grey areas and paint their certifications in black and white terms, as either enabling trade that 'bridges the digital divide' or banning 'toxic trade' that harms the poor. Doing so enables them to extract rent from the supply-chain and promote their particular solution to e-waste exports, but it also suggests that markets are always embedded with 'more-than-economic' values, such as sustainability and ethical responsibility.

In assessing the ambiguities over how ethical e-waste markets are established and what it means to promote environmental justice through market transactions, my analysis suggests that while labels have some positive effect on creating transparency in e-waste flows, democratic deficits are at play. Certifications improve electronics recycling on behalf of actors in the global South, but not with their participation. In short, the 'global' standards that create an 'ethical' marketplace for electronics recycling are always local and partial, thus raising the specter of unintended consequences for distant others as labels begin to 'travel'. These ambiguities should give consumers pause; using a certified e-waste recycler is not as tidy a solution as might be hoped. I conclude this chapter by raising certain classic themes within political ecology - access and control over resources, the significance of livelihoods, and the marginality of informal sectors – to foreground solidarity with recyclers and democracy in decision making as key to the processes of managing e-waste networks towards more sustainable ends.

Chapter 7: From disposal to production

In chapter 7, I explore the development of policies designed to redress the end-of-pipe focus of waste politics. An explicit premise in chapters 5 and 6 is that improving recycling technologies and oversight is necessary but not sufficient to fully addressing the problem of how and why e-waste is produced in particular ways. Coming to grips with the impact that privately made decisions about production – the selection of (toxic) materials, the design of devices, their longevity, etc. – has increasingly become ingrained in discourses around e-waste management. The development of extended producer responsibility (EPR) legislation in twenty five U.S. states embodies this trend and raises progressive possibilities. EPR works by making producers of electronics financially and/or physically responsible for the management of their products at their end-of-life, with the assumption being that the internalization of waste management costs will lead to changes in how products are made. In theory, producers, and not just consumers and municipalities, should bear the costs of their production choices. However, as I show in chapter 7, delving into the details of how these EPR laws work in practice reveals that they do not ultimately force the polluter to pay, nor are any incentives for product re-design actually initiated.

Although EPR laws are certainly better than the status quo of taxpayer funded electronics recycling at the municipal level, EPR remains bound within the liberal terrain of market-based incentives and as such does not lead to more democratic control over the trajectory of technological development. EPR unfortunately embodies what Samantha MacBride calls 'busyness': "a fulfilling sense of work and achievement that often brings positive side effects but fails to reach the central effect. If progress is a flowing stream, busy-ness is an eddy, moving vigorously but not forward" (2011, 6). EPR creates more and better recycling, but if we examine

recycling as a whole, it is relatively insignificant from a material throughput perspective. An important question must therefore be why recycling is so vehemently politicized and defended given its relatively small impact. If what advocates of EPR want is to reform the production process, they need to think more broadly about the sustainability of capitalism as a whole. Chapter 7 concludes by signaling towards what I think are more progressive and politically relevant developments that directly confront producer autonomy and the relations of planned obsolescence that come with it. The open source software movement, hackers, as well as repair and do-it-yourself advocates turn the notion of 'devolution' on its head and instead embody 'user empowerment' over the future of technology.

Finally, this dissertation concludes by reviewing the arguments and making a few policy suggestions. But as my goals are to evaluate the e-waste regulatory regime on its own terms and in light of its gaps, I also suggest alternative ways of addressing what I see to be the shortcomings of neoliberal environmental governance.

Chapter 3 – Theoretical Framework

I. Introduction

The central empirical thrust of this research is to examine the institutional 'fixes' that have been put in place to address what I am calling 'the e-waste problem'. The term 'fix' is a key insight from critical political economy that refers specifically to "strategies of externalization and internalization of socioenvironmental conditions, in search of profit, both by states and capital (Bakker 2009, 1782; see also Castree 2008; O'Connor 1998). For example, the accumulation of 'externalities', such as air pollution, can threaten public health to the extent that some sort of remediation is demanded through the state. That these externalities are simultaneously barriers to further accumulation as well as opportunities for new rounds of profit i.e. air pollution mitigation, demonstrates the ways in which capitalism continuously produces new landscapes of accumulation despite perpetual crises.

I have suggested in chapter 1 that analysis of a particular set of fixes – voluntary certifications for electronics recyclers and extended producer responsibility (EPR) legislation – reveals important insights about the political processes that constitute the development of a 'sustainable' e-waste regime. Analysis of e-waste politics, I have also argued, serves as a proxy for understanding broader social-ecological crises and the political mechanisms and institutional configurations produced to address those crises. Voluntary certifications, corporate social responsibility, and product stewardship are all key trends that are relevant beyond this particular case, and Polanyi's concept of the 'double movement' – which identifies a general tendency for the encroachment of market relations on society to be met with a 'push-back' in which society

organizes to protect itself from the market (1944 [2001]) - has often been invoked to describe these sorts of 'market environmentalism' (Guthman 2007; McCarthy 2004; Prudham 2003). Writing critically about the use of food labels, Guthman draws on Polanyi in raising the question as to whether, and to what extent, certain fixes contest or re-inscribe the dominance of market relations (2007).

While I find the concept of ecological fixes useful in identifying key elements of environmental governance in the U.S. today, Polanyi's anthropologically-informed double-movement concept provides much needed nuance in that it goes beyond the economic functionalism inherent to the notion that the pursuit of profit and the stabilization of accumulation drive all regulatory fixes (Bakker 2009, 1783). Both the nature of contemporary crises and the trends in governance are constituted by multiple logics, economic and otherwise, and not merely driven by abstract actors called 'capital' and 'the state'. Recycling embodies these nuances in that on the one hand, the recycling industry is largely a product of 'capital' and 'the state' turning a waste problem into a source of profit, but on the other hand, also reflect a set of moral and ethical values widely shared and acted upon. Recycling may be a coopted form of environmental activism, but it might also be more than that. The overarching purpose is to identify what political possibilities are foreclosed and what possibilities are opened up by the mechanisms put in place to address socially defined problems.

Within this broad problematic, I follow Gille's work on the waste regime in which she argues for analysis of waste production, representation, and politicization. Gille deploys this three-pronged approach in her research on the waste regime of Hungary from 1945 to the first decade of this century. The strength of this approach is that Gille is able to avoid reifying waste as a pre-given material and engages dialectically with wastes' social construction and its material

composition. The binary between studying wastes becoming and its material impact on economies and environments is collapsed through a focus on the embeddedness of waste within a range of social relations.

For example, Gille identifies three distinct waste regimes in Hungary – the metallic (1948-74), the efficiency (1975-84), and the chemical waste regime (1985-present). In the metallic regime, waste was seen as a 'free' resource and the state mobilized a massive infrastructure to reuse both production and consumer wastes. Waste production was a central element of political discourse, and not utilizing wastes was taboo. In this regime, waste was assumed to be like scrap metal in that it was regarded as discrete, non-toxic, and continuously recyclable. This cultural 'misrecognition' of waste as scrap metal and the political focus that resulted "afforded more control over production to blue-collar workers, whose control [of scrap] made threats of slowing the pace of work a real one" (2010, 1059). Hence Gille's argument that was is not merely a residue of the social, but constitutes it.

But as production shifted towards more chemically intensive industries, the logics of reuse became more difficult to implement. A move towards waste disposal technologies began to characterize Hungary's shift to a chemical waste regime, where end-of-pipe treatments were privatized and waste production i.e. the sources of waste, became taboo in political discourse. The question that Gille begins with – was socialism wasteful? – receives a historical and sophisticated analysis where she shows how shifts in waste regimes were not simply outcomes of a shift in ownership and economic interests (socialism to capitalism), but that "culture, knowledge, and materiality as well as their interaction played as significant a role in the actual tangible outcomes of waste policies and practices as did the relations of production or ownership" (ibid).

The central aim of this chapter is to provide a deeper theorization of the waste regime, and I do so by drawing together insights from Marx's historical materialism, actor-network theory (ANT), and Foucault's governmentality. While my analysis of the emerging e-waste regime is informed by these three bodies of theory, it is important to note here that the waste regime is not a tidy synthesis of political economy, ANT, and governmentality. These three approaches, while all sharing a critical epistemological standpoint, are not entirely commensurable and there are significant points of tension among them. Thus the chapter is organized around specific debates among the three traditions, followed by a discussion of how my empirical work informs, builds on, or departs from these debates.

Chapter outline

Section II is lengthy description of how Marxist political economy informs my approach to the waste regime, specifically my understanding of the significance of *the production of waste*. In brief, I think about crisis through the lens of Marxist political economy and its eco-variants in order to understand the way in which a historically and geographically particular set of social relations – those of capitalism – shape the uneven transformation of socionatures. More broadly, the materialist view that nature is socially produced through a process of *metabolism* highlights the critical point that human life is sustained through continuous processes of social and material transformation (Swyngedouw and Heynen 2003). That capitalism is a central mode of organizing this metabolism generates highly uneven outcomes in terms of "who gains from and who pays for, who benefits from and who suffers from particular processes of socioenvironmental change" (ibid, 910-911). Thus wealth and poverty, pristine landscapes and poisoned ones, are dialectically related. This set of critical theoretical tools draws attention to

the *systemic* qualities of the e-waste problem rather than reading them as symptomatic of market and/or regulatory failures. While this is necessarily a selective reading, the purpose here is to identify what is uniquely capitalist about the production, consumption, and disposal of electronic wastes. The crux of my argument is that a resource intensive, 'throwaway' society was not some 'natural' evolution or expression of 'American values', but has instead been a necessity to a system of production and consumption, constantly in crisis, that only incidentally meets human needs.

But since, as Gille argues, political economic analysis is always necessary but never sufficient and the logics and relations that produce waste must be analyzed in tandem with attention to the material composition of waste itself, my analysis demarcates *the materiality of waste* as its own analytical category distinct from, but related to, the mode of production. In section III, I demonstrate how ANT departs from Marxism's 'social production of nature' to speak of 'socionatural hybrids'. Here, ANT is incredibly useful in that ANT has a nuanced conception of agency, allowing multiple actors, including non-human/non-living ones, to shape socionatural networks. Thus in the assembling together of metals, plastics, brominated flame retardants, chemicals, laws, ideologies, laboring bodies, and technologies, it is not just 'capitalism' that shapes and determines the politics of e-waste. Rather, as Bakker and Bridge write, "things other than humans make a difference in the way social relations unfold" (2006, 18). ANT provides a valuable insight into the study of the governance of e-waste networks: non-living materials, such as e-wastes, are not mere vessels through which social relations unfold, but rather constitute those relations.

It is Gille's conceptualization of representations and politics as somehow separate moments that needs to be problematized. Politics are indeed composed of 'tools of policy' (Gille

2010, 1056), but discourses, ideas, norms, and common sense understandings themselves are political in that they have a kind of 'material force' (Mann 2009, 338). If e-waste is understood as primarily hazardous, or as primarily a commodity, those representations actually shape actions. So while I take Gille's argument that investigating the processes through which e-waste is made governable, and understanding the specific techniques through which it is governed as salutary, she does not develop an adequate theory of politics and the relationship between knowledge, power, and strategies of governing. I therefore collapse the categories of representation and politics into a single category (*representations of waste*) and draw on Foucault's work on power/knowledge in Section IV to understand how different types of knowledge make certain techniques of governing possible.

Foucault used the term governmentality to describe the formation of political rationalities that enable decentralized, non-coercive forms of governing to take place. For example, both Agrawal (2005) and Scott (1998) have examined how the use of statistics about forests makes those forests amenable to certain forms of governmental intervention, like modern forestry practices. In the case of e-waste, knowledge about what counts as e-waste (phones, computers, monitors, wires?), as well as what the metrics of good governance include (trade bans?), enable various institutions – recyclers, NGO's, waste generators – as well as individuals to 'do something' i.e. direct their waste to the 'right' recyclers. The key point is that Foucault shows how knowledge reorganizes the institutional framework around e-waste and enables the *decentralization* of political action. Such decentralization is crucial when the coercive power of the state might create opposition, for example, if the U.S. banned certain design practices that occur in manufacturing. Thus Rutland and Aylett observe that "It is in this climate, where voluntary measures are insufficient but direct regulation is seen as politically unviable, that the

facilitative power of governmentality finds its place" (2008, 641; see also Agrawal 2005). In part IV, I draw on Foucault's discussion of governmentality and Agrawal's development of environmentality to better analyze politics and power. In sum, I situate my work as a study in the political ecology of the e-waste regime. Instead of simply recreating Gille's theory, I have parsed out the production of waste, the materiality of waste, and the representations of waste as unique to my endeavor (see Figure 1).

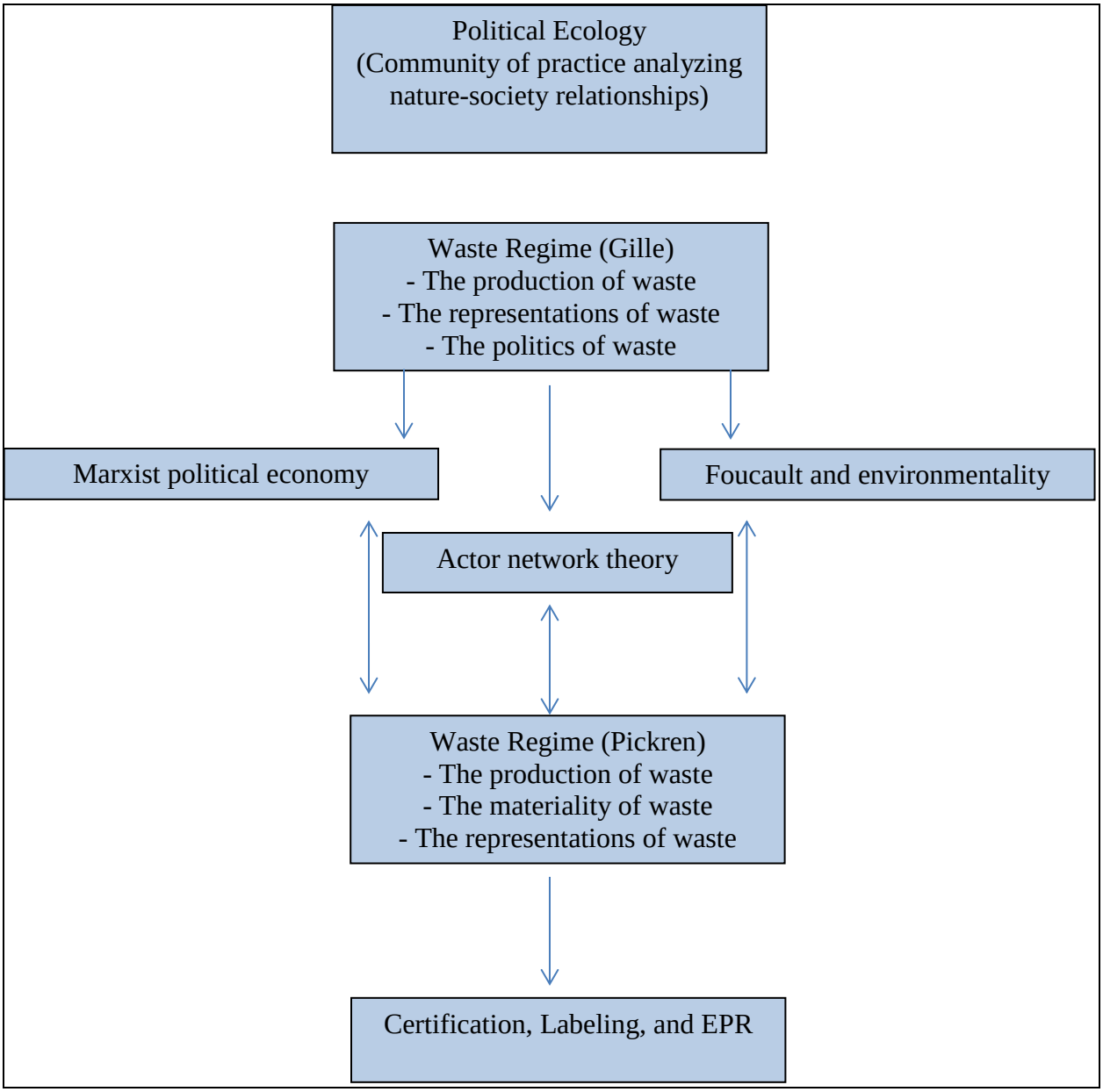

Figure 1 Theoretical Framework

II. Marxism and the Production of Space, Nature, and Waste

Uneven development and the production of space

At the abstract level, the historical narrative of capitalist crisis focuses on the internal contradictions inherent to a system based on the exploitation of living labor by owners of capital (Harvey 1982 [2006]); Smith 1984 [2008]; Massey 1984). This contradiction makes capitalism crisis-ridden and crisis-dependent. To elaborate, labor is the source of all surplus value, yet the collective imperative to suppress labor power in order to extract surplus value more efficiently than competitors leads to a realization problem for capital. In other words, profit is created by labor power (not in exchange), but since labor is reduced to such a minimal state of existence through the imperatives of competition, these profits cannot be realized in exchange i.e. there is not sufficient demand for the commodities produced. So exploitation of labor leads to overproduction of commodities on the one hand, but failure to expand the production of surplus value i.e. exploit living labor leads to a falling rate of profit. This dilemma is the kernel of Marx's theory of capitalist crisis.

Attempts to resolve this central contradiction between capital and labor take the form of organizational and technological as well as geographical reorganizations of production. The imperialist expansion of markets is one fix for overproduction, and the New Deal's promotion of 'middle-class' consumption is another. The New Deal had less to do with saving poor workers than it did with saving capitalism itself. These various socio-spatial 'fixes' do not resolve the crisis but can move it around in the built environment or delay it through the credit system (Harvey 1982). Capital cannot abide limits to growth, and crisis is the inevitable result. Capitalism thus becomes its own worst enemy – every landscape it creates eventually becomes a barrier to further accumulation. On the other hand, overcoming these barriers opens up new

rounds of accumulation. This process of uneven development relentlessly 'produces space', and the central insight from Marxist geography is that we can take that relation between capital and labor, in which wealth and poverty are dialectically intertwined, and see it reproduced: the divisions between the global North-South, between urban and rural areas, between declining neighborhoods and prosperous ones. Capitalism is fundamentally a geographical project.

Another important implication of Marx's theory is that capitalism cannot function as a system of maintenance or 'simple reproduction' (O'Connor 1994). Marx showed that in order for capitalism to be 'sustainable' in economic terms, it has to produce surplus value and it has to grow. Capitalists extract surplus value from labor power, and they can enjoy surplus values as revenues, but if they do not reinvest and throw capital back into more production then competition will ensure that they are not in business very long. Just as laborers must sell their labor power in order to survive, capitalists must do their part by engaging in production. Marx is therefore demonstrating that capitalism imposes impersonal forces upon society as a whole, and that we should not need recourse to 'greed' to understand a society divided by class. Competition in the realm of exchange is not the source of value, but a mere policing mechanism that ensures production continues (Harvey 2010, 257). Marx called this 'accumulation for accumulation's sake', and the implications of this impersonal imperative for both people and environments are legion. Sustainable development, in cynical terms, can be theorized as a new regime of accumulation, although one with a more 'eco-friendly' exterior.

In addition to overproduction stemming from the contradiction between capital and labor, crisis has also been theorized as emerging from the cost-side as well. The production of surplus value necessarily involves the exploitation of living labor, but it also must involve the transformation of 'nature', which in O'Connor's work is more or less understood as non-human

material conditions. Building on Polanyi's work, James O'Connor (1998) developed an ecological critique of capitalism in which he argued that capitalism has a tendency to externalize, or 'underproduce', the costs of production (e.g. exploit resources, generate pollution) onto society and the biophysical world despite the fact that capitalism depends on these very 'conditions of production' for its own maintenance. This is bad for workers, for nature, and for collective goods like urban space, and in the end social movements like that of labor, feminism, health care, and the environmental movement are a response to capitals degradation of these conditions of production, which are 'fictitious commodities' meaning they are not produced for the market (O'Connor 1994, 163; Polanyi 1944 [2001]). Thus without regulation of the destruction of its own necessary inputs, capitalism will not survive. For these reasons, O'Connor argues that sustainable capitalism is unlikely (1994, 168). This eco-Marxist formulation identifies important aspects of capitalism's anti-ecological character and it should be read against the technocratic approaches to green capitalism (see Hawken 1993) that urge for managerial and behavioral tweaks to a system that fundamentally works well and to which there is no viable alternative.

To summarize, capitalism is beset by crises of its own making. Due to antagonisms between capital, labor, and nature that are at the heart of value, capitalism is fundamentally unstable. Furthermore, it is an *expansive* system – it must grow or die. Thus accumulation for accumulation's sake is a central feature of capitalist economies. Appeals to efficiency and management only scratch the surface of much deeper contradictions. Finally, capitalism is extremely *myopic* in that creating more use-values for people (houses, food, clothing) or creating less waste is not socially necessary under capitalism because what is socially necessary is judged according to the market (Smith 1984 [2008], 88-89). Profit is the ultimate goal of the

production of nature and space, so pollution on the one hand and use-values on the other only matter as far as they pertain to maintenance of surplus value extraction.

This all may seem very rigid and orthodox, but it need not be a meta-theory of history (or waste), although it has certainly been interpreted as such by many Marxists as well as by many critics. These abstract features of capitalism play out in extremely messy concrete articulations, but this should not be interpreted as saying that capitalism is a colossus that structures the world. So how do these features of capitalism articulate with waste production and governance in the contemporary moment? Unfortunately, much of the literature on waste ignore this question and takes a performative theoretical bent in which the focus is on the physical transformation in form as 'wasted' objects become something new (Lepawsky and Mather 2011). Processes of 'wasting' are the subject of analysis, not waste itself. While it is true that the relationship between waste and value is quite contingent and slippery, it is important not to lose sight of the centrality of labor and the dynamics of capitalism in shaping processes of waste production and the reworking of discards into new 'lives'.

As a start, it is important to note that waste "isn't a fixed category of things; it is an effect of classification and relations…waste [is] a social text that discloses the logic or illogic of a culture" (Hawkins 2006, 2). Capitalist relations, as well as non-capitalist relations, therefore shape what counts as waste as well as well as where waste comes from. All societies produce waste (Melosi 1981), and at every state of economic activity, capitalist or otherwise, there are intended and unintended effects (Hudson 2008). Waste is therefore endemic to economic processes (ibid). But the imperatives of capital accumulation generate waste in particular ways. Much of the literature on waste that comes from a political economy perspective suggests that waste production has actually been a central 'fix' to crises of overproduction in 20th century U.S.

capitalism. While there are many flaws in this structural reading of waste's production, its significance is that it stands in contrast to the liberal view that wastes are simply 'externalities'. Instead, the production and circulation of waste, like that of value, is an uneven process driven by contradictions that are internal to capitalist relations.

The capitalist production of waste

The emergence of a 'throwaway society' has been analyzed from number of directions (Melosi 1981; Packard 1960 [2011]; Strasser 1999;). Marxist geographers and theorists have provided an important perspective by arguing that the Great Depression was ultimately an expression of a crisis of overproduction which necessitated new landscapes of accumulation as well as new regulatory fixes in order to save capitalism from a crisis of its own making (Harvey 1982). The system of Fordist accumulation/Keynesian regulation was designed specifically to save capitalism by expanding production while artificially stimulating demand[14]. In short, more people needed to buy more stuff, as the Great Depression demonstrated that top-heavy robber-baron style capitalism could not keep the system going. But abundance threatens the class system. In layman's terms, capitalism could produce lots of stuff, but if everyone's needs were met they might not show up for work the next day. Consumption needed to be planned. Saving capitalism from abundance entailed creating new patterns of land use, a new international division of labor that utilized the 'Third World' as a vast supply region, new patterns of

[14] Military expansion is not the focus here, but it is important to the narrative of waste. I consider military build-up to be a form of wasteful production. Seymour Melman describes the effects of the system of 'military Keynesianism', which still persists today, as providing a tremendous 'drag' on the economic productivity of the entire American economy (1987). Because the Pentagon can be assured a steady supply of money, cost-effectiveness does not play a part in research and development. Ironically, the emphasis on whether a product works rather than how much it costs has undermined the quality of American engineering. From electronics to machine tools, foreign engineered products have overtaken U.S. markets, as American productivity has suffered because of wasteful military spending (Melman 1987; Castells 1987; Noble 1995).

exploiting women's unpaid domestic labor, and new patterns of racial division. Of course, Fordism also entailed intensified exploitation of non-human nature on a greater scale than before. Waste production in a variety of forms was the central means by which economic growth could continue in such a way that maintained scarcity (Milani 2000, 23).

Milani argues that economic activity had to be fundamentally restructured around waste; the new middle class needed to shed their frugal habits in favor of the 'convenience' of disposability. An article in the Journal of Retailing proclaimed in the spring of 1955 that "we need things consumed, burned up, worn out, replaced, and discarded at an ever increasing pace" (quoted in Blumberg and Gottlieb 1989, 15). A consumer goods revolution took place that involved the restructuring of industry towards mass production/consumption, design changes that decreased the life span of commodities, and saw the meteoric rise of the packaging and advertising industries (Strasser 1999; Slade 2006; Field 1998; Foster 2009; Blumberg and Gottlieb 1989). The idea of planned obsolescence came to be a manufacturing mantra, as engineers figured out ways to make products break faster while still maintaining consumer faith in the quality of the product (Slade 2006). The shift to a 'post-industrial' economy has arguably accelerated waste production, with extremely rapid turnover in electronics as one example of the extension of 'throwaway' logic to modern products.

What flows from this critique is the sense that waste is not merely an abnormality or an externality, but is fundamentally an outcome of accumulation for accumulation's sake. The Marxist or Marxist-inspired literatures on waste and waste management hone in on this contradiction, and then typically describe how regulatory efforts are deflected onto less radical terrain. For example, in a seminal article Lake and Disch (1992) argued that the capitalist state has an interest in devising regulatory approaches that facilitate capital's response to crisis while

maintaining legitimacy (672). This is achieved through discursively constructing waste as a problem in the consumption sphere and rejecting interventions at the point of production as disruptive of the free market mechanism. The terrain of waste politics is confined to questions of technology, siting, and pricing, with the state appearing as neutral arbiter of disputes over where waste goes (Lake and Disch 1992). The state, rather than playing a role in facilitating capital accumulation, appears to merely have an interest in protecting public health and safety. The state accomplishes these tasks by setting the agenda, the language of discourse (technical questions), and by sequencing policy decisions in such a way that democratic participation occurs after decisions about production have already been made (ibid). The public appears to participate in the democratic process, but the policy choices are prescribed: where do you want your landfill, incinerator, or, at best, recycling facility? Potential conflicts over waste generation tend to be absorbed within these 'structuralist constraints and pluralist contradictions' (ibid).

There is a good deal of critical literature on waste management that more or less makes the same argument – the capitalist state is central to maintaining waste as an end-of-life problem for localities and taxpayers to deal with, while issues of planned obsolescence, anti-ecological design and material choices, and the autonomy of producers to be free of certain types of state intervention are held at bay (Blumberg and Gottlieb 1989; Horton 1995; MacBride 2011; Weinberg, Pellow, and Schnaiberg 2000). The politics of waste are therefore mainly about the choice of technologies (recycling, landfill, etc) and the siting of facilities, but not about "coming to terms with a system based on privately made production decisions" (Blumberg and Gottlieb 1989, 285). While this literature is more diverse than I am allowing here, critical political economy approaches to waste can begin from the social and ecological crises that are internal to capital, follow those crises through the landscape, and identify the hegemony of class politics as

maintaining those uneven processes and outcomes. Since my research questions have to do with issues of legitimacy in the development and implementation of e-waste fixes that I have already suggested are inadequate, my analysis would be incomplete without engagement with capitalist logics and power dynamics. But as my tone has already indicated, there are numerous gaps to be filled. Some of the main issues in the capital-centric understanding of crisis and regulation are a) the ontological framings of society and nature, b) issues of causality and agency, and c) issues of power. More specific to my study, there is a need to move beyond the deductive impulse where political economy is applied to the study of waste (Gille 2010, 1053) and engage with waste as significant in its own right.

III. Marxism and Actor-Network Theory on Nature-Society Ontologies, Agency, Materiality, and the Directedness of Socionatural Relations

The Marxist critique of the production of space, nature, and waste outlined above is one of the cornerstones of critical geography. But it has also generated considerable backlash from a number of places, one of which is from proponents of ANT. Whereas Marxism seeks to show how social processes, such as class relations, shape and remake the world in highly unequal ways, ANT turns the critical lens on social theories themselves, seeking instead to understand how class is contested and stabilized as an explanatory account (Holifield 2009). Ontologically, ANT assumes that there is no 'social' phenomenon called 'class', only processes of boundary making in which class is formed. This boundary making always involves "materially heterogeneous networks of relations" that are formed by multiple 'actants' – computers, people, water, laws – quite literally anything (Rutland and Aylett 2008, 632, citing Barnes 2005). ANT therefore makes no appeal that the networks that assemble 'e-waste' or 'hazardous recycling

practices' in particular ways are ever shaped by any forces 'outside' the network. Instead, it is the always unique process of assembling that is the target of description. There are no 'structures' only processes of 'structuring' (Holifield 2009, 648), no such thing as 'waste' or 'value', only 'wasting' and 'valuing' (Lepawsky and Mather 2011). In other words, ANT is not a theory in search of causal explanations but a framework that traces how 'matters of concern', the unsettled and disputed *reality* of networked assemblages, are translated in to 'matters of fact', bounded and settled notions of how the world works (Latour 2004, emphasis added).

This performative approach has generated considerable traction as a critique of Marxism (or any other theoretical lens, for that matter). Castree (2002, 117-122) outlines four areas where ANT has challenged (alleged) Marxist approaches to nature-society questions:

- *The presumed binarism of nature-society and local-global dichotomies*. As described above, ANT argues that the idea there are entities that are purely 'natural', 'social', 'local' or global' is a result of processes of ordering and compartmentalizing a messy world. Instead, ANT favors 'hybrid' networks where the social and natural are only definable in relation to one another and which can only be understood from the inside (no causal explanations that do not themselves have to be explained).
- *The asymmetry of explanations that arise from nature-society binaries*. This is the tendency for non-ANT analysts to prioritize either anthropomorphic or ecocentric explanations for phenomenon. For example, O'Connor's discussion of 'conditions of production' is almost entirely anthropomorphic in that 'resources' or 'conditions of production' are simply the result of capitalist relations. ANT instead argues that resources could never be non-social, and that the social and natural are co-constituted.

- *In Marxism, the capacity to act is presumed to be intrinsic to actors, and agency is only exercised by human agents*. Non-human objects are a kind of vessel through which social relations flow and thus play a passive role. Again, O'Connor is exemplary.
- *Power is anthropomorphic and overly centered*. Instead, ANT argues that power is a shared capacity among humans and non-humans, and that power is decentralized throughout networks.

While critiques of Marxists that *actually* espouse such views are certainly valid, I do think that some of these problems are straw-man arguments that neither Marx himself, nor many contemporary Marxists, would make. Castree writes that often the "Marxian 'foe' is represented in hazy and one-dimensional terms" (2002, 115). Geoff Mann notes the problem when he says that many critiques of Marxist historical materialism are often aimed at the more vulgar Marxism of Engels or Lenin (2009): "Materialism in the tradition of Marxian political economy is not identical to that of Marx or Gramsci, which was far less dogmatic, much more open, and historically and geographically sensitive – a materialism much better suited, it would seem, to political ecology" (338).

Leaving aside for a moment the validity of these critiques, the ANT approach has been influential and can be applied to understanding processes of environmental governance (Rutland and Aylett 2008), including waste management (Gille 2010; Lepawsky 2012; Lepawsky and Mather 2011). In particular, the strength of this framework is that it can produce empirically thick accounts of the ways that boundaries are drawn around objects of governance. In a recent intervention on e-waste governance, Lepawsky draws on Latour to argue that the law, or the 'work of jurisdiction', is crucial in assembling social action around waste only *after* it has been produced (2012, 1194). This work of jurisdiction involves

> "linking together a vast collection of otherwise unlike things…in the specific case of e-waste law in Canada and the U.S., the collection of otherwise unlike things linked together include, for example, *moral values and commands (e.g. 'do the right thing'*), microprocessors, hard-drives, metals that may be precious and/or have toxic characteristics, and plastics doped with flame retardants that can negatively affect human and environmental health…" (2012, 1197, emphasis added).

Focusing on the development of EPR legislation, Lepawsky argues that what the law counts as 'e-waste' and how it intervenes in this particular assemblage produces an outcome in which the links between manufacturing and waste production are made taboo. E-waste is not assembled as an issue of design, or competition between producers, but as an inevitable outcome of consumption. Furthermore, although EPR legislation requires producers to take some financial responsibility for collecting and recycling discarded electronics, the financing for these collection schemes is always paid by consumers, either through retailers charging a recycling fee when new electronics are purchased or because manufacturers can simply pass on recycling costs to consumers in the form of higher prices. Either way, extended producer responsibility becomes, in practice, extended *consumer* responsibility because it is ultimately consumers who are financing the recycling schemes. Because the financial burden of recycling costs, which is supposed to stimulate manufacturers to change their designs, is absent, EPR legislation fails to hit its main target of driving changes 'upstream'.

Lepawsky's analysis is a great example of how the law plays an "ontologically generative role in producing that which it claims only to govern (e-waste)" (2012, 1195). While I would not dispute the conclusions that Lepawsky reaches, his account lacks much sense of how the law came to frame e-waste in an end-of-pipe fashion. Surely, the data used to quantify e-waste and the existing case law on waste management all lead to e-waste being 'performed' in particular ways, but largely missing from the research is the historical political pressure applied by

manufacturers to preserve their autonomy in the realm of production (see MacBride 2011). The political struggles that shape what counts as e-waste, and the 'condensed' power of some institutions to shape those processes, is hinted at but never fully developed. These absences have to do with the ontological presumptions of ANT.

The value of an ANT approach to e-waste governance is that it engages with the *emergence* of waste rather than prefiguring it as a static set of objects that are 'just there'. But there are significant problems with ANT that I will briefly outline here: First, with ANT there is a difficulty in distinguishing among the different things that make up networks. Surely there are important differences between computers and people (Kirsch and Mitchell 2004, 689), or between the law itself and the actors that shape the law. Second, the assumption that each actor-network is unique and qualitatively distinct (Castree 2002, 134) means there can be no general theories that help situate phenomenon. Third, ANT does not seek to resolve or settle questions of how domination or inequality are produced and who or what is accountable, but only to produce *descriptions* of how multiple accounts are stabilized in hegemonic ways (Holifield 2009, 646-648). Finally, because of these issues, ANT has been accused, rightly in my mind, of being politically weak because it resists acknowledging that power can be 'marshaled' by some and not others (Castree 2002, 135).

Contrasting ANT's politics with those of Swyngedouw and Heynen, who argue for PE as a way to enhance the democratic content of the transformation of socionature, Holifield argues that such enhancing can occur by "taking full account of nonhuman participation in the social" (2009, 653). While I would not disagree, Holifield and Latour seem intent on dismissing the search for 'deep societal causes' for inequality simply because such accounts might condense into settled 'factual' explanations. While I take ANT's urging of radical reflexivity in the work

of analysis as salutary, I do not find it necessary to make analytical decisions without the benefit of any body of substantive social theory (Holifield 2009, 644). Kirsch and Mitchell are right to wonder what sort of politics arises when analysis is reduced to a matter of observation (2004. 694).

For these reasons, Castree argues for a tentative alignment of a 'weakened' version of ANT with more modest historical materialism, where "This weaker version of ANT would thus remain critical of binarist thinking, of asymmetry, of limited conceptions of agency and of centred conceptions of power" (2002, 135). But he also argues that it should concede the following points (ibid):

- That many actor-networks are driven by similar processes, notwithstanding their other differences.
- That these processes might be 'global' and systematic even as they are composed of nothing more than the ties between different 'localities'.
- That these processes are social and natural but not in equal measure, since it is the 'social' relations that are often disproportionately directive.
- That agents, while social, natural and relational, vary greatly in their powers to influence others.
- And that power, while dispersed, can be directed by some (namely, specific 'social' actors) more than others.

Here there is an interest in maintaining hierarchies and inequalities of power while also attending to "the materiality of things in lived social relations" (Kirsch and Mitchell 2004, 695). And in terms of political uses, Kirsch and Mitchell note that ANT's conceptualization of power as *only an effect* of contingent networked relations sets up its own binary: "either a person is an

autonomous subject or a person is the 'effect' of networks…this hardly exhausts the universe of possibilities" (2004, 689). I still find the Marxist adage that people make their own lives but not always under conditions of their own choosing to be a compelling argument for the relevance of materialist thinking.

My objective is to carve my own theoretical path, one that is attentive to wastes' 'becoming' and the way its materiality can shape processes of governance while also remaining attentive to the way that materiality is historically produced in particular ways (Bakker and Bridge 2006; Castree 2002; Kirsch and Mitchell 2004; Swyngedouw 1999). I maintain that there is a great deal of value in the relational Marxism typically found in political ecology, and the work of people like Harvey, Swyngedouw, and Heynen, which sees nature and society and the local and global as *internally* related yet distinct windows into the historically and geographically-specific processes of continuous change within capitalist societies (Castree 2002, 131). I therefore distinguish my approach to Lepawsky's Latourian work on e-waste. For example, in their search for e-waste in Bangladesh, Lepawsky and Mather (2011) could not find any – they found 'ongoing' economic activity instead of waste dumps, and uncovered processes of 'wasting and valuing' rather than discrete objects that were either waste or value. In their work, they came to realize that

> "we could follow actions until the things they enacted were enacted as something else…; where, for example, copper wires or gold circuitry became unrecognisable as electronics but were now, for example, copper ingots or gold bars. These moments of *transformation*, the sites where they occurred, and our research about them constitute some of the boundaries and edges of the geographies of e-waste" (2011, 247).

For Lepawsky and Mather, the slippery ontology of e-waste and the processes of things *becoming* something else are of central importance, which is why they speak of 'boundaries and edges' rather than beginnings and endings. This sort of argument has been critical in expanding

conceptualizations of economic activity beyond linear production-consumption chains. But it is important here to distinguish my own approach as slightly different; while I do not dispute 'ongoingness' and the centrality of the snowflake factor to such ongoingness, I do believe such a critique can go too far. As we argue in a forthcoming article, there are limits to the ability to simply 'perform' waste as something else (Herod et al, forthcoming). For example, as television production has shifted away from cathode-ray tube displays (CRTs) to flat screens, markets for CRT glass recovery have collapsed, leaving states like California with a massive glut of stockpiled material (*Resource Recycling* 2012). CRT glass, then, is not simply performed as waste but is now actually wasted as that material form is devalued in the Marxist sense that the labor embodied in the TV has been lost forever as it is replaced by new commodities.

Lepawsky and Mather are indicative of the ANT approach to waste in that they tend to fetishize the *physical transformation* of used goods into new products i.e. gold circuitry becoming gold bars, in such a way that anything that is particularly capitalist about those transformations is seemingly lost. Material transformations are indeed constant, as even discarded metals eventually degrade over centuries. But focusing on the circuits of capital and the realization of value as related to, but distinct from, these ongoing material transformations reveals actual endings and beginnings. Parsing out the differences between the two is important. I would argue that Lepawsky and others (Gregson et al 2010) focus on the discursive (what counts as waste) and the material (what are the physical qualities of waste) but pay less attention to the political economic. In chapter 5 I seek to show how all three intersect. Thus the snowflake factor must be connected to issues of production; the rift between how things are made and how they come apart that remains a critical barrier to more ecologically and socially just global networks for used electronics recycling.

Recent work by Ray Hudson provides a useful example of the sort of analysis employed here. Hudson argues that global networks of production, consumption, and disposal can be understood as constituted by relations among three 'registers' – the political economic (questions of labor, value, growth, and uneven development), the semiotic (practices of knowledge production and representation), and the material (biophysical processes, flows of energy, matter, etc.) – each of which should be considered independently as well as in relation to one another. While there are differences, I would argue that Hudson's three 'registers' bear a close resemblance to the tri-partite waste regime framework. Hudson argues that all economic activity involves transformation of materials and matter, and these transformations occur within limits imposed by physical laws. However, "unruly matter escapes the frame defined by a given transformative process. Consequently, at every stage in the economy the transformation of materials has both intended and unintended effects" (Hudson 2008, 433). As such, waste is endemic to economic processes (as an 'unintended effect'), but the issue of whether such wastes can be "re-valorized or take on new use values depends inter alia, on issues of meaning and processes of re-valuation" (ibid, 423), which in turn are shaped, but not quite determined, by the particular bio-chemical and physical characteristics of configurations of matter (ibid, 436). That matter is configured in particular ways is often shaped by dynamics of capital accumulation and logics of capitalist value is seemingly lost in Lepawsky and Mather's description of boundaries and edges of e-waste geographies.

In Chapter 5 I use a relational framework that combines political economy (questions of labor, value, growth, and uneven development), discourse analysis (practices of knowledge production and representation), and attention to materiality (biophysical processes, flows of energy, matter, etc.) each of which should be considered independently as well as in relation to

one another (Hudson 2008). For example, the governance of e-waste fundamentally involves acts of representation and the construction of meaning around practices of consumption, disposal and recycling (i.e. 'green' consumption, trade in used electronics has an ethical dimension). These knowledges and meanings are critical to constructing e-waste as an object of management, but the material qualities of the objects being governed, namely the contingency and heterogeneity of used electronics, often resist the smooth classification of material as either waste or commodity. But to do that work of locating accountability in how networks are articulated, I argue that the social relations of capitalist production generate certain tendencies – particularly rapid product obsolescence, unsustainable design choices, and the externalization of waste management costs – that create and reinforce a rift between how things are made and how they come apart that remains a critical barrier to more ecologically and socially just GPN's for used electronics. E-waste is 'uncooperative' (Bakker 2004) as an object of governance and has agency here, but this agency is understood as part of what Kirsch and Mitchell call "structural questions of networked agency" (2004, 690). In other words, chapter 5 seeks to draw from ANT to engage with the ways people, things, ideas, and many other relations are (temporarily) stabilized in global production networks while also, drawing from historical geographical materialism, seeking to explain how particular social relations, in this case, those of capitalism, direct the assembling of networks in certain ways.

IV. Marxism and Foucault on Strategies and Practices of Governing

These theoretical intersections are useful for understanding the gap between the realms of production and those of disposal in thinking about how things are put together and how they come apart. And while Marxist and ANT accounts engage with the role that practices of

representation and knowledge play in assembling objects of governance, the actual strategies of governing are best understood through recourse to Foucault.

Michel Foucault covered a multitude of topics in his scattered writings, but one of the central objects of his work has been to understand how power operates. He broadly conceived of power as operating through the alignment of discipline (Foucault 1977 [1995]) – the acts of surveillance and sometimes punishment that operate at the level of individual bodies – and biopower (1997 [2003]) – the regulation and management of entire populations through the 'art of government'. Discipline and biopower did not displace the exertion of sovereign power – the government of territory and the ability to kill or refrain from killing those within it – but rather all three exist together. Biopower, in particular, articulated a shift towards government as practices which can be made to improve populations, either through welfare provisioning, health care, economic growth, recycling, etc. Rather than searching for an essential theory of power, some of Foucault's central insights come from examining *how* power is operationalized or deployed in multiple ways (Rose-Redwood 2006, 474).

Foucault used the term governmentality or governmental rationality, to describe how power circulates through populations and individuals. Governmentality "refers to the governance of a mentality (a collectively held view that is communicated through a variety of discourses) by way of 'techniques of power' – calculated tactics that guide everyday citizen-subjects to act in accordance with societal norms" (Dean 2010, cited in Ettlinger 2011, 538). Stated differently, these 'techniques of power' are the "apparatuses of knowledge production and the rationalities of rule [that] are implicated in the processes of governing individuals and collectivities (Rose-Redwood 2006, 474). The focus on knowledge and discourses as forms of power moves away from a materialist/idealist dichotomy by showing how "political rationalities produce material

effects through the deployment of technologies of government" (Rose-Redwood 2006, 475). The 'how' of governing occurs through the discursive assembling of objects of intervention, which is done through the compiling of information about those objects. Thus statistics about forests, the counting and identification of different types of species, literally brings the forest as an object of governance into being (Agrawal 2005).

Foucault provides at least three key insights that inform my work. First is the insight that political problematizations, whether a cholera epidemic, wars, riots, technological change, or e-waste, "do not speak for themselves" (Rose 1999 [2007], 21) and have to be brought into being. Furthermore, the technologies of governing through which political objects are operationalized are not necessarily the work of the state, but also involve non-state actors in contested processes of meaning-making.

Second, Foucault develops an understanding of power not only as a negation, a repression of others' ability to act, but also as productive, as facilitating action as well. Voluntary certifications and ethical consumption, which are often described in the governance literature as forms of 'devolving' regulatory power to consumers, certainly speaks to this conceptualization of power (Guthman 2007).

Third, this facilitative power is not necessarily condensed and held by political parties, or powerful groups, it is also diffused because "discourses are constituted, even if unconsciously, by everyday citizens in mundane activity or practices" (Ettlinger 2011, 539). The implications of facilitative and decentralized power are that individuals do not automatically become 'accomplices' (Agrawal 2005) of the state and internalize governmental objectives, but that these agendas can be contested as well. Thus 'devolution' of political power implies different kinds of political agency and tactics that are not inherently weaker or less radical - people can wield

knowledge in liberating ways as well as in ways that reconstitute their own subjection. The focus on technologies of governing as making e-waste governable, and the decentralization of the governing practices, fills an important gap in traditional political economic analyses.

Capitalism-as-governmentality and governmentality-as-hegemony

This last point begs the question of how governmentality and the focus on knowledge production articulates with Marxian analysis of the circuits of capital and the significance of class as a social relation. My view is that it is critical to avoid reducing practices of knowledge production to political economic imperatives and vice versa (that capitalism is simply 'performed' into being through discourses). As Clive Barnett argues in a provocative piece, it is tempting to use Foucault's theories on power, specifically his conceptualizations of discipline, governmentality, and biopolitics, to fill gaps in the Marxian analysis of capitalism as a hegemonic project (Barnett 2005). Foucault, Barnett argues, seemingly provides answers to the question of how capitalism, as a system in constant need of reproduction, maintains itself by 'getting at' people in some way. In other words, it would seem that governmentality explains how the top-down structures of capitalism "are modulated with the micro-contexts of everyday routines" (Barnett 2005, 9) so that individual subjectivities are re-wired to reproduce capitalism and the state[15].

In this reading of capitalism-as-governmentality, discourses perform hegemonic functions in that the interests of the state can be translated through the population. In other words, discourses around sustainability, or green consumer behavior, function as ideological mechanisms that secure consent for state projects, with the state understood as an institution

[15] While Barnett is specifically writing about neoliberalism, I will take the liberty of expanding his argument to be about capitalism more broadly.

dominated by elite class interests. Shifts towards carbon trading, or consumption of ethical goods, can be understood as evidence of capitalist forces deflecting challenges to its totalizing rule, and Foucault shows us how people are 'duped' into becoming accomplices. Barnett argues that this instrumental use of Foucault to explain how politics and economics are fused together provides two consolations to critical academics: first, it allows analysts to discover hegemonic ideologies that are 'hidden', and second, it allows analysts to align themselves with 'resistance' to that hegemony in the form of collective struggles.

This reading of both Marxism and Foucault is inaccurate, according to Barnett. On the one hand, the idea that capitalism is a coherent and totalizing project, rather than an ad-hoc and contingent set of relations, is of course an overly economistic reading of political economy. And while Barnett may be right to debunk such essentialist readings of capitalism, he may also be guilty of making a straw-man argument by only selectively reading the literature. Nevertheless, 'structural' Marxisms do exist. In terms of reading Foucault through this structural Marxism, we end up with the sense that Foucault was mainly concerned with how social relations are the effects of capitalist hegemony. Power is therefore class power that represses opposition. In fact, Foucault's interest in power and governance

> "pertain less to repression and more to how actors are guided into actions that can result in a wide variety of outcomes, including repression…Whereas Marxists might focus on why class differences exist and persist, an analysis inspired by Foucault's later thoughts about governmentality and modern, diffuse power would ask how citizen-subjects in their everyday practices contribute to the maintenance of inequality along a variety of axes of difference (i.e., not confined to class)" (Ettlinger 2011, 548).

Foucault was therefore interested in empowerment and the freedom to act as well as power in the more traditional coercive sense.

When we read governmentality as securing capitalist hegemony, Barnett argues that we get an account of social relations in which subjects are constantly being remade from the outside. While it is true that we, as individuals, can never get outside of power, that individuals are never operating from a clean slate in which we can pursue our own pure, internally-defined interests, it is also true that the power that forms our subjectivities can also be deployed by individuals in progressive ways. Thus the ethical electronics consumer is not *necessarily* a dupe – the ethical consuming subject may do more than reproduce capitalism. The lesson I believe Barnett is getting at is that there can be 'bottom-up governmentality', which is the notion that "non-state and non-corporate actors are also engaged in trying to govern various fields of activity, both by acting on the conduct and contexts of ordinary everyday life, but also by acting on the conduct of state and corporate actors as well" (2005, 10). For example, Agrawal showed that "Advocates of decentralized as well as centralized government of forests thus wield statistical arguments in the defense of their goals. It would seem that statistical facts about forests could be yoked to multiple roles" (2005, 35). This wielding of information has certainly shaped e-waste politics.

The point is that Foucault is not providing Marxists with a theory of how class relations dominate people through the ideological work that discourses do, but rather that power, whether of a disciplining, dominating sort or of an enabling, positive kind, is ever-present. If power is diffuse throughout populations, so are forms of resistance; power and freedom do not exist in zero-sum relations to one another. That resistance should only take the form of collective rejections of market-relations and its ethos of the autonomous individual may also need to be reconsidered. In essentializing resistance, we might also miss the forms of "individualized collective-action" (Marchetti 2003; cited in Barnett 2005, 10) that are also part of the ascendance of market rule. In practice, what this means for academic analysis is attentiveness to the

contingency of the relationship between social groups, individuals, institutions, and power. Drawing bright lines between the dominance of capitalist relations and radical collective resistance misses the more common and complex middle ground. For example, could there be room for both global solidarity and greenwashing in the development of labeling schemes for electronics recyclers? Attending to that middle may also temper whatever fantasies we may have about radical change being a process of totally transcending the existing order. Much more likely is the double-movement, equally applicable today as it was when Polanyi formulated it.

I take up some of these thorny questions in both chapters 6 and 7. In chapter 6, I focus on how certain practices of representation make an alternative, ethical e-waste recycling market legible. But I also suggest that this alternative market reinforces many of the key logics that constitute uneven geographies that give rise to e-waste dumping in the first place. Certifications as forms of resistance work far more within the dominant North-South divisions than against them. Chapter 7 looks at another form of resistance, which are policies based on the principle of extended producer responsibility (EPR). I make a similar argument. Getting into the details of EPR laws reveals that, even on their own terms, these policies fail to achieve the desired effect of influencing producers to eliminate toxics. Despite the positive attributes of recycling, it remains marginal in relation to overall material throughput. Furthermore, its liberal distributive focus legitimizes the take-make-discard cycle and leaves producer autonomy over the trajectory of technological development unchecked.

By way of conclusion, chapter 8 highlights some of the activities of the open-source, hacker, and DIY technology movements as credible sources of outright resistance to growth, planned obsolescence, and property rights that prop up the existing status quo of neoliberal governance in the electronics sector. These movements exhibit some of the 'individual

collective-action' that Barnett suggests adherents to Foucault and Marx should attend to; people are challenging norms, discourses, and mentalities rather than only particular corporate actors or hierarchies. In other words, they demonstrate that the consumer can be powerful, just not necessarily through the demand signal. One of the curious paradoxes of our times is that technological development, particularly in the digital knowledge economy, is empowering users to create their own tools for further rounds of new production. In some sectors, the 'means of production' are diffusing to wider segments of the population, which opens up fascinating possibilities to rethink 'devolution' as 'user empowerment'. The sharing of information and tools via digital software and hardware enables economic activity to side-step the dominant capitalist labor relations towards transactions motivated by gift-giving, creativity, and meeting human needs. While these developments are not a panacea, they are a significant alternative/compliment to the liberal politics of more and better recycling.

But more broadly, my interest in theory extends to questions about politics, specifically issues surrounding the value of liberal and radical politics vis-à-vis transcending, reworking, or rebuilding existing social relations towards more equitable and just ends. My concerns are with forms of political agency that clearly work *within* the political and ideological framework of capitalism (Mann 2007, 164). Because while DIY movements may be radical, it is likely that they will always be small and on the margins of what passes for mainstream political action around electronics. Again, that middle ground, exemplified by recycler-citizens, seems to me to be worth further examination precisely because it so clearly, from my perspective at least, fits within the 'interests' of the status quo.

Chapter 4 – Methodology and Analysis

I. Introduction

This chapter details the methodological approaches used to investigate my research questions. The theoretical frameworks that guide my thinking shape the sorts of questions that I have asked, and in turn the types of questions shape the methods used to investigate them. I therefore must acknowledge that my analysis of what I have called 'the e-waste regime' will not be a comprehensive one, nor do I think such a comprehensive analysis to be possible. This is because, at the broadest level, my research involves understanding practices of meaning-making, which are always partial and unfinished. In this case, practices of meaning-making crystallize in the form of specific policies, but policies are particular moments of ongoing political processes. My rather modest goals have been to understand at least some slice of how policies are made, and in turn to understand how those policies shape places and connections between places. Certifications, state EPR laws, and international rules regarding the movement of used electronics both repress and produce actions, which accords with Foucault's view of power and his writings on governmentality. These acts of negation and positivity literally produce new geographies. For instance, the acts of codifying what counts as 'hazardous' e-waste and what counts as a commodity construct barriers to the movement of items while also opening new avenues for exchange and production. 'Hazardous e-waste practices' is an abstraction that has concrete effects on people's livelihoods.

Because my research questions are focused on the contested processes of making policy, I have employed qualitative and archival methods in order to gain 'thick' accounts of the values

and logics that different institutions and actors utilize in their approaches to e-waste management and to document the challenges and effects of implementation. Qualitative methods are appropriate "when research seeks to unravel complicated relationships or slowly evolving events. This approach is warranted whenever depth is required" (Hoggart, Lees, and Davies 2002, 205-206). Interviews in particular are an intensive rather than extensive method of enquiry, useful for understanding "the interplay of complex decision criteria" (ibid, 209). Additionally, the U.S. International Trade Commission does not categorize e-waste in the Harmonized Tariff Code, meaning no comprehensive trade flow data is available that allow for precise quantification of e-waste trade flows or of certification's impacts on those flows. The EPA is currently working on quantifying flows of e-waste export with the Massachusetts Institute of Technology and the United Nations University StEP Initiative. My project is not at odds with these quantification efforts; rather, I take quantification and the production of knowledge about e-waste more broadly as subjects of analysis. Understanding the qualitative interaction of social, economic, and environmental decision-making certainly involves engaging with how the resources (knowledge) used to make decisions are assembled in the first place.

II. Geography and Institutional Ethnography

Among the wide range of qualitative approaches available, institutional ethnography (IE) has been a useful guide in that it targets not just individual subjective experiences, but organizational and institutional processes that shape social relations (DeVault and McCoy 2002). Dorothy Smith, a key figure in IE, writes that

> "Institutions exist in that strange magical realm in which social relations based on texts transform the local particularities of people, place and time into standardized, generalized, and especially, translocal forms of coordinating people's activities. Texts perform at that key juncture between the local setting of

> people's everyday worlds and the ruling relations (Smith 2005, 101; quoted in Eastwood 2006, 182).

Stated differently, institutional ethnographers investigate the "everyday lived experiences of practitioners and how those experiences are coordinated by larger social relations[16]" (Eastwood 2006, 182). In other words, if part of ethnography is understanding situated practices ('what people do'), for scholars using IE, one of the goals of research is to unpack how 'what people do' is organized. Campbell and Gregor therefore talk about IE using two kinds of data: 'entry-level' data having to do with local accounts and local actions as well as 'second-level' data having to do with extra-local processes that shape those local actions (2004, 81). The everyday practices that are of concern in this project are those of recycling and managing discards, but rather than take surveys of recyclers or engage in an ethnography of a recycling factory, I am focusing on the processes of making rules, rules which then form and (re)shape an infrastructure[17]. A strength of IE is that it understands governing as a process of abstracting – how does something like 'hazardous recycling practices' or 'responsible recycling' come to be meaningful? What are the actual practices that make up those terms? Epistemologically, IE is consistent with the relational theoretical approaches discussed in the previous chapter in that there is always an ongoing process through which discursive and material practices shape one another.

Practitioners of IE do not specify a set of research tools nor a particular course of action, which can make it seem a bit vague and more epistemology than methodology. For example, DeVault and McCoy talk about research as an iterative process in which researchers "step by step…discover whom they need to interview, and what texts or discourses they need to examine"

[16] While I find the notion of 'larger' social relations to be somewhat problematic in that they refer to a macro-micro distinction that geographers have rejected in favor of attention to scale-making practices, IE has its roots in sociology.

[17] Of course, many recyclers are involved in both recycling as well as governance and rule-making, so I do not draw bright lines between 'entry-level' and 'second-level' data.

(2002, 755). IE is about 'how to look and listen' (Campbell and Gregor 2004) in order to understand how and why things happen in particular ways, but the course that that takes cannot be predetermined. When looking and listening for how rules are made, institutional ethnographers recognize the significance of expert or 'insider' knowledges that may be foreign to the researcher. Eastwood provides a useful way of thinking about the work of discourses in IE with her use of the term 'conceptual currency'. Conceptual currencies are those concepts that translate actual practices and experiences into abstractions that are recognizable by members of organizations (2006, 193). In her example of UN forest development policies, the term 'Traditional Forest-Related Knowledge' comes to stand in for a whole range of experiences (ibid). Such conceptual currencies do the work of organizing the policy-process.

In the case of recycling governance, the methods of data collection were geared towards letting the data, whether interview, observation, or texts, generate questions. For example, professional jargon in the recycling industry came to be of central importance to this study as a form of conceptual currency. The term 'recycling' itself is a black-box that needs unpacking, so if people in the industry talk about recycling, institutional ethnographers simply emphasize that the researcher get to know the particular *practices* that make up that term. This may seem rather obvious, but it is necessary – *how* did this particular set of practices come to be known by this particular term, and what are the consequences of this way of organizing the relations at hand? As an example, the life-span of laptop batteries is an important metric of assessing whether an item is still useable or whether it is end-of-life. But the abstraction, embedded within the e-Stewards standard, that laptop batteries should last one hour, potentially turns working laptops into wastes. A recycler who specializes in refurbishing laptops told me that if he had to follow that rule, he would go out of business (interview, 6/29/11). Requirements around laptop battery

life organize the movement of used electronics, but battery life obscures multiple possibilities – a laptop may have a poor battery, but as long as it is plugged into a power source, the battery does not inhibit functionality. These nuances appear throughout the empirical chapters and indicate the contested nature of processes of governance.

IE has primarily been developed by sociologists, but it has a great deal of resonance with work in geography, particularly research in political ecology. Geographers are centrally concerned with the issues of scale and context/place, and in the policy realm "the ability to understand the locally embedded but also see it in the multi-scalar and cross-territorial context is a strength of geographical policy studies" (Rydin 2005, 74). Likewise, the literatures on certification, labeling, and political ecology more broadly focus on the contradictions produced when abstract and aspatial 'universal' policies travel through various 'local' places (Baird and Quastel 2011; Vandergeest 2007). However, there is a dearth of discussion on methodology within political ecology (cf Rocheleau 1995). Political ecologists train their attention on political economic changes and the importance of knowledge and the work of discourses, but are not always explicit about their actual methods. I would argue that IE, or more specifically the use of interviews, archival research, and participant observation within an IE framing, is a useful methodology for type of political ecological analysis deployed here.

Finally, given IE's grounding in feminist theory, I understand the practice of research as one in which knowledge is always situated or embodied (Smith 1987), which means that the researcher is not simply reporting on the 'objective' facts that are 'out there', but is also a part of the social relations and knowledge production that are being studied. It is impossible to completely remove one's self from the study and be truly 'inductive' because as a researcher I am always bringing my own ideas into the research process. Since all knowledge is situated, the

issue of 'bias' becomes less important given that there is no privileged objective place from which to see the world. Nevertheless, issues of rigor are still important and I will take these up in the section on data analysis later in the chapter. Ultimately, while institutional ethnographers do not prescribe a set of methods or actions, the usage of terms like 'conceptual currency' guide my analysis. In the next section, I outline my study area and detail my specific methodological practices that are guided by IE's framework for understanding how rules are made.

III. Study Area

As I have mentioned, the intent of this project was not to quantify the direction of flows of e-waste from one particular site to another. Instead, my interest has been in how those flows are politicized, and to understand the potential outcomes of that politicization. Broadly, the geographic focus of my research has been on the U.S. and the *institutions* there that are involved in the production and management of electronics and electronic wastes. While I am interested in the particular qualities and practices taking place within recycling facilities and governing institutions in the U.S., my interest in those practices stems from how they are related to practices elsewhere. The recycling sites in informal economies in West Africa, India, and China that have captivated the public imagination were not visited during the course of this work, yet their influence and presence looms large in the work done. More pointedly, I argue that those informal sites have become symbolic of 'the e-waste problem', and images and reports about these sites have shaped the politicization of e-waste in the U.S. in very important ways. The geographic scope of this research is therefore focused on the U.S. as a site of electronics production (in terms of product design, not manufacturing) and as a site of the collection and management of electronic discards, with the specter of informal recycling in developing

countries serving as a kind of geographic imaginary that shapes those processes in the U.S. It has been the case that over the past dozen or so years, recognition that 'our' (U.S.) e-wastes travel to highly polluted sites and threaten the health of distant others has changed the policy landscape. My interest is in how that knowledge, which is partial and fraught with issues of representation, is literally remaking the institutional landscape of e-waste management in the U.S. and potentially abroad. Therefore the movement of information about e-waste is just as significant in this project as the movement of e-waste itself. Figures 2 provides an example of the type of geographic knowledge that is of interest in this study.

Figure 2. E-waste map (Source: Who Gets the Trash? Ekacewicz, Philippe. "Basel Action Network: Vital Waste Graphics". 2004 http://maps.grida.no/go/graphic/who_gets_the_trash

While I have not made attempts to quantify e-waste flows, I do draw on new research that attempts to do so. What we are learning from this research is that e-waste flows are complex and multi-directional, and that e-waste recycling around the world involves hazardous practices as well as environmentally and socially beneficial ones, all of which makes the political process of clarifying comprehensive rules for e-waste all the more difficult. The institutional reconfigurations under way in the U.S. need to account for this complexity and nuance.

IV. Data Collection

This research project has three components of data collection to address the research questions posed: archival, interview data, and participant observation. All three methods were used to support one another in a process of triangulation. Triangulation refers to the use of multiple methods in order to validate analysis of a particular phenomenon (Jick 1979). This section provides a broad discussion of my methods of data collection[18].

Archival research

The archival research focused on:

- Documents that specify the requirements and auditing processes of the R2 and e-Stewards standards.
- Documents related to the development of the R2 and e-Stewards standards in order to trace their differing origins.
- Documents that chronicle the marketing debate between R2 and e-Stewards, which includes promotional materials, industry publications, media reports, blogs, and

[18] Appendices at the end of the dissertation provide specific details about my interview questions and the types of archival documents used in relation to my particular research questions.

statements of corporate responsibility of adherents to each standard. These documents in particular are critical to understanding how the market for 'responsible' e-waste recycling is created. Much of this debate has occurred in online forums.

    - Some of these materials include maps, photographs, charts, and surveys that have been instrumental in representing 'the e-waste problem'. Again, Figure 1 and 2 are exemplary.

- Government reports and policy recommendations. By reports I am referring to government investigations into e-waste management, mostly coming from the Government Accountability Office (GAO). By policy recommendations I am referring to key texts that identify strategies for e-waste management that the federal government hopes to promote.
- Documents that provide details on EPR legislation requirements, including the state policies themselves as well as reports from EPR advocacy organizations.

This archival work is critical in documenting in detail how knowledge about e-waste is assembled and mobilized in the form of practices. In other words, in the archival texts that make up part of my data, we see an infrastructure being set up around e-waste in which certain activities become intelligible. These texts demonstrate the intertwining of discourses and material practices. All told, over 150 documents formed the basis of my archival research. Most were freely available online, but in some cases I signed up for industry newsletters to receive information. Finally, some documents, such as an internal memo from the Institute of Scrap Recycling Industries, were provided to me by interview participants.

Participant Observation

Participant observation and the collection of field notes was another method of data collection used here. As Cook writes, participant observation is an attempt to understand some phenomenon 'from the inside', or in the context of everyday experiences (1997, 127). Of course, the ability to get 'inside' a culture or setting is always fraught, so the aim of participant observation in IE is to try gather the 'stories' people tell about their experience but to connect those stories to processes that organize them (Campbell and Gregor 2004). The tacking back and forth between the immediate action and setting and a wider context sets IE apart from traditional ethnography, making it an ideal framework for doing political ecology. Collecting data through participant observation, as with formal interviews, involves taking in 'insider' accounts but also checking with participants to see if my own understanding of those accounts is accurate. The value of 'being there', while hard to quantify, for me has been that I can bring some element of rigor to the analysis. If the archival and interview data are saying one thing, and I can draw from experience to say that this is plausible, I feel more assured that my analysis is accurate.

There were two relatively short-term periods of participatory research: the first involved funding and operating an e-waste recycling collection event in my town, Athens, GA. The second involved a two-week intensive 'summer school' in Western Europe hosted by the United Nations University called the "Solving the E-waste Problem" or StEP initiative. I will describe those experiences here.

Local research: Athens-Clarke County e-recycling event

In the Spring of 2012, I utilized a small grant from the University of Georgia's Office of Sustainability to organize an e-waste collection and recycling event on UGA's campus that was

open to students and non-students. This involved setting up an infrastructure of vendors that would receive donated used electronics and other items as well as organizing a team of volunteers to help staff the event. Held during 'Earth Week', the event collected over 150 used televisions, dozens of batteries, large amounts of Styrofoam, and several computers and peripheral equipment. The purpose of organizing this event was two-fold. First, I wanted to help direct what are known as 'hard-to-recycle' materials away from landfills, which is often where those items end up. Second, I wanted to see first-hand how flows of money and materials worked, including the process of vetting recipients of those flows. The type of recycling event that I helped organize has become politicized, as many people have now heard about the dangers of 'sham e-waste recycling' i.e. recyclers who collect material in the U.S., 'cherry-pick' the most valuable materials, and then ship the remainders to developing countries. Key to this exposure was a CBS' *60 Minutes* piece aired in 2008 (Pelley) where, with the help of the Basel Action Network (BAN), their reporter followed e-waste collected at a county event in Colorado to China. Because of this report, the recycler running the event in Colorado faced criminal charges of mail and wire fraud, and was recently convicted in what was the first ever successful prosecution of an American recycler charged with illegally shipping e-waste to developing countries (Thomas 2013). It turns out that collecting e-waste from the public can be a high-stakes event. Given this level of scrutiny, I felt that organizing an event on my own would provide insights into how a recycling network operates.

The Athens-Clarke County (ACC) solid waste office will accept used electronics anytime at the landfill, so an e-waste recycling event is not the sole time that community members are able to recycle used electronics. However, customers are typically charged a $10 fee for dropping off CRT monitors at the ACC landfill, a fee that was waved for the event. CRT's have

leaded glass, and given that they have been replaced by LCD and LED monitors, the market for CRT's and CRT glass is drying up rapidly, hence the fee. ACC does not recycle any electronics in the facility they operate, but contract with a national company called Creative Recycling. Creative Recycling periodically picks up materials at the ACC landfill and takes it to their Atlanta recycling facility, and depending on what the materials are, ACC either pays Creative or Creative pays ACC[19]. Creative Recycling has facilities certified to the R2 standard. In organizing for the Earth Week event, we had hoped that Creative would send an 18-wheeler truck to staff the event. However, Creative did not respond to our requests for service. ACC also has a working relationship with a recycler in Athens called KP Surplus, and KP was willing to run e-waste collection.

The financing of the event was interesting. Community members could drop off their unwanted items for 'free', meaning they did not pay a fee upfront. But since KP Surplus was handling materials that often cost them money to recycle (CRT's), KP billed ACC after the event. Therefore a big part of the volunteer work involved tallying all of the material collected so that KP and ACC could be sure of the overall costs. Furthemore, KP did not actually do all of the recycling themselves. They were but one node in the network that used electronics flow through. KP would take the materials they wanted and try and re-sell them and ship the rest to companies like Creative Recycling, who have expensive machinery that can shred low-value items down to a commodity-grade. The co-owner of KP told me that they did not bother with becoming certified to R2 or e-Stewards because it was too expensive. Instead, KP would send materials to certified recyclers so that KP could benefit from the accountability that certification provides without actually being certified themselves. KP Surplus' website reads: "Items we

[19] For example, ACC would use the $10 fee to pay Creative for accepting CRT monitors. Creative might pay ACC for non-CRT items because those items possess greater value.

cannot find a market for we group by the ton and send in bulk to partners with the equipment, permits and facilities to properly handle the material." (website). I would argue that KP Surplus 'free-rides' on the certification trend.

The value to this project of organizing a recycling event was that I got a better understanding of the way that trust and expertise are crucial to the coordination of markets for used materials (see also Crang et al 2012). On the one hand, by using KP Surplus to handle collection and recycling for a public event, ACC was potentially exposing itself to negative publicity – KP Surplus does not have many of the certifications and environmental management systems (i.e. ISO) in place that larger companies in the region do. Yet the manager of the solid waste division at ACC trusts KP to do what they say they do. That relationship is based on past experiences working together instead of formalized certification systems. Of course, KP must operate within the bounds of the law, but ultimately there is very little oversight to ensure that KP does so. It is possible that the materials we sent to KP were sold as is, without testing for functionality, on the global market. The fact that I do not know is indicative of the way that e-waste recycling networks often operate.

In terms of expertise, organizing a collection event demonstrated the importance that knowledge of materials plays. As cars pulled through the collection area, the recyclers, which included KP surplus as well as Free IT Athens, were usually able to quickly assess the value of the materials coming in. Free IT Athens only does repair and refurbishing, not recycling, so they were looking for computers above a certain specification. KP Surplus was managing all of the rest of the material that Free IT Athens did not want. While Free IT Athens got a few re-usable items, KP was inundated with what basically amounted to junk. Much of this junk was older analog TV's, which no longer work anywhere thanks to the switch to a digital signal in 2009. It

was anticipated that the move to digital signals would create an influx of older televisions (Gronewold and Greenwire 2009), and this seemed to be the case in Athens. The manager of KP Surplus recognized the shift in policy as driving old TV's out of storage. Such insights also suggest the importance of IE's emphasis on local action being condition by extra-local processes. In sum, organizing this event helped me 'triangulate' (Jick 1979) what I was seeing on the ground with what I was learning in interviews and archival data collection.

International research: The United Nations University Solving the e-Waste Problem Summer School

The second period of participant observation involved my participation in the 2011 Solving the e-Waste Problem (StEP) Summer School organized by the United Nations University, a division of the UN Environment Programme. Participation in the summer school was based on my successful application and acceptance into the program, which was a competitive process open to graduate students working on any issue related to e-waste. I was one of 19 scholars from five different continents invited to the summer school, which took place in The Netherlands, Belgium, and Switzerland over a two-week period in September of 2011. The participants mostly came from engineering and the physical sciences, although I was one of several social scientists present.

The summer school was organized as a series of workshops aimed at a particular theme, which was "Closing resource loops – Complexities and solutions in managing e-waste". As is clear from the theme, the summer school was focused on e-waste management from an 'applied' perspective. In brief, the summer school itinerary was as follows.

- Where: For the first few days, the summer school was hosted by the Phillips Corporation at its headquarters in Eindhoven, Netherlands. From there, our group traveled to Antwerp, Belgium, where we were hosted by Umicore, one of the world's largest precious metal refineries. After leaving Belgium, we traveled to Davos, Switzerland to participate in the World Resources Forum held there. Along the way we toured various e-recycling facilities in the Netherlands, Belgium, and Switzerland.
- What: Part of the summer school involved the student participants presenting their area of research to the group in a conference-style format. There were also 'expert' panels and presentations given by a range of people, from engineers to EU bureaucrats to corporate sustainability managers from Dell, HP, Nokia, and Phillips. These presentations were supplemented by 'hands-on' workshops where we learned to dismantle various electronic devices. These presentations and workshops were meant as a primer for the main task of the summer school, which was to organize a half-day workshop at the World Resources Forum in Davos, Switzerland. Given the theme of 'closing loops', the summer school group was asked to develop a labeling scheme that could be used to identify and promote the use of recycled metals. The EU is facing a shortage of 'critical metals', mostly rare earth metals that are important in certain high-tech manufacturing processes. Our job was to work on a scheme that would increase the recovery of those critical materials to support this EU goal.

The value to my project of participating in the summer school was immense. I set out to participate in the program while simultaneously studying the policy process. Engaging with the

StEP Initiative on its own terms, I gained a great deal of information about how EPR legislation works in a variety of contexts. The EU has had comprehensive e-waste legislation since 2003. This legislation, called the Waste Electrical and Electronic Equipment (WEEE) Directive, specifies that manufacturers are responsible for recovering a certain amount of discarded electrical items. The successes and failures of the WEEE Directive provide lessons for the U.S. experience with EPR, and my involvement with StEP exposed me to how recyclers, manufacturers, and governments have responded to transnational changes in the infrastructure.

On the other hand, I was also interested in the way that the StEP Initiative and the actors involved framed the politics of e-waste. Going back to Gille's waste regime, I was curious to see what was discussed in the policy realm and what was taboo. That the summer school was largely framed around technical issues of maximizing material collection and recycling efficiency was unsurprising given the affiliation with the UN, the corporate sponsors, and the technical focus of most of the summer school participants.

As a brief example of the way political boundaries were drawn around topics, one of our big priorities in the school was in developing a labeling system that identified the use of recycled metals. We met with an expert on labeling from the UK who flatly stated that one of the uses of labels, from a business perspective, was that they could get 'Greenpeace to get off your doorstep'. If a company was facing a public relations problem associated with their supply-chain, labels could assuage the public's fears and restore trust. In other words, part of the training we were receiving about governance in the recycling industry was that corporate social responsibility sometimes amounted to getting pesky NGO's to leave you alone. Whether or not that meant a company was actually improving its labor or environmental practices was somewhat incidental. I can hardly think of a better definition of greenwashing.

To be fair, the anecdote above is not entirely representative of my experience at StEP. I did not expect that the United Nations University invited the StEP participants to engage in a radical political critique of the electronics industry, and in fact, StEP's practical focus provided a nice counterpoint to many of the radical geography conferences I have participated in. The UK labeling expert helped show us what labels can do, whereas I think much academic work focuses on what they cannot do. My participation in something very different from an academic conference helped me understand the different discourses that bound academic geography and the e-waste regime. There are many things in critical geography, as in e-waste recycling, that do not have to be explained to those conversant in that language. Getting out of a critical academic environment helped me see the *similarities in the differences* between my work and those of recyclers and bureaucrats. Furthermore, critical geography provides a number of important insights into the e-waste regime, but I have often felt that critical academic work lacks an ability to *construct* anything. The proclivity towards deconstructing the conditions of possibility that frame political action is useful, but I learned through StEP that it is also possible to wear multiple hats. Participants at StEP seemed to have the exact opposite problem that most critical geographers do – they were chugging along, building new models for recycling while hardly questioning the presumed value of their actions!

The power dynamics between myself, my fellow summer school participants, and the professional recyclers, regulators, and corporate bodies that sponsored our work were significant in the participant observation phase. Because I had been invited to participate in StEP and had made it through the application process, I immediately became part of a coherent group. There was a bonding process among the summer school students and our guides, who were scientists involved with the UNU. The purpose of being there was educational, so the atmosphere invited

questions and dialogue. Given that everyone knew something about electronics, conversations could begin at a rather technical place. In other words, I was an 'insider' at StEP. But the disadvantage of being welcomed into a summer school group, and being hosted by corporate partners, was that it was very difficult to ask provocative questions without feeling like you were 'biting the hand that feeds you'. It would have been impolite to ask Phillips executives 'embarrassing' questions about labor conditions in their factories, given that I was eating on their dime. Since I was an 'insider', I was unsure how to bring in issues that were important yet 'outside' of a direct relation to e-waste. For example, during a discussion at the World Resources Forum, I thought our group should talk about the differences in consumption of critical metals between the EU and Africa, but I was reprimanded by an executive from a mining firm who told me that that was too 'broad' a subject for that moment. Inequality was not on the table, and I had taken a misstep in trying to bring it in. These issues of positionality also came up during interviews, and I will discuss them further below. Getting access to research sites and information while also being critical of one's informants is a difficult dance, and ultimately it is never neatly resolved.

To summarize the data collected in my field work, it amounted to pages and pages of notes, some of which I took on my laptop and some of which were written on paper. I primarily used this data to triangulate my findings in the other research phases. The summer school was especially helpful in drawing my attention to scholarship on EPR legislation, which has informed my third research question (chapter 7). But beyond informing this particular study, the summer school enabled me to speak to different audiences and I hope to carry that ability through my professional career.

Interviews

Finally, data collection also involved semi-structured interviews. I interviewed 20 people who fit into one or more of the following groups: 1. NGO's (2) 2. Trade groups (4) 3. Auditors and certifying bodies (2) 4. Government regulators (state and federal) (1 state, 1 federal) 5. Manufacturers and retailers (1), and 6. Recyclers (12)[20]. As Baxter and Eyles (1997) have suggested, purposefully sampling interview participants is important in terms of establishing the credibility of informants. In those 20 semi-structured interviews, I gathered descriptive qualitative data on a number of topics that are explained below. In general, these interviews were intended to "capture the situated perspectives of market actors in ways that permit the interpretation of the conventions motivating their market actions" (Klooster 2006, 550). I used an unobtrusive digital voice recorder during formal interviews. One interview participant did not want to be recorded, so I took notes by hand instead.

Issues of access and positionality were also significant in the interview process. As Herod (1999) has noted, one of the advantages of interviewing people that are members of organizations is that there is typically some sort of institutional framework that can be discerned in advance by the researcher. I was able to go online, search organizations and people's names, and contact them relatively easily. Whether they responded or not is a different issue, but suffice to say that gaining initial access to the people I wanted to interview was somewhat easier than had I been interviewing recyclers in informal settings abroad. I had hoped that access to interview participants would follow the snowball method by which a few interviews open doors for more. This assumption was correct, but I believe that a few tactical choices were important. Given that several NGO's were instrumental in writing early reports that politicized e-waste and

[20] If someone fit into more than one of these categories (trade group and recycler, for instance), I counted them twice.

that these NGO's had a strong media presence, I assumed that they would be more inclined to speak with me than would a government official or business executive. I chose to do my initial interviews with individuals from the Silicon Valley Toxics Coalition and the Basel Action Network, respectively. These folks were supportive of my research interests and gave me names of other people they thought I should talk to. One of these people was the moderator of the initial stakeholder meetings convened by the EPA to develop the R2 standard. Using the BAN member as a reference, I was able to gain access to the moderator of the meetings, who by that time had actually become the administrator of the R2 standard itself. By interviewing a key person at BAN, which runs the e-Stewards certification standard, and the key person at R2, I was then able to tap into the network of recyclers that are actually certified to these standards. These 'gate-keepers' (Herod 1999) were tremendously helpful in gaining access to the recyclers that I needed to learn from.

My position vis-à-vis my interview participants was also significant during the course of my research. On the one hand, I was clearly an 'outsider' who lacked in-depth knowledge of the processes that were common sense to the participants, who were recyclers, policy-makers, regulators, and activists. But again, Herod correctly points out that the lines between insider and outsider are blurry (1999). Furthermore, the researcher can shift his or her positionality as they see fit (ibid). For example, in many of my early interviews, it was to my advantage to present myself as an uninformed student because I could ask questions about professional jargon, or conceptual currency. The recycling industry, like any industry or niche setting, has its own language; words and phrases like 'end-of-life', 'triage', 'asset management', 'scrap', and 'downstream' all mean very specific things in the recycling world. Despite my best attempts to come into interviews prepared to 'talk shop', there was always a learning process involved that I

carried forward into further interviews. But by positioning myself as a student, I could slow interview participants down when they got into using jargon. The jargon was standing in for 'what actually happens', which is the main target of IE (Campbell and Gregor 2004, 78). So when I asked a recycler "can you walk me through your business model in terms of what you actually do with discarded electronics you have collected", he used terms like 'triage' as a blanket term. But by asking what that actually meant, I was able to get a very detailed understanding of how complex the process of sorting used electronics is and how difficult it can be to decide whether something is working, repairable, or destined for scrap recovery. If I had presented myself as an 'expert', I may have undermined my ability to get information that I actually understood.

My knowledge about these terms progressed as I went along. Terms like 'triage' and 'asset management' were used consistently within the industry, and as I gained familiarity with the conceptual currency I was able to shift my positionality *within* interviews. I could 'play dumb', but at a certain point I could also ask pointed questions and contest details. For example, recyclers have a 'cut-line' in the triaging of used electronics. That cut-line is a set of specifications, and if say, a computer meets or exceeds those specifications, it would go towards re-use or refurbishment. If it was under that cut-line, say a Pentium III instead of a Pentium IV, it would go towards end-of-life recycling, which typically involves a process of shredding the computer down into its constituent elements. As I learned about these triaging details, I could ask questions about how that cut-line was determined. Why cut here instead of there? Once again, I was interested in 'what actually happens' and how decisions are made, and being able to at least pretend to be somewhat of an insider helped me in that process.

Positionality came to matter in a personal/ethical way as well. As I got to know more and more people in and around the industry, I came to understand the importance of personality dynamics within the industry. What I mean is that I gained technical knowledge as well as knowledge that could more or less be called 'gossip'. I would hesitate to say that this made me an 'insider' by any means, but it did clue me into the way that politics is not simply an impersonal process whereby certain pre-given interests (like class) were guiding action, but that politics also involves more mundane personal interactions and histories. Quite simply, people talked a lot about one another 'off the record', and these personal disputes often motivated their actions. In some cases, people clearly had an axe to grind about something someone else was doing, and since I was a researcher asking questions, those folks took that opportunity to air out their grievances. An auditor I spoke with told me that, given her status as a 'neutral' person who actually conducts certification inspections, she often had to 'bite her tongue' because the electronics recycling industry is

> "very, very, very political… I don't voice my opinion, I don't tell them what I think or feel, or what other people think or feel, they are two separate worlds. A lot of them [recyclers] have relationships together from when this all started years ago…There are people who are dead set how they think and feel about these things [certification procedures]. When you're talking with board members of the standards, you can't just let them know what you think. They will slice you a new one!" (interview 8/17/2011).

Needless to say, the highly charged political atmosphere made the analysis of interview data very difficult, a subject I deal with in the analysis section below.

The issues of access and positionality raise important ethical dilemmas and responsibilities in the research process. There are two specific issues that arose in my case. First, several interview participants told me that they 'knew of' recyclers who were certified to a particular standard simply as a matter of greenwashing. In other words, recyclers would get

certified to a standard for the marketing boost, but would not actually follow the standard to the letter. This placed me in a tough position – was I to call up the administrators for these standards and tell them that recyclers might not be playing by the rules? I chose not to relay that type of information to those administrators for two reasons. First, my interviewees are confidential sources under the IRB agreement for this research. Second, violating a voluntary standard does not mean that a law was broken. What these sorts of allegations reveal in empirical terms is that certifications are a highly imperfect regulatory mechanism, given that an audit is simply a snapshot of what a recycler does. Although I could not verify these allegations either way, I took their mere presence as a research finding.

The second sort of ethical issue that arose in the interviews, already discussed in the participant observation section, was the problem of how I as a researcher can maintain a 'critical' stance towards research participants who have helped me do my work. For instance, I share a commitment to environmental justice along with the NGO's doing research and writing reports on e-waste. My personal interaction with these participants was very pleasant and extremely helpful to me. As a sign of my gratitude, I agreed to help one of these NGO's write a legal memo that some of their constituents would use. But over the course of my research, I inevitably came to disagree with some of the positions and tactics that these NGO's used, which I detail in chapter 5. For example, while I think BAN has played a critical role in putting e-waste 'on the map', I have also come to learn that some of their reports are misleading and could have negative consequences. Specifically, I learned that a statistic that BAN constantly uses to market the e-Steward standard is actually unsubstantiated and anecdotal. So while I was and continue to be supportive of the work that BAN does, I was torn by the dilemma of how to write up my findings. As Herod notes,

> "In many ways there is an ethical paradox at work here. In order to gain access to information which helps the researcher to analyze critically particular events or processes, it is often most necessary to develop (if possible) a close working relationship with particular sources. Yet, critical perspectives which rely upon access to such sources are, by definition, sometimes likely to portray a particular source in a less than flattering light" (1999, 324).

There does not seem to be any neat solution to what is inevitably a messy process common to all research projects. The only way I could resolve the problem was to be as critical towards the organizations and people whose ideals I personally share as I am towards those who I already disagree with.

Appendix A-C provides a list of research questions, presented in chronological order to show how the questions changed. It was only after my sixth interview, during the summer of 2011, that I jettisoned the research focus on prison recycling. Appendices A and B therefore include questions about UNICOR prison recycling. Appendix C is a list of questions from my last interview, in early 2013, and is representative of the questions I asked on interviews 7-19. What should be clear is that my interview questions become much more honed and organized over time.

V. Data Analysis

The combination of archival, interview, and observational data provides a rich and nuanced set of empirics that has allowed me to gain an in-depth understanding of the contestations and potential outcomes surrounding labeling schemes for e-waste recyclers in the U.S. Analysis of policy documents, interview transcripts, and observational field notes began by categorizing textual data into meaningful thematic sections (Hoggart, Lees, and Davies 2002, 239). This is an iterative process that involves intensive and extensive examination of all available data. Data was organized using preset (etic) categories, or those concepts that were of

interest to me going in, as well as emergent (emic) categories that evolve from the research process. Instead of using qualitative data analysis software, I simply used a series of folders in Microsoft Word to categorize my interview, archival, and field data. In terms of categorizing data, I began with a set of foundational archival documents, which were texts that I felt outlined the general contours of debates in the recycling industry. I used these texts to form my initial interview questions. After the interviews, I started my analysis by reading through the transcriptions and pulling out common themes until no new themes emerged (saturation). I then sorted different quotes into one or often multiple thematic categories. For example, in asking recyclers why they chose to become certified, several respondents have suggested that 'social responsibility' is a key driver. Of course, there were multiple reasons for becoming certified, so I created a folder called 'drivers of certification' and organized various responses under that heading. I did this by cutting and pasting text into folders, and it was certainly the case that much of the data was coded in multiple folders.

I created folders for each of the following analytical themes that emerged from my interview data:

- The development of R2 and e-Stewards standards
- Differences between the standards
- Drivers of certification
- How certification works with the particular business model of recyclers
- Compliance with R2 and e-Stewards
- Tensions over whether something was a 'waste' or a 'commodity'
- Issues for recyclers stemming from production/manufacturers
- Debates about e-waste exports

As stated, generating these thematic categories was an iterative process. Some of the categories correspond directly to my interview questions and archival texts. For example, I started out trying to unpack the political process of developing the R2 standard, a process so contentious that it led to a rival standard being created (e-Stewards). From the beginning, 'the development of R2 and e-Stewards' was one of my analytical themes, as was 'debates about exports'. I knew that these were topics I wanted to address because I had read about them in some of BAN's reports. But as I began to transcribe and analyze those early interviews, I came up with new questions and new themes emerged (emic themes). For instance, none of my initial archival data made me aware of how important the materiality of e-waste is to processes of governance. What electronics are made of, how they are put together, and the contingency of how they are used, stored, and moved around all impact the ability of recyclers to make determinations about whether something is a waste or a commodity. I will take this up in detail in Chapter 4, but I bring it up here as an example of how categories evolve out of the research process. Once these new themes emerged, I then sought out new documents that I could use to triangulate them.

Once the data was organized into themes, I began the interpretive process of a) making connections between themes (ex. how does 'compliance' with regulation relate to 'issues stemming from manufacturing'?), b) identifying frequent themes as well as exceptional ones (everyone seemed to have an opinion on e-waste exports, but few people talked about issues emerging in production), and c) connecting themes to particular categories of respondents (what is important to NGO's, trade groups, etc?).

In order to bring rigor to processes of data collection and analysis, several techniques were employed. One of the best ways to ensure that researcher interpretations of qualitative data are credible is to invite commentary from the respondents (member checking), both during data

collection and after (Baxter and Eyles 1997; Lincoln and Guba 1985; Silverman 1993). In three cases, I actually conducted follow-up interviews with participants. However, most of the time this was not possible, so in practice member checking simply meant that I would ask research participants about issues that other participants had raised. I was not trying to get necessarily to the 'right' answer or to find the 'definitive' opinion, but to examine how controversies were generated and experienced by those participants.

As I have already mentioned, another popular strategy in qualitative data analysis is to triangulate findings using multiple sources i.e. multiple interview respondents and/or multiple archival sources 'back up' initial respondents (Jick 1979). Finally, to ensure that research findings are determined by the respondents in their particular context, and not by the researcher (confirmability), a research audit of all notes, data, and interpretations will be conducted in which the assumptions and concepts of the researcher will be made apparent rather than hidden (Baxter and Eyles 1997; Lincoln and Guba 1985).

Chapter 5 – Waste or Resource? Materiality and Agency in E-Waste Recycling Networks

"A priest went to a remote village in an African Country (Ghana?) to preach the Gospel. He met a young man, Kofi Mensah, to whom he preached the gospel and Kofi Mensah accepted and was baptized. His name was changed to John Mensah with the instruction that he is not supposed to eat rabbits on Fridays. There was famine in the village one Friday and all search for food proved futile. John, as he is now called, picked up his cutlass and went to the farm to look for food. He passed by his trap and noticed that it had caught a big rabbit! Knowing that he is not supposed to eat rabbits on Fridays he took the rabbit to a nearby river said a few words, sprinkled water on the rabbit and took it home.
He prepared a nice local delicacy and started eating when the priest arrived. The priest asked why he was eating rabbit on a Friday and John replied that it was not a rabbit but a chicken. Perplexed, the priest asked for explanation and John explained "well you came to my country and preached the gospel to me, I accepted it, got baptized and my name was changed from Kofi Mensah to John Mensah. In the same vein I also got this rabbit, took it the riverside, baptized it and changed its name to chicken. So what I'm eating is no longer a rabbit but a chicken".
The implication: People give definitions to e-waste based on their own convenience."

- Anecdote told to the StEP Summer School members by Sampson Atiemo, a participant from Ghana.

I. Introduction

This chapter focuses on the processes of developing the R2 and e-Stewards standards for electronics recyclers. Between 2006 and 2008, a group of 25-30 'stakeholders' – members of the EPA, recyclers, manufacturers, members of the Institute of Scrap Recycling Industries (ISRI), NGO's, auditors, and state regulators – convened a series of meetings designed to hammer out a standard set of 'best practices' called Responsible Recyclers (R2) that recyclers could voluntarily choose to follow. The R2 standard "would also provide essential information/assurances to prospective customers" (R2 Solutions website), in other words, allowing certified recyclers to distinguish themselves from the 'sham recyclers[21]' whose unscrupulous trading practices were leading to the detrimental social and environmental outcomes made visible by NGO reports

[21] As a reminder, 'sham recyclers' was a term used in BAN's initial 2002 report to describe recyclers who collect used electronics under the pretense of recycling but who then act as brokers, packing used electronics onto shipping containers bound for developing countries.

earlier in the decade. However, disagreements over *how* to make this distinction led to divisions among stakeholders, giving rise to a separate and competing standard called e-Stewards. While there were a number of specific issues in play – how to control exports, the use of prison labor in recycling operations run by federal correctional institutes, and a ban on landfilling used electronics - the essence of this split was over whether e-waste was a 'rabbit' (hazardous waste) or a 'chicken' (a commodity).

In brief, the environmental NGO's participating in the R2 development process – the Basel Action Network (BAN) and the Electronics TakeBack Coalition (ETBC) – argued that used electronics were hazardous wastes whose movement from OECD to non-OECD countries, as well as to landfills or to prison recycling facilities, should be completely banned. Other stakeholders, like members of ISRI (the major trade group representing scrap industries), argued against this interpretation and instead sought to use the R2 certification to simply highlight recyclers' compliance with existing law, which in the U.S. allows most used electronics to circulate freely as commodities. While there is a great deal of nuance and detail here that needs to be explored, this was essentially the central dispute that led to BAN and ETBC breaking from the R2 process and forming their own standard: e-Stewards. In chapter 6, I examine how R2 and e-Stewards market themselves based on these distinctions and explore the ambiguities surrounding the effects of these standards' implementation. Here, my focus is on how the standards were developed and the processes of codification themselves.

Chapter outline

This chapter uses archival and interview data to unravel the political processes of demarcating a voluntary regulatory framework for electronics recyclers in the U.S. The

empirical heart of the chapter provides a thorough examination of how the R2 and e-Steward standards were developed and why they diverged. In more colloquial terms, this chapter is about how the sausage is made. I argue that the divisions between R2 and e-Stewards were driven by divergent ideological positions about the nature of the global economy and the role of trade within that economy[22]. This is not a difficult argument to make; certainly, different ideological positions on the use of prison labor, or the appropriate way to address issues of 'sham recycling' and exports drove wedges between the actors involved. It is not surprising that a trade group like ISRI would defend electronics recycling as a legitimate trade, or that an NGO like BAN, whose namesake comes from international legislation controlling hazardous waste, would look to expand the scope of U.S. hazardous waste regulation to include more electronic wastes. However, the difficulties of greening the supply-network of used electronics go beyond these kinds of interest group politics. I make three interrelated arguments based on my empirical research that speak to some contemporary debates on governing networks.

First, by studying the political process, I explore a key contradiction of labeling as a mechanism of sustainable governance: while labels seek to unveil the relations of 'where e-waste goes' and weed out 'sham recyclers', what are not transparent are the complex political relations embedded within labels themselves. Labels need to be peeled back, and the processes they hide need to be examined. For example, 'organic' food connotes a set of practices that ostensibly stand in opposition to industrial agricultural practices. Yet as Guthman demonstrated, existing structural conditions in California assembled the 'organic' agriculture sector there in ways that ended up mirroring the industrial practices it set out to oppose (2004). While the notion that consumer choice and market signaling are meaningful exercises of ethical action is a

[22] For example, a recent panel at a recycling conference in Europe was entitled "Free Trade, Fair Trade, or No Trade".

seductive one (see Barham 2002; Guthman 2007), it is vital to recognize that markets are not neutral or even democratic arenas, but sites of struggle. Is food really 'organic' if it is harvested by exploited immigrant labor? Could electronics recycling really be 'green' if conducted by prisoners or migrants in southern China without adequate labor rights? In this instance, the appearance of two competing market standards makes this political tension all the more visible. Consumers should be wary of these fixes and need more than a superficial understanding of what it means to 'responsibly' recycle their electronics.

Second, and once again in reference to the epigraph, I argue that attention to the mobility of waste, its ability to defy categorization, makes it a complex and unruly target of governance. Waste generally, and e-waste in particular, is not similar to other types of certified commodities/processes, so certification studies do not map neatly onto waste. As Moore (2012), drawing on Zizek (2006) has argued, waste can be thought of as a kind of 'parallax object' - something that disturbs or disrupts settled norms and concepts. A whole host of waste researchers now argue that waste is not a fixed endpoint or a static set of objects, but a mobile and contingent category (Davies 2012; Gidwani and Reddy 2011; Gregson et al 2010; Lepawsky and Mather 2011). My analysis of the political processes of standardizing best practices in e-waste management is therefore not just limited to examination of the ideological disagreements between human actors and institutions, but extends to an engagement with waste itself. E-waste comprises a diverse set of materials (phones, computers, monitors, wires, radios, toasters, etc.) with many different kinds of properties, and this sheer diversity of physical configurations of electronic devices make the *a priori* determination of something as either a waste or a commodity highly contingent. These processes of standardization, while intending to rigidly codify best practices, can never be fully realized due to the necessity of relational governance in

markets for used goods (Crang et al 2012). The focus on materiality in the governance of global e-waste networks draws attention to contingency, trust, and embeddedness in the circulation, recovery of value, and certification of electronics recycling.

Third, while much of the literature on waste mobilities tends to revel in this performative emphasis on waste's 'becoming', merely extending agency to e-waste in networked relations is not the end goal here. Rather, I examine how and *why* these material properties emerge in the way they do and direct attention to the chaos of capitalist competition and accumulation as a (not *the)* critical underlying determinant of the problems of e-waste management. I seek to show how certain dynamics of capitalist production – planned obsolescence, unsustainable design choices, and the externalization of waste management costs – drive many of the difficulties that recyclers face in their day-to-day operations. As one recycler told me, recyclers often find themselves 'treating the symptoms' of production choices (interview, 8/2/11). A lack of connectivity between production and disposal is a key underlying issue in e-waste management specifically and in waste management in general.

Assembling these arguments together, I maintain that certifications are politically saturated market-making devices that are fraught not only with ideological divisions and rent-seeking interests but are disrupted by the material heterogeneity of the non-human objects they are targeting for regulation. As I laid out in chapter 1, there is a very real gap between the ideal of standardization and the contingent realities of what recyclers do. While this is to some extent unavoidable, by linking the unruliness of waste as an object of regulation to those (dis)connections between production, consumption, and disposal, I extend the 'chains of explanation' beyond the immediate issues in the recycling industries and argue that more symmetry is needed in how things are made and how they come apart. My adaptation of the

waste regime concept connects the mode of production, the politics of waste, and waste itself in an analytical way. While the notion that the non-human world, or perhaps life itself[23], does not often cooperate with processes of commodification and/or regulation is a common theme in political ecology, the significance of these arguments is that they demonstrate what is unique about e-waste in this historical moment and suggest the challenges of coming to grips with the environmental and social implications of the current treadmill of production, consumption, and disposal that characterizes the digital age.

The rest of the chapter is organized as follows. I begin by examining the literatures on waste within geography which have focused on the 'ongoingness' (Lepawsky and Mather 2011) of economic activity beyond the point of consumption. In terms of governance, 'ongoingness' situates e-waste as distinct from most previous examples in the certification literature. Certifying recyclers is the first example of these kinds of mechanisms being deployed in the area of waste management.

Following this brief literature review, Section III describes the evolution of the regulatory context in the U.S. regarding electronic waste. "E-waste is essentially unregulated at the federal level" (Barbour 2012) which means it can be disposed of in municipal landfills or incinerators and can be freely exported with few exceptions. In theory, the R2 standard was to fill the gaps in existing U.S. law that allowed for hazardous practices to occur under the guise of recycling. However, the R2 standard development process ran in to two thorny domestic issues – the role of landfills and of prison recycling operations – as well as disputes over the appropriate way to address 'sham recycling' and the issue of exports. Section IV provides details over the nuances of these disputes and why they led to the divisions in the R2 process that led to a separate standard (e-Stewards).

[23] I thank Paul Robbins for this comment.

While these political differences help explain the presence of two competing standards for electronics recyclers, I will also argue in Section V that even had a core set of 'best practices' been agreed upon, the 'snowflake factor' of what e-waste always prevents comprehensive oversight over what e-waste recyclers do. In other words, whether following R2 or e-Stewards, efforts to codify when and where used electronics are wastes or resources is disrupted because of the heterogeneity of items classified as 'e-waste' (phones, computers, televisions, etc), their qualities (working or non-working, repairable, etc), which themselves emerge from the different manufacturing and design strategies of competing brands, contingent patterns of use, wear and tear and also repair and maintenance (Crang et al 2012), and the different political economic contexts in which recycling takes place, where wastes may become resources precisely because of lax environmental and safety regulations (Gregson et al 2012). A combination of these factors, plus the additional issue of rapid product turnover and product innovation (for example, from CRT-monitors to LED screens), recyclers all along the commodity network are *reacting* to the supply of used goods available to them; thus efforts by governments and NGO's to impose standards on their processes run into a great deal of contingency. The disconnect between the necessity of relational governance and the ideal of standardization presents a major challenge to governing the detritus of the digital age. Empirically, this chapter identifies political struggles embedded within certification processes and assesses the strengths and weaknesses of both the R2 and e-Stewards' effectiveness.

II. Labeling E-Waste Management

Voluntary standards and certification schemes have become a prominent tool of environmental governance and have proliferated across a wide range of products and processes,

from food to clothing to forest products (Baird and Quastel 2011; Guthman 2007; Hughes and Reimer 2004; Klooster 2006, 2010; Mutersbaugh 2005; Mutersbaugh and Lyons 2010). As I outlined in chapter 1, one of the most critical issues raised by the literatures on labeling and 'sustainable consumption' is the recognition that the process of defining 'sustainable practice' itself is a political one fraught with multiple ideologies and material interests. Politics and power constitute the relations of 'sustainable' supply chain management; in this case, what counts as 'good' e-waste recycling, and who gets to decide? Klooster writes that in the political processes of standardization, different actors have greater or lesser ability to shape the rigor, acceptability, and legitimacy of standards (2010) i.e. what standards do, who abides by them, and how they are perceived by the public and other actors. Furthermore, labels bring to the fore the reality that actually-existing markets are constituted not simply by economic logics of price but by 'fuzzier' logics of 'quality', 'responsibility', 'morality', and 'sustainability' (see Berndt and Boeckler 2011; Sheppard 2011).

While the literatures on certifications and labeling are useful in drawing attention to issues of power and legitimacy within commodity-networks, the extension of these policy tools to the realm of waste management raises unique issues. Waste should not be assumed to be like other certified products, like seafood or timber. In trying to understand the difficulties of standardizing global e-waste flows, the literatures on certification must be read through existing research on waste. Whether an item is a waste or a commodity shapes its trajectory through space, but waste and value are not essential, transhistorical but relational categories (Gidwani and Reddy 2011). Lepawksy and Billah accurately summarize a key tenet of waste scholarship in asserting that "practices of wasting and valuing are both spatially and temporally contingent" (2011). In short, what is waste in one place may have value in another, but this is further

complicated by the constant evolution of electronic products in terms of design, material use, size, etc. As explained below, the "different materialities of resources may be sources of unpredictability, unruliness and, in some cases resistance to human intention" (Bakker and Bridge 2006, 18), thus making waste 'uncooperative' (Bakker 2004) with institutional attempts at management. What waste *is* matters tremendously, just as the literatures on certification have highlighted the particular and local contexts of activities like fishing, timber harvesting, and coffee production (Baird and Quastel 2011; Klooster 2006; Mutersbaugh 2004; Vandergeest 2007). Beyond labeling, political ecologists are broadly critical of the tendency for the diverse biophysical characteristics of the non-human world to be subsumed within market demands and logics (Castree 2008; Robertson 2006).

Paying close attention to e-waste, rather than simply applying lessons from literatures on certification to waste, has been critical to this project. The contingencies of waste, or 'mobilities' in Davies terms (2012), have, as Moore suggested, proven to be disruptive of a great deal of existing approaches in geography that one might use to analyze the greening of economic networks. A recent flurry of work on flows of wastes and used materials such as end-of-life ships (Gregson et al 2010; Gregson et al 2012), used cars (Brooks 2012), used clothing (see Crang et al 2012), and used electronics (Lepawsky and Billah 2011; Lepawsky and Mather 2011; Lepawsky and McNabb 2010) into new arenas of production, consumption, and disposal has challenged economic geographers and scholars of global production networks (GPN's) to re-conceptualize economic activity as ongoing (not ending with consumption), multi-directional (North-South/South-North, intra-regional), governed at multiple scales and by multiple actors (not just transnational producers), and as having complex and differentiated regimes of value where 'wastes' can become 'resources'. In drawing attention to the circulation of wasted

materials, this work has pushed understanding of the 'economic' beyond production and consumption to incorporate a more complex picture of material transformation as used goods become incorporated into new products.

Waste and governance

Disrupting further still, the unique qualities of waste have been shown to be particularly important in regards to the governance or coordination of global networks for used materials. Specifically, the material heterogeneity of used goods, what Rivoli calls the 'snowflake factor' (2005; cited in Crang et al 2012), demands a relational form of governance where brokers and intermediaries, rather than lead firms, guide the extraction of value from discarded items (Crang et al 2012). In other words, because "every [used] item is individual, in terms of both the variety of products and their condition" (Crang et al 2012, 7) and "even mass-produced goods become unique due to the differential wear and use affecting their condition (ibid, 11)", processes of recovering value rely heavily on expert knowledge of materials and markets. These material contingencies are especially pronounced in the electronic waste sector. For example, Lepawsky and Billah write that

> "Unlike formalized commodity chains like cotton (Çalıskan 2010), the trade in rubbish electronics lacks the formal systems of control that standardize the commodity in terms of quality or that adjudicate disputes in cases of unsatisfactory exchanges. Consequently, Bangladeshi rubbish electronics importers must attend to their shipments with a great deal of personal attention (2011, 130)".

Recycling networks are therefore governed 'from the middle' i.e. by brokers, rather than through standards imposed through the supply-chain (Crang et al 2012, 7; see also Gibbon et al 2008). The 'snowflake factor' is central to the unique problems that arise in any attempts to standardize best practices in e-waste management. Quite clearly, waste is more than "stuff that is being

governed" (Gregson and Crang 2010, 1027) and has some agency here. The implications extend beyond theoretical issues in that practitioners of industrial ecology, who attempt to create 'circular economies' where wastes are transformed into resources, have yet to seriously engage with the snowflake factor.

In order to see how these issues of power and agency play out, the next section begins to lay some groundwork in terms of understanding the regulatory landscape that voluntary certifications emerge from. The role of the law, and of institutions like the EPA and Congress in shaping the scope and enforcement of the law, figures prominently in understanding e-waste geographies and efforts to reform them. Throughout what follows, the epigraph about rabbits and chickens and about interpretations and interests remains an important undercurrent.

III. Evolution of the Regulatory Context

Over the last 15 years, the electronics recycling industry in the U.S. has grown tremendously. A 2010 survey found 30,000 people working in an industry that produced a combined revenue of $5.2 billion (Dauod 2011). This growth can be attributed to the ubiquity of electronics in the workplace and in everyday life, and with this growth has come increased scrutiny of the regulatory environment (ibid). The survey listed regulatory uncertainty, increased demand for third-party certifications, and customer concerns about downstream accountability as major issues facing the industry (ibid). This is certainly a change from recent history; one recycler I interviewed described the e-recycling industry in the 90's and early 00's as "like the wild west. If you had a pick-up truck, you could show up at a facility and become the recycler for that company" (interview, 6/15/11). While it is difficult to measure public awareness and opinion about e-waste, anecdotally, BAN's 2002 report *Exporting Harm: The High-Tech*

Trashing of Asia "changed the frame of reference" in the recycling industry by "pulling back the curtain" regarding e-waste geographies (interview, 6/30/11). Other major media coverage by CBS (Pelley 2008), PBS (Klein 2009), and NPR (Gross 2010) also precipitated changes. One electronics recycler noticed a shift in public awareness: "Ten years ago people used to just thank us for holding a [electronics recycling] collection event. Now they ask us 'where is this stuff going'?" (interview 11/14/11). In the next chapter, I discuss in detail how demand for quality and accountability in the electronics recycling industry has shaped the marketplace.

Part of the reason that the electronics recycling industry resembled the 'wild west' is that the U.S. does not have federally mandated electronics recycling[24], e-wastes are not universally classified as hazardous[25] wastes, and the enforcement of hazardous waste regulations that do apply to e-wastes is weak (GAO 2008). In short, the electronics recycling industry is almost entirely unregulated by federal law. The implications are important for understanding why voluntary certifications emerged.

In chapter 2, I briefly described the existing regulatory context in the U.S (see Table 1). The U.S. has no recycling mandate for used electronics, and the applicable federal legislation – the Resource Conservation and Recovery Act (RCRA) – categorizes electronics destined for recycling as commodities, rather than hazardous wastes. Thus the EPA is promoting reuse and recycling rather than RCRA mandated disposal. For example, circuit boards qualify as hazardous waste, but used and unused circuit boards, as well as shredded circuit boards that have had the batteries and/or mercury switches removed are exempt from RCRA disposal Requirements. The EPA considers these items to be 'commodities' that should be managed

[24] While there are a number of state laws and federal recommendations and incentives regarding electronics recycling, I will discuss those in detail in chapter 6

[25] Hazardous wastes meet one of the four following characteristics: Ignitability, corrosivity, reactivity, and toxicity. See EPA for a full list of hazardous materials http://www.epa.gov/osw/hazard/wastetypes/characteristic.htm.

Table 1 The Resource Conservation and Recovery Act and Discarded Electronics (Domestic Requirements)			
	Hazardous but 'exempt' from disposal requirements	Hazardous but 'excluded' from disposal requirements (non-wastes/commodities)	Hazardous, mandated disposal in hazardous waste landfill
Household wastes (including electronics)	X		
Scrap metal for recycling	X		
Whole circuit boards for recycling	X		
Materials or equipment for reuse		X	
Shredded circuit boards for recycling[26]		X	
Processed CRT glass for recycling		X	
Intact whole CRT monitors for recycling		X	
Generated by non-households, generated at a rate of 220lbs/month, and intended for disposal not recycling			X

[26] Packaged to prevent release, with batteries and mercury switches removed.

Table 1 The Resource Conservation and Recovery Act and Discarded Electronics (Domestic Requirements). Source: Tonetti 2007

through markets. Thus, from a regulatory perspective, whether something is hazardous or not depends not just on its physical properties, but on how it is being used. If it is not a rabbit, you can eat it any day of the week.

The exemptions and exclusions in RCRA have been expanded over time (Abela and Campbell 2009; Puckett et al 2002). Cathode-ray tubes, which contain several pounds of lead, were formerly treated as hazardous waste under RCRA (see Figure 3).

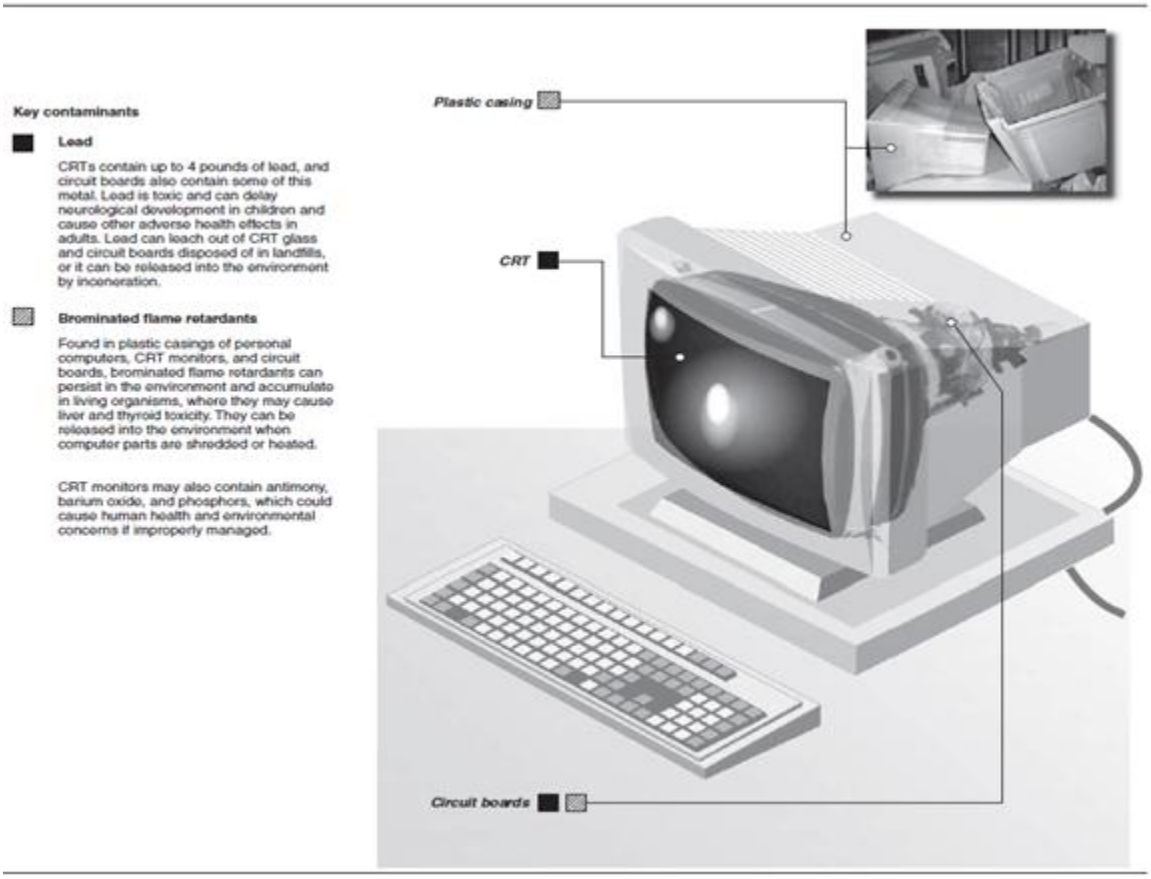

Figure 3 Anatomy of a cathode-ray tube (CRT). Source: Government Accountability Office (2008, 12)

However, in 2006, the EPA formulated the 'CRT Rule', which "reduced regulatory requirements that previously applied by creating an almost complete exception to CRTs destined for recycling or reuse domestically, and triggering only notice and consent requirements for foreign export" (Abela and Campbell 2010, 9). For example, intact whole CRT units have no domestic regulations and their export for re-use is allowed as long as the exporter sends a one-time notification of shipment to the EPA and maintains records of the shipment for three years. Likewise, processed and sorted CRT glass is treated as a commodity. *The only currently existing restriction on the export of electronics* is that shipments of broken CRT's require a 60 day notification of export and the consent of both exporting and importing government authorities.

While the EPA's reasoning behind these exemption and exclusions is to promote recycling and reuse[27], critics argue that these exemptions and exclusions are actually loopholes that brokers use to export non-working waste electronics and hazardous scrap to developing countries (Abela and Campbell 2010; Puckett et al 2002; Puckett et al 2005). In their 2002 report, BAN argue that "by exempting E-wastes from export regulations, the U.S. subjects the rest of the world to its policy of ignoring the inherent risks in a material simply because somebody claims on a bill of lading that the material will be recycled" (Puckett et al 2002, 28). This view stands in contrast to the EPA's view the designation of hazardous is related to the context of how a waste is being handled. The director of BAN likened the term 'recycling' to a 'password' licensing any type of e-waste export (NPR 2010). While promoting recycling is often preferable to mandating landfill disposal, simply notifying and receiving consent from an importer falls well short of actually verifying that socially and 'environmentally sound

[27] Eric Harris of the Institute of Scrap Recycling Industries said of the CRT Rule: "the EPA has codified a longstanding principle in the scrap recycling industry: that scrap is not waste and recycling is not disposal" (Barlas 2006)

practices'[28] will be used in the recycling process. Although RCRA ostensibly controls hazardous waste from 'cradle-to-grave' (generation, transportation, treatment, storage, and disposal), because RCRA does not require importers of hazardous materials to use environmentally sound practices, it has been derided as 'cradle-to-border' regulation (Hoskinson 2011, 7). E-wastes may leave the U.S. classified as 'commodities' or 'non-wastes', but that does not preclude the possibility that hazardous characteristics could present themselves somewhere 'downstream'.

Although RCRA's consent and notification requirements for e-waste exports are weak, they are routinely violated. Commenting on the poor enforcement of the CRT Rule, electronics recycler Robin Ingenthron remarked in a blog that "I have kept meticulous [consent to trade] records, and can't get anyone at EPA or Region I to show any interest in them. They aren't getting them from any of my competitors, either. This is how "reuse" becomes a loophole" (Ingenthron 2012). In 2008, the Government Accountability Office found this loophole was being regularly exploited. In a 2008 'sting', GAO investigators posed as foreign buyers and found 43 recyclers willing to ship broken CRT's without following the notification and consent requirements of the CRT Rule (GAO 2008). And as Abela and Campbell note, "To add insult to injury, many of the recyclers that offered to ship illegally the CRTs abroad also actively cultivate a 'green' image, stating that their practices are 'environmentally friendly…' (2010, 10).

To summarize, RCRA has a rather narrow scope for defining hazardous wastes (household hazardous wastes are excluded from RCRA disposal requirements), and even those materials defined as hazardous can be exempt or excluded from RCRA disposal requirements if they are sent for recycling or some other commercial activity. An electronics recycler in the U.S. can skirt RCRA by labeling a shipment as 'non-waste' or as destined for 'recycling', allowing

[28] Environmentally sound practices has a specific meaning under the Basel Convention which will be explained below.

him or her to send what the industry calls 'toxics along for the ride' – mixing unusable waste electronics in with shipments of working devices or commodity-grade scrap. In terms of enforcement, only CRT's are actively regulated, but these regulations simply require documenting notification and consent of exports and do not include any requirements that importers safely manage shipments.

In response to these shortcomings, the GAO recommended in 2008 that the EPA expand the scope of the CRT Rule to include notification and consent for CRT's exported for reuse (and not just recycling) and ensure that environmentally sound practices are being used outside of U.S. borders (8). They also recommended that the U.S. ratify the Basel Convention[29], which would harmonize RCRA with international law, and that the EPA work with Customs and Border Protection and the International Trade Commission to "improve identification and tracking of exported used electronics" (ibid). In response, the EPA disagreed with these recommendations and said "(1) it did not want to build an 'extensive compliance monitoring and enforcement program' around the CRT rule or any other individual provision of its broader RCRA program and (2) it preferred nonregulatory, voluntary approaches to address the problems discussed in this report" (GAO 2008, 8).

It is precisely these ambiguities and loopholes in the law that have generated demand for voluntary regulatory oversight. The law figures prominently in most accounts of e-waste management, and in chapter 3 I discussed Lepawsky's Latourian analysis of e-waste regulation where he argues that the law, or the 'work of jurisdiction', generates social responses to waste only *after* it has been produced (2012, 1194). I am in general agreement with Lepawsky's argument about the end-of-pipe focus of the law, but think a fuller account of how e-waste

[29] The Basel Convention on the Transboundary Movement of Hazardous Wastes and Their Disposal is the major piece of international legislation regulating the trade in hazardous wastes. The intersections of RCRA and the Basel Convention will be discussed in detail in the section on exports below.

comes to be politicized and governed should account for the *absences and/or ambiguities* of the law, particularly around exemptions and exclusions for certain materials as well as trade and labor conditions. It is precisely because U.S. laws at the federal level are not comprehensive and not well enforced that an opportunity is created for NGO's, industry groups, and other paramarket organizations to create voluntary labeling schemes and certifications that fill those gaps while also working to extract value from e-waste circulation. These absences and ambiguities allow discourses such as 'toxic trade' to do the work of 'moral ordering' by interpolating the consumer as a political actor (Guthman 2007) who, through the use of labels, accomplishes what the law does not. Lepawsky's main point – that e-waste is produced as a problem of post-consumer waste distribution rather than one of production – still holds, but the argument developed here is that this is not purely a function of the law, but also of its absence (see Barkan 2011).

Why third-party certification?

Before analyzing the labeling schemes themselves, it is worth analyzing more fully why the EPA sought to work with NGO's and industry groups to develop a voluntary scheme instead of simply changing the requirements for electronics recyclers under RCRA. The exemptions and exclusions in RCRA could be closed, thus expanding the scope of what is regulated directly by the EPA. But in an interview, one EPA official familiar with electronics recycling cited the Paperwork Reduction Act of 1980 as a barrier to direct regulatory change. Under the Paperwork Reduction Act, a federal agency cannot solicit information from more than nine entities without first receiving approval from the Office of Management and Budget (OMB). The EPA official told me

> "if you can't get information it's harder to regulate…so when we [the EPA] went through the development of these [electronic recycling] guidelines we said 'we don't wanna go through OMB, they're gonna change the guidelines'. It's just too much paperwork and time involved. So we said 'we're going to look at developing some sort of third party scheme'" (interview 5/16/11).

In other words, the EPA cannot promulgate regulatory changes without gathering information. To gather information, they need OMB approval, which also subjects those changes to scrutiny by the OMB. The fact that a federal agency is hamstrung in its regulatory capacity by 'paperwork reduction' is revealing of a how market-based certification scheme can become such an appealing regulatory tool. As the sphere over which agencies can decisively act gets smaller, public-private partnerships are easily rolled out as institutional 'fixes'.

In addition to skirting OMB requirements, what makes third-party voluntary certifications more politically palatable than direct regulatory change is that these certifications are not legally-binding or mandatory. It is important to bear this in mind when assessing what certifications do, because it is not the case that failing a certification audit necessarily involves any legal liability. Certifications provide the appearance of reform and change, without necessarily mandating it. A certification audit is simply intended to highlight compliance with the law, and as such the audit is key to the entire certification process. Both the R2 and e-Stewards certifications audit procedures are relatively the same in that they follow a quality control system known as PDCA – Plan, Do, Check, Act. PDCA essentially asks a business to come up with a plan, carry it out, collect data, and take corrective action.

An audit for recyclers based on PDCA involves an auditor reviewing a set of documents that guide a facility's operation[30]. These documents include things like insurance certificates, compliance documents, downstream vendor information and audits, operating procedures, and

[30] R2 and e-Stewards are 'third-party certifications' where the auditor is the neutral third-party who is supposedly conducting an unbiased review.

environmental health and safety plans[31]. In phase one, auditors review these documents and in phase two they conduct site inspections. When auditors detect processes that are out of line with the standard they are auditing to, the recycler would need to document that a 'corrective action' has taken place. Once recyclers complete both phases and meet the standard, they receive certification. In short, the certification procedure more or less relies on a recycler creating a paper trail that makes their in-house processes transparent and documents that their downstream vendors are transparent in their handling of material as well. It is essentially a 'snap-shot', and one of the administrators of the R2 standard was careful to explain to me that certifications are not enforcement programs (interview, 6/27/11). Certifications are not inspections of shipping containers, for example. Furthermore, there is nothing to stop a recycler from generating the necessary documentation to achieve certification, and then doing something completely different in their day-to-day activity.

The auditors are themselves certified by ANSI-ASQ National Accreditation Board (ANAB) which "assesses and accredits certification bodies that demonstrate competence to audit and certify organizations conforming to management system standards" (website)[32]. When comparing R2 and e-Stewards, the important thing to note is that in e-Stewards, the recycler must pay the auditor *and* must pay BAN a 'licensing fee' to display the e-Steward logo. Up until May of 2013, the R2 certification process only required recyclers to pay the auditors for the compliance review. R2 has now announced that they will also charge a licensing fee in order to finance more 'aggressive' marketing of the standard (R2 Update 2013). Another major difference is that R2 is an open-source standard, meaning anyone can view the requirements. E-Stewards is owned by BAN and is a proprietary standard, which means the requirements are

[31] One auditor described these documents as a 'manual', and likened it to a recipe.
[32] ANAB audits the auditors

hidden behind a pay-wall[33]. BAN explains that they use the money from the licensing fee to expand marketing of the standard and to provide technical advising for recyclers.

One auditor familiar with both standards said that from a 'systems perspective', the auditing process is basically the same for both (interview, 8/17/11). A different auditor also came to the same conclusion, but told me that members of BAN get "angry" when the similarities between the auditing procedures are brought up (interview, 8/15/11). Creating distance between the two standards and the marketing competition over which certification embodies best practices is taken up in detail in chapter 6. Before getting there, the next section describes how the differences originated at the initial R2 development meetings.

IV. R2 and E-Stewards Development

R2 going beyond the law?

Returning to the issue of ambiguities and failures of the law to protect people from harm in the e-waste recycling process, between 2006-2008, 25-30 members of several different organizations met to define the details of the R2 voluntary certification standard. The meetings were funded by the EPA, but the EPA was very careful to position themselves as 'just another stakeholder', meaning the R2 standard was not to be confused with an 'EPA certification'. Although R2 exists today as a third-party standard, the EPA did play a big role in defining the scope of what would be addressed. One of the members of BAN present at the meetings told me that the expectation was that the R2 standard would actually go *beyond* what recyclers are legally required to do given that RCRA only regulates a small sub-section of discarded electronics and

[33] During the course of this research, I was never able to actually see the e-Stewards requirements. Even if I had paid to see the standard, I would be prohibited from reprinting it. I was, however, able to access their guidelines for implementing the requirements, which filled in some of the blanks.

that enforcement is weak. Even though the EPA was 'just another stakeholder', a representative from BAN present at the meetings said

> "There were two issues that came up where they [EPA] absolutely surprised everybody and put their put their foot down and said this multi-stakeholder group may not go where you're headed. Those two issues were on banning prison recycling, they said we won't allow this standard to ban prison recycling because they wanted [the government] to be able to use FPI [Federal Prison Industries]. So that was off the table. So the EPA said R2 may not ban prisons. The second issue was allowing toxic materials to go into landfills and incinerators. They told us they would not allow the R2 standard to go beyond regulations! This was two years into the dialogue they dropped this bomb. People said 'wait a minute we thought we were here precisely to go beyond regulations with this voluntary program and they said 'sorry can't go there'" (Interview, 4/13/11).

As discussed in chapter 3, the exercise of power is not always an overt, coercive process but can also be as simple as setting an agenda that includes and excludes certain things. The EPA drew boundaries around the role of landfills and prison recycling in a voluntary system, placing them beyond the reach of R2's reform. Thus the R2 standard was effectively relegated to simply highlighting recyclers' compliance with RCRA, rather than drawing attention to recyclers who went above and beyond RCRA's meager requirements. While the landfill issue is relatively minor[34], the question of whether UNICOR, a government-run corporation that employs prisoners in e-waste recycling, could be certified as part of the emerging 'green' infrastructure that R2 was ostensibly creating was a major stumbling block to finding consensus over 'best practices'. Prison recycling, and prison labor more generally, is highly controversial and certainly merits some analysis.

[34] Provision 5 of the R2 standard states: "An R2 electronics recycler shall not utilize energy recovery, incineration, or land disposal as a management strategy for FMs or equipment and components containing FMs [Focus Materials i.e. hazardous wastes]. However, if circumstances beyond the control of the R2 recycler disrupt its normal management of an FM, it may consider these technologies to the extent allowed under applicable law". The reasoning behind this provision became clear in 2012 when declining demand for CRT recycling led California to consider allowing CRT glass to be disposed of in hazardous landfills as opposed to the normal requirement that the glass be recycled (Thomas 2012). In short, as the market for CRT's declines, fewer options for recycling are available and landfilling becomes more necessary.

Unicor prison recycling

UNICOR is a wholly-government owned corporation created by Executive Order in 1934 in order to provide inmate training and rehabilitation for federal prisoners by offering various work programs (UNICOR 2009)[35]. Administered by the Bureau of Prisons within the Department of Justice, UNICOR is a significant player in the e-waste industry[36] because of its contractual relationships with the federal government, the largest purchaser of IT in the world (GAO 2010). As the prison population exploded after 1980 and continues to rise dramatically (Tonry 2004), UNICOR's role as a management tool has become seemingly indispensable to those working within the prison system (UNICOR 2009). However, despite UNICOR's size and government support, many of UNICOR's practices are controversial and potentially inimical to the goals of certification.

First, UNICOR does not refer to itself as a competitiveness business, but rather considers itself a *"management tool that the BOP relies on to control its overcrowded facilities*" (UNICOR 1993, 3, cited in Jackson et al 2006, 20, emphasis added). It is this distinctive disciplinary mandate, rather than profitability, or environmental protection per se, which forms the foundation of UNICOR. For instance, UNICOR practices "measured modernization – limiting automation in order to maximize the number of prisoners who work" (Jackson et al 2006, 6). Few industries on the 'outside' would engage in such a practice, yet UNICOR is working within an exceptional set of institutional requirements. Secondly, prison laborers are not considered

[35] The official mission statement of UNICOR reads "It is the mission of UNICOR, Inc. (FPI) to employ and provide job skills training to the greatest practicable number of inmates confined within the Federal Bureau of Prisons; contribute to the safety and security of our Nation's federal correctional facilities by keeping inmates constructively occupied; provide market-quality products and services; operate in a self-sustaining manner; and minimize FPI's impact on private business and labor…When the prisoners work, so does the system" (UNICOR website, "About" section).

[36] UNICOR operates seven e-waste recycling facilities in prisons around the U.S., employing around 900 inmates. These operations generate about $8-10 million dollars a year (UNICOR website). In all industries, UNICOR employs about 17,000 federal inmates but is short of its goal to employ 25% of the federal prison population.

'employees' under the Fair Labor Standards Act, and as such are prohibited from organizing, are not protected from employer retaliation, nor are external health and safety inspectors allowed to conduct surprise visits to factory floors. Third, in order to avoid competition with the private sector, UNICOR began pursuing a number of unique business strategies in the 1990's, such as expansion into services, 'repatriating' work from sweatshops abroad[37], and 'expanding pie' situations where UNICOR can expand alongside the private sector rather than in a zero-sum relationship (UNICOR 2009; see also Congressional Research Service 2007).

BAN and ETBC opposed UNICOR's involvement in the electronics recycling industry because their investigative reporting uncovered allegations of prisoner and staff exposure to hazardous materials in the workplace (Jackson et al 2006). The Department of Justice's Office of the Inspector General found UNICOR to have operated CRT-glass recycling factories without adequate health, safety, and environmental oversight for years in the late 90's-early 00's, exposing inmates and staff to poisons (OIG 2010). Furthermore, UNICOR misled investigators about these health and safety issues and overall exhibited "a culture that did not sufficiently value worker safety and environmental protection" (ibid, xii). These conditions have led detractors of UNICOR to argue that they represent a 'sweatshop-model' of e-waste recycling that decreases the quality of domestic recycling infrastructure (Jackson et al 2006, 25) and undermines reform. However, because UNICOR performs such supposedly critical disciplinary functions to the mass incarceration system, the EPA was not in a position to cut UNICOR out of the R2 voluntary standard. Even though UNICOR operates according to a unique set of institutional logics (security, labor-intensity, and internal oversight) that are inimical to notions

[37] The Basel Action Network estimates that 50-80% of e-waste that is collected for recycling in the U.S. is actually exported to recyclers in developing countries, where environmental and health and safety regulations are often lacking (Puckett et al 2002; see also GAO 2008).

of social and environmental justice, UNICOR now has several facilities certified to the R2 standard.

Despite a great deal of excellent work on the relationship between the prison-industrial complex and labor markets[38] (see Beckett and Western 2001, 2010; Chiricos and Delone 1992; Peck and Theodore 2008), to date no studies have addressed the ways in which UNICOR's growth-qua-prisoner management strategies have come into direct contact/conflict with parallel state strategies to create 'sustainable' and 'green' markets 'on the outside'. The particular bureaucratic strategies of UNICOR seem to work at cross purposes with efforts to reform the e-waste commodity network. Unfortunately, a more thorough investigation of UNICOR was not possible in this study given problems related to accessing prisons as research sites. Crucial questions will have to remain unanswered for the time being. Possible future research questions include investigating how prison policies are coordinated with environmental and worker safety policies and how UNICOR navigates contracts despite diverse political opposition.

The Politics of Classification in E-Waste Trade Debates

The third and most divisive issue surrounding the R2 standard was that of export, particularly tensions over U.S. recyclers and regulators obligations under RCRA and their obligations (if any) under international legislation (the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal). According to interviews, the stakeholders, all agreed that the R2 standard would disallow any exporting practices that would violate the laws of importing countries. However, a major dispute arose over interpretation of the Basel Convention, which is an international agreement brokered at the

[38] Most of these studies focus on the relationship between unemployment rates and incarceration and on the employment effects that incarceration has on ex-inmates.

United Nations in 1989. The Basel Convention, ratified by 172 countries, requires 'prior informed consent' (PIC) and 'environmentally sound management' (ESM) for the shipment of hazardous wastes between OECD and non-OECD parties to the Convention. The Convention also prohibits any non-party to the Convention (e.g. the U.S.[39]) from trading hazardous wastes with a Basel party (e.g. Indonesia), unless they had previous bilateral, multilateral, or other agreements in place[40]. In theory, if R2 was going to be consistent with the laws of importing countries, it could not permit the export from the U.S. of hazardous wastes to non-OECD countries that have ratified the Basel Convention.

Interviews revealed a rift in interpretation of the Basel Convention at the R2 meetings, and thus a tension over what constituted a legal export. There were two related issues that came into play: how R2 defined 'focus materials' i.e. hazardous wastes, and how R2 codified the export requirements for used electronics traded for repair. As a non-party, the U.S. cannot trade hazardous waste with a party to the Basel Convention, but if used electronics are not waste, then the Convention does not apply. Refrain: If it is not a rabbit, you can eat it any day of the week.

Scope of the Basel Convention

The environmental NGO's in the R2 process wanted the R2 standard to peg its definitions of hazardous wastes, what the R2 group was calling 'focus materials', to the Basel Convention. The Convention, which came about in response to several high profile incidents of hazardous

[39]As Gaba explains, "The reason that the United States has not ratified Basel is the universal assumption that the requirements of Basel could not be implemented unless Congress enacted legislation granting EPA additional authority. In testimony to Congress, the Administrator of EPA and the Assistant Secretary of State for Environment stated that the United States could not ratify the Basel Convention until Congress had adopted amendments to RCRA that conferred authority on EPA to implement the Convention" (2012, 468). In other words, the EPA is passing the buck to Congress. Gaba actually argues that the EPA already has the authority to amend RCRA to be line with Basel.

[40] The U.S. has bilateral agreements in place with Mexico, Canada, Costa Rica, Malaysia and the Philippines and a multilateral agreement with the OECD countries, which means the U.S. can legally trade hazardous wastes with these countries under the various stipulations of those agreements (see Gaba 2011 for a detailed explanation).

waste dumping in poor countries (Basel Convention at a Glance, no date), is similar to RCRA in that the Convention requires exporters of hazardous waste to receive PIC from importers. But the Convention differs from RCRA in two significant ways. First, the list of materials considered hazardous under Basel is broader than RCRA, mainly because Basel does not provide the same exemptions and exclusions for hazardous items if they are traded for recycling. An intact, whole CRT monitor is treated as a hazardous waste under Basel regardless of whether it is sent for recycling or disposal. Second, in addition to PIC, the Convention also prohibits the export of hazardous wastes if the exporting country "has reason to believe that the wastes in question will not be managed in an environmentally sound manner" (Basel Convention, Article 4 (2)(e)). The Convention defines "environmentally sound management" (ESM) as "taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes" (Puckett et al 2002, 32).

The most important thing to note is that Basel does not actually ban the export of hazardous wastes but simply requires consent, documentation, and environmentally sound management of imports and prohibits non-parties like the U.S. exporting to Basel parties. When BAN and ETBC pushed for R2 to completely ban most e-waste exports, the group came to the compromise that instead of a ban, R2 simply had to be legal according to the laws of the importing country. Since Basel has a broader definition of hazardous wastes, and since the U.S. is not allowed to trade these wastes with parties to the Convention, the idea was that this provision would eliminate most toxic trades. However, the R2 standard did not totally mesh with Basel's hazardous waste definitions because it leaves out certain materials that Basel

covers[41], allows many shredded electronics to skirt hazardous designation[42], and allows small shipments to be exempt from export regulation[43]. Because of these deviations (and other ambiguous language, see BAN and ETBC 2008) from Basel, R2 certified recyclers can potentially violate the laws of importing countries while complying with the certification because what they are shipping is, according to R2, considered to be a non-waste and thus not covered by Basel. This is a serious flaw in R2 and one of the reasons BAN split to create e-Stewards.

Annex IX, B1110: The struggle over a footnote

The other major divide over the export issue whether the Convention (and by proxy, R2) would allow the export of used electronics for *repair*. While the Convention is clear on defining prohibited wastes, such as broken cathode-ray tube monitors, and allowing trade in commodities, such as working electronics, repair is a less clear category. Did exporting a non-working computer or phone that could possibly be repaired constitute a shipment of hazardous waste or a movement of a commodity? The questions of functionality and repair raised in these meetings are revealing of the ways knowledge and representation figure prominently in the governance of networks, but also of the way in which materiality strongly conditions these practices.

At those meetings, BAN argued that the Basel Convention only allows for the export of electronics that have been 'tested' and are 'fully functional' (working commodities). According to BAN, requiring tests of functionality is the only way to ensure that 'export for re-use or repair' is not a loophole for circumventing hazardous waste export controls i.e. labeling a shipment as

[41] These include materials containing cadmium, beryllium, chromium, arsenic, selenium and hazardous toners (BAN and ETBC 2008).
[42] Under R2, shredded electronics can contain 'de minimus' amounts of toxics and be exempt from export regulation. The Convention covers 'de minimus' toxins (BAN and ETBC 2008, 8).
[43] Shipments of less than 15 untested or non-working units for "sampling" are exempt from all due diligence requirements and export restrictions [citations: 6(d) and (f)] as long as they are not "shipments within a proximate timeframe" (BAN and ETBC 2008, 7).

'reuse' to get around hazardous waste regulation (BAN 2011). BAN argues that if an item is exported and a part is removed or upgraded in a repair (e.g. RAM upgrade), if that part is discarded or recycled in the importing country then the entire shipment violates the Basel Convention because a waste has been created (the disposed of part) (ibid). BAN's basis for this 'tested' 'fully functional' requirement are two Basel Convention 'guidance documents' , one for mobile phones[44] (Basel Convention 2008, 47) and one for computing equipment[45] (Basel Convention 2011, 42). Despite the fact that these guidance documents are not legally binding[46], BAN argued that in order for R2 to be compliant with international law it would have to adopt the 'tested' 'fully functional' specification. This interpretation effectively cuts off all forms of repair in the importing country, and instead suggests that the exporting country should conduct any necessary repairs *before* materials are shipped.

But a closer reading of the 'tested' 'fully functional' requirement in the two guidance documents reveals a very important footnote. In the guidelines for computing equipment, once a device has been tested and is fully functional[47], it can be imported by a Basel party for the purpose of direct reuse, but not disposal or recycling (PACE 2011, 48)[48]. But direct 'reuse' contains a footnote linking back to the Basel Convention, which says that "reuse can include repair, refurbishment or upgrading, but not major repair" (Annex IX of the Basel Convention,

[44] The Mobile Phone Partnership Initiative (MPPI). Available at http://archive.basel.int/industry/mppi/gdfd30Jun2010.pdf

[45] The Partnership for Action on Computing Equipment (PACE). Available at http://archive.basel.int/industry/compartnership/docdevpart/GuidanceDocumentPACE-2011-03-18.pdf

[46] As explained to me by someone who participated in the PACE guidelines, "A guidance document written by a small subset of representatives to [Basel Party] meetings is not binding law, it is grounds for dispute mediation if two parties disagree. If it was actually the way [BAN] interprets it - a binding ruling, like a court or regulator - then the USA was right not to ratify the Convention and no nation should give sovereignty to a subset/committee of international bureaucrats" (personal communication, 4/26/11).

[47] Computing equipment or components are "fully functional" when they have been tested and demonstrated to be capable of performing the essential key functions they were designed to perform. Essential Key Function: The originally-intended function(s) of a unit of equipment or component that will satisfactorily enable the equipment or component to be reused (PACE 2011, 48).

[48] The same footnote appears in the guidance document for mobile phones.

List B 1110). Other stakeholders at the R2 meetings grabbed onto List B 1110 to argue, contra BAN and ETBC, that the R2 standard should leave open the possibility that exports for repair could be considered legal. These stakeholders wanted R2 to protect what is known as 'elective upgrade' of imported equipment. For example, as one recycler present at the R2 meetings wrote in a blog, many contract manufacturers of western brands import 'fully functional' used items but still remove parts, make upgrades, and recycle discarded parts (Ingenthron 8/21/10). For example, the Foxconn factory, which makes new equipment, might also import fully functional used Pentium III PC's but 'electively upgrade' them to Pentium IV's, creating 'wasted' capacitors in the process[49]. Proponents of protecting elective upgrade in R2 interpreted the Basel Convention as saying that as long as these spent capacitors are recycled in an 'environmentally sound' way, it would appear that the shipment would be legal[50]. Whether and how these disputed interpretations between guidance documents and Annex IX play out in international law is still up in the air. But the importance of the footnote suggests two things: one, exporting 'fully functional' devices is no guarantee that direct re-use takes place and two, not all of the importers of used electronics are informal scrap dealers. These grey areas indicate the ambiguities that arise as standardization runs into the 'snowflake factor' and contingent regimes of valuation.

While this debate continues to evolve, the fact that BAN, which is an NGO and not an official party to the Basel Convention, acted as an interpreter of an international agreement created problems for the EPA. One participant remarked that "what happened was that the EPA was put in the very uncomfortable position of having to either side with ISRI [list B1110 protects

[49] Contract manufacturers for electronics demonstrate the multiple linkages that make up global production networks. These contractors may produce name-brand electronics for major manufacturers, but they also may serve the 'grey market' i.e. producing 'knock-off' brand items for consumption in other markets.

[50] Whether or not those contract manufacturers could recycle discarded parts themselves or would need to re-export the part is unclear.

export for repair] or side with an NGO [export for repair is illegal] and they didn't want to do either of those things" (interview 4/12/11). Instead,

> "the moderator of the R2 meetings did something which was fairly ingenious: he said why don't we just say 'a practice must be legal'. Saving us all the time of reading…whether one interpretation of this Annex IX B 1110 or [BAN's] is correct, we can just continue the momentum by everyone agreeing that it 'must be legal'" (interview 6/27/11).

At this stage of the R2 development process (two years in), BAN left the negotiations in part on the basis that allowing export of items for repair would violate the Basel Convention. They decided to create their own standard, which would become e-Stewards.

As a result of these disputes over classification, the R2 standard came into effect in 2009, and it allows certified recyclers in the U.S. to export working equipment and equipment for repair provided that they have been 'tested' and have 'key functions', that the export is legal according to the laws in the importing and exporting country, and that this legality is documented in writing by the 'competent authority[51]' in the importing country. In my opinion, one of the good things about R2 is that it tries to protect repair economies from being cut out of the market. One of the R2 proponents remarked that "we were successful in having R2 open the gate for repair and refurbishment, which BAN tried to close and started e-Stewards in order to close it" (interview, 06/27/11). However, R2's critics are correct to point out vague language and inconsistencies with the Basel Convention. Even though R2 prohibits the export of hazardous wastes to Basel parties, it has slightly less stringent definitions of what hazardous wastes are. This opens the door for recyclers audited to the R2 standard to still potentially violate the Basel Convention. And even though UNICOR has ceased the CRT-glass breaking activities at their

[51] Another point of contention is whether the competent authority should be an environmental agency or a commerce agency.

facilities that led to harmful exposure of inmates and staff, the use of hyper-exploited, vulnerable populations in potentially hazardous work is unconscionable.

After leaving the R2 meetings in 2008 on the basis that the Basel Convention bans export for repair (despite ambiguity over the Conventions rules), BAN created and rolled-out the e-Stewards standard in 2010. Although many of the provisions are the same as R2, e-Stewards takes a different approach on the export issue and also has a more rigorous industrial hygiene monitoring system[52]. As the director of BAN wrote in a blog, e-Stewards calls on recyclers to "behave as if the United States had ratified the agreements of the Basel Convention and the Basel Ban" (BAN FAQ's, n.d.). The Basel Ban is an amendment to the Basel Convention that was drafted in 1995 but has yet to receive enough signatures to enter into force. The Ban goes beyond the Convention's requirements of 'prior informed consent' and 'environmentally sound management' for exports by banning all exports of hazardous wastes, even for recycling. Like R2, e-Stewards requires downstream audits but also demands that recyclers adhere to BAN's interpretation of the Basel Convention, which BAN argues prohibits export for repair. In this view, the potential dangers of electronics recycling are prioritized over the commercial possibilities. Exports to non-OECD countries for disposal, recycling, and repair are voluntarily banned under e-Stewards, which means that only processed scrap and working materials that are sent *directly for re-use* can be exported. Table 2 provides a broad comparison of R2 and e-Stewards.

[52] E-Stewards are required to have the ISO: 14001 environmental management system in place.

Table 2. Comparison of R2 and e-Stewards Standards		
	Responsible Recyclers (R2)	e-Stewards
Origins/Development	• EPA funded meetings 2006-2008. • Consulted recyclers • Certification became available in 2009.	• Created after BAN and other NGO's left the R2 development meeting over disagreement that allowing exports would violate laws of developing countries. • Consulted recyclers. • Available in 2010.
Key Supporters	• Institute of Scrap Recycling Industries (trade group) • Recyclers	• Greenpeace • Natural Resources Defense Council • Sierra Club • Recyclers • e-Stewards Enterprises (waste generators that pledge to use only e-Stewards certified recyclers)
Exports for Recycling	• Allowed, 'must be legal' according to the EPA and importing country. • Used electronics primarily considered to be commodities	• Prohibited, with the exceptions of processed commodity-grade scrap and 'tested and fully functional' items for re-use. • Standard based on international treaty (Basel Convention) • Used electronics primarily considered to be hazardous wastes.
Key Marketing Strategies	• Exports bridge the 'digital divide'. • 80% of used electronics are processed within the U.S. • Exports create American jobs. • Recycling prevents need for raw materials.	• Exports are violation of global environmental justice principles. • 50-80% of used electronics collected for recycling in the U.S. are exported. • Preventing exports creates American jobs.
Number of Facilities Certified (as of November 2012)	• 311 (Certified)	• 126 (Certified or contracted to certify) • 41 e-Stewards Enterprises

Geographic Distribution of Certified or Contracted to Certify Recycling Facilities	• 297 North America (~95%)
	  ○ 7 Canada
	  ○ 6 Mexico
	  ○ 1 Costa Rica,
	  ○ 283 U.S.
	• 5 Europe (~2%)
	  ○ 4 U.K.
	  ○ 1 Germany
	• 9 Asia (~3%)
		• 125 North America (> 99%)
		  ○ 2 Canada
		  ○ 4 Mexico
		  ○ 119 U.S.
		• 1 Europe (U.K.) (< 1%)

	○ 1 China ○ 2 Malaysia ○ 1 India ○ 4 Australia ○ 1 New Zealand	
Certification Process	• Third-party auditing by accredited certifying body • Two-stage audit • Annual follow-up audits	• Third-party auditing by accredited certifying body • Two-stage audit • Audits usually witnessed by BAN consultant • 'Surveillance' audits (potentially more frequent than annual)
Environmental management system (EMS)	• EMS required, but specific system left to recycler to chose	• ISO 14001 required
Fee Structure	• Recycler pays auditor • Auditing fee estimated at US $6,000-15,000, or more depending on activities and size of facility • Recycler pays R2 Solutions licensing fee of $1500 per facility • Additional cost of establishing an EMS	• Recycler pays auditor • No estimates given for auditing fee • Recycler pays BAN a licensing fee to use label • Additional cost of achieving ISO 14001
Allows prison labor recycling	• Yes	• No
Standard is publicly available	• Yes	• No, proprietary

Table 2. Comparison of R2 and e-Stewards Standards

V. The Snowflake Factor – Bringing in the Non-Human

A strong argument can be made that competing ideologies about trade and environmental protection between actors involved in the development of the R2 and e-Stewards standards generate friction over the standardization of best practices in electronics recycling. This is no doubt part of the story. However, perhaps a more nuanced analysis would include engagement with the capacities that e-wastes themselves have in resisting commodification and/or regulation.

If e-waste did not have such a great deal of flux in its status as a commodity or a waste, standardizing its treatment would be simpler. In this section, I consider the relations between the material qualities of e-wastes and some of the particular tendencies of capitalism. As I will argue here, it is precisely in the chaos of production and competition, driven by logics of capitalist value, that some of the key underlying socio-environmental issues of the digital age originate and to which recyclers are tasked with remedying. More specifically, planned obsolescence, an industry principle of stimulating consumer demand either by limiting the life-span of a product or creating minor aesthetic changes (Slade 2006) leads to rapid product turnover[53], which means recyclers are constantly responding to technological changes driven by competition between producer brands. This continuous turnover is further exacerbated by design choices that pose problems for recyclers, whether because toxic materials are used or the designs are intended to suppress repair and re-use, or both. The ability to externalize the negative effects of these production choices is made possible through the political disconnect between production and disposal, where e-waste becomes a problem of distribution and technological/management capacity for consumers, governments, and the recycling industry. The result is a massive stream of e-waste, much of it toxic and designed without recycling in mind, where distinguishing between commodity and waste, between recyclable and repairable, is highly contingent and often difficult. I now turn to each of these moments and the ways in which these conditions undermine the work that recyclers and regulators do.

[53] As Bill Gates famously said, "the only big companies that succeed will be those that obsolete their own products before someone else does" (quoted in Nunes and Breene 2011).

Planned obsolescence, disposability, and recycling

Many electronic items have been present in the waste stream for years and even decades. For historic e-wastes such as CRT-monitors, making determinations of functionality and recyclability involves rather straightforward testing procedures that recyclers have been using for years. But the electronics marketplace is extremely dynamic and new materials are continuously entering into consumption and thus disposal. For example, the UK's Ministry of Environment found that an average of 60 to 70 new smartphones enter the marketplace each year (cited in MyPhoneMD, 16 July 2012). While space does not permit a full analysis of the political economic origins of planned obsolescence (see Blumberg and Gottlieb 1989; MacBride 2011; Slade 2006), it is readily visible in today's electronics market. Apple's vice president for marketing recently stated "Isn't it amazing how something new makes the previous thing instantly look old?" (quoted in Bilton, 28 October 2012). Such restructuring of economic activity around waste blurs the lines between genuine innovation and devaluation[54], and it is most certainly an outcome of 'accumulation for accumulation's sake' and a perverse effect of capitalism's necessity for growth (Pellow 2007). It should also be read as one of the underlying causes of the growth of waste production, a topic that largely remains taboo in the policy realm (Gille 2007; Lepawsky 2012; MacBride 2011).

While the disposability of electronics may be a necessity for capital accumulation, this does not mean electronics are designed for ease of recycling in mind. Instead, the opposite is often true. As a recycler told me, "[product] designers are chasing a different animal than all of this end-of-life stuff" (interview, 6/30/11). For example, iFixit, an organization that promotes re-

[54] Devaluation is used here in direct reference to Marx's usage, where devaluation involves the replacement of a working machine with a newer or different technology or replacement by cheaper labor. Because the labor power embodied in the machine ceases to be transferred into new products, devaluation represents the destruction of value.

use by providing repair manuals for electronics, recently made a scathing critique of Apple's newest laptop design, writing:

> "The Retina MacBook is the least repairable laptop we've ever taken apart: Unlike the previous model, the display is fused to the glass, which means replacing the LCD requires buying an expensive display assembly. The RAM is now soldered to the logic board — making future memory upgrades impossible. And the battery is glued to the case, requiring customers to mail their laptop to Apple every so often for a $200 replacement. The design may well be comprised of "highly recyclable aluminum and glass" — but my friends in the electronics recycling industry tell me they have no way of recycling aluminum that has glass glued to it like Apple did with both this machine and the recent iPad" (Wiens, 14 June 2012).

While many of the major brands, including Apple, rightly boast about using recycled content and of having removed toxins such as arsenic and mercury from their products, the use of proprietary screws to prevent repair and upgrading on some of its products suggests a more cynical agenda in which extending the life of products is put beyond the reach of the average user. Apple has long used this 'sealed-box design' for what they call their 'consumer' line of products – iPods, iPads, and iPhones – that are not made for hardware upgradeability. But the extension of sealed-box design to the MacBook Pro with Retina display, part of Apple's 'pro' line of products, which are geared towards advanced users who buy expensive machines with the expectation that they will be upgradeable, is feared to be a trend (Hoffman, 20 August 2012). Design can be a key aspect of ensuring product obsolescence: 'By preventing user-repair and upgrades, Wiens writes that consumers are being put on a treadmill of consumption dictated by Apple: "They [Apple] want you on a 1- to 2-year purchase cycle for iPods, and a 2- to 3-year purchase cycle for laptops" (quoted in Kehney, 20 January 2011).

Original equipment manufactuers (OEM's, or brand names) have a generally antagonistic relationship with refurbishment, given that groups like iFixit enable the extension of product lives. An environmental consultant I interviewed described this antagonism:

> "In many ways the OEMs want to be really green and stuff but they really are not supportive of refurbishing because it's hard to control. They are much more directed at end-of-life [management], because they want their material to be crushed, burned, and melted for two reasons: they don't want the risk liability, and they want people to buy new stuff!" (interview, 8/15/11).

So while the refurbishment niche of electronics recycling may act as a 'thorn in the side' of OEM's (interview, 8/2/11) by extending product's use, because many recyclers seek to win waste management contracts with OEM's, they can also serve as hand-maidens to disposability. One recycler I spoke with who manages warranty take-backs for retail stores told me he was "startled…to see the number of brand new flat panels [TV's] that are sent to us to be recovered and destroyed. This is material that a customer takes home, it fails within the warranty period, [the customer] takes it back and the OEM doesn't even want it! They [OEM's] say 'dispose of it there' (interview, 5/11/11). The point here is that producers at best ignore and at worst work against recyclers engaged in repair or refurbishment, making them a dubious ally in efforts to better 'ethically' manage used electronics.

It is important to recognize here that planned obsolescence need not be seen as a sinister plot. One recycler I spoke with said the term planned obsolescence "imputes a maliciousness upon manufacturers… what I can say is the rate of change in the industry is rapid. The unthinking observer might impute a motive. I just don't know that it's there, I just think these guys are fiercely competing with one another" (interview, 1/17/13). I think this clarifies Marx's point that capitalism operates according to a set of impersonal forces i.e. competition, that make the question of motives secondary.

In terms of governance, the dynamics of planned obsolescence, proprietary production choices, and competition directly impact the materiality of electronics by creating highly complex, heterogeneous products. This heterogeneity in turn undermines the necessary practices

of representation and standardization that would enable certification actors (lead firms in GPN parlance) to clearly manage electronic discards from a central place in the network. What 'e-waste' is is always changing thanks to a dynamic system of production, so processes of regulation are always reactive and incomplete. For example, since smart phone sales have surpassed sales of PC's, with tablets set to do so as well (Blodget and Cocotas, 1 October 2012), recyclers seeking to meet e-Stewards 'tested, fully functional' or R2's 'possible to repair' requirements for export face a steep learning curve. The head of TechSoup, a leading refurbishing organization, remarked that the rise of tablets negatively affects their business because the screens are "difficult to pop-off and the internal elements are hard to refurbish" (*Resource Recycling*, 4/27/12). All of the recyclers I interviewed for this study told me that keeping up with the pace of technological change was one of their biggest challenges. The recycler who described destroying warranty take-backs said this of his refurbishment operations:

> "It's really important that we know what we're handling…But we have to know the guys at Nintendo didn't stop after they made the Wii. They're working on something that probably has technology or materials that we don't know yet. We don't know what the reuse and refurbishing programs look like in five years. Our techs here have to…start coming up with ideas about whether these things can be refurbished or whether it's end-of-life when the user is tired of it" (interview, 5/11/11).

In terms of compliance with certification, then, this contingency in what is being regulated means that a great deal of trust must be placed on the certified recycler to autonomously make decisions that are consistent with standards. For example, one e-Steward certified recycler told me

> "The folks at BAN…don't understand what is required to really prove 'fully functional' of different types of equipment. We deal with hundreds of different types of products. It really falls on us to define, within the context of our company, what that means. There is some grey in there, obviously some common items that you can identify 'fully functional', but you know, the real specialty pieces that we get in, nobody at BAN understands that material and they depend

> on us to make sure we have a process in place to verify before it ships" (interview 6/15/11).

Likewise, at the e-recycling event I coordinated in Athens, expert knowledge of materials was what allowed the event to run smoothly. While I was only witnessing the point of collection and not recycling, the understanding of materials in terms of their condition and value was on full display. Were the city of Athens put in charge of collection at these events, there would have been far greater confusion about how to divide up materials. Similar to Crang et al's (2012) findings, we see here how the snowflake factor necessitates trust and flexibility in the secondary market. Certifications may add a layer of additional responsibility for recyclers, but the management of such a complex waste stream can never be fully standardized and is inevitably completed in situ. The complexity of electronics acts as a kind of non-human agency, forcing continuous revision of both R2, e-Stewards, and the law more generally. Underlying and exacerbating the dynamism of this waste stream are the production relations of late-modern capitalism. For geographers, understanding how networks are formed and stabilized requires attention not only to the behaviors of firms and other human agents, but to the physical forms economic objects take as well.

VI. Discussion

This chapter has analyzed the evolution of the regulatory context for electronic wastes in the U.S. and focused specifically on the development of the R2 and e-Stewards voluntary certifications. The central point of contention in the emerging e-waste regime has been over when and where used electronics are (hazardous) wastes and when they are commodities. The standardization of 'best practices' for electronics recyclers rests upon these processes of codification. Drawing on the framework developed in chapter 3, my analysis of these processes

brought together political practices of representation, the materiality of wastes, and political economic processes of production as different but interrelated moments that compose the e-waste regime. The issues I have raised here suggest significant differences between certifications for used goods and those for other types of commodities.

In broader theoretical terms, I have provided empirical evidence that there might be a 'false antithesis' (Castree 2002) between certain forms of ANT and Marxism, and that there can be a productive interface between the two approaches. My adaptation of Gille's waste regime allows these two approaches to serve as windows into different moments that get at both the logics driving the production of waste and the way that the materiality of waste plays an active, rather than passive role, in assembling the emerging e-waste regime. These theoretical intersections are useful for understanding the gap between the realms of production and those of disposal in thinking about how things are put together and how they come apart.

Several important threads have been raised that require further analysis. As I have just argued, voluntary certifications and the electronics recycling industry more broadly are focused on end-of-pipe problems associated with e-waste management. This focus is not necessarily misplaced – there are very real threats associated with electronics recycling around the world and those problems need to be addressed – but it needs to be balanced out by attention to 'upstream' issues with product design and growth. But one of the curious things about market-based certifications as drivers of progressive change is that they begin to function as analogs to the system they are trying to change (Guthman 2007). Because certifications can only effect change if they are taken up in the market, there has to be a demand for them. But in the struggle to gain market share, several counter-productive things occur: first, the administrators of both R2 and e-Stewards over simplify e-waste geographies and engage in a re-fetishization of certified

recycling. The complexity of e-waste mobilities get lost in 'imaginaries' used to bring R2 and e-Stewards to market, which tend towards black-and-white portrayals of both the problems associated with e-waste management and the potential solutions. The second counter-productive moment has already been noted by Lepawsky, who succinctly notes

> "turning to market mechanisms to handle e-waste as a post-consumption problem means that the firms and paramarket organizations that derive revenue from this stream have at least reduced, if not eliminate, any incentives they have for diminishing the volume of e-waste moving through the recycling stream" (2012, 1203).

The next two chapters explore these threads in more details. Chapter 6 specifically looks at how certifications are impacting the electronics recycling industry. The central empirical kernel builds on this chapters focus on the indeterminacy of used electronics as commodity/waste, but examines how that indeterminacy is erased in the marketing battle over whether R2 of e-Stewards is superior. In short, chapter 6 is primarily concerned with struggles over legitimacy in the 'alternative' electronics recycling industry. Chapter 7 provides some depth to Lepawsky's assertion by taking a closer look at how certifications co-exist with simultaneous efforts to force reform on the production side of the electronics industry. It is not completely fair to say that certification actors are disinterested in upstream issues, and in fact EPR legislation has been promoted alongside certification as a kind of tandem approach. More specifically, the implementation of EPR legislation in 25 U.S. states has the express purpose of driving design-for-recycling and the reduction of toxics in electronics production. Chapter 7 assesses these efforts in more detail, which makes my analysis of the e-waste regime more encompassing of the breadth of changes taking place.

Chapter 6 Political Ecologies of Electronic Waste: Uncertainty and Legitimacy in the Governance of E-Waste Geographies

I. Introduction

The previous chapter highlighted the complexities of governing e-waste. I showed that there are important grey areas and ambiguities embedded within both the R2 and e-Stewards certifications that arise because of the slipperiness of used electronics as both potentially hazardous wastes and commodities. It is precisely because of this slipperiness that if one follows the movement of used electronics through global networks, one would see both dump sites and sites of production, and often in the same place. In an attempt to parse out this ambiguity, the e-Stewards standard is based more on the precautionary principle that e-waste is harmful until proven to be safe, and that dump sites must be deprived of imports of hazardous e-wastes. The R2 standard takes the opposite approach, prioritizing the potential value of used electronics and the positive impacts of reuse, repair, and recycling. Both labels claim to make this complex field legible; neither one does.

This chapter builds on the previous by unpacking how these disparate interpretations about e-waste geographies are shaping a new 'alternative', 'ethical' e-waste economy. Such a thing does not simply exist and must be brought into being. What follows therefore revolves around the two axes of understanding both *how* certifications work as technologies of governance, as well as the potential effects their circulation might have. Certifications are supposed to work as alternatives to the status quo, and to do so they rely upon both competitive markets and self-governing subjects who seek to 'do good'. But as I show here, competitive

markets and doing good are in tension; the responsible citizens and corporations supposedly empowered to positively effect change in e-waste flows in many ways recreate dominant power relations between North and South and reinforce the illusory power of voting with your dollars.

Even though neither R2 nor e-Stewards accurately reflect the contingency and nuance of the e-waste problem and its potential solutions, both standards market themselves as doing so. Because there are two competing certifications that both claim to encapsulate 'best practices' in e-recycling, not only are the administrators of these standards trying to differentiate themselves from conventional e-waste recycling (non-certified practitioners), they are also trying to differentiate from each other. This is a struggle over legitimacy. In terms of how certifications work, I argue that knowledge, in the form of statistics and other quantitative data, as well as narratives about e-waste geographies, such as 'digital development' and 'toxic trade', make certain voluntary codifications of used electronics legitimate and amenable to consumer action. Both the R2 and e-Stewards labels tell stories about what they supposedly do and these stories 'do work' by assembling the market in particular ways[55]. Harkening back to the overview of governmentality and environmentality in chapter 3, I argue that certifications and the discourses that constitute them act as technologies of political-economic calculation that facilitate normalizing practices (M. Goodman 2001, 501). This normalization of 'sustainable' e-waste management is not something imposed by a centralized nation-state upon a population, but circulates in more decentralized ways through non-state actors like NGO's, bureaucrats, trade groups, and others who produce knowledge about e-waste.

In less theoretical terms, this chapter shows *how* processes of 'sustainable' disposal in the North can be progressively connected to livelihoods elsewhere through market transactions. In

[55] To hammer home the point, a recent scrap industry newsletter noted that "debate over the issue of exports has often been driven by conjecture" (Thomas 2013).

the case of e-waste, organizations like BAN and its competitor, the Institute of Scrap Recycling Industries (supporter of R2), play key roles in defining the problem (through discourses like 'toxic trade' or 'digital development'), the metrics of good governance (trade bans or trade reforms), as well as in creating niche markets through which consumers can act to effect the problem (using certified recyclers). The ways in which these institutions produce e-waste as an object of regulation/commodification depend upon simplifying and abstracting from actually-existing e-waste flows, which are complex, multi-directional, and involve both resource recovery and hazardous activity across diverse recycling sites (Lepawsky and Mather 2011).

In terms of the effects that these forms of governance produce, I suggest that there is an important disconnect between the abstractions necessary to make e-waste recycling amenable to consumer action and the nuances of place-specific recycling practices. At issue is not whether certifications simplify reality, which all acts of representation do, but rather of interest are the specific kinds of economic activities, practices, and places that are stabilized by particular representations, as well as those that might be dis-articulated (Bair and Werner 2011) or excluded from the emerging 'ethical' e-waste regime. Given that how problems are constructed critically shapes potential solutions, a healthy skepticism of how the 'e-waste problem' is constituted is required.

Focusing more on one aspect of the e-waste regime, this chapter unpacks the political practices of representation that work to establish the R2 and e-Stewards labeling schemes as legitimate 'fixes' (Castree 2008) to the still emerging crisis of electronic waste circulation and disposal. I delve into the complexities and contradictions that are embedded within the narratives, or 'political ecological imaginaries' (M.K. Goodman 2004), that I argue are central to the remaking of e-waste networks. I make three interrelated arguments. First, given the

ambiguities in the law, and the paucity of data and relative ignorance among the general public and policy-makers about the geographies of e-waste, NGO's, trade groups, and other certification actors play critical roles in securing narratives like 'digital development' or 'toxic trade' as the hegemonic common sense understanding of the e-waste problem, thus guiding policy-making, shaping ethical relations of responsibility for consumers of electronics, and serving to extract rent for certain actors. More broadly, these narratives of differentiation are key to the devolution of regulatory control to the site of the cash register in that they "interpolate the knowledgeable consumer" (Guthman 2007, 472; see also Barham 2002).

Second, competition between R2 and e-Stewards to establish market dominance produces a contradiction in which labels intended to de-fetishize electronics disposal reveal certain contextual elements of the trade that fit with the respective marketing narrative while obscuring grey areas that do not, thus 're-working' the fetish (M.K. Goodman 2004) of 'ethical' recycling. This re-working not only shapes consumer understandings of problems, it also demonstrates how competition over legitimacy actually perverts this 'alternative' market in the way that Lepawsky (2012) describes. The processes of branding may actually reduce any incentive that supporters of R2 or e-Stewards have for reducing e-waste production. Recycling 'better' is of course needed, but it could potentially wash out the more effective, but politically difficult, efforts aimed at reducing e-waste quantities and toxicity. There is a danger of certified e-waste recycling becoming what Samantha MacBride calls 'busyness': "a fulfilling sense of work and achievement that often brings positive side effects but fails to reach the central effect. If progress is a flowing stream, busy-ness is an eddy, moving vigorously but not forward" (2011, 6). Diversion into 'busyness' has been a hallmark of municipally-funded curbside recycling programs.

Finally, while the active and knowledgeable citizen-consumer can play a positive role in progressive environmental politics, a political ecology approach to waste politics decenters the citizen-consumer as the agent of change and instead asks what solutions to the e-waste trade grounded in solidarity with informal recyclers might look like. Both e-Stewards and R2 target these informal recyclers as the beneficiaries of their activities, yet no actors from developing countries were involved in the development of either certification. E-recycling is improved on their behalf but not with their participation. The democratic deficits (Vandergeest 2007) of market-based transnational governance are a central concern in the certification literature, which raises Klooster's important caution that fair trade may sometimes entrench North-South divisions rather than ameliorate them (2006, 543; see also Baird and Quasel 2011; Swyngedouw 2005). Rather than impose changes unilaterally on a diverse supply-network through the agency of Northern institutions and consumers, prioritizing certain 'classic' political ecology themes - access and control over resources, the significance of livelihoods, and the marginality of informal sectors - foregrounds solidarity with recyclers and democracy in decision making as key to the processes of managing e-waste networks towards more sustainable ends.

Chapter outline

The next section (Section II) contextualizes each of these arguments within the literature. I briefly reintroduce governmentality and environmentality and show how the contemporary literature on certification and fair trade implicitly or explicitly picks up some of the key themes around knowledge/power and discourses shaping behavior and markets. Section III gets into the details of how and why certifications are being taken up in the electronics recycling industry and documents the fierce marketing battle taking place, which is ultimately about legitimacy as a

means to greater market share. Section IV shows that while perhaps convenient for certain actors, much of the knowledge about e-waste geographies is deployed in somewhat cynical ways. The potential effects of these claims are discussed in terms of their impact on informal economies and their relation to efforts to put pressure on producers to change the way products are made. This last issue is taken up as the core theme of chapter 7.

A brief note on terminology is in order considering that the entirety of the literature on certification focuses on relations between consumers and producers of a commodity. Here, the relationship in question involves producers and consumers of electronics as well as a myriad of actors involved in the post-consumption management of those devices. Each set of actors is complex: producers exist in a global network of brand names, contract manufacturers, hardware designers, and many others. Consumers consist of institutional as well as individuals purchasers of electronics. For the most part, in the U.S. consumers are the ones held responsible for the post-consumption lives of devices, although producers are increasingly being held accountable. And the category of post-consumption e-waste managers is perhaps the most complex, consisting broadly of formal and informal sector recyclers (who are deeply interconnected as well). Furthermore, these post-consumption e-waste managers are also often producers themselves, recycling and recovering value from discarded electronics and creating new products or raw materials. Voluntary certifications involve all three of these sets of actors, but in order to make some sense of who is being linked with whom, in this chapter I refer to waste generators (consumers) and recyclers as the targets of regulation.

II. The Contradictions of Labeling as Mechanisms of Environmental Governance

While the literatures on certification provide a guide to analyzing my specific case, the literatures on governmentality situate certification studies within a broader conversation about state-society relationships. Several themes, discussed in chapter 3, are relevant. First, regulations are always dependent on some forms of knowledge production that make objects governable. Second, the production and contestation of such knowledge is not strictly the purview of the traditional state, but is decentralized through the population. Third, the decentralization of power/knowledge both facilitates and negates action. Power is not simply the power to oppress and subjugate others, but to enroll people as accomplices in governing themselves. In this case, the development of voluntary certifications for e-waste clearly do not imply a withering away of the traditional nation-state in a zero-sum game (Swyngedouw 2000), but rather demarcate a shift in accountability by enrolling NGO's, industry groups, and other members of civil-society into more decentralized forms of governmental action. Certifications are a kind of governing technology that enables such a transition to occur. But once such a technology is created, the question becomes how these technologies rework institutions, networks, and subjectivities. Linkages need to be made between a particular problem – e-waste dumping and hazardous recycling – and a set of actions. Labels do this work of communicating meaning, and this chapter focuses on how labels communicate meaning that assemble e-waste recycling in ways that 'do good'. The themes of institutions, regulations, and practices changing in relation to forms of knowledge production figure prominently within the literature on certification, although Foucault is not always directly cited. I now turn to a brief review of the relevant certification literature.

While it is true that eco-labels for electronics recyclers place "the responsibilities for socio-environmental governance…at the rather rocky feet of consumers" (M.K. Goodman 2010, 106), particularly important here are the role of NGO's and institutions in mediating the ability of consumers to 'care at a distance' and make those connections more sustainable and ethical (Baird and Quastel 2011; Klooster 2006; 2010). As Ponte and Gibbon argue, it is not overt 'class power' but the ability to establish a dominant normative paradigm about 'quality' that creates legitimacy for standards to operate (ibid). The creation of an ethical trade in used electronics, like food, involves the political-economic linking of consumers and producers in non-conventional ways, but "these morally-charged links are also forged *semiotically* through the discursive and visual narratives that saturate these foods [or e-wastes] with politicized and ethical *meanings* intended for extensive reading by consumers" (M.K. Goodman 2004, 893, emphasis in original). Narratives linking distant producers (recyclers) and consumers (waste generators) in ethical relationships, what Michael K. Goodman calls 'political ecological imaginaries' become 'indispensable' to the establishment and maintenance of fair trade networks or other types of progressive market activity (2004). For instance, using the example of a breakfast cereal whose purchase is meant to conserve the Amazon, Bryant and M.K. Goodman (2004) focus on the representational practices through which a "complex socio-ecological phenomenon such as the Amazon becomes simplified and embedded in Northern understanding in a particular way amenable to appropriation by 'alternative' consumption networks" (350). In other words, stories emerging in the North about the South 'cultivate' the sensibilities of Northern consumers in particular ways that enable 'alternative' forms of consumption to work (ibid; see also Morris and Young 2004).

But one of the many ironies of certification is that this cultivation involves a kind of double fetish (Cook and Crang 1996), or as M.K. Goodman describes, a 're-working' of the commodity fetish to the advantage of those involved in fair trade: "The operationalization of this re-working is at once the removal of the commodity veil, but also a replacing of the fetish in the images of indigenous producers, tropes of productive tropical nature, and meanings of alternative development" (Goodman 2004, 902). As Carrier describes, the image on the coffee bag of the peasant small-holder coffee grower comes to define the 'ethicality' that consumers are looking for. What might be omitted in this imagery is the migrant labor used to harvest that fair trade coffee (2010). In short, the ethicality of the fair trade object is always partial – some aspects of the contextual relations of a product are highlighted while others are ignored (ibid, 686).

As I will demonstrate in the empirical section in regards to e-waste, knowledge about people, places, and commodities (and wastes) become re-worked in ways that are simultaneously revealing *and* obfuscating. Like other fair trade schemes, certifications for ethical electronics recyclers rely upon narratives that construct the e-waste problem in ways that render it governable, or 'legible' in Scott's sense (1998). However, given the complexity of global commodity-networks like those for used electronics, these governing narratives rely on abstractions that over-simplify and re-work the fetish of what e-waste is, where it goes, and how it should be managed. These simplifications are a necessary product of the pressures of market-based regulatory schemes – in order for certifications to affect flows of materials, they must be in demand. But like the Amazon cereal or fair trade coffee, the political ecological imaginaries about the geographies of used electronics that create that demand "fill the vacuum of geographical ignorance with questionable, *but commercially effective*, images of other places and cultures" (Castree 2001, 1521, emphasis added).

In the empirical section below, I describe the drivers of electronics recycling certification, followed by a critique of the ways certification actors represent both the problems of e-waste flows and their potential solutions. I conclude by addressing alternative 'political ecological imaginaries'.

III. The Political Ecological Imaginaries of E-Waste

Drivers of certification

In her analysis of ethical trading initiatives in the Kenyan cut flower industry, Hughes found that the development of codes of conduct and ethical standards arose not from individual flower consumers themselves, but from retail buyers acting on *behalf* of consumers (2004). These retailers saw codes of conduct as a way to preempt negative media exposure about labor practices in the cut flower industry. While it is not yet clear what individual consumers actually know about e-waste geographies, in talking with recyclers, regulators, and other industry actors, I argue here that a similar process is taking place. The demand for recycling certification seems to be coming from original-equipment manufacturers (OEM's), municipalities, as well as large health and financial corporations interested in data security and brand protection. Indeed, a recent survey found that 74.1% of electronics collected by recyclers in the U.S. came from business and commercial sources (Daoud 2011). For these large institutional consumers of electronics, certification is a way to "have some assurance that they are not going to be exposed" to negative publicity such as *60 Minutes* or BAN's reports (interview, 7/1/11). As one OEM executive put it, "we want to prevent BAN from dropping banners off our roof…BAN can only negatively affect our sales[56]" (interview, 1/24/12).

[56] Unfurling banners from building rooftops is a well-known Greenpeace tactic. The head of BAN is a former Greenpeace activist.

In a savvy marketing move, BAN created the e-Stewards Enterprise program, which allows companies to display the e-Stewards logo on the promise that they will use e-Stewards certified recyclers for their discarded assets. For example, Wells Fargo promotes its corporate social responsibility efforts through e-Steward certification, arguing that becoming an e-Stewards Enterprise is "the best way to make sure discarded electronics stay out of the hands of children. It's that simple." (BAN 2010 annual report, 5). With huge customers like Wells Fargo and Samsung signed on to the Enterprise program, recyclers see e-Stewards certification as a potential way to win asset management contracts with these Enterprises. All of the recyclers I spoke with regarded certification as a way to differentiate themselves from 'scrap brokers', those who claim to recycle but are actually just aggregators who ship mixed loads of waste along with commodities. A recycler who participated in the initial R2 development process said that it was driven by "a few industry players who wanted to have some form of differentiation, real or perceived, from the rest of the industry" (interview, 1/17/13). And while all of these recyclers have an interest in environmentally sound business practices, a more candid response was that certification is

> "…a cost of business. Strictly put. I might be doing the right thing by the planet or people in the developing world, there may be lots of social and environmental attributes but the reality is that it's the cost of doing business in the same way as buying a new file cabinet or getting a tune up on my truck. That's good for the environment too. But certification is something I can upsell, and that's what it's all about" (interview, 7/1/11).

That recyclers are using certifications both to improve their practices and extract rent from the commodity network is consistent with more 'culturally' inflected analyses of economies in which actors "[mobilize] a variety of frames of references in addition to instrumental rationality" (Berndt and Boeckler 2011, 560). In that vein, certifications are a kind of 'technology' that sutures together these multiple frames.

While recyclers are trying to establish a gap between themselves and 'sham recyclers' by becoming certified, the administrators of e-Stewards and R2 are further trying to differentiate *between certifications*. With demand for accountability in part coming from large institutional customers, a fierce marketing battle has erupted between R2 and e-Stewards over which certification provides the brand protection, data security, and ethicality that these large e-waste generators are looking for[57]. By nature of being market-based schemes, both R2 and e-Stewards can only impact the flows of used electronics if they are actually adopted. I turn now to the discourses through which R2 and e-Stewards compete to establish their respective brand with the intent of peeling back the label and revealing the silences and ambiguities of certified recycling.

e-Stewards, R2, and governing e-waste flows

While BAN should be applauded for pulling back the curtain on the hazards associated with the globalization of electronics recycling, because they believe that all non-working electronics should be managed as hazardous wastes rather than as resources, they tend to conflate the entire category of used electronics export with waste disposal, seeing recycling as a Trojan horse for dumping. This is what Carrier describes as allowing the 'instance' [e-waste dumping] to stand in for the 'category' [used electronics export] (2010). In marketing the e-Steward standard, BAN hopes to raise awareness of the problem and its solution. Appearing on the popular National Public Radio program *Fresh Air*, BAN Executive Director Jim Puckett claimed that "The dirty little secret is that when you take [your electronic waste] to a recycler, instead of throwing it in a trashcan, about 80 percent of that material, very quickly, finds itself on a container ship going to a country like China, Nigeria, India, Vietnam, Pakistan — where very

[57] This battle has taken place in a variety of venues, from industry publication editorials, newsletters published by either standard holder, multiple blogs and websites, and industry conferences.

dirty things happen to it" (NPR Staff 2010). BAN then argues that using a recycler certified not to export these hazardous wastes prevents harm from occurring. Despite the anecdotal nature of the '80 percent exported' claim, it has been widely cited, arguably making this environmental injustice framing the hegemonic representation of the 'e-waste' issue.

There are four strategies by which BAN has effectively steered the framing of e-waste politics. First, BAN's photos and documentary films of people engaged in hazardous practices in the informal sector have circulated widely in public fora, and they prove beyond a doubt that electronics from rich countries do end up in poor ones, posing a threat to human and environmental health when improperly recycled or dumped. BAN's director has appeared in multiple prominent media outlets, including CBS' *60 Minutes* (Pelley 2008), PBS' *Frontline* (Klein 2009), NPR's *Fresh Air,* and the e-Stewards standard is featured in the viral *Story of Stuff* Youtube series (see BAN.org). R2 has not engaged in this level of 'awareness raising'. While I have made no attempt to measure public reaction to these viral reports, I would argue that the primary intent of these stories it to invoke guilt in order to spur regulatory action.

Second, in their press releases, trade publications, and promotional videos and texts, BAN talks about used electronics almost exclusively in terms of hazardous waste management instead of using terms like 'scrap' or 'commodity' (see Puckett et al 2002; Puckett et al 2005; BAN.org). Erring on the side of waste management is a precautionary measure – even working commodities become wastes eventually. However, classifying and managing materials as wastes may prevent the recovery of value (see Crang et al 2013; Gregson et al 2012). For example, non-working electronics are prohibited from being exported under e-Stewards, despite the fact that this precludes these items from being repaired, upgraded, and reused. BAN strongly promotes U.S. ratification of the Basel Ban Amendment to the Basel Convention, an international treaty

regarding the transboundary movements of hazardous waste. The Basel Ban and Convention make regulatory distinctions between OECD and non-OECD countries as the appropriate scale of regulation, and the Ban prohibits the OECD to non-OECD flow of e-waste even for recycling. It is precisely because the Ban is absent from U.S. law that the e-Stewards certification can attract recyclers who want to promote their enhanced accountability.

Third, BAN's marketing campaign impugns all non-Stewards as possibly contributing to the problems their documentaries have uncovered in the informal sector. The following press release, which not-so-subtly lampoons R2, is typical: "Sadly not all of those companies that call themselves *responsible recyclers* are truly responsible and many are not recyclers at all, but are just exporters" (BAN press release 2011a, emphasis added). The aggressiveness of BAN's marketing reached a peak in early 2012 when BAN tried to subsume the R2 standards' requirements within e-Stewards certification, allowing those pursuing e-Stewards to achieve both certifications at once (BAN press release, 1 March 2012). R2 administrators had to issue a statement clarifying that "R2 is in no way, and never will be, a 'subset' of e-Stewards" (Lingelbach and Hilton, 1 March 2012).

Finally, BAN and other groups of electronics recyclers argue that e-waste exports undermine the development of the recycling industry in the U.S. An e-Steward certified recycler and member of a coalition of recyclers formed to promote the passage of the Responsible Electronics Recycling Act (RERA), which includes an export ban consistent with e-Stewards certification, has argued that such legislation would

> "create at least 7 jobs in refurbishment, demanufacturing or material processing for every job involved in packing and stacking electronics for export. This would lead to tremendous growth in the American electronics recycling industry through existing and new businesses" (Coalition for American Electronics Recycling, FAQ).

In contrast, R2 Solutions, the administrative body for the R2 standard, has been less publicly visible and their marketing takes on a much more defensive posture in responding to BAN's claims[58]. The Institute of Scrap Recycling Industries, a trade group and proponent of R2, commissioned a survey of recyclers in which it was found that roughly 80% of used electronics are either processed in the U.S. or sent to another domestic company for processing (Daoud 2011). ISRI used this study to argue that "electronics are recycled in America, not 'dumped' overseas" (cited in BAN 2011b). However, this export figure is just as ambiguous as BAN's because those domestic processors are unlikely to report any illegal export in a survey. Despite the continued ambiguity of e-waste export data, ISRI defends the electronics recycling industry and exports, putting a positive spin on the industry in tough economic times: "We still [are] in an economy that´s not so great, and the number of jobs that this industry is creating is very, very significant in an otherwise sluggish economy…they are good paying, green jobs" (quoted in Carroll 7 November 2011). ISRI maintains that exports *sustain* the employment of 30,000 American workers (Press release, 19 January 2012), a claim that is in direct contrast to proponents of e-Stewards and RERA.

As for the 'sham recyclers' exposed by BAN and shown nationally on *60 Minutes,* ISRI president Robin Weiner has argued that a 'few bad actors' are not representative of the industry and that BAN had allowed *60 Minutes* had misled its viewers (Weiner, 2008). In contrast to BAN, ISRI argues that the e-recycling industry deals in commodities, not wastes. In an internal memo provided to me by an interview participant, ISRI provides language that members might use to dissuade expanded regulatory changes by the EPA: "managing hazardous wastes…is not what we do… To the contrary, we eliminate the need for valuable materials to ever become

[58] However, perhaps aware that they might be losing the marketing battle, R2 Solutions recently announced that they would begin an 'aggressive' marketing campaign targeted at institutions that generate large volumes of e-waste (R2 Update 2013).

waste in the first place" (no page). Rather than focus on hazardous fractions of e-waste, ISRI highlights the "energy savings, carbon emission reductions, and recovery of recyclables such as steel, gold, platinum, palladium and plastics thereby reducing the need to mine virgin ores from the earth to produce new materials" (Weiner 2008, 2). In addition to these environmental impacts, R2 proponents suggest that the export of non-working material (commodities) allows importers to cheaply upgrade electronic devices, thus satisfying a growing demand for affordable technology in developing countries i.e. 'bridging the digital divide'.

As for regulation,

> "ISRI believes that distinctions are properly made between responsible and irresponsible recyclers, not based upon geographic criteria…Any legislation or rules should be written in a manner that takes irresponsible recyclers out of the supply chain, regardless of whether they are located in the Chicago, Brussels, Mumbai or Shanghai" (ISRI 2012).

Despite R2's relative lack of public visibility, it does appear to have made in-roads in the recycling industry. Figure 6.1 shows larger numbers of recyclers certified to R2 than e-Stewards. While a comprehensive survey concerning the reasons for this discrepancy has not been done, a number of (anecdotal) reasons presented themselves in interviews: R2's lower costs (no ISO 14001 requirements, no licensing fee[59]), its flexibility with certain technical requirements, and ideological disagreements about e-Stewards export ban.

A major barrier to testing the veracity of both e-Stewards/RERA ban proponents and R2/ISRI industry claims is that the EPA, and other government agencies like port authorities, have been unable or unwilling to collect data on and track material flows not only on volumes and characteristics of electronic waste discards at the national scale, but on wastes produced throughout products' life-cycle, including in manufacturing (MacBride 2011). However, the

[59] However, right as this dissertation was being completed, R2 Solutions announced that they would be charging a licensing fee of $1500 per facility (R2 Update 2013).

U.S. International Trade Commission recently released the most comprehensive report on e-waste exports to date. This report, based on a survey of over 5,000 recyclers, did not find evidence that '50-80%' of e-waste collected in the U.S. is exported to informal sectors in non-OECD countries. Rather, it found that, by value, 88% of used electronics exported for repair/refurbishment were tested and in working condition (U.S. ITC 2013, xvi). The report also found that "by end use of the products, commodity materials intended for smelting or refining accounted for the largest share of U.S. exports by weight (43 percent)" with only .8% being exported for direct disposal (ibid, 5-2). However, the report did acknowledge that 18% of exports went to final uses that were 'unknown' (ibid). Furthermore, "the survey could not determine whether U.S. exports of UEPs bound for recycling or disposal in 2011 were sent to [informal] facilities, nor could it capture ad hoc shipments of undeclared UEPs [used electronic products] mixed in with exports of other items" (ibid, xviii).

In short, the U.S. ITC report establishes what the (unintentional) philosopher Donald Rumsfeld would call 'known knowns' and 'known unknowns'. In other words, the report clarifies what we know about legal export practices of working equipment and commodity-grade material, but does not capture information about what we do not know about (illegal and/or unethical practices of dumping). In the absence of clear information about 'the e-waste problem', NGO's and market actors are free to paint pictures that broadly support their material (political-economic, social and environmental) interests. As one recycler and supporter of e-Stewards told me, figures like '50-80% exports being dumped' and 'seven U.S. jobs created' by closing down exports are "really a best guess by people who know the industry" (interview, 12/9/11). Making policies that impact a diverse global network on guesses opens up the distinct possibility for unintended consequences to unfold. These nuances and grey areas are obscured

because certification requires market penetration in order to affect reform, and market penetration requires establishing a political ecological imaginary that creates demand. The next section evaluates these representations in light of emerging data by raising questions about e-waste origins, the diversity of global recycling processes, scales of regulation, and the political uses of certification.

IV. Distilling the politics of e-waste

The problem of origins

Through the use of the four strategies discussed above, BAN has constructed the North-South dumping of e-waste as the key environmental injustice of the digital age. The only context given for the harsh images of the informal sector in China, India, and Africa is the origin of the e-waste: exports from OECD to non-OECD. BAN has followed sea containers from the U.S. to Asia and has found dumped electronics bearing the property tags of institutions in developed countries. But as academic researchers have entered the debate about the direction and quantity of these flows, a more nuanced picture emerges than the simple narrative of North-South dumping. This research has shown that the developing world will *domestically* generate more used and end-of-life electronics than developed countries as early as 2017 (Williams et al 2008), with China and India expected to see 400% and 500% growth rates in discards, respectively, by 2020 (Schluep et al 2009). A recent study of e-waste in West Africa[60] found that 50-85% was generated by domestic consumption, not imports (Schleup et al 2011). Furthermore, journalist Adam Minter, who has written extensively about e-waste recycling in China, says that "American and European e-wastes…are a declining percentage of the overall level of waste being processed in [Guiyu]" (quoted in Moskvitch 2012).

[60] Benin, Cote d'Ivoire, Liberia, Ghana, and Nigeria were part of the Basel Convention study.

It also appears that intra-regional trade is greater than inter-regional trade (North-South) (Lepawsky and McNabb 2010). Rather than a one-way flow of pollution to developing countries i.e. the 'pollution haven hypothesis', many countries are both sources and destinations of e-waste (ibid). This presents a problem for BAN, whose e-Stewards standard is based on the Basel Ban, which BAN says "was never designed to halt intra-OECD/EU trade or trade *between non-OECD countries* in hazardous wastes, but only the most abusive form of hazardous waste trade – the trade designed to exploit weaker economies from the OECD group for economic reasons" (BAN 2011b, 1, emphasis added).

With domestic generation and intra-regional trade comprising significant portions of e-waste flows, it does not immediately follow that banning all trade from OECD to non-OECD will eliminate the hazards of informal e-waste disposal (Williams et al 2008). The E.U., which has voluntarily implemented a full ban on exports of untested used electronics, even for recycling, has significant 'leakage' of illegal exports (Lewis 2010). In fact, the majority of e-waste exports to Africa come from Europe, not the United States (U.S. ITC 2013, 5-3). The points of contention raised here are not meant to deny the existence of illegal and unscrupulous behavior in the recycling industry[61], but rather to say that the problem has perhaps exceeded the boundaries of a North-South political framing. The network for e-waste circulation is complex and multi-directional. Perhaps most significantly, lurking within this data is the reality that the 'post-industrial knowledge economy' has not done away with waste or 'decoupled' economic growth from materials use. Coming to grips with a world awash in e-waste must involve addressing the rights of producers to engage in toxic production, planned obsolescence, and growth itself.

[61] This illegal activity continues. A recent bust in an Indonesian port uncovered 113 containers containing 'mixed toxic scrap', including e-waste (Leineweber 2012).

End uses for exported used electronics

The discursive rendering of used EEE exports as 'toxic waste disposal' homogenizes the diverse activities taking place around the world. While crude methods such as acid-leaching and wire burning are used in some places (Puckett et al 2002; Puckett et al 2005), researchers are finding that the majority of what is being imported in places like Peru (Kahhat and Williams 2009) and Ghana (Amoyaw-Osei et al 2011) is repaired and re-used rather than dumped in informal sites. The Ghana study found 30,000 people working to re-use and repair 85% of imports, leaving a "significant portion" of the other 15% "destined directly to informal recycling" (ibid, page x). While this 15% accumulates and poses significant threats to workers and environments because Ghana lacks adequate end-of-life recycling, it casts some doubt on the anecdotal claim that 50-80% of exports are 'waste' and that what comes into Ghana on sea containers goes immediately to the infamous Agbogloshie dumping ground (Puckett et al 2005; Hugo 2010). It instead suggests the presence of value, where "such imports support substantial economies of repair and refurbishing" (Lepawsky 2012, 10; see also Gregson et al 2012).

In a more nuanced rendering of the problems of e-waste recycling in Africa, members of the United Nations University Solving the E-Waste Problem initiative (StEP) recommend that policy in Ghana and Nigeria

> "avoid the import of e-waste and near-end-of-life equipment without hampering the meaningful and socio - economically valuable trade of used EEE of good quality. In the view of the sector's positive socio-economic performance, all policy measures aiming to improve e-waste management in West Africa should refrain from *undifferentiated banning of second-hand imports and refurbishing activities* and strive for a co-operative approach by including the market and sector associations" (Schleup 2012, emphasis added).

Recognizing the limits of blanket prohibitions, StEP has recommended what they call the 'Best of Two Worlds' approach (Wang et al 2012). In this paradigm, complete hand-dismantling

combined with state-of-the-art end-processing (refining) optimizes both materials recovery and environmental safety and represents an ideal combination of both developing and developed world specializations. Because the informal sector has such low labor costs, recyclers in places like Ghana could potentially be incentivized to engage in hand dismantling of pre-processed e-waste, followed by the re-export of hazardous fractions and recovered materials back to safer handling facilities in other countries (ibid; see also iFixit.org; Kahhat and Williams 2009; Retroworks.net). Such an international division of labor that invites informal recycler participation, while not a panacea, moves more towards solidarity with the informal sector rather than an outright rejection of it.

While I was able to learn about a number of development projects targeting informal e-waste recyclers through my involvement with the StEP Initiative, due to funding constraints I was not able to study any of them on the ground. However, Rajyashree N. Reddy has conducted a much needed field-study of one of these projects - the Indo-German-Swiss e-Waste Initiative (2013). While not explicitly dealing with exports, Reddy's ethnographic work with the largely Muslim informal e-scrap collectors in Bangalore, India's Silicon Valley, is significant in that it assesss attempts to 'modernize' and incorporate the informal sector. In Bangalore, the informal e-scrap collectors and processors in and around the IT hubs secure access to streams of discarded electronics through cultivation of face-to-face relationships with IT managers in the formal sector. Many of these informal e-scrap workers were able to earn decent incomes and buy small plots of real estate from which they further entrenched their territorial access to e-waste generators. Not only did these workers provide a crucial service to Bangalore's waste management infrastructure, but by repairing and salvaging electronics were able to disseminate technology to populations that typically cannot afford new products. Reddy argues that

> "the economies of disassembly forged by informal recyclers are about more than bare life (that is, mere survival and creation of subsistence opportunities). I would assert that as e-waste recyclers salvaged things from digital detritus they are also fashioning themselves as creative individuals whose labours lead them to innovatively re-imagine, re-craft and recombine the constituent parts of end-of-life computers to produce new commodities and new uses for dying computers….During my fieldwork, many informal recyclers spoke of the giddy excitement with which they tinkered with e-waste and the pride they felt when they developed a knack for ingeniously extracting or recombining constituent parts of obsolete computers to fashion new digital and nondigital commodities" (2013, 65).

However, given that many of these informal recyclers use hazardous chemical processes to recover metals from e-waste, they became targeted for reform. In 2004, a coalition composed of the Indian Ministry of Environment Forestry, an organization called the German Society for Technological Cooperation, and the Swiss Federal Laboratory for Material Science and Technology engaged in a well-intentioned effort to develop and modernize e-waste management in Bangalore. These development organizations expressed a commitment to allow informal recyclers to transition into a formal system, yet in practice ended up excluding them by only allowing 'authorized' e-scrap collectors to manage materials. The bureaucratic hurdles of becoming 'authorized' favored large capital firms over the existing networks of informal recyclers and severed the territorial claims and face-to-face connections that allowed the informal sector to thrive. Of course, all of this occurred with the explicit intent of protecting informal scrap recyclers from themselves. While the Indo-German-Swiss e-Waste Initiative has been hailed as a policy success and is being spread to other Indian cities, Reddy argues that the negative effects of formalization on informal livelihoods ought to be paramount.

Scales of regulation

Given the complex circuitry of e-waste, and the diversity of economic processes through which materials circulate, the regulatory focus at the scale of OECD to non-OECD may be inappropriate. For example, electronics recycler, blogger, and 'fair trade' advocate Robin Ingenthron points to "legitimate refurbishing markets" in non-OECD 'developing countries' like Singapore and Malaysia that have sophisticated contract manufacturers that not only produce electronics, but also do warranty repair and upgrading of old items, both non-working and 'fully functional' (see Ingenthron 2009). Ingethron's company supplies these 'grey market' firms with surplus products as well as technical assistance and economic incentives to improve health and safety standards. These grey market importers then repair non-working items and upgrade 'fully functional' equipment, selling it as generic 'knock-off' items for a consumer base that cannot afford brand new electronics. Whether or not these facilities, which serve a market also known as the 'good enough market'[62] (Gadiesh, Leung, and Vestring 2007), can engage in repair of non-working equipment and recycling of hazardous materials arguably cannot be determined at the scale of 'OECD' or 'non-OECD'; informal recycling exists in OECD countries just as formal sector recycling exists in non-OECD countries. Ingenthron points out the hypocrisy of trusting these firms with manufacturer warranty repairs but criminalizing their activities when they buy non-working electronics outside these channels for repair, upgrade, and re-sale (2011) Ingenthron has called BAN's refusal to acknowledge the grey market as patronizing, labeling an export ban as "making the perfect the enemy of the good" (Ingenthron 2010).

[62] i.e. refurbished electronics that are not name brand but are 'good enough' to get online.

Certifications as protectionist?

There are significant geopolitical and economic issues at stake in terms of the relationship between the primary and secondary consumer markets for electronics. Several recyclers described to me the way their recycling activities worked in concert with the planned obsolescence interests of OEMs. A former executive at a large California recycler told me

> "90 percent of my business was OEM and they wanted everything destroyed. I would destroy brand new beautiful Yamaha pianos, mixer boards, ten thousand dollar things, flat screens, projections. I'd ask 'why do you destroy this stuff? Why can't it go to market?' [OEM's would say] 'Well we don't make parts for it anymore, we don't want to service the warranty'. They make products and they don't make replacement parts for them and then want them destroyed!" (interview, 8/2/11).

While I can only speculate, a potential reason companies like Samsung have signed on to support an e-Stewards or RERA trade ban is that these companies would then be able to restrict secondary markets in Asia from importing used products that are then upgraded and sold to the 'good enough market'. In short, environmental certification can act as economic protectionism, which in the case of hindering electronics repair leads to diminished environmental outcomes by reducing products lifespan. However, when questioned along this line, an OEM executive that I spoke with rejected the claim of protectionism. Nevertheless, there have been multiple lawsuits by OEM's directed at refurbishers that strongly suggest otherwise[63].

In sum, there is a highly uneven economic geography to the used electronics trade that does not fit within clunky categories of 'North-South', 'OECD-non-OECD', developed and developing, 'waste dumping' or 'resource recovery'. Contingency is the rule rather than the exception. However, there are good reasons that BAN focuses on the poisonous recycling sites of the digital age – people are in fact being exposed to hazards. But as stated above, in the global

[63] See Dell's suit against Tiger Direct (Kovar 2009), Fuji's suit against Jazz (New York Times 2004), and Canon's action against an ink-cartridge refiller (Hashiguchi 2008)

circuitry of used electronics, singling out OECD to non-OECD trade as the source of hazardous exposure oversimplifies the problem. Neither certifications nor trade law will reduce the demand for raw materials that drives the trade (U.S. ITC 2013, 6-4). Furthermore, Ingethron's point that legitimate repair and refurbishing operations may become casualties of well-meaning environmentalists in the North highlights the potential for simplifications to create new problems. The point here is that policies and standards seeking to enroll waste generators into more ethical relations with distant others rely on abstractions that, while perhaps assuaging the guilt of those generators, often distort the complexity of global-local relations. These distortions work to extract rent for certification actors but as political ecologists are wont to point out, such efforts work as analogs to the very system they are trying to reform (Guthman 2007). This is one of the contradictions of market-based environmental governance: in the competitive race to reform the market, certification actors engage in a kind of representational race-to-the-bottom in which the simplest ideas become embodied in the label and sold to consumers.

V. Discussion

As of this writing, it would be extremely difficult to quantitatively evaluate the impact of an e-Stewards trade ban versus an R2 trade reform or 'fair trade' platform on 'downstream' flows[64]. The U.S. ITC survey respondents indicated that state EPR laws and certifications were discouraging exports, and that 80% of certified recyclers were tracking their exports to final destination, compared with just 6% of non-certified firms (2013, 6-11). While this survey provides a broader description of exports and certifications than my work, my intention in this chapter has been to demonstrate the ways in which efforts to govern this complex supply chain

[64] Evaluating trade flows are difficult because a) 'e-waste' or 'used electronics' are not distinct categories within the Harmonized Tariff Codes and b) as of this writing very few recyclers have been certified to either R2 or e-Stewards for more than one year.

are indeed subject to significant distortions and political manipulation in the processes of branding that market-based labels demand.

Adding nuance to Lepawsky's analysis of the law (discussed in chapter 5), I have argued that in the grey areas of the law, certifications and the political ecological imaginaries about e-waste and recycling sites that enable them have played the critical role in producing e-waste as a problem that is amenable to certain types of consumer agency, namely market transactions. Moreover, in the rolling-out of these ethical markets for e-waste disposal, the fetish of recycling is re-worked: what is revealed is just as significant as what is hidden. Where e-waste comes from, where it goes, what happens to it, and how it ought to be governed are always only partially addressed by both e-Stewards and R2. These ambiguities should give consumers pause; using a certified e-waste recycler is not as tidy a solution to environmental injustice as might be hoped. Whereas Gille's work on Hungary's waste regime is sensitive to processes occurring beyond the scale of the nation-state, she acknowledges that "more research is needed to analyze how the production, representation, and the politics of waste all leech across national borders" (2010, 1062). My work more fully develops analysis of the multi-scalar relations embedded within processes of shaping what counts as waste and how it is acted upon.

Finally, two political ecology themes stand out as significant both in terms of e-waste politics and for the larger trend of 'voting with your dollars' to rectify social and environmental problems. The first is the way certifications conflate market shifts with democracy. The second is the potential for consumer-based politics to be diversionary and close off more politically difficult, yet more effective, alternative actions. I explore each of these issues by way of conclusion.

To be fair, for U.S. consumers, both individuals and institutions, certifications provide some modicum of security against unscrupulous waste brokering. But these certifications are not, as the Wells Fargo testimonial suggests, making this supply-chain simpler or more legible in terms of their effects on distant livelihoods. The criticisms leveled above point to the importance of contingency in processes of recycling and value recovery and raise the possibility of unintended consequences for both informal sector recyclers and grey market consumers. Towards greater inclusiveness, the 'Best of 2 Worlds' approach developed by researchers with the StEP initiative provides an alternative that more fully engages recyclers in developing countries as active participants in economic activity rather than as passive recipients of toxic waste. StEP is by no means a radical step-forward, but it does theoretically allow for the informal sector to improve, rather than assume it will disappear given constraints on the trade in used electronics. This opens up space for traditions of informal sector labor organizing (see Bhomik 2006) to inform e-waste governance as opposed to locating solidarity at the cash register. But as Reddy has shown, these development projects are not a magic bullet and can also do a great deal of harm.

Finally, perhaps the most significant point here is that using market-based mechanisms to reform e-waste exports is easily co-opted by manufacturers looking to steer political pressure away from more onerous, but potentially more effective, regulations such as toxics bans or design requirements that directly engage with production. This is not to say that reforming recycling is useless or unwarranted, but rather to suggest that it might fall into what Samantha MacBride calls 'busyness'. Busyness is manifest in calls to recycle more, recycle 'better', consume less/consume differently, with the expectation that these changes in consumer behavior at the end-of-pipe will drive material changes 'upstream'. But as one recycler told put it,

"recyclers are always addressing symptoms. The symptoms are things like the problematic [mercury] tubes to take out. Industry guys [sic] like me solve those problems. But we are solving basically symptoms, not the cause" (interview 8/2/11). The politics of certified e-recycling continue to run parallel to broader issues of resource consumption and growth, and unfortunately certification for recyclers furthers this frustrating trend.

The next chapter takes a closer look at a few policy developments that indicate a potential shift in waste politics away from the end-of-pipe focus. Extended producer responsibility (EPR) legislation has passed in 25 U.S. states with the general purpose of directing the costs and logistics of e-waste management back onto the shoulders of OEM's, with the idea being that paying for e-waste management will incentivize producers to change product design to enhance recyclability. But as I will demonstrate, the forms that EPR laws have taken are fairly weak in their ability to achieve the full set of goals that EPR proponents hope for. Chapter 7 walks through the evolution of EPR legislation in the U.S. and charts the development of the current patchwork of state laws.

Chapter 7 – From Disposal to Production

I. Introduction

Up to this point, this research has focused on managing the distribution of e-wastes through a diverse global network. Chapter 5 highlighted the difficulties of codifying distinctions between used electronics as clearly hazardous wastes or commodities. The previous chapter unpacked how the R2 and e-Stewards standards are re-working the global network for electronics recycling in ambiguous ways. As I have shown, even when assessed on their own terms of making e-waste geographies legible, voluntary certifications leave much to be desired. A major undercurrent in the previous empirical chapters, however, has been that much of what plagues the recycling industry – planned obsolescence, toxics use - originates in production. Recyclers, NGO's, and recycling reformers of all stripes readily acknowledge that addressing problems in the recycling industry is only part of the picture. In their initial landmark report, *Exporting Harm*, as well as in their current advocacy, BAN allows that "If E-waste were not hazardous, it would still be a nuisance but it would no longer be deadly and destructive to human health and viable ecosystems" (Puckett et al 2002, 40). In the ubiquitous (in the U.S. at least) refrain of 'reduce, recycle, reuse', waste reduction, both in terms of quantities and toxicity, has been the most difficult to achieve. This chapter engages with political efforts to go beyond end-of-pipe treatments of e-waste to effect 'upstream' change.

In the case of electronics, efforts to challenge the hegemony of producer autonomy in the production process in the U.S. have taken the form of extended producer responsibility (EPR) laws. While I would hesitate to say that any of these developments will radically democratize

production, EPR chips away at the dominant paradigm of consumers and municipalities busily spending time and money collecting, sorting, and scrambling to recover value from the post-consumer waste stream. Recognizing that consumers and municipalities have little to no influence over the material characteristics of products, EPR moves more towards the 'polluter pays' principle where the internalization of waste management costs drives changes in product design. Although the reliance on market incentives, public-private cooperation, and consumer action have been widely criticized in the neoliberal environmentalism literature (see Heynen and Robbins 2005; McCarthy and Prudham 2004 for an overview), because EPR actually mandates recycling and other regulatory controls, there is the potential for e-waste laws to generate some progressive possibilities.

EPR laws work by requiring producers (brand owners, not necessarily manufacturers) to take some, or all, of the financial and/or operational burden for managing consumer products at their end of life. Also referred to as 'product stewardship' or 'take-back' schemes, EPR policies have two central aims: lowering waste management costs for taxpayers and incentivizing producers to change their designs to use more secondary materials, be more recyclable, and less toxic. At the very least, EPR laws ease the burden of waste management costs for municipalities by requiring producers to take responsibility for the costs of managing their discarded products. Designs that make recycling expensive or difficult, or the use of toxic materials that do the same, would be disfavored if producers were unable to externalize these costs onto the taxpaying public. Thus EPR relies on the premise that changes in waste management i.e. 'downstream' will drive changes 'upstream' (MacBride 2011, 114). Although ostensibly driven by market signals, EPR requires a great deal of state involvement in tracking and enforcing progress. Twenty-five U.S. states have now passed EPR laws for electronics, but each of these laws is

unique in terms of what electronics are covered (scope), who pays for collecting and recycling targeted materials (finance), and the requirements for managing those materials (responsibility). With so many different requirements, the current EPR framework in the U.S. can accurately be described as a 'patchwork' (GAO 2010).

In theory, EPR programs expand electronics recycling, create jobs, enhance the availability of secondary resources 'downstream', and incentivize 'greener' designs 'upstream'. When combined with certifications for electronics recyclers, these mechanisms should reduce the most egregious abuses documented both at the recycling phase (Puckett et al 2002; Puckett et al 2005) and in production (Pellow and Park 2002; Smith, Sonnenfeld, and Pellow 2006). Many state's EPR laws include reference to recycler certifications. But where the rubber hits the road is in the political process. As with the previous chapters, I use the tri-partite framing of the e-waste regime concept – thinking through political economy, materiality, and political practices of representation – to understand how such upstream policies have been developed and how they are reworking the infrastructure for electronics recycling.

In focusing on the development of EPR legislation, the key questions are about the scope, financing, and delegation of responsibility embedded within the laws. These areas are highly contested, and producers of electronics have been quite visible in their attempts to influence the key aspects of EPR legislation to water down requirements. As I will show in this chapter, EPR does increase electronics recycling rates by creating markets for discarded devices. It reduces the downstream impacts of landfilling or incinerating electronics and keeps valuable materials circulating. But unfortunately, EPR as it is currently practiced in the U.S. does not meet its goals of financial equity or material change upstream. Once again, the devil is in the details; one has to get 'pretty far into the weeds' to understand how these disappointing outcomes are produced.

I make three interrelated arguments. The first argument stems from analysis of the evolution of EPR legislation in the U.S. The state-by-state patchwork has many differing effects on manufacturers, recyclers, and states. In brief, two broad issues are worth noting here. The first is an apparent increase in transboundary movement. The patchwork creates 'leakage' of low value materials from non-EPR states into states that have those laws because collectors and recyclers can get paid through the take-back programs. The second effect is a lack of harmonization. Electronics producers have complained about the duplicitous compliance requirements among the different states and are now advocating for a national EPR law that would harmonize requirements. This criticism of the current patchwork is actually quite hypocritical; between 2001-2004, these same producers scuttled an attempt at developing such a national framework.

My second argument is that while many recyclers and state legislators support existing EPR legislation, the success of these programs is quite mixed. While EPR has improved collection of discarded electronics and often makes recycling easier for the public, it does not appear that EPR as it currently exists has any effect on product redesign or toxics reduction. The explanation for this outcome has to do with the responsibility for collection and the financing of the schemes. Most states allow for manufacturers to meet their collection requirements by recovering a certain amount of electronics by weight. The amount is determined either by a company's market share (percentage, by weight, of products sold in a state) or their return share (percentage, by weight, of particular brands collected for recycling), but either way, there is no direct incentive for producers to make products last longer, be more recyclable, or less toxic. Moreover, the costs of complying with these collection schemes are simply passed on to the consumer, or in the case of California, paid directly by the consumer at the point of sale. A

recycling fee charged to manufacturers based on the material characteristics of individual products (not just brands) i.e. how hard or easy it is to recycle, would carry the most re-design incentive but is also the most difficult to implement because these fees "would have to reflect a wide array of product characteristics, such as weight, bulk, chemical constituents of the product, and degree of recyclability" (Sachs 2006. 76). And despite the popularity of market-based incentives and demand signaling, it appears that the most effective toxics reduction tool is 'old-school' command-and-control rules that ban the use of certain toxic materials (Sachs 2006; INFORM 2003).

In practical terms, the shortcomings of EPR need not be permanent and have more to do with the technicalities of implementation than the theory of EPR itself. Over time, EPR may evolve to have more teeth. Nevertheless, drawing on these critiques of existing EPR legislation as well as the previous analyses of certifications, my concluding argument is that instead of shifting designs, reducing toxics, and turning e-waste into a mere 'nuisance', EPR seems to simply ramp up a recycling system that runs parallel to, but does not directly address, issues of growth and democracy over how things are produced and to what ends. While I do not wish to dampen enthusiasm for e-waste politics and all of the great work that social movements, NGO's, and others are doing (see Pellow 2007), my sense is that the incremental steps being taken towards more and better recycling are necessary but not nearly sufficient. My final argument, which carries over into the concluding chapter, is that some potentially radical things are happening in the open-source/hacker/repair movement around the world. These disparate movements, which blur the lines between anarcho-hacker collectives, right and left libertarians, and do-it-yourselfers (DIY) are largely working outside of the mainstream political process and constructing alternative futures that more directly confront a political economy based on growth.

People are creating their own software and hardware, sharing information and tools, and attempting to control the life-cycle and uses of technology. These movements have something in common with the misunderstood Luddites, who sought not to destroy technology, but to exert control over it rather than it control them (Noble 1995). As Soderberg notes, interesting things start to happen when consumer goods are taken by users as the starting point of a new cycle of production (2008). The struggle that Marx identified between the relations and forces of production continues today.

Chapter outline

This chapter moves the concept of the e-waste regime beyond the focus on waste distribution and more fully engages with the politics around production. Section III looks at the 'downstream' effects of EPR laws, specifically in terms of the variations in scope, financing, and responsibility among the twenty five EPR laws and how they are shaping the e-waste regime. Section IV analyzes how the scope, financing, and responsibility of EPR laws diverge from the stated goals of reducing toxics, and thus takes the 'upstream' impacts as the focus. Finally, Section V sets up the concluding chapter, which explores the possibilities of information sharing and open-source technology as a source of formidable resistance to producer control over the trajectory of technological development. The next section provides context for these analyses.

II. Evolution of the Regulatory Context

One of the major catalysts for the development of EPR legislation both in North America and Europe was the changing materiality of the municipal waste stream (Speigelman and Sheehan 2005). 100 years ago, the majority of wastes collected from households were ashes or

biodegradable materials such as food waste (ibid). Over the course of the 20th century, this waste stream shifted from mostly organic material to mostly products and packaging, much of which is made from synthetic materials like plastics (ibid; see also Melosi 1981). Plastic packaging, batteries, tires, thermostats, and electronics are all items whose material qualities make them especially difficult for municipalities to recycle, especially when collected in mixed-loads with paper, cans, glass, and other discards collected by curbside recycling programs (MacBride 2011). Furthermore, while many organic wastes can be fully re-used and realized at the local scale, many modern synthetic wastes such as plastics cannot (ibid). Thus federal policies that redirect synthetic wastes back to producers and leave easily recyclable and re-useable materials such as paper, scrap metal, and organic wastes at the local level can create shorter materials loops as well as jobs.

It is within this context that EPR laws emerge. Again, a waste regime is partly defined by the materiality of discards; a shift to synthetic, complex consumer products is quite simply at odds with what curbside municipal recycling systems do well. But my approach here is not to simply evaluate how well or poorly EPR policies manage modern wastes like e-waste, although I do not wish to ignore those questions either. In bringing in materiality, political economy, and governmentality, I try to move past this sort of liberal analysis and engage with the contradictions of capitalist relations as well as the ways in which the hegemony of these relations are maintained and contested. As a researcher and a citizen, my own proclivity is to try and step back and think not just about a problem and its solutions (certifications, EPR), but to search for alternatives conceptualizations and framings. In this case, what happens when particular ways of understanding the relationship between society, environment, and waste become entrenched in particular technologies of governing, like recycling? Can recycling more and recycling better

significantly alter the dominant relations that produce waste in the first place and the uneven geographies through which waste circulates? By changing recycling, do consumers exert more control over the trajectory of technological development? Samantha MacBride's excellent book, *Recycling Reconsidered* (2011) provides a guide to my thinking here.

In the previous chapter, I showed how market pressures divert the R2 and e-Stewards certifications away from waste reduction towards 'better' wasting. Particular forms of knowledge about e-waste as a political object can actually do the work of reproducing the hegemony of markets. Of course cooptation, whether overt or as in the case of certifications simply a logical outcome of market demands, is not exactly new. In her fascinating history of the recycling movement in the U.S., MacBride shows how knowledge about municipal solid waste, consumer subjectivities, institutions, and political praxis changed together to confront the sudden appearance of a 'waste crisis' in the 20th century. But rather than directly addressing supply-side political and economic dynamics, she argues that the moral fervor of the recycling movement was diverted to the relatively insignificant (in terms of material throughput) realms of post-consumer, municipal solid waste management and recycling. What are today sacred tenets of mainstream environmentalism – recycling, buying less/buying differently, and keeping up the fight against polluters – are in many ways actually counterproductive to further significant change in material transformations. Macbride defines this state of affairs as busyness, which I cited in previous chapters as "a fulfilling sense of work and achievement that often brings positive side effects but fails to reach the central effect. If progress is a flowing stream, busy-ness is an eddy, moving vigorously but not forward" (2011, 6).

This is of course understandable given that municipal solid waste – the everyday garbage produced by private and public consumption – has always been more visible than other kinds of

wastes. Furthermore, high profile instances of threats posed by hazardous waste, such as the Love Canal incident, have rightfully garnered significant public attention. The question then becomes why we choose to address these particular narrow slices of the waste problem in the particular ways that we do. The interventions that have been made, like taxpayer funded, post-consumer curbside recycling and disposal run by municipalities and hazardous waste tracking, monitoring, and storing, are vehemently defended by environmental organizations as being a 'good start'. After all, nationally the U.S. recycled 33% of the 250 million tons of MSW generated in 2009 (MacBride 2011, 242). Recycling has a kind of 'feel-good' quality in that the visible waste in our everyday lives can be known and tracked with quantifiable results. Consumers can be part of the solution, as Keep America Beautiful urges us to do with their slogan that 'People start pollution. They can stop it too'. It is telling that Keep America Beautiful was actually created by the packaging industry in response to a move by Vermont in 1953 to outlaw disposable containers (Rogers 2006).

What is curious about this form of environmental consciousness is its persistence in U.S. politics. While careful to emphasize the positive aspects and potential of recycling, MacBride shows that our roughly sixty year experiment with modern waste policy "*isn't working* to reduce tonnage, toxicity, and [the] continued growth of materials extractions and transformations in the United States or globally" (2011, 222, emphasis in original). By asking what it is that curbside recycling is 'a start' to, Macbride is not tearing down recycling so much as she is attempting to understand how alternative conceptualizations of environmental politics have been precluded. For example, separate from MSW and hazardous wastes are the categories of industrial, agricultural, and mining wastes, which amount to an astounding 11.7 *billion* tons (ibid), a number that is almost 50 times greater than the 250 million tons of MSW that Americans spend

so much time sorting and recycling. The fact that industrial wastes - wastes produced behind the gates of private factories - are not even regularly tracked by the EPA[65] invokes the parable of the blind men and the elephant. Progressives and environmentalists, myself included, are touching one part of the elephant and telling ourselves feel-good stories about the importance of recycling. Waste reduction is hard, recycling is relatively easy. EPR laws make it even easier.

But when we are getting busy recycling MSW and now e-waste, what are we not doing? The other side of busyness is what MacBride calls 'unpolitics', which describes the "case of a serious problem no one is politically interested in and no one talks about" (2011, 11). Why, for example, does EPR target post-consumer waste for 'producer responsibility'? Why not force producers to collect data and engage in measures that prevent waste in the manufacturing process (MacBride 2011), where the greatest life-cycle impacts occur? (Williams 2004). If the U.S. wants to enhance the use of secondary materials, as outlined in the Obama Adminstration's National Strategy for Electronic Stewardship (2011), why not amend the General Mining Law of 1872, which foregoes taxes on mining on public land? The short answer is that these political changes are difficult given the entrenched interests behind them. Recycling raises issues related to the visibility, toxicity, and economic and environmental costs of a 'throwaway society', but it does so in a non-threatening way. EPR as it is currently practiced unfortunately does not change that.

I raise the concepts of busyness and unpolitics to illustrate the way technologies of governance normalize certain practices. The discourses of incremental change, driven by public-private cooperation and changing consumer demand that permeate recycling politics, and mainstream environmental politics more broadly are perhaps part of the problem. But as I

[65] The EPA conducted one estimate of non-hazardous industrial wastes in 1987 but does not conduct annual studies as it does with MSW and hazardous wastes.

suggested in chapter 3, the governmentalizing of subjects in particular ways is not a totalizing process. There is 'bottom-up governmentality', where individuals and collectives recognize planned obsolescence, the treadmill of production and the naïve assumption that recycling is an end in itself and begin to challenge it. Too often critical scholarship writes off the consumer as a dupe. Consumers, I want to argue, perhaps deserve more credit. Today consumers have more tools than their shopping behavior, or even the boycott, to effect change. A small number of technology users are circumventing the above mentioned issues by creating their own software and hardware and by agitating for the right to share information freely so that others can do the same. An information commons creates the possibility for a democratizing of the means of production. This is not technological determinism, but is rather about the empowerment of labor, conceived in the broadest sense. This broadly conceived, heterogeneous movement, I argue, can be thought of along the lines of Polanyi's double movement and presents an interesting alternative/companion to recycling and EPR. The pressing need for such alternatives should become clear following the next two analytical sections.

III. The Downstream Effects of the EPR Patchwork

Rather than attempt to analyze all twenty five different state EPR laws, my approach is more selective and aims to highlight how, through bureaucratic means, progressive legislation like EPR gets bogged down and diverted into busyness. This section analyzes the wide variations in how these schemes define the scope of covered electronic products (CEPs), how their collection is financed, and the management requirements. I do my best to spare the reader the byzantine complexities. As I have already suggested, these schemes have generally improved

the collection of CEP's for recycling and diverted materials away from landfills. However, the variations have led to a number of problems that face manufacturers, recyclers, and states.

Scope

In general, all twenty five EPR schemes work by identifying a set of CEP's and a set of 'covered entities' (households, businesses, etc.) from which these CEP's must be collected. As Lepawsky notes, "governing e-waste enacts contingent, rather than necessary, ontologies of waste" (2012, 1196). While it is true that the law 'performs' e-waste in particular ways, the law itself is shaped by lobbying interests that have a stake in whether or not something 'counts' as e-waste. Presumably, electronic products would be included or excluded from being CEP's based on whether or not they exhibit hazardous characteristics and/or possess valuable materials. But some of the differences seem arbitrary. For example, the state of Michigan's EPR law covers iPads or Kindle Fire's (computers) from households or small businesses (fewer than 7 employees), but does not cover Kindle Readers at all. Tables 3 and 4 show CEP's and covered entities, respectively, for all twenty five states.

Table 3. Covered electronic devices																	
State	Computer	Laptop	Monitor	TV	Printer	Fax	Scanner	Keyboard or mouse	DVD players	VCR	MP3 player	Cable /Sat. box	Cell phone	Game console	E-Reader	Small server	Digital Picture Frame
California		X	X	X					X[66]								
Connecticut	X	X	X	X	X												
Hawaii	X	X	X	X	X												
Illinois	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Indiana	X	X	X	X		X		X	X	X							
Maine		X	X	X	X									X			X
Maryland	X	X	X	X													X
Michigan	X	X	X	X	X												
Minnesota	X	X	X	X	X	X		X	X								X
Missouri	X	X	X														
New Jersey	X	X	X	X	X												X
New York	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
North Carolina	X	X	X	X	X	X	X	X									
Oklahoma	X	X	X														
Oregon	X	X	X	X													
Pennsylvania	X	X	X	X	X			X									
Rhode Island	X	X	X	X													
South Carolina	X	X	X	X	X												

[66] Only portable DVD players

Texas	X	X	X	X													
Vermont	X	X	X	X				X									
Virginia	X	X	X														
Washington	X	X	X	X													
West Virginia	X	X	X	X													
Wisconsin	X	X	X	X	X	X		X	X	X							
Utah	Utah's law only requires producers to report on recycling options available																

Table 3. Covered electronic devices. Data drawn from the Electronics TakeBack Coalition (a, no date) and the Electronics Recycling Coordination Clearinghouse (ERCC, no date).

Table 4. Covered Entities

State	Households	Businesses	Government	Non-profits/Charities	Schools	Notes
California	X	X	X	X		
Connecticut	X					
Hawaii	X	X	X	X	X	
Illinois	X					
Indiana	X	X			X	Not colleges or universities
Maine	X	X		X	X	Small businesses and non-profits (<100 employees)
Maryland	X	X	X	X		
Michigan	X	X				Businesses < 7 employees
Minnesota	X					
Missouri	X					
New Jersey	X	X				Businesses < 50 employees

New York	X	X	X	X	X	
North Carolina	X			X		Businesses <10 employees
Oklahoma	X					
Oregon	X	X		X		Businesses <10 employees or any person giving <7 devices at one time
Pennsylvania	X	X			X	Businesses <50 employees
Rhode Island	X					
South Carolina	X					
Texas	X					
Vermont	X	X		X	X	
Virginia	X					
Washington	X	X	X	X	X	Government and business <50 employees
West Virginia	X	X	X	X	X	
Wisconsin	X				X	

Table 4. Covered Entities. Source: Electronics Recycling Coordination Clearinghouse (a)

Collection and finance

If manufacturers sell CEP's in that state, they must engage in some effort to collect and recycle those products. Some states, like Texas and Virginia, simply require producers to set up take-back programs for computers, laptops, and monitors and register the programs with the state. However, Texas and Virginia have weak convenience requirements[67] and do not set collection targets. Manufacturers in Texas are required to report the amount of collected

[67] Allowing consumers to mail-back computers, laptops, or monitors counts as 'convenient' in Texas and Virginia.

products to the state, but are not required to make these reports public[68]. Because there are no collection targets or strong convenience requirements and no enforcement of whether manufacturers actually follow the take-back plans that they submit, Texas and Virginia have some of the lowest per capita recycling rates in the country (see Electronics Recycling Coordination Clearinghouse, b).

Many other states, like Rhode Island, Oregon, and Washington, while all varying in their implementation, have high per capita collection rates because they set specific targets for collection and convenience. Manufacturers are not going door-to-door collecting their products from households and businesses but are contracting collection, transport, and recycling out to existing service providers. In Oregon, manufacturers can opt in to a state plan or create their own plan to collect, transport, and recycle CEP's. Either way, Oregon has a goal of recycling 3.3 lbs per capita, and manufacturers are required to recycle a portion of that state-wide goal that is based on their return share. If recyclers fail to collect their portion, they are charged a per-pound rate for the difference. The initial registration fee is used by the state to enforce the law (Texas Campaign for the Environment 2010, 11). To provide an example of how complex the variations in the law are, Maine's public-private take-back system requires municipalities to collect used electronics and transport them to consolidation points, where the equipment is weighed and documented by brand. The state then bills manufacturers for recycling based on its share of the equipment returned through the consolidation points (ibid, 12). Table 5 provides a brief description of how each state law assigns logistical and financial responsibility.

[68] The Texas Campaign for the Environment had to file a Freedom of Information Act request just to get data on Texas' program.

Table 5. Who pays for collection and recycling		
	Who pays	Details
California	Consumers pay a fee at purchase. Fee money goes to state, used to reimburse recyclers and collectors.	Producers must comply with the ROHS directive (see below). Landfill ban. No prison labor ban
Connecticut	Return Share. Municipalities arrange for collection and transportation to recyclers, Recyclers bill the manufacturers	Landfill ban. No prison labor ban.
Hawaii	Manufacturers must establish plans to collect and recycle their products.	No landfill ban. No prison labor ban.
Illinois	Overall statewide goal is a return share goal (increased up to 10% over previous year goal.) Converting the statewide goal into company Obligations is based on market share for TV companies& return share for IT companies.	Landfill ban. Prison labor ban.
Indiana	Market share. Producers pay for collection, transportation, and recycling, meeting goals based on market share of video display devices sold.	Landfill ban. No prison labor ban.
Maine	Producers pay for transport and recycling,some collection costs. Municipalities pay for some collection costs. IT costs split by return share. TV cost split by market share	Landfill ban. No prison labor ban.
Maryland	Manufacturers pay fees to State. State funds reimburse Counties who pay for recycling via grants.	No landfill ban. No prison labor ban.
Michigan	Producers pay for collection, transportation, and recycling, but no level of service is mandated.	TV companies have non - binding goal of 60% by weight of what company sold in previous year. Prison labor ban. No landfill ban.
Minnesota	Market share. Producers pay for collection, transportation, and recycling.	Manufacturers must recycle 80% by weight of previous year sales. Prison labor ban except for non-profit reuse and repair. Landfill ban.
Missouri	Producers pay for collection, transportation, and recycling, but no level of service is mandated.	No landfill ban. No prison labor ban.
New Jersey	Return share. Producers pay for collection, transportation, and recycling. TV companies assign costs of collective return share via market share.	Landfill ban. Prison labor ban. Products must be ROHS compliant on heavy metals.
New York	Producers pay for collection, transportation, and recycling according to their market share. Law establishes a statewide goal, then producers are assigned their portion according to market share. Producers also must take back one unit	Landfill ban. No prison labor ban.
North Carolina	Producers must pay for transportation from collection sites (run by govt, retailers, or non-profits) as well as recycling costs. They don't pay for collection. Market share for TV. Return share for IT companies.	Landfill ban. No prison labor ban.
Oklahoma	Producers pay for collection, transportation, and recycling, but no level of service is mandated.	No landfill ban. No prison labor ban.
Oregon	Producers pay for collection, transportation, and recycling. TV companies assign costs of collective return share via market share.	Manufacturers must have collection site in every county, plus every city over 10,000. Landfill ban. No prison labor ban.
Pennsylvania	A manufacturer shall establish, conduct and manage a plan to collect, transport and recycle a quantity of covered devices equal to the manufacturer's market share.	Landfill ban. Recyclers must be certified to R2 or e-Stewards.
Rhode Island	Producers pay for collection, transportation, and recycling	Landfill ban. Prison labor ban.
South Carolina	Producers must have a take-back program, but no level of service is mandated.	Landfill ban. No prison labor ban.
Texas	Producers must have a program, but no level of service is mandated.	No landfill ban. No prison labor ban.

Vermont	Combines market share goals and convenience requirements. Must have 3 sites/county plus 1 site in every city of 10,000 or more.	Landfill ban. No prison labor ban.
Virginia	Producers must have a take-back program, but no level of service is mandated.	No landfill ban. No prison labor ban.
Washington	Producers pay for collection, transportation, and recycling. Return share.	No landfill ban. Prison labor ban.
West Virginia	Producers pay registration fee of $10K if they have no take-back program, or $3k if they do.	No landfill ban. No prison labor ban.
Wisconsin	Producers pay for collection, transportation, and recycling based on their market share. Goal is 80% by weight of products sold to households and schools 3 years previous.	Landfill ban. Prison labor ban.

Table 5. Who pays for collection and recycling

According to my interviews and a survey conducted by the Government Accountability Office (GAO 2010), manufacturers are generally frustrated by the duplicitous requirements of the current EPR infrastructure. The GAO survey lists the following specific issues as a compliance burden for manufacturers: paying annual registration fees to multiple states, submitting multiple reports to state environmental agencies, reviewing and paying invoices to multiple recyclers, and conducting legal analyses of state laws to determine the responsibilities placed on manufacturers (2010, 15). Manufacturers have a number of responses to these compliance costs.

First, an analysis of EPR in the U.S. by the Electronics TakeBack Coalition found that once manufacturers collect the minimum amount of material required by a state, they stop collection (Electronics TakeBack Coalition (b), no date, 4). And in states like Washington where manufacturers can set up their own plans and contract out to service providers, they drive costs down by creating competition between recyclers. A member of an NGO in Washington remarked that

> "Now that there is a state producer responsibility law, the producers come in and say 'we're gonna get as many e-waste processors signed up as possible and then play them off each other and get prices low as we can'…And so now you've got all these recyclers competing against each other to get the state mandated stuff and it's a race to the bottom and the OEM's are running the show (interview, 3/14/11).

Finally, the response of manufacturers to high compliance costs is simply to build in the costs of the EPR programs into the price of the product (Cassel 2012, 21; Sachs 2006). It also means that states without EPR laws, like Georgia, pay for the cost of programs in states that do have the laws since presumably consumers everywhere are paying higher prices. Although this works against the incentive to re-design products, it is at least more equitable since it is a tax born by consumers of electronics, rather than taxpayers as a whole.

Cross-boundary flows, fraud, and 'cancellation'

California has played a unique role in the development of (quasi)EPR legislation and their experience provides several lessons for the future of EPR. As the first state to pass an electronics recycling law in 2003 (S.B. 20), California decided to forego producer responsibility and instead operates their program through an advanced recycling fee (ARF). When consumers purchase new electronics, they pay a fee that ranges between $8 and $25, depending on the size of their new purchase. This fee is then passed from retailers[69] to the state, who uses the fees to reimburse collectors and recyclers for the costs of CEP's. In order for collectors and recyclers to be reimbursed, they must be approved by the state and must document that the CEP's came from homes or businesses within California. The advantages of using an ARF are that it funds the recycling mandate (Sachs 2006). The disadvantages, in terms of downstream impacts, are that in practice California's law has initiated illegal cross-boundary flows and discouraged re-use.

A 2010 story by *The Sacramento Bee* described S.B. 20 as producing a "new California Gold Rush" as used electronics collected from out-of-state flooded in from collectors hoping to get paid through the California system, where the state reimburses collectors and recyclers of CEP's $.39 a pound (Knudson 2010). In order to receive payment, collectors and recyclers must

[69] Retailers receive a 3% cut for handling the fee.

simply maintain logs showing that the CEP's were collected from within California. But the state began discovering fraudulent logs, with names like Dustin Hoffman, Robin Williams, and Mike Tyson included on claims for state reimbursement (ibid). The state often discovered these fraudulent claims after payment had already been made. These cross-boundary movements, known in the industry as 'leakage', were driven by simple economic calculations: given the low value and high-cost of safely recycling CRT-monitors, in say, Arizona, an entrepreneurial individual could simply forge a set of names and addresses and sell those monitors to an approved collector in California. Hence the state law turned California into a 'magnet for fraud', with an estimated $30 million dollars in fraudulent claims that may have been paid (ibid). The GAO report and my own interviews found that fraud was a potential issue in other states, but no widespread problems have been reported anywhere else.

Another unfortunate issue associated with S.B. 20 is that recyclers are only paid for units recycled, not units re-used (see CalRecycle). This is an incentive to crush and shred working devices ('cancellation') in order to receive payment[70]. And as electronics recycler and blogger Robin Ingenthron has pointed out, when California began crushing working monitors instead of exporting them to buyers overseas that wanted them, California ended up with a large stockpile of CRT glass (Ingenthron 2012). Direct re-use of CRT's in developing countries may be the only market for a technology that has dramatically declined in demand as flat-screen technologies have grown. The *New York Times* recently reported that in 2004, recyclers were paid more than $200 a ton for CRT glass, whereas today, those same companies have to pay $200 a ton to get anyone to take the same glass (Urbina 2013).

[70] In contrast, Illinois gives manufacturers extra credit towards their collection goals for units re-used instead of recycled (Electronics TakeBack Coalition, no date, 6).

One possible solution to the compliance costs and cross-boundary flows inherent to a patchwork of state laws would be to developed a uniform national approach. From 2001-2004, a group of manufacturers, state regulators, recyclers, and NGO's convened to create a national EPR framework for electronics called the National Electronic Product Stewardship Initiative (NEPSI). However, manufacturers did not agree with the scope and financing of NEPSI, and walked away from the process. The irony is that today, these same manufacturers favor a national approach. A recycler I interviewed who participated in the NEPSI process said that initially manufacturers simply opposed a national law for no other reason than that it was a regulatory action. But now that "they [manufacturers] are suffering under the state by state and the differences from state to state and the headache that it is, they know it will be easier for them to have a national approach" (interview, 1/17/13).

IV. EPR and Upstream Impacts

Despite the high compliance costs, cross-border leakage, and anti-reuse incentives (in California's case), the results of these laws have been positive in terms of generating collection and perhaps even creating recycling jobs. Cassel states that recycling rates in EPR states can be five times higher than states without laws (Cassel 2012, 20)[71], and that electronics recycling can create up to 20 jobs per 1,000 tons processed and remanufactured (ibid, 21). Improving the amount of electronics collected for recycling is undoubtedly a good thing when compared to the alternatives, especially since electronics can exhibit hazardous characteristics. When electronics, and the gold, copper, and rare-earth metals like palladium get put into landfills, production of

[71] Comparison of pre and post-EPR collection rates are difficult because many states do not have data on electronic discards prior to the passage of a law. Cross-state comparisons have to be adjusted for the variations in scope between the laws. Nevertheless, states that have had EPR for multiple years have seen increases in per capita collection rates. See the Electronics TakeBack Coalition http://www.electronicstakeback.com/wp-content/uploads/Collection_Volumes_by_State.pdf

new materials does not simply stop. Those metals are mined out of the ground, and mining is one of the world's most polluting activities (Blacksmith Institute 2012). Recovering those materials through recycling can make them viable as inputs for new rounds of production. Of course, the health and growth of the recycling industry does not necessarily correlate with overall waste reduction. This is known as Jevon's Paradox, where gains in efficiency are outpaced by growth in overall consumption (see Foster 2009). Speigelman and Sheehan note that by the 1990's in the U.S., increases in recycling were matched by increases in the amount of wastes generated, which offset gains in waste reduction (2004).

The heart of the matter is really whether EPR facilitates any changes in product design. Simply increasing recycling rates could be accomplished by means other than EPR. But the collection and financing of the schemes in the U.S. has not led to design changes (GAO 2010). In terms of collection, because all but seven EPR states allow producers to meet legal requirements by recovering electronics by weight, typically a number based on market share[72], producers pay for the recycling of not only their own brand but the brands of their competitors as well. In these *collective* take-back schemes, there is little to no incentive for recyclers to engage in any design changes because the benefits would not accrue to the individual brand owner (Castell et al 2004; MacBride 2011; Sachs 2006). For instance, if Dell made a PC with design-for-recycling (DfR) specifications but had to collect hard-to-recycle PC's made by Hewlett Packard, Dell would not see any cost savings.

In terms of the financing for these collective schemes, my analysis is in sync with Lepawsky's recent work on e-waste EPR in the U.S. and Canada, where he argues that these laws delegate financial responsibility to producers in name only (2012). California and all of

[72] Market share refers to the amount of products sold by a manufacturer within a particular state. Therefore if a state collects 1,000,000 lbs of covered electronics and a manufacturer has a 10% market share, they would pay for 10% of 1,000,000 by weight or 100,000 lbs.

Canada (except Ontario), finance EPR through an ARF that *consumers* pay when they purchase new electronics. Ontario and the other 24 U.S. states finance EPR through a fee paid by *manufacturers*. But because nothing prevents these manufacturers from passing on the costs of EPR to consumers in the form of higher prices, both the visible fee paid in California and the invisible fee paid in the rest of the U.S. actually delegate financial responsibility to consumers. Instead of re-design incentives, what is in effect 'extended consumer responsibility' "enables producers to continue to externalize costs of end-of-life product management, a result diametrically opposed to what EPR is supposed to achieve" (Lepawsky 2012, 1201).

A system based on *individual* manufacturers collecting *only* their brand of devices creates more of an incentive for product re-design (Rossem, Tojo and Lindhqvist 2006; Sachs 2006;). Such an individual take-back scheme could resemble something akin to a product lease, where the consumer purchases the function of the product rather than the physical product itself (Fishbein, McGarry, and Dillon 2000; Sachs 2006). However, such an individual take-back scheme is easier to implement with large business customers than it is the general public. This has to do with the geographies of reverse-logistics: in recovering leased products, materials are widely dispersed throughout the population in individual households. Instead of leasing, seven EPR states[73] attempt individual producer responsibility by requiring manufacturers to collect an amount based on their return share, which is a manufacturer's percentage, by weight, of identified brands of CEP's returned for recycling[74]. But a fee system based on weight has very little to do with toxicity or recyclability (Huisman et al 2006). Manufacturers could reduce their recycling costs by designing light-weight, but still toxic, products (Lepawsky 2012).

[73] Connecticut, Illinois, New Jersey, North Carolina, and Washington cover all products by return share. Maine and Oregon cover certain products by return share with the remainder collected by market share.

[74] If Sony brands made up 10% of the electronics recovered for recycling in Washington, for example, then Sony would pay 10% of the total recycling costs for the state program.

Instead of individual brands collecting specific discarded products, another way individual EPR could be implemented is through an upfront recycling fee that is pegged to the material characteristics of a device. In practical terms, if individual brand owners were charged a fee that reflected the management costs of a particular product they make, like an HP dc5800 computer, then perhaps cost-internalization could occur. But again, given the complexity of electronic products – the different composition of plastics, metals, weight, chemical use, etc. – the sheer number of products, and rapid turnover, such an individual financing scheme remains extremely difficult to construct. An entire cottage industry dedicated to measuring the life-cycle costs of not just classes of products, but actual individual products would need to be developed to estimate the appropriate management fee.

Ironically, electronics manufacturers surveyed in the GAO study argued that a barrier to product design changes is "the inability of manufacturers to anticipate how recycling practices and technologies may develop over time" (2010, 17). Linking back to chapter 5, where recyclers were voicing their frustration over having to constantly react to changes in production, it appears that manufacturers have the same problem! Yet when I asked an OEM executive why they did not operate their own recycling facilities, he dismissed recycling and said that it was too 'low tech' for their engineers (interview, 1/24/12). Recycling and manufacturing remain at arms-length.

Other upstream policies

The EPR experiment has so far failed to produce the desired results of toxics reduction. But manufacturers surveyed by the GAO argued that a voluntary initiative – the Electronic Product Environmental Assessment Tool (EPEAT) – has had a greater impact on product

redesign. EPEAT is a rating-system that evaluates certain electronic products against a set of required and optional criteria such as materials selection, design for recycling, and end-of-life management. Based on how many of the optional criteria are met, an electronic device can be certified as bronze (meets all the required criteria), silver (all required criteria, plus 50% of optional criteria), or gold (all required criteria, plus 75% of optional criteria). What incentivizes producers to manufacture products that meet EPEAT criteria are voluntary commitments or requirements by large institutional customers to buy EPEAT certified devices. For example, since 2007, federal agencies are required to buy EPEAT-registered electronic products for at least 95 percent of electronic product acquisitions (EPA.gov, 'Environmentally Preferable Purchasing'). However, EPEAT has recently come under fire for claims of greenwashing. While ostensibly creating a 'race to the top' in terms of environmental performance, the crucial questions once again revolve around the scope of EPEAT (what is covered, what is not), and how the criteria are established. For instance, the MacBook Pro with Retina Display, derided in chapter 5 as the 'least repairable laptop', recently received EPEAT's gold standard rating.

On the bright side, what has appeared to work, both in Europe and the U.S., is the Reduction of Hazardous Substances (ROHS) law adopted by the European Union in 2003. In order for manufacturers to sell the electronics in the massive European market, ROHS "states that, by July 1, 2006, no new electrical and electronic equipment put on the market may contain lead, mercury, cadmium, or hexavalent chromium. Polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) — two types of flame retardant — are also prohibited" (INFORM 2003). This has had a ripple effect throughout the global market, with many manufacturers applying ROHS standards to products sold in the U.S. in order to simplify their supply chains (ibid). As Sachs notes, "An old fashioned command-and-control ban, which

directly inserts government into the research and development labs of manufacturers, appears to be a far more powerful driver of changes in product design than the take-back requirement" (2006, 82).

V. The Contradictions of Recycling Politics

To summarize, the politicization of electronics production processes is an important and progressive development in the evolution of the U.S. e-waste regime. The problems of e-waste management identified in chapters 5 and 6 should not be isolated from tendencies in production to externalize costs and relentlessly turnover products. Responsibility for a more 'sustainable' digital materials economy rests not just on consumers and recyclers to ethically manage our discards, but extends beyond the factory gates into the manufacturer's boardrooms. However, I argue that the form of this politicization gives off more heat than light. It seems as though the mere presence of laws bearing the moniker 'extended producer responsibility' has naively been assumed to generate the desired effects of 'cleaner' production. But in looking at the details of how these laws work, I see busyness in action. States are enhancing rates of recycling of an important waste stream with a decreased burden on taxpayers, but if we step back and assess the situation from a broader view, the same 'take-make-discard' economy where producers are in the driver's seat remains. A recycler who operates under the Washington state law neatly summed up the shortcomings of the U.S. experience with EPR:

> The product stewardship laws, I have a lot of criticism of them, I think in the case of our law, it does not properly send the message to consumers of the wasteful behavior, their habits. For us, you got a TV you want to get rid of, you take it down to Goodwill and drop it, it's free. It's just free shit. It doesn't tell me that there is any cost to that behavior. It says keep on doing it, it is a good thing. I don't think people who believe in waste reduction are getting what they want from product stewardship. It's been great at collecting material, we're getting mountains. It's been really, really good at collections…. [but] Reducing energy

> consumption, oh my god. Reduce buying this stuff, that's running against the entire marketing budget of the entire planet which is trying to tell us to buy more stuff. Because jobs are all about stuff." (interview 7/1/11).

The issues that this recycler raises go beyond the narrow focus on design. Even were our EPR laws able to send the proper signals from downsteam to upstream and initiate design changes (which they do not), we might need to ask ourselves *why* it is that 'jobs are all about stuff'. Why, if people were to suddenly renounce consumption, would actual people's lives suffer? Unfortunately, it is true that reduced consumer demand would slow economic growth, and anything that slows economic growth creates a crisis which unevenly inflicts pain on society. Capitalism cannot be a system of simple reproduction but rather must continually expand. Furthermore, the production of food, clothing, shelter, and other necessities are only incidental to the production of surplus value. An inability to connect the dots between the narrow problems facing the electronics recycling industry and these broader relations of capitalism, in my view, is a critical blind spot in mainstream approaches to sustainability. Producing a flat-screen TV that lasts twenty five years simply does not make sense for a company like Phillips, and EPR will not change that. Following Marx through people like David Harvey, Neil Smith, and James O'Connor we see that capitalism is a system that is constantly in crisis stemming from its internal relations as well as its relations with the non-human world. And while I have yet to be dissuaded of the veracity of these critiques, unfortunately they do not translate directly into political opposition. It remains, to paraphrase Frederic Jameson, easier to envision the end of the world than to envision an end to capitalism.

If recycling is necessary but not sufficient to sustainability, and capitalism itself is the problem, the question is where we go from here. The hard-line approach would be that nothing less than the total usurpation of capitalist social relations will suffice. But I think that approach

to critical politics reproduces the kind of capitalocentrism that Gibson-Graham suggest avoiding, where capitalist social relations are read as totalizing and all-encompassing (1996). My thinking about alternatives to the liberal politics of certification and EPR is quite open to contingency and for the possibility that alternatives already exist – are immanent within capitalism itself (see also Mann 2007). And again drawing from Gibson-Graham, as well as Polanyi, these alternatives may be found in a myriad of 'small' movements and acts of resistance that are not one-hundred percent 'outside' of market relations. In the next chapter, I summarize the arguments developed so far and make a few policy recommendations regarding the e-waste regime as it currently exists. I then move towards new ideas that are broader than recycling per se, but deal with the overall question of how people can direct the metabolism of nature in more just ways.

Chapter 8 – Conclusions

I. Introduction

I am standing on a factory floor in Regensdorf, Switzerland watching a man in a Bobcat (small bulldozer) maintain a huge 20 foot high pile of e-waste (Figure 4) All day, every day, it

Figure 4. E-waste pile

is someone's job here to manage the overflow of scrap so that it can be sorted and processed. This image has stuck with me as one that encapsulates a particular moment in place and time. 100 years ago, ashes, horse manure, and other organic matter would have made up the majority

of waste discards in a country like the U.S. or Switzerland, but today, we have this mangle of wire, plastic, and metal to tell us where we have been and where we are going collectively as a society. This snapshot has many stories to tell, and what I have tried to do here is think through how this pile of stuff becomes political, and to what ends.

Conventional approaches to e-waste research focus on technical issues of waste management, including recycling technologies, logistics, and efficiency. Many of these studies and reports begin by cataloguing quantities and characteristics of e-waste, and I too began my story by running down some of the many fascinating statistics about electronics production and disposal. The research and practice of waste management is really an attempt to put waste in the right place, to corral its messiness into an orderly and modern process of handling and disposal. E-waste here is political in the sense that 'resources' are being wasted and 'hazards' are proliferating. There is certainly value in this type of work.

But much of the social science research on waste and e-waste asks 'bigger' questions that have less to do with waste and its disposition and more to do with, unsurprisingly, the relationship between waste and the social order. What I have tried to do here is meet waste management halfway by asking about the technologies of recycling and disposal and the capabilities of particular policy tools. But I have also tried to situate those managerial approaches within dynamics of capitalist growth and within theories of politics. From this vantage, the pile of e-waste above is not just a problem of management but signals the more difficult question of the (un)sustainability of the current social, economic, cultural, and political moment. Moving from the liberal perspective of waste management to a more critical approach suddenly puts waste management on unstable ground; the question changes from 'is this the most optimal and efficient strategy for managing e-waste?' to 'how did we get here?', 'why these

political interventions and not others?', and 'what alternative ways of living are there?'. I have tracked back and forth between these questions throughout this dissertation.

In this concluding chapter, I would like to continue this line of thinking by assessing e-waste management on its own terms as well as in terms of the blind-spots it leaves. I begin by briefly reviewing the arguments in each empirical chapter, followed by a few policy recommendations. While I have been highly critical of the emerging e-waste regime, I would be disappointed if my research were to have absolutely no value to someone in a position to influence policy. But given my own sense that liberal policy fixes are inadequate to the sort of politics that is necessary to more meaningful change, beyond issues around recycling, I conclude the dissertation by thinking through some new ideas that may drive my next project.

II. Where we have been

My research questions have sought to unpack the emergence of an 'e-waste problem' and the rolling-out of political interventions aimed at addressing it. E-waste, as I have suggested, is a useful window into contemporary processes of socionatural change in that e-waste is close to home. Therefore thinking about what sort of problem e-waste might be, what caused it, and what might be done about it is an invitation to use one's 'geographical imagination' to start seeing connections between places. My own office, and the computer I am writing this on, is part of a tangled web of relations that connect me to disparate sites of extraction, production, and disposal around the world. I hold that research that aims to defetishize commodity relations remains a vital component of human geography as a discipline. More specifically, I have cast my lot in with the field of political ecology, which means I am drawing from a theoretically and empirically diverse set of literatures with a common aim: to understand the context within which

socionatural change occurs and to offer a normative critique. Political ecology is often Marxist in considering the economic drivers of such change, but more often than not it is also attentive to the discursive and symbolic relations that make 'nature' comprehensible as an object of development (Escobar 1996)[75].

Bringing political ecology to the study of e-waste is productive on both ends. The empirical study of e-waste has been dominated by physical scientists, whereas my approach owes more to David Pellow, who paved the way for critical studies of the social and environmental impacts of the information economy (Pellow and Park 2002; Pellow 2007). In the other direction, my work on e-waste contributes to the growing field of 'First World political ecology', where issues of access to and control over resources that had heretofore been studied mostly in 'Third World' contexts are 'brought home' to the global North (Schroeder, St. Martin, and Albert 2006; see also McCarthy 2005). Of course, in so doing, my work illuminates not only the ways in which environmental governance in the U.S. is distinct from the developing world context, but also demonstrates the ways that those processes in the U.S. are deeply connected to and affect other more distant places. Finally, my engagement with waste from a political ecology perspective is more attuned to waste as an emergent object as opposed to a static material, and as such I have moved political ecology beyond its environmental justice roots while maintaining those normative commitments.

Gille's elaboration of the waste regime concept allowed me to develop a waste-specific, mid-level theoretical approach suited to political ecology. Gille's tripartite framing of waste regimes as composed of the production of waste, the representations of waste, and the politics of waste informed the development of my research questions early on. However, as I argued in chapter 3, Gille lacks an explicit theorization of how she understands those three frames. I

[75] Marx's materialism was of course also attentive to the role of ideas in shaping history.

therefore reworked her categories by drawing more directly from Marxism, ANT, and Foucault and in so doing carved out the production of waste, the materiality of waste, and the political representations of waste as my own categories of analysis. Each empirical chapter has placed these three moments in conversation with one another. Moreover, the intersections of the theory and methods have enabled me to answer my research questions.

Research question 1 and key argument: The unruliness of waste

How were the R2 and e-Stewards voluntary standards developed, and how have different actors shaped and contested definitions of 'best practices' actions, metrics of performance, and the delegation of responsibility?

- **How do materials come apart, and how can different categorizations of waste and resource be smoothed over, certified, and accounted for in a diverse global network of secondary processing?**

My analysis of the development of the R2 and e-Stewards certifications in chapter 5 went deep into the political process of greening a supply-chain. I explained the ideological differences that motivated the various actors to argue for particular interpretations of 'best practices' in e-recycling. Where I innovated was that I also showed how the material heterogeneity of discarded electronics – their diverse physical and manufactured properties – played a role in differentially enabling, constraining, and/or disrupting "the social practices through which resource [and waste] regulation is achieved" (Bakker and Bridge 2006, 21).

Importantly, I did not come to this argument by imposing theory on my data. Rather, the use of institutional ethnography forced me to study the actual practices of recycling and then pull out and situate those practices within relations that coordinate them. My interview participants

and my other data led me to conclude that the qualities of e-waste, more specifically the difficult to pin-down status of it as both waste and commodity, really do matter in terms of governing. Waste, like Bakker's analysis of water, can be unruly and uncooperative (Bakker 2005). ANT helped me situate those findings because the always hybrid nature of human/non-human assemblages adequately confronts the "question of how to account for the socio-economic production and discursive construction of nature, while simultaneously acknowledging the productive capacities of the non-human world" (Bakker and Bridge 2006, 11). However, in pushing back against ANT, I also showed that humans and non-humans participate in the governance of networks, but unequally, as the social relations of capitalism produce the contradictions through which the agency of waste emerges. In terms of larger impact, I engaged with Castree's (2002) call for a sympathetic meeting between ANT and Marxism but maintained sight of how things are historically produced and assembled in particular ways.

Research question 2 and key argument: Re-working the fetish

How is the implementation and adoption of these competing certifications shaping the e-waste regime?

- **In what ways do certifications work as market-making devices? In other words, what are the processes through which a market for 'ethical' or 'sustainable' e-waste recycling is created, made legitimate, and maintained?**
- **What are the ambiguities, contradictions, and democratic deficits that emerge from promoting global environmental justice politics through market-driven disposal choices?**

Despite the ambiguities inherent to standardizing a constantly shifting commodity-network, the R2 and e-Stewards certifications must present their interpretations of best practices as legible and rational interventions into the e-waste problem. Certifications work by erasing complexity, and in chapter 6 I focused on the knowledge, data, statistics, and narratives that do that work of shaping understandings of 'the e-waste problem' itself and its possible solutions. Again drawing on my theory and methods, the emphasis on beginning with knowledge and discourse as facilitating particular kinds of actions has been particularly useful in this project because while political economy identifies important tendencies that shape the contours of global production, consumption, and recycling networks for electronics, precisely where and how policies intervene in those networks is shaped by discursive and ideological practices that are not entirely reducible to capitalist political economy.

Empirically, I showed that the effects of these political ecological imaginaries are to allow certain actors to extract rent from the supply-chain based on their exploitation of the desire for corporate social responsibility and the protection of brand-identity that certifications promise for e-waste generators. Whether the ethical behavior of recyclers is real or perceived is largely beside the point from the perspective of recyclers and their large corporate customers. Many recyclers I interviewed were quite forthcoming in making that type of assertion. While perhaps not a new insight for critical geographers, the focus on legitimacy highlights the embeddedness of economic networks within contested and multiple types of value.

Looking at the international effects of the implementation of certifications, the U.S. ITC found that certifications are reducing exports of used electronics (2013). Whether that means exports to informal sites are decreasing remains unclear. But the crucial questions are being raised by people like recycler and blogger Robin Ingenthron and groups like iFixit, who have

challenged the notion that informal recycling is inherently negative. At stake are livelihoods around the world that depend on access to used electronics, so consumers of certified recycling in the U.S. ought not to unthinkingly embrace labels as neat solutions to the problems of e-waste dumping and trade. Beyond recycling, I feel that using certified products or services should not be unequivocally embraced as a form of progressive political action. Positive outcomes can be produced, but the democratic process of deciding upon what certifications do and who gets to decide remains the central issue.

Research question 3 and key argument 3: Busyness

What is the relationship between certification and extended producer responsibility (EPR) legislation?

- **How do the EPR laws in the U.S. work in terms of the scope of e-wastes covered, their financing, and their delegation of responsibility?**
- **What alternatives to EPR might better influence democratic control over the production process?**

Finally, an unfortunate but not unexpected outcome of market-based governance is that certifications legitimate the continued production of e-waste. EPR laws are intended to move away from this end-of-pipe focus that is a hallmark of waste management in the U.S., but in practice EPR does not yet have the teeth to truly incentivize producers to change the designs of their products. Moreover, in many U.S. states EPR is little more than a scheme to finance electronics recycling. Even though this financial shift may unburden municipalities from some waste management costs, it largely continues the status quo just with different people paying for recycling. MacBride's use of the term busyness signals the coopted nature of EPR, but my work

shows *how* this outcome is produced through the rather banal methods of limiting the scope, financing, and collection logistics of the law. Were EPR laws to target specific products with recycling fees that reflected their material costs, producers would have a financial incentive to redesign products so as to avoid those losses. This is very difficult to do given that producers and recyclers typically operate as separate firms, and producers are secretive about their production processes and materials selection. In terms of larger impact, this chapter should serve as a useful reminder that the mere presence of laws called 'EPR' may not actually produce the expected outcomes of toxics reduction. Before turning to my final subquestion, I will now briefly outline some policy recommendations.

Recommendations

With those criticisms in place, it is of course true that both certifications and EPR laws do many things well. Given the costs of certification, they are not likely to be pursued by e-waste brokers whose main business is shipping mixed loads of electronics abroad[76]. Likewise, EPR laws like Illinois' cover a huge range of products, increase recycling rates, and provide incentives for recyclers to re-use rather than simply process used electronics for commodity recovery. Even if producer's behavior does not change, EPR keeps secondary materials circulating. I would therefore hope that the U.S. passes comprehensive federal EPR legislation similar to the EU's Waste Electrical and Electronic Equipment (WEEE) Directive. However, the U.S. and the EU need to figure out ways to create a fee structure that is based not on weight but on 'environmental weight' (Huisman et al 2006), meaning a fee based on the material characteristics of products. To do that, manufacturers will either need to set up their own

[76] By that same token, certifications do nothing to prevent illegal or unethical activity by recyclers or brokers who simply chose to ignore them.

recycling companies, as Sony has done in Japan, or manufacturers will need to more closely cooperate with recyclers to work on design-for-recycling. The impetus for such changes may in fact soon come from the supply-side, with the United Nations Environment Programme predicting a ten-fold increase in the demand for critical metals in the coming years (2013). Optimizing recycling to account for the complexity and diversity of products was certainly a main topic of discussion in my involvement at the StEP program and a paradigm shift in the recycling industry away from particular materials and towards particular products is already underway (ibid).

The controversies over e-waste exports are the most difficult to deal with from a policy perspective. In general, I am sympathetic to the 'fair trade' argument that proponents of R2 and independent actors like Robin Ingenthron support. My sympathies stem from the possibilities for informal sector recyclers in other countries to be deprived of livelihoods by well-meaning environmentalists in countries like the U.S. The informal sector, as Reddy (2013) has shown, can be a source of ingenuity, creativity, and self-reliance. On the other hand, I am skeptical of discourses of development that are latent within the promotion of the 'modernization' of the informal sector. The assumption that incorporation into the formal e-waste economy automatically leads to prosperity is one of the great shibboleths of liberal economics. While I cannot resolve this debate with a broad generalization, in practice I would like to see transnational social movements of the sort Pellow writes about (2007) be more engaged with supporting the informal e-waste economies around the world. Groups like BAN should work more directly with the informal sector, rather than taking photos of them and showing them to consumers in the U.S. in order to drive customers towards their certification. Development projects like those associated with StEP, or that Reddy has studied, have significant problems but

can be improved with more participation from the actual recyclers. As much as possible, bottom-up development where informal sector actors are in key decision making roles should be promoted.

III. Looking forward

I have spoken to many graduate students who say they hate their thesis or dissertation topic and do not want to think about it ever again once they have completed it. I can sympathize with that feeling, but only to a limited extent. I think e-waste and policy are important, and it is an issue that pertains to many people's lives in a direct way. Where I am frustrated is in terms of not being able to find a neat and tidy answer to the question, which I now get all the time, of 'what should I do with this e-waste?'. I tell them to recycle it, but to do some due diligence on the recycler beforehand. But then I think about that pile pictured above just getting bigger and bigger.

I have argued that efforts to recycle more and recycle better are important incremental steps that need to be taken, but that recycling by itself works within, rather than against, the logics of a market system that is both expansive and myopic and ultimately antithetical to long-term sustainability. Too narrow a political focus on recycling as an end-in-itself closes off the important opportunity to use recycling as a wedge to politicize production and capitalist social relations more broadly. Since I have spent a great deal of effort making this argument, I hope that it is a convincing one. But if so, it raises an even more troubling question, which is that if recycling is so inadequate as a form of political praxis, why is it so popular? After all, it is often noted that more Americans recycle than vote (MacBride 2011). Said differently, why doesn't the pile of e-waste pictured above generate revolutionary and radical political praxis? Are people

somehow wrong to struggle over recycling, in the same way that workers agitating for better wages have been derided as dupes (Mann 2007)? And what would a more radical politics around electronics look like?

These are the sorts of thorny questions that have plagued social theory for about a century, and I do not intend to fully resolve them. In fact, they are not questions that can be fully resolved because history is always open and unfolding. Nevertheless, they have to be continually asked. People are not wrong to care about recycling and issues of waste management. But as one of those people, I cannot help but feel that my interest in improving e-waste recycling does little more than 'treat the symptoms' of some more fundamental problem. My intellectual journey as a young scholar, I realize now, has been about trying to figure out what that fundamental problem (or problems) might be and how it might be changed.

For me, the categories of Marxist political economy remain central to understanding how the logic of value produces space and nature in uneven ways. But it is also critical to engage in such a rethinking of 'fundamental' problems outside of a narrowly defined class relation, where confrontations between 'capital' and 'labor' are seen as the fount of history. Capital is 'overdetermined' (Gibson-Graham 2006), meaning the identification of singular 'causes' for social phenomena, such as 'class' will always miss the way 'class' intersects with race, gender, nationality, ideology, and other 'explanatory' axes. In other words, the 'real world' is a great deal messier than such abstractions might allow. The idealized white male industrial worker is not, and never was, the essential historical subject (Tsing 2009).

Consider the problem today of identifying where 'class struggle' occurs. Given that sites of production are seemingly everywhere, where lines between work and leisure, production and consumption, are blurred, particularly in considering economies related to digitalization and

technology, it is not at all clear how to operationalize Marxist political economy and geography (Soderberg 2008). Struggles around and against the capitalist production of waste take on many forms, and most are not framed in those explicit terms. If we are to go beyond critiques of liberalism towards building alternative futures, we need ideas that can adequately situate our contemporary crises.

Luckily, thinking about alternatives and how the world might be otherwise is not the sole privilege of academics. On the contrary, as a social scientist, I look to my own surroundings to find those alternatives. The Occupy movement, do-it-yourselfers, hackers, information-sharing collectives and many others are carrying that torch of alternative, even radical politics. These movements all embody the growing significance of decentralized, non-hierarchical forms of political representation, and they are mounting counter-hegemonic projects that challenge not only the material basis of economic dominance, but the 'ethicopolitical' (Mann 2009) underpinning of that dominance as well. By 'ethicopolitical', Mann (through Gramsci) is referring to the "field of competing normative ideas regarding the unfolding of history" (2009, 336). In other words, if capitalism in part operates so successfully because it provides compelling and legitimate explanations for how the world does and ought to work, struggles against it must also then provide persuasive ethical arguments for why some alternative works better. To walk that back slightly, these ethicopolitical critiques need not be explicitly anti-capitalist but rather need only frame certain practices as unjust and convince people that things "could and should be otherwise" (Mann 2009, 342). The 'moment of hegemony' (ibid) is equally about changing material circumstances as it is about shifting ideologies. By concluding with a few examples, I hope to contribute to a broader conversation whose import extends beyond issues of e-waste.

Kyle Wiens is CEO of an organization called iFixit that provides repair manuals for just about every electronic device on the market with the intent of 'creating a community where people help each other fix stuff'. Recognizing that manufacturers actively work against the longevity of consumer products, Wiens argues that the world actually has enough electronic devices to go around (2012). While seemingly innocuous, pointing out that manufacturing another billion cell phones next year is actually unnecessary from the perspective of meeting human needs is striking a blow against the dominance of 'take-make-discard' that the mainstream recycling movement seems to no longer find controversial. An argument for sufficiency rather than efficiency, embodied in iFixit's motto that 'repair is better than recycling', changes the conversation in an important way.

But people need to have the ability, and the legal right, to repair products. In a recent case in Australia, Toshiba forced the owner of a website that hosted repair manuals for electronic gadgets to remove those manuals from the web. Opening up your laptop to make an upgrade typically voids the warranty. For the most part, people do not have control over the electronic products they buy. Rejecting this, iFixit has a manifesto that declares, among other things, "if you can't fix it, you don't own it" (iFixit.com/Manifesto). They are challenging producer control over products by agitating for changes to intellectual property and copyright law that would allow users to empower themselves with information.

iFixit is a proponent of what is known as open-source, which essentially means that the blueprint for a particular technology is universally accessible and modifiable. The organization Open Source Ecology takes this model out of its roots in the computer world and into other kinds of machines. Open Source Ecology has developed what they call the 'Global Village Construction Set', which is "an open source, low-cost, high performance technological platform

that allows for the easy, DIY fabrication of the 50 different Industrial Machines that it takes to build a sustainable civilization with modern comforts" (Open Source Ecology.org). In practice, by providing easy access to open source designs, the barriers to entry for a number of industries are lowered significantly. Rather than rely on John Deere for tractor repairs, Open Source Ecology enables you to build and maintain your own tractor. There are many other examples of these kinds of developments, and they could be read as fantasies of technological salvation. What I see is people trying to meet human needs in ways that do not totally transcend the commodity relation, but side-step it by decentralizing the means of production.

Johan Soderberg has recently begun the much needed project of analyzing these developments through Marxist and post-Marxist theory in a fascinating book called *Hacking Capitalism* (2008). Consumers of electronics today bear some relation to the role of consumers in the past, but things may be changing. On the one hand, users of digital technologies have become important sources of innovation, surplus value, and the reproduction of capitalism. Consider a Facebook profile in which the user's identity becomes a source of profit for advertising firms. It is true that learning to use software and hardware is necessary to post-Fordist capitalism in the same way that education and workforce training were to Fordism (Soderberg 2008). For the U.S. economy to operate smoothly, our college students must spend their days with their eyes glued to their smartphones. Marx recognized that consumption and production were dialectically linked. On the other hand, Soderberg argues that

> "A paradoxical series of events has brought about *user empowerment*. We trace it to the termination of craft skills inside the capitalist production process. *Deskilling of employees has come full circle with the reskilling of non-employees*. Tools and skills are cheapened and spread from the capitalist production site to the whole of society. Arguably, the means of production are being re-appropriated by the proletariat in this way" (2008, 9, emphasis added).

So while our college students may reproduce the social relations of capitalist reproduction, they can also use that knowledge to be productive in ways that are not instrumental to capital. Creating new software code and giving it away, sharing information about how to repair things or produce things all begin to level the playing field in a modest way. In these hacker/repair/gift economies, we might rethink 'devolution' in terms of 'user empowerment':

> "The promise of hacking is that, by making computer technology accessible to non-professionals, it undermines the social division of labour as the regulating principle for technological development. In plain language; corporate and government institutions have lost their monopoly over research and development. Concrete political results follow when decisions over technology are spread to the crowd" (Soderberg 2008, 4).

In conclusion, while I am troubled by the trajectory of technological development, I see important changes happening on the margins. These are changes that not only shift economic power away from corporate monopolies, but that challenge the common sense notion that things have to be the way they are. If history has taught us anything, it is that these moments of economic and cultural change happen very slowly. Things couldn't stay the same even if I wanted them to, and in that I find some hope.

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Appendix A – First example of research questions

Interview 1/6/11 2pm

Let me tell you what my research is about. A lot of research has been on issues of export and trade, so I'm trying to focus on the domestic side of e-waste recycling.

Im interested in the emergin regulatory landscape. One of the questions I'm interested in is how different interests are shaping the construction of a 'green' infrastructure for e-waste recycling and reuse, specifically whether the use of prison labor is consistent with a 'green' or 'sustainable' economy. I'm interested in the connections between governing and regulating e-waste and governing inmates through labor – on the one hand we have this crisis of e-waste disposal, and on the other hand, we've got 2 million prisoners and

1. I've set up two research phases. The first is concerned with the political processes and debates that went into the shaping of the R2 standard. I understand pretty well what the differences between the standards are, but what intrigues me is understanding how and why the split between r2 and e-stewards happened.
2. The second phase involves learning more about the history of UNICOR, how it does what it does, in other words, what logics guide UNICOR in their operations?

My hypothesis in all of this is that the way UNICOR does business is actually at odds with the goals of transparency that certification is purported to provide. So in a way what the EPA is trying to do in terms of improving e-waste infrastructure is actually at odds with UNICOR's mandate to keep prisoners occupied. I'm hypothesizing that the EPA did not want to help create a standard that would prohibit UNICOR from having access to public contracts for e-waste recycling. To put it in academic terms, it seems like these are internal contradictions within the state.

Phase One:

1. What role have you played in developing these standards?
2. What insights do you have into how these negotiations over standards took place? What kinds of values did different actors bring to the table? How do you negotiate making a rigorous standard but also one that is acceptable to corporate actors?
3. Why did BAN and ETBC drop out?
4. Why are voluntary standards an important regulatory tool? Are these ideal methods? Doesn't voluntary certification put the onus on consumers to implement best practices?

   -DON'T LEVEL THE PLAYING FIELD

5. Can you reflect on why it is so difficult to implement so called command and control legislation that could directly regulate electronics production and disposal?
6. What kinds of ideas motivate SVTC and support for e-Stewards?

Why is environmental justice an important part of what you do?

7. What effect are these standards having on e-waste disposal? Is it too soon to tell? Which standard do you think will lead and why?

Phase Two:

1. Does UNICOR's pursuit of R2 certification undermine that standard or conversely, does becoming certified greenwash what UNICOR does and help cover up their record?
2. Why or why can't UNICOR be a part of a green infrastructure?
3. If UNICOR were to stop recycling, what about prisoner jobs and safety?
4. Do you have any insights on places to look for info on UNICOR?

Lastly, what would you ideally like to see happen with e-waste regulation? Does producer responsibility translate into production changes?

Big question: what does a green economy look like?

Appendix B – Second example of research questions

Interview questions for 7/1/11

1. Can you talk about how you got into the business and how its changed over the past few years?

3. how big is your company and how many millions of pounds of e-waste do you process?

4. Can you give me an idea of what your triage is like?

- repair and reuse?

- what do you do with non-repairable stuff? Shredding? Smelting?

-where does commodity grade material go?

I'm trying to understand if there is a difference in the kinds of recycling that e-stewards and r2 recyclers engage in, like hand disassembly vs. shredding. Since e-stewards can't export, I'm wondering if more e-stewards are shredders.

REGULATORY ASPECTS

5. As a preferred recycler in the state system, how does that work? OEM's pay for the program? Did your credentials help you get that contract?

6. Are you R2 certified and an e-Stewards pledge? So does that mean you can export, or how do those two things work together?

10. why get certified what does it do for your business?

-has certification been workable with your business model or are there some aspects that are impractical?

7. if you do export, how do you manage the downstream overseas?

8. how do you prevent toxics along for the ride?

*what is the PACE group?

2. whats driving regulation in the industry?

*do you have much input to manufacturers to talk about upstream issues, like design for recycling?

9. where do you see this industry going?

Appendix C – Third example of research questions

Interview questions 1/17/2013

My research is focused on the ongoing debate over the appropriate regulatory framework for e-recyclers in the U.S. It seems to me that there are two central points of contention: a) when and where is something a waste and when is it a commodity? b) how do we distinguish legitimate export for repair from 'toxics along for the ride' dumping? I think most people acknowledge that export for recycling is not a great idea, and that export for re-use is a good idea. Since I'm a geographer, I'm interested in how these codifications shape 'where' things go.

Other important issues are things like the patchwork of state laws, pending federal legislation, and Obama's task force recommendations. But my main focus has been on voluntary certification and the battle between R2 and e-Stewards to market themselves as 'best practices' in the industry. I see points a) and b) above really important to distinguishing between the two standards, where R2 chooses to treat most things as scrap while e-Stewards uses Basel interpretations of hazardous wastes, which then means that exports are restricted to those directly for re-use.

I think the debate over exports is really interesting - do we fix some of the global problems through a trade ban or through better trade?

Lastly, I think some of the upstream (production) issues are really critical but don't get discussed quite as much. Where is the line between innovation and waste production?

Business Model

1. Can you tell me about the business model of PCRR?

- What are your qualifications for distinguishing between refurbishment, reuse, and recycling?

- Does the sheer diversity and complexity of electronics (different designs, different brands, different patterns of use and wear and tear) make it difficult to figure out when something is working, non-working, able to repair/refurbish, or in need of scrap processing?

2. Can you tell me about the chain of how things come to PCRR and where they go after?

3. What is the main output of PCRR? In other words, what makes money?

Standards

4. What do you think is driving the adoption of certification standards?

5. How does becoming R2 certified help your business? Are there parts of the certification that are impractical for your business model?

6. In your mind, what are the key differences between R2 and e-Stewards that have led you towards R2?

7. Since most companies end up exporting at some point (through contractors), does it worry you that a company like Intercon would end up in trouble with BAN?

8. There is an argument out there criticizing e-Stewards and BAN for a couple of things:

a) unfair marketing (using 80% of US e-waste is exported as a 'fact')

b) that by interpreting Basel as prohibiting export for repair it actually works in the favor of OEM's who like to see the second hand market in developing countries suffer. What is your take on some of these marketing tactics?

Upstream issues

9. The relationship between OEM's and recyclers strikes me as very interesting. It would seem like OEM's see refurbishment as a threat to their business, but this clearly isn't always the case (PCRR as a MAR). How do you see the relationship between the recycling industry and producers?

10. How can there be more connectivity between production and recycling? For example, is Design for Recycling moving forward?

11. How effective are things like EPR and EPEAT? Is reenwashing a big problem?