Article

Journal of Environment & Development
0(0) 1–23

DOI: 10.1177/1070496519898218
journals.sagepub.com/home/jed
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Building Policy Coherence for Sound Waste Electrical and Electronic Equipment Management in a Developing Country

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Abstract

This article explores the compatibility of Ghana's e-waste policy (Act 917) in the country's socioeconomic context. Our article starts with two main questions based on our empirical engagements with the act which, contextually, mimics the extended producer responsibility. First, we question the pessimistic imaginaries about the e-waste industry that seeks its outright trade ban or promotes a single version of recycling. Second, we query if the underlying assumptions and basic mechanisms of extended producer responsibility can create the enabling environment to actualize sound e-waste management. Based on prevailing context, the imaginaries appear socially peripheral, isolated, and powerless, and we call for a broader, unbiased, in-depth, critical systems thinking for understanding the complexities and multidimensional nature of the waste electrical and electronic equipment industry. We suggest that it is by fostering the positive synergies across sectors and among policies that environmentally sound e-waste policy outcomes can be achievable.

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Keywords
policy coherence, critical systems thinking, social realities, labor rationalities, Ghana

Humankind's insatiable demand for electrical and electronic equipment (EEE) is creating the world's fastest growing waste stream (Ryder & Zhao, 2019) or a "Tsunami of e-waste" in United Nations' evocative terms (Steiner, 2015, p. i). The growing waste electrical and electronic equipment (hereafter e-waste or WEEE)[1] and the lack of environmentally sound management of WEEE have attracted diverse intellectual and policy debates and unending media commentaries (Frontline, 2009; United Nations Environment Programme, 2015) over the release of toxins to the environment and human bodies. Some studies have criticized the burning of WEEE to harvest copper (Atiemo et al., 2016; Brigden et al., 2008) and advocate for policies with broader global appeal and reforms, including circular economy principles (Akese & Little, 2018; Grant & Oteng-Ababio, 2019). In recent times, increasing awareness of the problem have led to a "turn to extended producer responsibility [EPR] policy initiative" as a potential solution (Khan, 2018). The EPR requires manufacturers to accept responsibility for the end of life of their product life cycles and seeks to regulate and upgrade e-waste by formalizing the sector (Baldé et al., 2017).

Meanwhile, researchers working mainly from developing economies, saddled with the virtual nonexistence of internationally standardized treatment facilities, more typically view WEEE management as both strategic and lucrative and through an informal economy lens (Grant & Oteng-Ababio, 2019; Millington & Lawhon, 2018). Ryder and Zhao (2019) make an apt pronouncement; thus,

> while more electronic devices are part of the problem, they also can be a big part of the solution. A more digital and connected world will help us accelerate progress towards the SDGs, offering unprecedented opportunities for emerging economies … Get it right and we will see a lot less of our precious minerals … dumped into landfill. The benefit to industry and the health of people and the environment could be enormous. (p. i)

The debate, though far from settled, only emphasizes the reformatory nature of the global e-waste systems and policies. In Ghana, Grant and Oteng-Ababio (2019) noted that the WEEE industry had presaged a pervasive and inexpensive informal recycling, efficient in its way but inherently hazard-ridden (also Cucchiella et al., 2015). In most cases, engaging the WEEE industry informally depends on whether the sector is viewed from a discourse of resilience and innovation or from a survivalist or self-governance lens (Stacey, 2018). These

policy relationalities mean that policy making is no longer the preserve of a particular country (Anane-Fenin & Akinlabi, 2017). It involves taking cognizance of other key players such as environmental nongovernmental organizations that operate across spaces and whose ideological differences can devalorize or valorize people and places (Oteng-Ababio & van der Velden, 2019). So far, Ghana's e-waste management policy initiative has generated a mishmash of techniques, from development programs (Atiemo et al., 2016) and eviction (Oteng-Ababio & Grant, 2018) to new e-waste legislation (Republic of Ghana, 2016).

The parliament of Ghana passed Act 917 in 2016 to promote environmentally sound WEEE management. The question is whether such an act, mirroring the principles of EPR, create a sound WEEE management system? What is the integrity of the persistence of a North–South-dominant story line? These fundamental concerns present immediate policy implications yet have scarcely been studied and answered. We address these questions by adopting the critical systems approach (CST) to regulation. This approach facilitates different perspectives on cause and effect on who or what can be regulated (the subjects and objects of control; van der Velden, et al., 2019). The approach is essential because the turn to EPR offers a lens on critical trends in neoliberal development governance. In our view, the situation where state agencies are lobbied to promulgate *sound environmental laws* only complicates e-waste worlds of work and defies realities (Afena, 2012).

Critical Systems Thinking, e-Waste Trade Circuitry, and Management

In recent years, CST has emerged as key concept researchers apply in numerous regulatory contexts. The approach facilitates the interrogation of a different perspective on cause and effect, on the subjects and objects of regulation, and on interactions between different modes of regulation (Stephens, et al., 2019). CST comes from the ecology and general systems theory (Jackson, 2006). It proposes to replace a "balance of nature" and self-regulating systems ontology that draws on the concepts of equilibrium, stability, and predictability. Recently, the approach has been used in ways that encourage socioecological awareness and human/nonhuman emancipation. It enables an analysis of complex socio-environmental problems and proposes interventions to address such issues (van der Velden et al., 2019).

For Garner et al. (2011), regulation is the "act or process of controlling by rule or restriction." Within this regulatory paradigm, CST builds forth a polycentric tool, in which the power to regulate lies not solely with the state but arises from a system of constraints. To that extent, regulatory systems show some characteristics, such as nonlinearity, emergence, and self-organization (van der Velden

et al., 2019). Our approach is informed by the work of Lessig (1998), who provides a conceptual schema, describing four modes of regulation and their (in)direct interactions: law, social norms, markets, and architecture. Architecture, encompassing nature, materials, and design, is a nonhuman actor with strong regulatory effects. It constrains both, directly and indirectly, the organizational effectiveness of (inter)national laws (Manomaivibool, 2009). The mapping of this polycentric system of regulation results in a regulatory ecology (Sjåfjell & Taylor, 2015). This system facilitates perspectives in the policy and better explains the social and material complexities of product life cycles.

Using the CST lens, we interrogate the compatibility of Ghana's EPR underpinned regulation and the WEEE trade practices and recycling. Years of fruitless search for environmentally sound WEEE management has caused international concern over the release of toxins to the environment and human bodies (Manomaivibool, 2009). This awareness craves the need for policy solutions and explains why EPR has received significant attention (Widmer & Lombard, 2005). As a cornerstone of most success stories in developed countries, EPR has been tipped as a potential solution for Ghana's WEEE mismanagement (Nnorom & Osibanjo, 2008). Although well-documented successes in global North abound, some studies have cautioned that such implementation models might not always be advantageous. Based on their research in Asia, Hotta et al. (2009) concluded that "there is no single right interpretation of the EPR principle" (p. 8), and therefore, researchers must be careful view it in context.

Both in content and policy discourse, Act 917 mimics EPR. Theoretically, EPR is supposed to be a guiding principle for the selection of policy instruments and requires manufacturers to accept responsibility for their product life cycles (Khan, 2018). From that perspective, we see its application to be premature and running ahead of theory and evidence. We concur with Hotta et al. (2009) that replicating EPR successes in a different context is not an easy feat and requires a good understanding of the policy process. We believe that in an interconnected world, economies are shaped by both local and external factors, hence the need for a synergetic approach among local governance, institutional capacities, and politics. As rightly captured in an Organisation for Economic Co-operation and Development (OECD, 2013) policy document, "in today's interconnected global economy, policies implemented by developed economies are especially likely to influence the growth and development prospects of lower-income countries" (p. 1). Governments in developing economies have the responsibility to design policies that enhance rather than impact adversely on the capacities of the relatively poor people.

The WEEE industry is well documented. Yet, government's policy response to WEEE mismanagement (i.e., Act 917) defies local realities (Khan, 2018; Morrison, 2017). In 2008, for example, the government of Ghana passed the

Energy Efficiency Regulations 2008 (LI 1932), followed by the Energy Efficiency Standards and Labelling Regulations, in 2009 (LI 1958), which made it illegal to import any used refrigerating appliance into the country (Atiemo et al., 2016; Oteng-Ababio, 2018). Furthermore, in June 2017, the Ministry of Environment, Science, Technology and Innovation (MESTI) and the German government initiated an Environmentally Sound Disposal and Recycling of E-waste Programme at Agbogbloshie with an approved €15 million budget (Ghana News Agency, 2017). This was after another €18 million contract signed between MESTI and SCL Waste Management Limited in December 2016 to recycle e-waste. Also, in November 2016, MESTI and the Environmental Protection Agency (EPA) began the construction of a $30 million facility for e-waste recycling. Furthermore, MESTI, EPA, and University of Cape Coast benefited from a $250,000 grant for a HANISA E-Waste Model Project (Bokpe, 2017).

These are disturbingly duplicating interventions. They occur in apparent reaction to media reports (details in subsequent discussions) such as *Welcome to Sodom*, which often tell only part of the story (Grant & Oteng-Ababio, 2019; Morrison, 2017). Taking a leaf from the tenets of CST, policy makers should appreciate WEEE and its complex networks and the roles and responsibilities of the various actors. Governments must strive to identify both facilitating and hindering factors within global a "coerced response" embedded (Cucchiella et al., 2015, p. 264), an anomaly that raises doubts about the policy's cohesiveness and suitability for its intended purpose (Bisschop, 2013). Before expanding on this perspective, we discuss in the next section our study location, data sources, and the methods employed to arrive at our conclusions.

Agbogbloshie e-Waste Materiality and Policy Regime

Generally, data for the case study (see Yin, 2014) were collected from May 2016 to September 2017 in Agbogbloshie, a predominantly migrant settlement in the heart of Accra (Ghana) housing, a vegetable market, a scrap metal yard, a vast slum, an industrial area, and a household waste dump (see Google map photo in Figure 1). The area undoubtedly is a thoroughly polluted place, and the people working in the recycling trade are exposed to severe health and safety risks (Oteng-Ababio & van der Velden, 2019). It is nonetheless in the words of Steiner (2015, p. i) "an economic stupidity" to throw away WEEE because it generates jobs and contributes to a vital repair and recycling culture. Unfortunately, most Western media narratives overlook this complexity (Gillespie, 2016; Morrison, 2017). They tend to focus exclusively on the negatives and painting Agbogbloshie as an e-waste dump. They draw on dramatic imagery of the burning of cables and tires for copper extraction, which forms only part of the activities of the scrap metal yard.

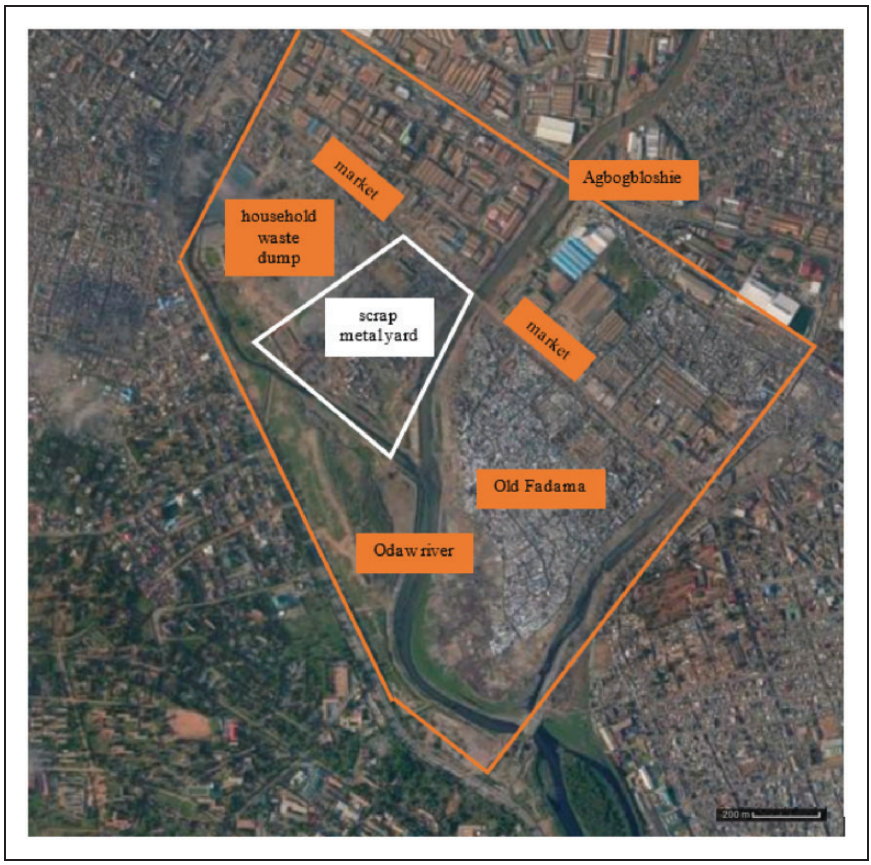

Figure 1. A map showing Agbogbloshie (study area) boundaries.
Source. Oteng-Ababio and Van der Velden (2019).

Christened arguably as the most massive e-waste dump in the world (Brigden et al., 2008), "the world's largest e-waste dump",[2] "welcome to hell" (Kaplan, 2014), "inside the hellscape where our computers go to die" (McElvaney, 2014), among the 10 most polluted sites in the world (Blacksmith Institute, 2013), and so forth, Agbogbloshie presents an excellent example of the growing e-waste trade, or what Doyen calls "reverse privacy" (see Doyon, 2012, p. 43), receiving hundreds of thousands of tons of e-waste annually (Frontline, 2009). Quoting one environmental journalist in Ghana, Mike Anane, Consumers International (2008) writes:

> Ghana is increasingly becoming a dumping ground for waste from Europe and the U.S. We are talking about several tons of obsolete discarded computers, monitors,

> etc. We don't have the mechanism or the system in place in this country to recycle these wastes. Some of these items come in under the guise of donations, but when you examine the items, they don't work. (p. 2)

Indeed, the logline of a 2018 film, *Welcome to Sodom*, directed by Florian Weigensamer and Christian Krönes, epitomizes the extent to which Agbogbloshie has been demonized. The logline reads:

> Agbogbloshie, Accra, is the largest electronic waste dump in the world. About 6,000 women, men, and children live and work here. They call it "Sodom." Every year about 250,000 tons of sorted out computers, smartphones, air conditions tanks, and other devices from a far-away electrified and digitalized world end up here. Illegally. Cleverly interwoven, the destinies of the various protagonists unravel the complex story of this apocalyptic society. Their very personal inner voices allow a deep insight into life and work at this place — and of Sodom itself. And you can be sure — it will most probably be the final destination of the smartphone, the computer you buy today.

The *Filmmaker Magazine* sums up the film thus: "through jaw-dropping artistry, this stunning film plunges us deep into a shockingly dystopian universe." The challenge here is there is no reliable estimate which comes close to suggesting that 250,000 tons of e-waste annually ends up at Agbogbloshie. As rightly noted in the documentary, e-waste is brought in by pushcarts and motorized tricycles, but as argued by Oteng-Ababio and van der Velden (2019), if 250,000 tons of illegally imported e-waste were brought into the scrap metal yard yearly, this would have amounted to 35,000 computer monitors or 14,000 air conditioner units or 4 million mobile phones every day. To anyone spending a few days in the scrap metal yard knows that these numbers are absurd.

Our focus in this article is not to interrogate Agbogbloshie's (over)stigmatization. Instead, we focus on how compatible Act 917, underpinned by EPR, can help achieve a sound WEEE management practices and avoid what Bennett (2003) calls "dramatization bias" (p. 45), which creates risks for the vulnerable people for whom such narratives seek to generate sympathy. The authorities have, historically, used media demonization as a justification to forcefully evict people (Morrison, 2017). Although e-waste is a huge global issue, we believe the problem does not get resolved by guilting consumers in developed economies. Instead, we need practical and maintainable, regulation, underpinned by CST, which recognizes the importance of the informal sector and secures the health and safety of all people involved. Agbogbloshie provides a unique opportunity to illustrate how WEEE management and livelihood complexities respond to a mostly human-blind regulation such as Act 917.

Methodologically, we employed direct observation and in-depth interviews, which generated rich data on respondents' lifeworlds (Kvale, 2007). Insights

from previous studies (Akese & Little, 2018; Grant & Oteng-Ababio, 2016) provide the basis for informed observation of the site's social ecology, including social activities, which impact people's livelihood strategies and contours. The approach helped in disaggregating the actors' responsibilities and provided insights into policies and factors that facilitate or hinder the e-waste industry. The observations informed the reshaping of the interview guide regarding trade contours, livelihood options, and power relations. The face-to-face interviews were conducted on a purposively drawn sample comprising government officials from the Accra Metropolitan Assembly (AMA), the EPA, and the customs division of the Ghana Revenue Authority. In addition, 14 informal recyclers, all internal migrants from northern Ghana, were also interviewed. This group included two each of past and present executives of the Greater Accra Scrap Dealers Association.[3]

These interviews provided a broad overview of participants' lived realities, while interactions with public and nongovernmental organization officials offered further insights into the nature and volume of the e-waste trade. Thematic and narrative analyses were used to organize and categorize the data. This approach emphasizes the varied representations, practices, and experiences and identifies contradictions, challenges, ambiguities, and marginalized viewpoints. The results help in reconstructing different contours of the e-waste trade and present selected quotations from the stakeholders to illustrate specific policy and livelihood options, including trading among developing economies. We restricted ourselves to the analysis of official customs data for computers and mobile phone trade, due to data incompleteness of other EEE. The customs data captured the country of origin, importer and exporter, description (type) of commodity, net mass, cost, insurance, and freight value (Grant & Oteng-Ababio, 2019). The data offer a nuanced understanding of the current WEEE industry (trade) and highlights the trade dynamics and worlds of work, which have hitherto remained somewhat opaque. The next section examines the e-waste trade contours within the country's socioeconomic space.

Results: EEE Detritus Trade, Materiality, and Governance

WEEE Trade Contours: The Emerging South–South Trade

The fact that Agbogbloshie houses a large, well-organized but brittle informal economy[4] is not in dispute. Similarly, though the persistence of a North–South waste flow is not a new story line (Frontline, 2009), it remains incomplete. Empirically, our data do not discount this North-South flow, but it complicates that story line. First, prior analysis carried out on 2010–2014 import data on general EEE (see Table 1) shows that over the 5 years, a total of 157,000 tons of new and used EEE were imported into Ghana (Grant & Oteng-Ababio, 2019). These data undermine the claim of 250,000 tons per year illegal imports of

e-waste to Ghana and reveal that large household appliances account for almost half of the total volume in weight.

Regarding the compatibility of Act 917, Table 1 shows that used appliance imports and usage are the norm in several product categories (e.g., radios, stereos, air conditioners, refrigerators, etc.). This means that the policy has to cope with the problem of free riders,[5] though there are signs that the problem can be more pronounced (Grant & Oteng-Ababio, 2016). The fieldwork indicates that the popularity of used and assembled products is a major concern. In most cases, they are cheaper and more custom-made than branded products. However, their mode of delivery (by small shops or independent technicians) makes it likely that they would become "orphan products" in any EPR program. By implication, the country stands vulnerable to the problem of "orphan products" from scores of small, short-lived companies and assemblers (Manomaivibool, 2009).

In the opinion of Khan (2016), "in a world where all commodities eventually turn into waste and waste itself is increasingly turning back into commodities, the legal division between these two material categories is inevitable and confusing" (p. 154). By implication, the persistence of secondhand imports provides some indication of the amount of e-waste in store, which a World Bank (2015) report conservatively estimates to be 1,100,000 tons (p. 37). From the analysis, we can tentatively conclude that presenting e-waste as a "First World" problem ignores the fact that Ghanaians themselves consume large amounts of electronics. Again, the repair and recycling of these are not only an important economic activity (Akese & Little, 2018) but an essential contribution to sustainable consumption in Ghana.

A further analysis of mobile phones and accessories (mostly new) imports between 2009 and 2017 sheds light on increased South–South trade and

Table 1. Top 10 Used-Electronics Imports in Tonnage Volumes, Ghana 2010–2014.

Category	Total tonnage[a]	% Used
PCs	66,756	8
Refrigerators	66,190	62
Air conditioners	13,330	99
Radios	5,387	95
Mobile phones	701	1
LCD monitors	700	50
LCD TVs	690	15
Irons	416	25
Stereos	371	88
Kettles	113	19

Source. Extracted from Ghana customs declaration (Bill of Entry; 2010–2014).
[a]Total volume new and used.

contradicts the media narrative of a North-South flow of waste dumping in Ghana. The data (Figure 2) revealed that Ghana currently imports phones from 30 countries. Significantly, more than 93% of the total imports came from developing countries, while OECD countries accounted for only 6.3%. From the analysis, imports from four non-OECD countries alone (United Arab Emirates [33.09%], Hong Kong [21.64%], China [19.68%], and India [9.24%]) accounted for 84% of the total imports. Equally, only two OECD countries (Finland and the United Kingdom) appeared among the top ten of Ghana's phone trading partners, occupying the 7th (1.5%) and 8th (1.2%) positions, respectively. Instructively, Nigeria and Togo are among the top

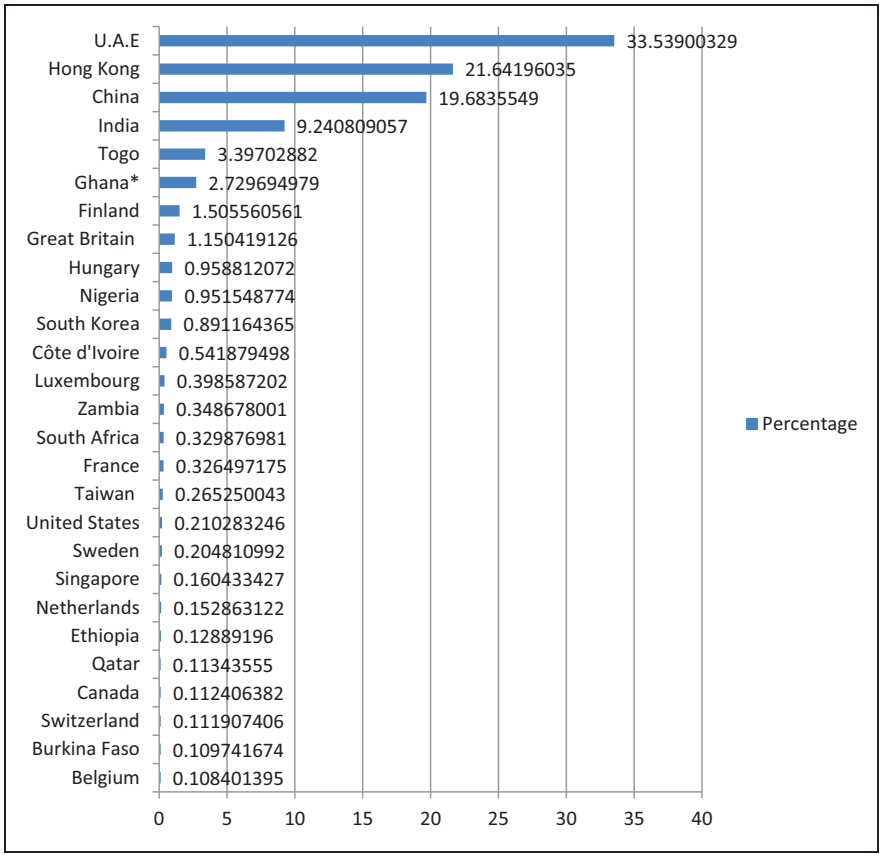

Figure 2. Countries of Ghana's mobile phone imports (2009–2017).
Source. Extracted from Ghana customs declaration (Bill of Entry; 2009–2017).
*Smuggled and adopted mobile phones.

sources of mobile phone imports to Ghana, emphasizing the heavy import traffic coming from countries sharing land borders with Ghana.

This interregional trade poses a challenge for the implementation of the new e-waste law. A real threat comes from the issue of free riding, which comes from imperfect and corrupted officials and market surveillance that allows a sizable black market, smuggling, and counterfeit products to exist. Invariably, those involved in these illegal activities would, by default, be free riders in an EPR-driven policy. According to prior studies (Grant & Oteng-Ababio, 2019), there are inherent trade irregularities that can distort the official shipment statistics. For example, manufacturers might submit understated figures to custom officials to avoid paying taxes. Similarly, importers can bundle extra accessories with the imports of primary devices without paying additional duties and then repackage and sell them separately. The same techniques can be used to free ride EPR policies.

Our study revealed Ghana is not only an importer of mobile phones but also an e-scrap (metals) exporter. According to Grant and Oteng-Ababio (2019), this trade can be a US$2.4 million business (or 0.03% of the gross domestic product [GDP]) in 2011. Figure 3 presents a "league table" of the beneficiary countries of Ghana's revalued e-exports between 2009 and 2017. Per the available data, China ranks first with a value of about US$475,440 (19.81%), followed by India (11.85%) and Germany (8.75%). Noteworthy is the fact that the five OECD countries on the chart with an aggregate export value of only 18.07%, fall short of China's total exports.

The practical value of our study lies in the emphasis on the dominance of trade flows toward a South–South direction as against a North–South, as earlier commentaries (Consumers International, 2008; Frontline, 2009) had sought to portray. This dynamic was echoed (and substantiated) by the Chinese ambassador to Ghana thus: "The trade volume [between China and Ghana] has surged from less than $100 million in 2000 to $5.6 billion in 2014 . . . Ghana's export to China has also increased significantly to a high of 86%" (Baohong, 2016). It also portends considerable policy changes, lest it unjustly bury local potentials and realities or differentially affect the marginalized and stretch their response capacities to the limit (Carmody & Owusu, 2016). This empiric resonates with United Nations Conference on Trade and Development's (2011) observation, cited in Horner (2016) that "more exports from developing countries now go to other developing countries . . . , and that [in] 1995, 52.6% of Africa's exports went to Europe, but this share declined to 37.3% in 2015; [while] trade with developing economies almost doubled — from 25.6% in 1995 to 49.8% by 2015". The findings belie attempts to cleanly partition the e-waste trade contours into a wealthy, hi-technology global North exporter (winners) and impoverished, technologically starved global South importers (losers; Anane-Fenin & Akinlabi, 2017). Such an exclusionary approach unjustly precludes the observed flourishing South–South trade and disguises the trade's immense potential to shape and reshape

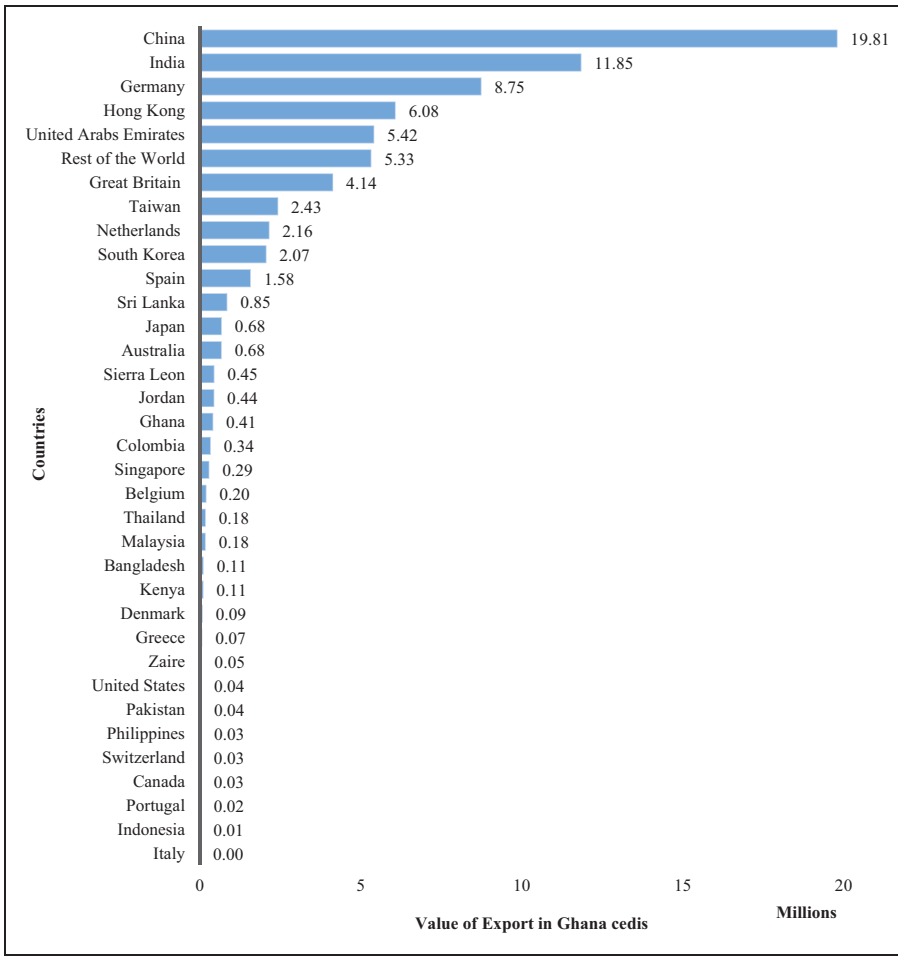

Figure 3. Total export of e-scrap from Ghana (2009–2017).
Source. Extracts from Ghana customs declaration (2009–2017).

the local economy (Gillespie, 2016). The next section provides insights into work–life trajectory of WEEE and some potential effects on the local economy.

Can the WEEE Trade Be a Case of Exploitation by Deception?

Our key informants helped unpack the local, national, and global markets. We identified a set of economic actors and activities involved in both the generation of WEEE and the creation of a good or service, as captured in Figure 4. Our data provide valuable insights into the linkages regarding how value is created

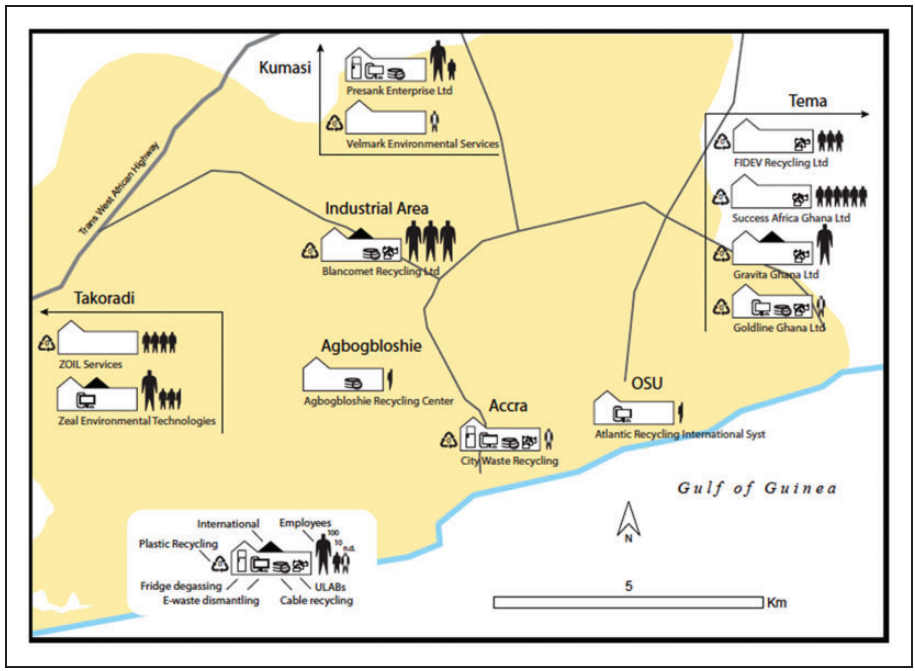

Figure 4. Network and flows of e-waste materials within Ghana.
Source. Grant and Oteng-Ababio (2019).
Note. ULAB = used lead-acid batteries; OSU = A neighborhood in Accra.

and differentially captured. In addition to the importation and wholesaling of WEEE, there are at least four conduits to recover or create new value from WEEE: resale, refurbishing, repair, and dismantling (see Grant & Oteng-Ababio, 2019). These serve different end markets—domestic, regional, and global. It was particularly revealing that although the "free zone"[6] e-waste companies, including Success Africa Ltd and Gravita Ltd, are registered in Ghana, they primarily operate as subsidiaries of India-based companies.

Mostly, foreign subsidiaries engage the low-paid, low-skilled, poor informal recyclers who use rudimentary processes and collection techniques to capture, enhance, and add value indirectly (Inverardi-Ferri, 2017). For example, components such as printed circuit boards (PCBs) are harvested informally in Agbogbloshie (Accra), purchased and accumulated by Nord-Schrott International agents, and exported to their mother company in Germany. From there, precious metals such as gold are extracted and sent to jewelry manufacturers in China (and elsewhere) that make wedding rings for sale in jewelry shops in various retail locations worldwide.

In discussion with some key informants in the foreign subsidiary companies, it was evident that the e-waste industry has assumed both strategic and lucrative status. For instance, the marginalized urban migrants participate in the activities because it offers rapid cash flow as revenues materialize immediately "goods" are sold. However, the economic impact is lackluster and does not guarantee equitable transfusion of resources among all the stakeholders along the value chain. This signifies a failure to adopt coherent policies to challenge the status quo. For example, most informal participants revealed that their contracts are simple oral deals, unlike the detailed agreements between the subsidiary companies and their parent industries. According to the interviewees, they choose informal pathways to avoid undue political obstacles. Ultimately, the prevalence of such tendencies tends to power asymmetric and institutional limits to endogenous enforcement.

The lack of a coherent CST-informed policy at the local level, coupled with constant stigmatization, has created an opportunity for a semblance of exploitation by deception by isolating and controlling the "profitable" parts of the trade. Local recyclers displayed stark ignorance of the real socioeconomic impact of their often despised activities. Indeed, only 2 (14%) out of the 14 recyclers had some insights regarding the actual value of the PCBs as they travel away from Accra (Ghana). This naiveté explains the relatively low pricing for the product. For example, our research found that a kilo of PCBs, mainly from computers, attracts GH¢30, or GH¢30,000 a ton. This takes not less than 2 weeks to aggregate, while those from mobile phones, which take months, go for GH¢70,000 a ton or GH¢70 a kilo. Meanwhile, on the international market, a ton of PCBs generate between $7,000 and $8,000 and a profit margin ranging from 40% to 150% higher (PI with a Marketing Officer at Umicore[7] Plant, Brussels, September 28, 2018).

In addition, we observed that the upstream participants (middlemen) operate in secrecy by maintaining discretion about their business contacts and relying on expatriate management. Such modus operandi is inherently exploitative and creates exclusionary tendencies through which the capitalist economy secures its resources (Sanyal & Bhattacharya, 2009, p. 37). A 24-year-old recycler with over five years experience remarked:

> We cannot extract the gold, but tens of hundreds of businesses and swathes of individuals make profits [SIC] from recycling using our [own] tools—which unfortunately often serve to motivate AMA [city authorities] to interrupt our business. To them [AMA], companies are big-big machines that guarantee human welfare. (PI, October 24, 2015)

The aforementioned narrative resonates with concerns of about 90% of the interviewees who equate business to one's ability to "put food on the table." They argue that, though the authorities consistently use media dramatization biases as a justification to evict them forcefully, the "e-waste dumping storyline

is ill-informed, and thousands of them continue eke out a living from such an (in)formal value chain with interlinkages and rapid cash flow". Prakash and Manhart (2010, p. 38) estimate the industry's contribution to Ghana's economy at 0.55% of GDP, although they admit that data paucity makes the industry's contribution difficult to estimate. On job creation, an illuminating remark by a 42-year-old retired public servant provides an opportunity for appreciating how inequality may persist:

> Though our job [scavenging] is controversial, we produce feedstock to many industries home and abroad. We are at the bottom so we earn the smallest income but endure the highest risks ... We are financially and physically invisible. Instead of the authorities working to remove the barriers impeding our forward march, they strangely continue to exact official harassment, facilitate police extortion, and exacerbate public ridicule and stigmatization. (PI, 27 October 2016)

Most interviewees (about 90%) agreed that though WEEE recycling offers a livelihood opportunity, technology and finance are the critical dividing line with "those investing more reaping the lion's share." This calls for a CST-informed regulatory framework, which moves the trade beyond just the formal–informal divide and provides a nuanced understanding of its full potentials and its embedded invisible exploitive tendencies.

Although inconclusive, our findings challenge the compatibility of Act 917 within the Ghanaian context. We caution that should any future e-waste ban becomes a temporary success (a possibility yet to be explored), it may excacerbate tensions among the marginalized population whose only motivation is to make a living in an economically challenging environment. Eviction threats do nothing to address social ills – such as theft, drug peddling, or prostitution – and may make them worse. We observed acts of violence by a section of the youth who, literally, feel as though they are an unwanted "surplus" to a society that excludes them and is in search of anything that can temporarily release their anger or present an opportunity for promoting their common interest or what Harvey (2009) calls militant particularism. Such tendencies can undermine official policy objectives and aggravate the potential for conflict in an ethnically divided area.

WEEE Materiality Circuitry, Livelihood Realities, and ACT 917

Our article examined the extent to which Ghana's new e-waste regulatory regime is in sync with the WEEE industry and the local socioeconomic realities. The study provides an opportunity to understand how the inherent inequality and exploitation in the e-waste industry may be mitigated (Inverardi-Ferri, 2017). In its present architecture, Ghana's regulatory fabric continuously discriminates

against the *scavengers*, a sector whose contributions manifest in varied geographies and materiality—in reuse, repair, refurbishment, and material recovery—who are supposedly equals in governance but are, at best, seen as outcasts from official systems (Khan, 2016). Their activities form part of what Baldé et al. (2017) see as a US$52 billion global recycling and reexporting of the metal industry or the US$4 billion mobile phone repair industry (Le Moigne, 2017). To that extent, their nonrecognition reflects a lack of appreciation of the complexity of informality and hides both its positive linkages and its exploitative tendencies.

Per our findings, the WEEE industry is empirically diverse. Hence, there is the need to move beyond a nationally bounded account and connect coherently to both intra- and international relationships in ways that differ empirically from traditional accounts (Consumers International, 2008; Frontline, 2009). Without denying informality's negative dimensions, our empirical analysis, outcomes, and conclusions highlight its embedded burgeoning livelihood opportunities and their transformation into vital resources. We observed unconventional extraction of minerals (e.g., copper), which ended up in international markets (Oteng-Ababio, 2018). Under the circumstances, using health issues as an external planetary villain to exact a WEEE ban may inflict collateral damage. The abortive LI1932, passed in 2008, which banned the importation of used refrigerators and freezers, readily comes to mind. Although the LI mandates the Energy Commission to seize such appliances wherever they are stored or offered for sale and destroy them within 4 weeks, evidence abounds that there is little compliance, as old fridges are openly traded in every Ghanaian market today.

The wholesale adoption of the tenets of the EPR informs our skepticism over the compatibility of Act 917, which shifts the responsibility of safe WEEE regularization from city authorities to the producers. It lacks coherent linkages with observable social realities, where the informal sector accounts for approximately 95% of the market, yet the act takes no notice of this (Oteng-Ababio, 2018). Although the EPR provides a strong incentive for companies to produce easily recyclable and less toxic products, it is not clear how this will pan out in Ghana where the majority of consumers rely on secondhand products. Equally difficult to implement is the clause that mandates local authorities to designate "disposal assembly points" (Act 31) where "actors" are to deliver collected e-waste because there is no demonstrable motivation to do as expected. Earlier studies had revealed that most people prefer to store their WEEE as it is perceived to be of value (Afena, 2012). Furthermore, there is the expectation that importers and manufacturers should contribute to an eco-fund to finance the construction and maintenance of an e-waste recycling facility. This obligation would be an arduous task due to the informal nature of the industry and the dominance of the reused market. In essence, the act envisages a state-led collection system, totally delinked from the existing formal–informal collaborations at both the local and transnational scales. Thus, the act creates an imaginary space of WEEE collection in which the informal sector does not exist.

Going forward, recognizing the WEEE flows is paramount. We particularly caution against uncritical attempts to ignore WEEE's mostly untapped potential for promoting the more judicious use of global resources and bolstering local livelihood opportunities. Resorting to a vaguely configured governance regime legitimizes the exploitation of the informal recyclers, who municipal authorities have already subjected to harassment, hostility, and seizure (Oteng-Ababio, 2018). Creating an inclusive WEEE governance is better than reinforcing the traditional nonrecognition of informality, which perpetuates exploitation by deception. Although the formal sector continues to fruitlessly strive to construct a distorted, state-led e-waste utopia, which ignores the vibrant informal contours (Myers, 2011), achieving regulatory compliance and sustainability must be informed by a clear understanding of the sector's multidimensionality and embedded realities. In short, policy makers need to take a systemic approach to designing policy that includes protecting people's interests, health concerns, and socioeconomic opportunities, being cognizant of the fact that peoples' real circumstances are too important to be ignored, particularly with the sustainable development goals in mind.[8]

In the African context, this is particularly crucial because in addition to the key issues of urbanization and climate change, the continent currently faces a poverty and youth bulge (International Labour Organization, 2017, p. i), with more than 200 million unemployed youth (aged between 15 and 24), a figure expected to exceed 830 million by 2050 (Ighobor, 2017). The continent today is saddled with a triple helix of threats from rapid urbanization, dealing with increased climate variability and creating quality and sufficient employment opportunities for its youth. In the words of Tony Elumelu, chairman of Heirs Holdings Investment Company, how the "youth bulge[9]" (i.e., 60% of jobless) is managed may spell Africa's "promise or peril." A World Bank report in 2015 further revealed that only "52% of people aged 15–24, was employed." The precarity of the situation manifests in Ghana's 22.3% poverty gap (measured as a percentage of people living below $2 a day), which lags behind South Africa (12.3%) and substantially behind Malaysia (0.2%; World Bank, 2015). Reversing the trend requires policies that ensure that economic growth gains are shared inclusively.

Conclusion

The article unpacks how e-waste trade flows and configurations affect local socioeconomic realities and its variegated outcomes and uneven geographies. This is against the backdrop of a raging, too-neat bimodal debate describing "dumping of e-waste by rich developed nations in poor developing ones" (Clapp, 2001) and what Horner (2016) terms "mixed optimism drawn from win–win notions of trade" (p. 414) culminating in the promulgation of Act 917. Our findings remain skeptical about the appropriateness of the new regulation because it asssumes formalization of a purely informal system and seeks to create a state-led utopia. Our study sees informality as in part a safety net and

a commercial space where commodities are produced by the urban poor and circulate outside dominant capitalist relations (Sanyal & Bhattacharya, 2009). It portrays the WEEE industry as encapsulating an economically motivated chain of activities that require synergetic policies and significant downstream investments. As rightly noted by van der Velden et al. (2019), this also means engaging professionals who will devise regulatory frameworks that recognize the existing systems governing WEEE and situate the sector within the overall national development framework. Doing so, in the opinion of Grant and Oteng-Ababio (2019), requires profound changes at several sites—the ore mines, producer sites, urban mines—and the appreciation of circulation of material transformations among spatially separated locations.

The question is how to develop and balance the policy structure to meet the valid environmental and health concerns while at the same time addressing the socioeconomic imperative of poverty alleviation in a world of extreme inequalities, where the *rich* are where they are because of their development models that undermine rather than reinforce socioeconomic inequality. In our opinion, the solution lies in adopting feasible CST trade-offs—actions that unsettle the status quo. Such trade-offs should recognize the fact that people's social realities make their environmental concerns pale into insignificance. These are the new realities to which policy makers, researchers, and even the urban poor must adjust (see Morrison, 2017; Oteng-Ababio & van der Velden, 2019). More studies are required to better understand and reach out to the urban poor, who occupy the most vulnerable links in the WEEE value chain. The objective of such research should be to facilitate a comprehensive assessment of their needs, concerns, and perceptions regarding the realities and challenges to community buy-in and participation. Ultimately, policy experts must confront these realities and proffer mutually beneficial policies through genuine stakeholder consultations. This approach provides a uniform platform for all vulnerable groups to become engaged stakeholders; such an approach unlocks untapped opportunities necessary for reshaping and rethinking the WEEE industry potentialities and vulnerabilities (Oteng-Ababio & Grant, 2018) for building stakeholders' resilience and for improving their environmental and health equity.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This article is written as part of Sustainable Market Actors for Responsible Trade, a HORIZON2020-financed research project (grant agreement No. 693642).

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Notes

1. *Electronic waste* is the term used to describe broken-down electronics and electrical appliances or equipment that are discarded owing to obsolescence and partial or complete inoperability. These can include anything from large household appliances, such as air conditioners and refrigerators, to consumer electronics, including televisions, radios, cell phones, MP3 players, and computers.
2. See http://www.welcome-to-sodom.com.
3. The Greater Accra Scrap Dealers Association is an "elected" group responsible for coordinating the interests of members.
4. We purposively employ the term *brittle* because each node in the value chain can be disrupted by state policy interventions, which are most of the time tainted by donor support influence and subtle manipulations. Other destructive forces include local and international market forces (scrap metal price fluctuations, intermittent flows, and intense informal competition) and formal firms entering the arena are intensifying pressures.
5. As far as EPR is concerned, the actors who put the products on the market can be divided into responsible producers and free riders. Free riders are the greatest threat to EPR. Not only do the free riders evade the onus placed on the other producers, but they also increase the problem with orphan products, the cost of which the responsible producers might have to shoulder when the free riders' products get discharged into the system.
6. The Ghana Free Zone Act, Act 504 of 1995, promoted trade liberalization and provided incentives to manufacturing firms. Initially, the shortage of knowledge about the real value of WEEE trade aided profit-motivated foreign firms to successfully lobby the government for exclusivity in key "gray areas." The government granted this exclusivity in 2004, and the companies operated in "secrecy," which they religiously safeguarded by employing expatriate management staff.
7. Umicore is one of the world's largest industrial recyclers of e-waste.
8. The South refers to countries challenged by elevated levels of poverty and are primarily located south of the rich countries. They refer to a geographic region—West Africa—and not to a compass direction. The idea behind "South–South cooperation" is that when countries with common interests provide access to each other's resources—through development assistance, loans, direct investments, technology, or knowledge—the net benefits can be symbiotic, generating employment across borders and providing more tax revenue to be invested in public goods and services, thereby reducing poverty and improving livelihoods.
9. The youth bulge is a common phenomenon in many developing countries and, in particular, in the least developed countries. It is often due to a stage of development where a country achieves success in reducing infant mortality but mothers still have a high fertility rate. The result is that a large share of the population is composed of children and young adults, and today's children are tomorrow's young adults.

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