Defining an Equitable Israeli-Palestinian E-waste Economy

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Abstract

The electrical and electronic waste (e-waste) crisis is a key and pressing environmental problem, with considerable attention focused on the transboundary movement of discarded electronics from the global North to informal e-waste processing hubs in the global South. Initial, and still dominant, discussion of these flows and the destination hubs was a somewhat caricatured portrayal of the toxic transfer to "digital dumps" in the South of the refuse resulting from overconsumption in the North, giving rise to e-waste trade bans as accepted solutions to the problem. More recently, scholars have considered the tensions between the economic gains and environmental efficiencies of processing e-waste in the South and the health and environmental risks it poses, especially to the local communities. To date, however, little work has explored the development desires of e-waste dependent communities nor strategies to transform informal e-waste hubs into sustainable and clean industrial sectors formally integrated with e-waste management systems from exporting countries.

This dissertation addresses this knowledge gap by conducting a Participatory Action Research (PAR) methodology on one instance of North-to-South e-waste trade between Israel and the West Bank from June 2014 – December 2015. Based in the West Line informal e-waste hub in South-West Hebron, West Bank, this dissertation describes a PAR method that worked with the West Line community to articulate an improved e-waste industry and implement tangible initiatives to achieve it. The participatory process revealed that this long-term informal e-waste hub has grown economically dependent on

imported e-waste, and in contrast to mainstream solutions that seek to ban North-to-South e-waste trade, the local community articulated a development trajectory to regulate and transition this industry in an equitable and environmentally-friendly manner.

This dissertation is divided into five components: an introduction, three manuscripts, and a conclusion. The introduction begins with a broad overview of the e-waste literature with a focus on geographer's contribution to this field, followed by the specific objectives and research questions that guided this dissertation. I then provide the geopolitical context of the Israel-West Bank e-waste economy along with a description of the PAR method that guided this research.

The first manuscript describes the PAR approach carried out in the West Line community to upgrade the social and environmental conditions of the West Line e-waste hub. This approach contributed to the critique of "rapid participatory development" and the search for ways to recover its initial goals, detailing a unique adaptation of the Delphi-method that allowed the facilitation of a broadly endorsed development trajectory within a heterogeneous and conflicted community.

The second manuscript details a multi-method study that triangulates information from over 300 qualitative interviews, field observations, and structured interviews from a systematic stratified randomized sample drawn from all operating e-waste businesses in the West Line. This study uncovered an e-waste processing industry that imported 16,958 – 25,168 tons of e-waste in 2015, creating 381 enterprises, 1,098 jobs, and USD $28.5 million gross value added to the national economy. This study not only reveals the

magnitude of a largely hidden industry, but also details an adaptable method to analyze the quantities of e-waste flows and economic gains of analogous informal e-waste processing hubs.

The third manuscript employs a dis/articulations perspective to analyze the inclusionary and exclusionary impacts of Israel's new Extended Producer Responsibility (EPR) policy and subsequent creation of a regulated e-waste commodity chain. Through a detailed historical analysis of the West Line e-waste industry, I reveal the geopolitical and economic forces that delinked this region from an economy dependent on Israeli employment and subsequently linked it to the Israeli e-waste commodity chain. This manuscript challenges conceptions of "extended" and "responsibility" in EPR laws to integrate pre-existing e-waste economies into regulated e-waste commodity chains.

The conclusion reflects on the PAR process to achieve the West Line communities articulated goal of regulating a local e-waste industry and the levels of friction encountered by various Israeli and Palestinian stakeholders that control or influence this industry. I extend findings from this study to challenge international e-waste policy to incorporate the voices of e-waste dependent communities in the South as a moral compass to determine how to best manage transboundary e-waste trade.

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List of Abbreviations and Symbols

AFR	Advanced Recycling Fee
BFR	Brominated Flame Retardant
CBOs	Community-Based Organizations
CR	Community Representative
CRT	Cathode Ray Tube
DfE	Design for Environment
EC	European Community
EPR	Extended Producer Responsibility
EQA	Palestinian Environmental Quality Authority
E-waste	Electronic Waste
GCC	Global Commodity Chain
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GVA	Gross Value Added
GVC	Global Value Chain
HUEM	Household Unincorporated Enterprises with At Least Some Market Production Survey
MoEP	Israeli Ministry of Environmental Protection
NGO	Non-Government Organization
NIS	New Israeli Shekel (official currency in Israel)
OECD	Organization of Economic Cooperation and Development
PAR	Participatory Action Research
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCDD/F	Polychlorinated Dibenzo-p-Dioxin and Dibenzofuran
POPs	Persistent Organic Pollutants
PPA	Participatory Poverty Assessment
PRO	Producer Responsibility Organization
PVC	Polyvinyl Chloride
RAND	Research and Development
RMB	Renminbi (official currency in China)
StEP	Solving the E-waste Problem
USD	United States Dollar
USITC	United States International Trade Commission
VAT	Value Added Tax

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Manuscript 1

Introduction and Overview

A combination of growing global consumption and rapid product obsolescence has made electrical and electronic waste (e-waste) the fastest growing and most valuable waste stream worldwide, estimated at 65 million tons per year (StEP, 2016), and valued at more than a USD $14 billion industry (ABI Research, 2010). The (mis)management of increasing quantities of e-waste has sparked a key and pressing environmental problem, with considerable attention focused on the transboundary movement of discarded electronics from the global North to informal e-waste processing hubs in the global South.

E-waste presents complex disposal challenges due to its internal components combining valuable metals (e.g. gold, copper) and toxic substances (e.g. cadmium, mercury, lead, persistent organic pollutants). Many marginalized populations have begun importing e-waste as a means to generate income through recycling and refurbishing. However, this form of livelihood often trades an immediate and much-needed source of income for the creation of destructive and long-lasting environmental and health damages due to “backyard” or “informal” methods of extraction (i.e. acid leaching, open burning, unregulated landfilling, etc.) (Brigden et al., 2008; Keller, 2006; Wong et al., 2007). Thus, the appeal and feasibility of profitable e-waste recycling businesses in low-income populations has turned e-waste into a double-edged sword. Valuable materials can be recovered economically (Varin & Roinat, 2008), saving natural resources in the process (Li et al., 2007), and providing local incomes; however, when e-waste is improperly

processed, the risk of releasing hazardous substances into the environment threatens the health of workers and the surrounding population.

The dual character of e-waste being both resource and hazard has provided fertile ground for researching this particular contradiction. Over the past 15 years, e-waste has attracted considerable attention from academics, with a Scopus search for "e-waste" revealing 1,325 articles, nearly all of which are published since 2000, and each year incrementally generating more than the previous. These studies have been dominated by the fields of environmental science, engineering, and chemistry generally focusing on technical questions of e-waste management and investigating the human-environment impacts of crude dismantling processes.

In a comprehensive review of geographer's contribution to the e-waste problem, Pickren (2014) identifies three domains this field has advanced: mapping transboundary e-waste flows, in depth studies exploring informal e-waste hubs, and policy schemes for domestic and international e-waste management. These three domains are confronted head-on in this dissertation, which explores one instance of North-South e-waste trade between Israel and the West Bank. This dissertation fills a critical knowledge gap in the e-waste literature, not simply by adding another case study of North-South e-waste trade, but, more fundamentally, by introducing the often neglected voice and perspective of marginalized communities dependent on e-waste recycling to debates in the e-waste literature. The following section advances Pickren's (2014) preliminary overview of

these three interconnected domains as an orientating framework to identify knowledge gaps in the e-waste literature that this dissertation fills.

Mapping Transboundary E-waste Flows

The impulse to characterize and explain transboundary e-waste flows emerged from an increasing awareness of now infamous e-waste importation hubs in Asia and Africa that became global sites of concern, serving as harsh visualizations of the dark side of the digital age. Initial conceptions of transboundary e-waste flows was a simplified portrayal of e-waste moving from "developed" to "developing" countries – drawing parallels to the outsourcing of manufacturing jobs overseas where low labour costs and lax environmental regulations can increase profits (USNEWS, 2014). Such understandings, to an extent, derived from anecdotal evidence in NGO and media reports sharing compelling imagery of poor working conditions and excessive pollution attributed to processing refuse of rich countries (60 Minutes, 2008; Frontline, 2009; Puckett et al., 2002). Simplistic conceptualizations of North to South e-waste flows were codified in bi-modal imaginaries set out in the BAN Amendment to the Basel Convention, that would prohibit shipments of hazardous waste from developed nations (i.e. Annex VII countries: Organization for Economic Cooperation and Development (OECD), the European Community (EC) and Lichtenstein) to the developing world (i.e. Non-Annex VII countries) (Lepawsky, 2015).

The pollution haven hypothesis has provided a theoretical framework for scholarly and journalistic attempts to understand transboundary e-waste trade and the

proliferation of e-waste hotspots in the developing world. In broad terms, the hypothesis predicts that economic activities that are pollution intensive will relocate to jurisdictions that have less stringent environmental regulations. That is, in a competitive economic environment, polluting industries will reduce production costs and maintain a comparative advantage by removing costs associated with adhering to strict environmental regulations by shifting their activities to jurisdictions where such regulations are lax. While the hypothesis dates back to attempts to understand the relationships between trade and environmental behavior since the 1970s (See Clapp, 2001 and Kellenberg, 2010 for critical overviews of the literature), it is only recently that researchers have mobilized it to understand and predict trade patterns in hazardous waste, including e-waste (Bernard, 2015; Kellenberg 2010; Lepawsky & McNabb 2010; Lucier & Gureau, 2015; Pellow, 2007).

Studies applying the pollution haven hypothesis to global e-waste flows have produced mixed results. Such studies have tested the hypothesis through either econometric models or empirically through trade data. For example, Kellenberg (2009) uses empirical trade data on the stringency and enforcement of environmental policy to demonstrate that the level of environmental regulation across different jurisdictions significantly determines the patterns of waste trade. That is, the likelihood of importing waste from trading partners is higher for developing countries with lower regulatory oversight. Efthymiou et al. (2016) use macroeconomic data on per capita income, openness of economy, and the human development index for known and expected routes of illegal e-waste trade to show that e-waste flows from economically and socially

developed regions to countries with significantly lower levels of development, with few exceptions. Using COMTRADE data on the licit trade of "waste batteries and accumulators" as a proxy for e-waste, Lepawsky & McNabb (2010:188) conclude that while their data to some extent support the hypothesis, it "is not as robust as might be expected."

In light of the theoretical and empirical evidence on pollution havens, the consensus within the literature is that other factors clearly contribute to the movement of e-waste to developing countries (Kahhat & Williams 2010; Lepawsky & Billah 2011; Reddy, 2015). Rather than trade driven primarily by waste for dumping, recent studies have recast informal e-waste hubs as economic industries with productive activities such as reuse, repair, and material recovery that drive e-waste to most developing countries (Grant & Oteng-Ababio, 2013, Lepawsky & Billah, 2011; Lepawsky & Mather, 2011; Reddy, 2013; Schleup et al., 2009; Tong & Wang, 2004). As a consequence, the outcome of such flows cannot be sufficiently understood as primarily generating pollution havens. Furthermore, there are many countries with loose and patchy environmental regulations and low worker salaries, but only a few specific regions in a subset of developing countries have emerged as key destinations of e-waste exports (e.g. Agbogbloshie, Ghana; Lagos, Nigeria; and Guiyu, China). Thus, there remain unaccounted for place-specific characteristics that foster the emergence and spatial concentration of e-waste importation hubs.

In Depth Studies of Informal E-waste Hubs

Considerable attention in the literature has focused on informal e-waste economies on the receiving end of these international flows. A review of documented informal e-waste hubs in China, Ghana, India, and Nigeria from a combination of academic, journalist, and NGO sources reveal the tensions between human-environment risks and the economic dependence of e-waste recycling. Studies of informal hubs have more comprehensively evaluated the human-environment risks of informal e-waste recycling, whereas economic analyses of e-waste hubs are still in their infancy. Also, burgeoning in depth studies of informal e-waste hubs have alluded to place-specific characteristics that foster the emergence of informal e-waste economies, such as a pre-existing priming industry, a sudden deprivation of primary income, and inexpensive transport access to international flows.

Numerous studies have documented the release and migration of e-waste related hazardous substances into the environment and its uptake in humans caused by crude recycling and dismantling processes (for a comprehensive review see Grant et al., 2013 and Sepúlveda et al., 2010). In e-waste dominated towns in China, the uptake of inorganic and organic toxicants in humans has been most comprehensively documented. For example, Wu et al. (2008) found elevated levels of PBDEs and PCBs in biota samples compared to control samples and Ma et al. (2012) found that women have a significantly higher body burden of known carcinogens, PCDD/Fs, in breast milk, placenta and hair. Other studies have shown how exposure to e-waste contaminants

(particularly heavy metals and flame retardants) can lead to a variety of severe health concerns far beyond the localized e-waste processing environment itself (Bellinger et al., 2003; Chevrier et al., 2010; Harley et al., 2010; Herbstman et al., 2010; Stapleton et al., 2011; Turyk et al., 2008; Zheng et al., 2008). Direct environmental consequences have been witnessed in the informal e-waste recycling city of Guiyu, China, where groundwater pollution has deteriorated the local drinking water supply requiring water to be transported from the town of Ninjing 30 km away (Puckett et al., 2002). In Accra, Ghana, in the infamous Agbogbloshie e-waste site, numerous toxins, persistent organic pollutants (POPs) and heavy metals (lead, tin, zinc and copper) have been detected in the soil at over one hundred times the typical background levels (Brigden et al., 2008).

Analyses of the economic impact of informal e-waste hubs have relied on media reports and NGO investigations to estimate the Gross Value Added (GVA) e-waste processing contributes to the national economy. For example, the most widely cited estimates of the e-waste industry in Guiyu, China are based on a few media reports providing rough estimates ranging from USD $112 million (Xinhua Net, 2005) to USD $150 million per year (South China Morning Post, 2002). In Lagos, Nigeria Manhart et al. (2011) estimated the GVA of the refurbishment sector alone, by multiplying an estimate of the number of refurbishers by the average salary of the workshop owners, employees, and apprentices in these, and found that this sector generates USD $50.8 million per year, equivalent to 0.015% of Nigeria's GDP. In a similar study on the socio-economic impacts of e-waste in Agbogbloshie, Prakash et al. (2010) found e-waste processing to contribute USD $106 - 268 million to the national economy, a figure

obtained by multiplying the number of e-waste "collectors", "recyclers", and "refurbishers" by their respective average salaries. While these studies are limited to anecdotal estimations, unreliable international trade data, and rudimentary industry sampling designs, they all report e-waste processing to significantly impact national economies.

Descriptions of informal e-waste hubs have also alluded to a set of regional characteristics that trigger the emergence of informal e-waste hubs. For example, a disruption in a region's primary livelihood coupled with a historical link to collecting and processing discarded materials has been identified as a common pattern leading to the emergence of informal e-waste hubs in several regions. In Guiyu, Li et al. (2011) attributes poor agricultural production, due to its location in a low-lying, flood-prone area, coupled with the region's reputation for collecting waste as far back as the 1950s as catalysts for e-waste processing. Studies on Agbogbloshie find that the e-waste industry was established and grew due to a combination of socio-economic factors: increased migration from the north, downward social movement by those unable to afford more expensive areas in Accra, and spill-over population from adjacent markets (Amoyaw-Osei, 2011; Grant & Oteng-Ababio, 2012). Here, e-waste and scrap metal provide an important source of income for a marginalized population with few to no alternative options. In Lagos, before e-waste was imported to this region, second-hand markets, like the Alaba International Market, date back to 1978, attracting buyers of second-hand products from neighbouring countries (Manhart et al., 2011). Sullivan (2014) theorizes that the rise of e-waste processing in Lagos paralleled the decline of diverse

manufacturing industries (particularly the cotton textile industries) during the early 1990s, as foreign competition, smuggling and counterfeiting undercut these markets. Skilled labourers shifted from manufacturing industries to refurbishing electronics in the emerging second-hand electronic goods industry.

Another common characteristic catalyzing the emergence of informal e-waste hubs have been an influx of migrant workers and marginalized populations who provide cheap labour required to dismantle and/or refurbish e-waste economically. In Guiyu, former farmers from Northern provinces of Hunan and Anhui have migrated to Guiyu to take on jobs processing e-waste (Puckett et al., 2002). In Lagos, the collection and dismantling of e-waste is dominated by poor migrants from rural areas in Northern Nigeria, where there are few alternatives to small-scale agriculture (Manhart et al., 2011). Similarly, in Agbogbloshie, most of those working as collectors, recyclers, and refurbishers have migrated from northern regions of the country that face chronic food insecurity in search of better economic prospects (Amoyaw-Osei, 2011; Prakash et al., 2010). In India, members of lower castes who suffer social exclusion, low status, and lack job opportunities are forced to migrate to cities to collect and process discarded materials (Pandey & Govind, 2014). Laha (2014) notes that in Delhi, rural migrants pushed out of the agricultural sector join the e-waste trade that is often facilitated by the caste and community identities that underpin social relations and interactions. Moreover, Reddy (2015b) identifies impoverished and marginalized Muslim communities in Bangalore who dominate informal e-waste recycling and that the relatively lucrative profits of this

industry have pulled unemployed and underemployed Muslim neighbours and relatives into this business.

Access to e-waste, both domestically and internationally, presents a geographic characteristic that pulls regions into informal e-waste hubs. For example, with the exception of Dehli, all of Greenpeace's (2015) identified e-waste importation hubs are located in port cities, which commonsensically allows e-waste to easily arrive in shipping containers. In a well-researched journalistic book on the international scrap industry, Minter (2013) reveals China's competitive edge to process foreign e-waste over other countries with cheap labour since Chinese shipping companies heavily discount backhauls to avoid shipping empty containers back to China. In China, informal recyclers tend to cluster around key waterways and ports of entry – the most prominent informal sector in Guangdong province is situated adjacent to Hong Kong facilitating logistically-convenient illegal e-waste imports (Wang et al., 2013). Even more, Guangdong is located near numerous electronic manufacturing facilities – meeting a need for an ever-growing demand for cheap materials. In Africa, Lagos and Accra serve as port cities and entry points for imported goods to Western and Central Africa, making these regions a funnel for e-waste importation (Grant & Oteng-Ababio, 2012).

Certainly, the phenomena of informal e-waste hubs is new on the academic landscape as research investigating the economic impacts of these hubs and the underlying geo-socio-economic reasons specific places attract this form of livelihood are just beginning to emerge. A more detailed account of the inert characteristics of informal

e-waste hubs would better inform debates in the literature regarding policy options for e-waste trade and management.

North-South E-waste Trade Policy

An expanding body of literature has debated appropriate policies for transboundary e-waste trade by examining the resource efficiencies, environmental and health risks, and management of North-South e-waste trade. In much of the early legislative and NGO responses, such transboundary e-waste economies were framed as a hindrance to development and judged to be an anomalous or transient phenomenon that was (or should be) on the way out (Puckett et al., 2002; UNEP, 1989). More recently, scholars have considered the tensions between the economic gains and environmental efficiencies of processing e-waste in the South and the health and environmental risks it poses, especially to the local communities. These led to the emergence of calls for "win-win" e-waste management policies, combining manual dismantling and repair in the South with state-of-the-art recycling technology in the North (Rochat et al., 2008; Wang et al., 2012). Throughout this debate, few studies have sought out long-term engagement with communities dependent on imported e-waste to valorize their perspectives as a moral compass to guide appropriate policy options that impact their livelihoods most directly.

Studies accentuating the benefits of North-South e-waste trade highlight the reuse and repair of electronics in developing countries, which extend the life of electronics and "bridge the digital divide" between developing and developed countries (Kahhat &

Williams, 2012; Schluep et al., 2009; Williams et al., 2008). Others argue that e-waste exported to the global South reallocates resources as spare parts and raw materials. This creates significant post-consumption economic activity and reduces the need for primary extraction of metals from mining ores (Chen & Graedel, 2012; Lepawsky & Billah, 2011; Wang et al., 2012; Zhang et al., 2012). More skeptical arguments emphasize the negative environmental and human health impacts of hazardous e-waste dismantling methods that are more common in developing countries due to laidback environmental regulations and enforcement (Ni & Zeng, 2009). These are often illustrated by images of crude dismantling processes using basic hand tools to smash and separate valuable metals from electronic devices, open burning of PVC-coated wires to extract copper, and nitric acid baths to recover precious metals (e.g. gold, silver, palladium, etc.) from printed circuit boards.

In parallel, increasing quantities of e-waste generation coupled with a growing awareness of the human-environment risks of landfilling and illegal disposal (both domestic and overseas) has given urgency to adopt Extended Producer Responsibility (EPR) as a policy option to better manage e-waste. EPR policies have been initially applied to e-waste management as a way to solve the problem at the beginning of the pipeline (Design for Environment) and the end (regulating collection and recycling). Under EPR legislation, the responsibility of e-waste shifts upstream (both financially and physically) to producers and manufactures, which is argued to provide incentives to ‘design out’ environmental problems by keeping the entire lifecycle of the product in mind. While the interpretations and practical implementation of EPR vary from country

to country, they all share the basic ideology of EPR as a pollution prevention strategy that shifts focus from localized production facilities to broader product systems (Milojkovic & Litovski, 2005). Langrová (2002) summarized the main goals of a successful EPR framework as waste prevention and reduction, increased product reuse, increased use of recycled materials in production, reduced natural resource consumption, and internalization of environmental costs into product prices.

EPR does not constitute a cookie-cutter policy mechanism, but rather provides the foundation or skeleton for a range of policy instruments from which implementing countries can choose to best suit their specific needs and contexts. Examples of policy instruments under the EPR umbrella include: advanced recycling fees (AFRs), product take-back mandates, virgin material taxes, subsidies for recycling particular e-waste items, bans/restrictions on substances in electronics, recycling permits and standards, targets for recycling particular waste items, information campaigns or a combination of these instruments (Nnorom & Osibanjo, 2008).

While EPR policies are intended to address e-waste both at the beginning and end of the pipeline, most EPR schemes focus exclusively on the latter (Plambeck & Wang, 2009). Several academic and policy reviews have criticized EPR schemes for having weak or non-existent incentives for environmental design (Atasu & Subramanian, 2012; Gui et al., 2013; Rotter et al., 2011; Sachs, 2006). Moreover, Lepawsky (2012) argues that EPR policies place the financial burden of collecting and recycling e-waste on

consumer-citizens, which discourages producers to incorporate design for environment in electronics.

Throughout each of the domains geographers have contributed to in the e-waste literature, long-term immersive engagements with communities dependent on e-waste recycling present a critical knowledge gap. Studies that map transboundary e-waste flows, characterize informal e-waste hubs, and analyze North-South e-waste trade policy tend to utilize an outside-in approach common in traditional science where e-waste communities are researched on, rather than researched with. Missing from this literature are studies of informal e-waste hubs that explicitly integrate the local community into the generation and interpretation of research results. Such an approach, which this thesis takes, would not only provide the critical descriptive knowledge needed for more robust understandings of the e-waste problem, but introduces the voice and perspectives of vulnerable populations dependent on e-waste recycling that are most directly impacted by policy options.

OBJECTIVE

This dissertation intervenes in and sharpens the three dominant approaches to North-South e-waste trade synthesized above by investigating one instance of North-South e-waste trade between Israel and the West Bank, which has centralized in a string of villages in South-West Hebron known as the “West Line”. The objective of this dissertation is to uncover and analyze the multi-faceted dimensions of the transfer of e-waste from Israel to the West Line informal e-waste hub, discern whether or not this trade

is desirable either in its current form or a reformed structure, and propose strategies and means for improving the situation that may also serve as broader models for e-waste formalization in analogous informal e-waste hubs. This dissertation was guided by the following broad research questions:

- What is a desired e-waste economy according to those working and living in the West Line e-waste processing hub?
- What participatory methods can elicit an articulated desired e-waste economy that is broadly endorsed by a heterogeneous and conflicted West Line population?
- Given that transboundary movement of e-waste between Israel and the West Bank is likely to persist, are there ways to improve this trade to achieve the desired e-waste economy defined by the West Line community?
- How can a community-articulated cross-border e-waste economy be practically achieved? Can it be achieved?
- What is the economic significance of the West Line e-waste hub to the West Line, West Bank, and Israeli economy? What methods can be employed to produce reliable estimates of an informal e-waste economy?

The following section provides an overview of the West Line e-waste hub and situates this particular cross-border e-waste economy in the context of the geopolitics of the Israeli occupation. I then detail my initial engagement with the West Line community

before commencing a doctorate program and the resultant participatory method employed that directed the research trajectory of this dissertation.

THE GEOPOLITICS OF THE ISRAEL-WEST BANK E-WASTE TRADE

While the Israel-West Bank e-waste trade, and the centralized West Line e-waste hub, occurs in an idiosyncratic geopolitical and social context (as do other hubs, each in their own way), it also represents a microcosm of the global cross-border flow of e-waste and shares similarities in the dynamics and structure of the industry. Major factors driving North-South e-waste trade such as discrepancies in labour costs and environmental regulations and enforcement between "developed" and "developing" countries are intensified in the Israel-West Bank case by the geographic proximity and exclusive one-way transfer between e-waste importer and exporter coupled with the complex social and political histories of Israel and the West Bank. Thus, the Israel-West Bank e-waste trade provides a rich case study to deepen understandings of the tensions and dynamics of more dispersed and diluted instances of transboundary e-waste flows and extend lessons and insight to analogous informal hubs dependent on e-waste importation. This section describes the unique geopolitics of the West Bank and how the Israeli occupation has played a critical role in shaping this particular cross-border e-waste industry.

The Palestinian Economy under Israeli Occupation

The Palestinian economy shares some characteristics with other emerging/transitional economies while having obvious and distinctive features resulting from the Israeli occupation and the limitations imposed on border crossing. First of all, Palestine has no single national currency but uses three currencies (Israeli Shekels, Jordanian Dinars, and American Dollars) for different purposes. Second, the Palestinian economy is mainly a service economy, as 38% of the Palestinian GDP is generated from the service sector, while a mere 5% is generated from agriculture and 15% from industry (MAS, 2010). Third, Palestine has become heavily reliant on foreign aid, which stood at USD $1.8 billion in 2008, constituting 30% of the national GDP. Foreign aid pays an estimated 140,000 employees to provide essential services for nearly half of the population, essentially allowing the Palestinian Authority to operate (Liu, 2010).

The Palestinian territories of the West Bank and Gaza face significant levels of poverty and unemployment. The downward spiralling economic situation is becoming grave, with 67% of Palestinians living below the poverty line and 48% in extreme poverty (Kawasmi & White, 2010). The most serious effect of this downturn has been the emergence of chronic unemployment. Unemployment rates in the 1980s were generally under 5%, while since the mid-1990s they have risen to over 20% (Khalidi & Taghdisi-Rad, 2009)[1].

[1] The poverty and employment statistics in this paragraph should be taken with caution as the studies cited do not indicate whether or not they incorporate informal employment into their calculations and neither study provides an operational definition of "poverty" or "unemployment".

Economic conditions in Palestine deteriorated in the early 1990s after the economy fell under the Paris Economic Protocol of April 1994. The Paris Protocol established the interim-period economic relations between Israel and the Palestinian Authority based on a model known as a "customs union", the primary characteristic of which is the absence of economic borders between members of the union. Although this framework intended to ensure the free flow of workers, the Paris Protocol did not prevent prohibiting Palestinian workers from entering Israel, which has allowed prolonged closures in the Occupied Territories and limited the number of Palestinians given work permits. This caused a decline in real per capita GDP of 36.1% between 1992 and 1996 resulting from a combined effect of falling aggregate income and robust population growth. Extensive corruption in the Palestinian Authority in combination with Israeli closure policies further disrupted previously established labour and commodity market relationships (US Foreign Affairs, 2012). At the heart of Palestine's poor economic situation and development prospects are the policy measures of successive Israeli governments towards the Palestinian economy. Since 1967, these policies have shifted from integrating Palestine's natural resources (land, water, labour) into Israel's economy, to policies that have been unhelpful, and some would say work to actively disrupt and isolate Palestine's economy and markets (Khalidi, 2009).

Palestine's geographic position and inability to control its borders has made it reliant on Israel to access the world market and it has developed a dependency on Israeli companies to act as mediators to international markets. This is evidenced by the small number of Palestinian businesses that have offices overseas (Kawasmi & White, 2010).

Even more, for over 30 years Israel allowed hundreds of thousands of Palestinians to work in Israel in agriculture, construction and other blue-collar jobs. During the mid-1990s, over a fifth of the Palestinian population (150,000) was entering Israel to work daily ("Economy of the State of Palestine," 2017). In September 2000, during the outbreak of the Second Intifada and increasing violent reactions to the Israeli occupation, harsh restrictions were imposed on the movement of Palestinians within and from the occupied territories further restricting employment opportunities. The number of Palestinians granted access to work in Israel declined dramatically, as in 2007 only 68,000 Palestinians worked in Israel and Jewish settlements in the West Bank (55,250 in 2015), which skyrocketed Palestinian unemployment rates (PIBA, 2015). Before the Second Intifada, income from employment in Israel was estimated to account for at least one-sixth of the national economy (PCBS, 2003).

The unstable economic conditions and apparent "temporariness" of the occupation has been argued to be a mode of Israeli control on the Palestinian territories (Gordon, 2008). For example, the use of the provisional term "occupation" to describe the political status of the West Bank, as opposed to "colonization" is a prominent example of the temporary modality of control. With extreme uncertainty regarding access to Israel and economic development, there is little incentive for long-term investments in local industry, which has worked to paralyze national development.

This perception of "temporariness" coupled with Palestinian businesses aversion to pay taxes to the Israeli occupation has played a key role in the informal status of most

Palestinian enterprises. While it's hard to derive accurate numbers of an informal sector, it has been estimated that informal businesses in Palestine employ approximately 180,000 people generating USD $300 million annually (Massar Associates, 2003) and contribute up to 50% of the national economy (Kawasmi & White, 2010). Informal businesses are often small, requiring little to no capital, provide moderate to low incomes, unstable employment and normally operate in unsafe working conditions. While it has been shown that the informal sector performs a valuable economic role in Palestine's economy, other opinions concerning the vulnerabilities and lack of protection of workers and their families emphasize the dichotomy between formal and informal businesses (Halil, 2008).

How the Occupation has shaped the E-waste Industry

The origins of the Israel-West Bank e-waste industry stem from economic controls of the occupation. For example, dependence over several decades on Israeli employment on the one hand, combined with limited investments and growth in local businesses due to Israeli restrictions on Palestinian development and mobility on the other, made the Palestinian economy vulnerable to employment in Israel. In the wake of the second Intifada, between 2000 and 2007, approximately 80,000 Palestinians who used to be employed in Israel were denied permission to enter Israel (Btselem, 2011). This loss of income compounded by a national economic crisis, raised unemployment and poverty levels. This mostly affected uneducated workers employed in Israel who received significantly higher wages than those available in the West Bank (Miaari & Saier, 2011).

While a cross-border scrap industry had existed on a small scale for some time in the Palestinian areas, it became increasingly appealing with the loss of other opportunities for work, especially work whose income could approach those of the lost jobs in Israel – stimulating the creation of hundreds of informal scrap businesses of all sizes. The capital required to finance a scrap yard was already available to many Palestinians from their years of relatively high waged work in Israel, while existing connections within Israel facilitated sources of e-waste collection. Because its raw materials are informal, and its products can be as well, the e-waste industry lends itself to unregulated self-employment, and the creation of family businesses, which are a culturally resonant model within the Palestinian culture (Kawasmi & White, 2010). The informal nature of the scrap industry, innocent of taxation, offers a considerable advantage relative to other forms of employment. Nor does the industry require any advanced education levels, so it offers an easy transition for workers who worked in unskilled jobs in Israel.

While informal e-waste processing can be found dispersed across the West Bank, this form of livelihood has largely concentrated in a cluster of villages (i.e. Beit Awwa, Deir Samet, Al Kom, and Idhna) known as the "West Line" in South-West Hebron due to its proximity to Israel, history of importing Israeli used products, proportionally higher levels of unemployment following the Second Intifada, and geo-political location in Area B and C (See Figure 1). The rise in unemployment, which was intensified in the West Line due to its close distance to Israel (Miaari et al., 2014), acted as a catalyst for residents to search for any form of alternative employment, either long-term or

temporary, which did not depend on permission to enter Israel. The historical roots in processing used furniture coupled with a local growing awareness of the increasing value of dismantling and processing e-waste, fostered a transition for the surge of newly unemployed residents to shift from an economy dependent on Israeli employment to an economy dependent on Israeli e-waste. The goods transported over the Green Line into the West Bank by a small number of people still able to enter Israel leveraged employment for many more in the industry that resell, refurbish, and/or dismantle these items once they reached the West Line. This *ad hoc* industry has grown rapidly in the West Line, collecting and importing up to 40,000 tons of Israeli e-waste annually, which supports over 380 businesses, more than 1,000 full time jobs, and generates roughly USD $28.5 million GVA annually (see manuscript 2).

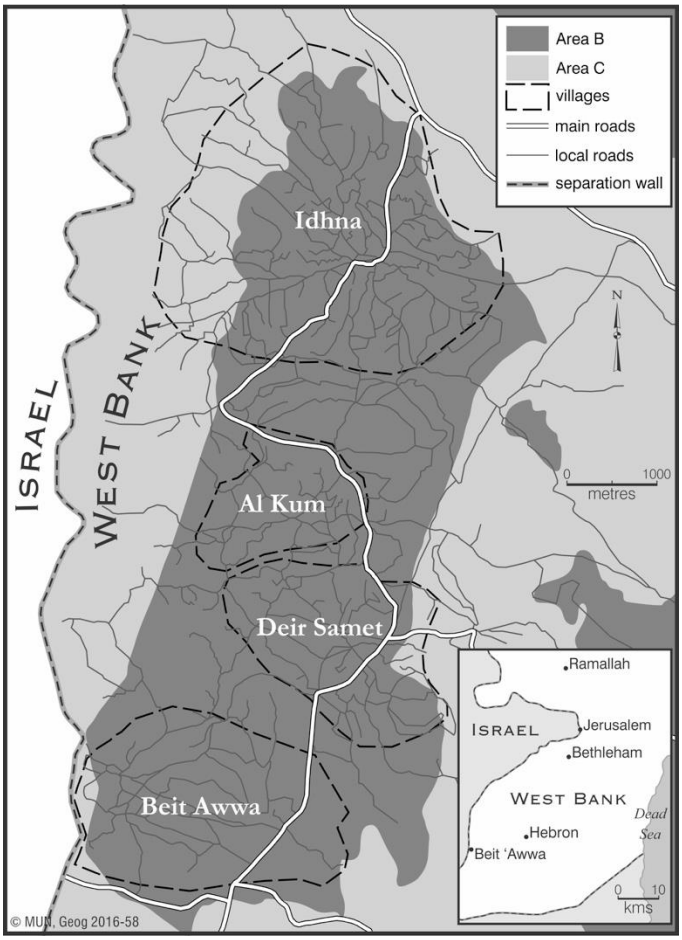

Figure 1: Map of the geo-political administrative divisions in the West Line villages

The entire flow and informal treatment of e-waste both feeds off of and depends on the geo-political situation between Israel and Palestine. Israel and the West Bank share one of the most unique borders between two territories, entailing a massive (but incomplete) separation wall, thousands of formal workers crossing the border daily (as well as considerable informal crossings), and a palpable complex geography of military occupation. The discrepancy of wealth between Israel (GDP per capita $32,298) and the West Bank (GDP per capita $1,924), represents one of the greatest economic differences

between two border territories in the world (IMF, 2012; Makovsky, 2011). The hundreds of checkpoints between Israel and the West Bank, viewed by one side as necessary security structures keeping Palestinians out of Israel and by the other as mechanisms of dispossession and control, embody the unequal power dynamics between these two territories (Tawil-Souri, 2009).

The impacts of the occupation on the Israel-West Bank e-waste industry begin with the transfer of e-waste into the West Bank, which is able to "fly under the radar" due to Palestine's inability to control its borders and the presence of settlers living in the West Bank allowing for ambiguity in determining the destination of trucks crossing the border. E-waste collection drivers take longer routes to return to the West Bank in order to enter through a major checkpoint in Jerusalem (the 'tunnels') that is operated by the army. Compared to privatized checkpoints operated by hired professionals that must adhere to contract stipulations, army operated checkpoints are managed by young drafted soldiers that are temporarily stationed at checkpoints. The tunnels checkpoint in Jerusalem is known to have less security and allows trucks to enter the West Bank with less hassle, and until very recently, without declaring any goods, that is, not incurring any taxation. Since Palestinians are prohibited from driving in Israel, all collection drivers are Israeli residents and drive trucks with Israeli license plates; border guards can assume they are driving directly to an Israeli settlement, not invoking any tax or security checks. Once a car has entered the West Bank, there is no tracking system to determine whether it is entering a settlement or driving to a Palestinian village. Theoretically, e-waste loads could be destined for a settlement, technically never leaving the "country." The

Palestinian Authority has no ability to limit the amount of e-waste coming across the border and is completely vulnerable to Israeli border security measures.

The entire e-waste economy in the West Bank is contingent on access to permits to enter Israel and collect e-waste and used materials. The permit regime has functioned as a mode of control over the Palestinian population since it has "created and promulgated norms of 'correct' behavior and thus has helped shape the interests and comportment of the inhabitants in a productive way" (Gordon, 2008: 38). Frequently, a person requesting a permit would be interviewed by Israel's General Secret Services officer, also known by its Hebrew acronym as the Shabak or Shin Bet. Access to the requested permit is often contingent upon the applicant's willingness to collaborate, which can entail relaying information to Israeli authorities on persons or organizations of interest, extracting confessions from political prisoners, recruiting additional agents, and/or carrying out para-military activities (Cohen, 2010: 153). Collaborators serve two supplemental roles that are more significant than their formal roles, functioning as a means of control to encourage "correct" conduct. The prospect that anybody could be a collaborator becomes an effective tool to encourage people to act and even think in ways that reduce organized dissent against the occupying powers. They also fragment the society, undercutting the confidence and trust required to "create alliances, promote solidarity, and spur political resistance" (Gordon, 2008: 48).

From 1967-1993, during the formal years of Israeli occupation, restrictions on Palestinian movement were relatively light. After the First Intifada in 1987, travel

between Gaza and West Bank became forbidden, and a permit system was enforced. The "peace years" (1993-2000) held more stringent spatial controls dividing the West Bank into Areas A, B, and C under the Oslo Agreement. Area A is under full Palestinian civil and military control, Area B is under full Palestinian civil control and joint Israeli-Palestinian military control, and Area C is under full Israeli civil and military control. According to the Oslo accord, these demarcations define clear divisions of governance; however, in practice, the borders between Areas A, B, and C are opaque at best. Complicating matters, increasing Israeli settlements and by-pass roads emerged in the West Bank, physical barricades including checkpoints became routine, while the construction of the "separation wall" created a fragmented Palestinian terrain (Tawil-Souri, 2009).

This fragmentation of the West Bank has made strict enforcement of regulations and laws in Areas B and C nearly impossible. This reality is clearly exemplified in the current location of scrap yards and e-waste burn sites in the West Bank. The most densely populated areas in the West Line are in Area B, where the majority of e-waste scrap yards are located. They can operate in a milieu of lax governance, while the majority of open burning sites (the most visibly harmful e-waste processing technique in the region) occur in Area C. This is no coincidence. Palestinian police cannot access Area C without advance Israeli permission that can take up to 48 hours to obtain, Israeli military are rarely present, and Palestinian landowners are prohibited from building in Area C leaving much of the land vacant. Because of this, harmful e-waste burning has moved to Area C where there is little fear of punishment and land owners are absent and thus unable to

prevent burning on their land. Conversely, we find scrap yards are built in Area B, since scrap yards built in Area C are typically demolished by Israeli military since building permits are not given.

The fragmented and often chaotic state of Palestinian governance in the West Bank has allowed for the informal e-waste industry to exist in these villages for well over ten years without Palestinian Ministry officials becoming aware of the full scope and seriousness of this phenomenon. However, in the past three years, what was an "invisible" cross-border e-waste industry has become visible to the Israeli and Palestinian authorities, due to the intense quantity of open-burning occurring in the West Line as well as the increasing visibility of research and advocacy documented in this dissertation. Without a firm grasp of the economic importance of this industry nor close consultation with the West Line villages dependent on these inputs, knee-jerk policy reactions from both Israeli and Palestinian authorities have banned certain e-waste materials (e.g. CRT televisions, cables) from entering the West Bank and shut down informal e-waste businesses. These policy responses echo international management stances, and, similarly, have not only failed to prevent e-waste trade and environmental harm but have put a serious financial strain on the local e-waste dependent economy.

The remarkable spatial contiguity of "First" and "Third" world in the Israeli-Palestinian case, where Israel's "out of the way" disposal is to Palestinian burn sites that are directly upstream (in a shared watershed that supplies Israeli drinking water) provides a one-of-a-kind opportunity to deepen understandings of the tensions and dynamics of

such transboundary e-waste flows. This dissertation, thus, contributes to an emerging dialogue regarding the modalities to regulate or improve North-South e-waste trade (Chi et al., 2011; Davis & Garb, 2015; Gunsilius, 2010; Rochat et al., 2008; Wang et al., 2012; Yu et al., 2010), and is among the first of its kind to elicit the development desires of a community that is dependent on imported e-waste.

PARTICIPATORY ACTION RESEARCH (PAR) AS METHODOLOGY

This dissertation emerged from ongoing engagement with the West Line community, which began over a year before commencing a doctorate program. As an intern under Dr. Garb, and later a Master's student, I had been involved in the West Line e-waste industry through a variety of research efforts, such as: a comprehensive spatial-temporal mapping of e-waste burn sites in the Hebron Governorate, tracking e-waste flows between Israel and the West Bank, identifying human-environment consequences resulting from crude recycling practices, and developing pathways to transition the informal e-waste sector into a sustainable and clean industry. The progression to a doctorate program at Memorial University and extension of this work forced me to reflect on deeper questions of whether or not this community desired to base their local economy on processing Israeli e-waste. The impulse to address this question and determine a preferred development trajectory with the West Line community and implement tangible actions that would improve local conditions led me to anchor my dissertation research on the principles of Participatory Action Research (PAR).

PAR differs from traditional positivist-based social research regarding the epistemological groundings, the methods used and the goals of the research outcomes. The epistemological underpinnings of PAR emerged as a break from the positivist and empiricist science that had dominated the technocratic research language (Shantz, 2008). PAR rejects the claims of a positivistic epistemology which holds that in order for information to be credible it must be value-free, objective and claim absolute truth. In contrast, PAR embraces a social construction of knowledge, and an explicitly socially engaged, democratic and political practice (Brydon-Miller et al., 2003). Objectivity and truth are not viewed as absolute, but relative, and are determined by consensus within a particular community (Rahman, 2008). PAR emphasizes "knowing through doing" in contrast to knowing through conceptualizing – embracing the power and relevance of pragmatism (Brydon-Miller et al., 2003). Thus, rather than having theory guide practice, PAR favours practice to guide theory.

Obtaining the acceptance of new ways of knowing has required new ways to validate the results of PAR. Positivist science argues PAR cannot generalize its research findings, which reduces the validity of its results. In response to this criticism, PAR advocates have either argued that their methods are even more rigorous under positivist standards or refused to adhere to positivist standards of validity entirely. Scholars arguing the former have challenged the dominance of quantitative modeling in the fields of organizational behaviour (Whyte et al., 1989) and international development (Chambers, 1995) by drawing on empirical case studies to demonstrate that grounded knowledge obtained by those researched on can produce more robust data and measurement criterion

according to traditional positivist standards. Moreover, findings are argued to be more reliable since data are collected through a continual learning process rather than at one specific point in time and "facts" are checked by having community members read and edit final reports. A separate faction of PAR advocates claim that PAR cannot answer the positivist's questions of validity since it belongs to a separate paradigm of social inquiry. This argument stems from Heinz Moser's reflections on the validity of PAR during a German trend of "emancipatory research" that synergized political change and participatory research strategies in the 1960s. Moser argued that PAR should not be answerable to positivist's question of validity nor objectivity, but should be held up to its own standard of "dialogical argumentation", where "truth" is a matter of consensus rather than being verified by some externally determined standard (Rahman, 2008).

PAR methodology differs from traditional social research in that it's *methodology* would be better characterized as an *orientation to inquiry* "that seeks to create participative communities of inquiry in which qualities of engagement, curiosity and question posing are brought to bear on significant practical issues" (Reason & Bradbury, 2008). Inquiry based on PAR principles understands the world through collective efforts to transform it, collaboratively and reflectively, in the hope that meaningful change will eventually emerge. The process of PAR typically engages communities in systematic cycles of action and reflection: in action phases communities test practices and gather evidence; in reflection phases they make sense together and plan further actions. These cycles of action and reflection integrate knowing and acting, allowing PAR to address the "gap" between perceptions and practices.

Since PAR emerged from a desire to effect change, the goals of PAR deviate from those of traditional social research that aim to generate "knowledge for understanding". Conversely, PAR advocates worry more about relevance and social change for at-risk stakeholders (Brydon-Miller et al., 2003). However, there has been debate over what constitutes successful "social change" in PAR. In a critical appraisal of PAR applications for social workers, Healy (2001) highlights diverging expectations of "social change" in PAR between the researcher and the local community. The former defines PAR a success when it leads to a comprehensive transformation of social order, whereas the latter tends to define success in terms of quick results in local change. The recent popularization and, at times, overuse of PAR has deepened this tension and led to inappropriate applications, where there is not a synergistic fit between the researcher, community, research topic, and organizational context (Alvarez & Guttierez, 2001). Since "practice" verifies the success of PAR, Shantz (2008) proposes a rule of thumb that the researched on (i.e. the local community) should ultimately be the ones to validate whether or not a PAR project has been successful.

PAR holds a complex history as it did not originate from a single school of thought, but evolved in parallel across many disciplines and in many forms. For example, Orlando Fals Borda identified at least 32 schools associated with the idea of participation in social economic and political research when reviewing the history of PAR at the World Conference on Participatory Convergence in Knowledge in 1997 (Fals Borda, 1998). This complex history coupled with the many definitions of and orientations towards PAR, have led scholars to diverge on what actually constitutes PAR. For example, some

PAR scholars hold strict beliefs that the ‘community’ (often misrepresented as pre-existing and easily definable and is further critiqued in the first manuscript) must be involved in the research process from design to results (Whyte, 1989), and that the community must collectively investigate their own reality by themselves or, if requested, in partnership with outside researchers (Rahman, 2008). Other PAR scholars, and I would agree with them, would argue that control of the research is rarely delegated to the community, nor would they necessarily want it (Cornwall, 1995). Researchers typically initiate contact with communities, since it is rare for a community to be organized together, seek out a form of PAR to solve pressing issues in their community, and solicit a researcher to facilitate this process (Maguire, 1987). Reason (1994) notes that “paradoxically, many PAR projects would not occur without the initiative of someone with time, skill, and commitment, someone who will almost inevitably be a member of privileged and educated groups” (p. 334). The fact that so little is written on the “beginnings and endings” of PAR practice attests to these fuzzy conceptions (McArdle, 2008).

My initial engagement in the West Line community was through a Palestinian colleague of Dr. Garb who arranged for a local English/Arabic speaker to accompany me in the villages. I began with the goal of generating a broad overview of the e-waste industry in the villages to understand and explain the tensions between economic gains and human-environment risks intrinsic in this industry. Through nearly one hundred interviews with individuals working in the e-waste industry and local community members and by attending municipal and civic society meetings, I recognized a need and

desire for community-driven change, which organically led me to design and facilitate a PAR project with the West Line community. To determine an appropriate PAR design and role for myself as an outside researcher, I leaned on Stoecker's (1997) three guideposts for academics conducting PAR projects: 1) determine what the project is trying to do; 2) identify your skills and how you can best benefit the community; and 3) determine how much research participation the community needs and wants.

In order to effectively carry-out this PAR method, I chose to immerse myself in the community by residing in the villages for over 11 months in 2015, with additional month-long visits afterwards. During my time in the villages I would either live with local families or rent vacant apartments. I found that by spending my free time in the villages I was able to pick up on various social and political cleavages and tensions in the community that were less likely to emerge through direct interviews alone.

It is important to note that while I initially laid out a detailed PAR method, throughout facilitating this project several complications emerged, which forced me to alter the structure of this method (for a comprehensive description of the participatory method see manuscript 1). This is a widely recognized challenge among PAR practitioners, which has been addressed by embracing an approach of "muddling through" (McArdle, 2008; Mead, 2008). This approach believes that it is essential to hold an open and inquiring mind in the face of decision-making in complex environments which can be characterized by emergent and partial data, strong emotions, unclear personal and political motivations, and diverse and at times conflicting beliefs. By

"muddling through" my PAR project, I acknowledge that good planning is essential, but no substitute for an active and reflexive engagement with the research process as it develops.

In the first manuscript of this dissertation, I extend the PAR method implemented in the West Line to address the challenges of representation in participatory development. Participatory approaches in international development projects have been heavily influenced by the theoretical and practical contributions of PAR, presenting a radical change to traditional methods by empowering the community to investigate their reality and take action to improve their circumstances. Yet, the wide-spread acceptance and institutionalization of "participation" in international development projects tends to produce a standardized, rapid, and often watered-down participatory process that often reinforces existing powers. In scaling up participatory approaches and incorporating them into mainstream development, the more radical values of community participation, such as a commitment to challenging undemocratic and unequal power structures, developing professional and personal ties with the community, and generating bottom-up comprehensive and complex accounts of communities have been watered-down and replaced with standardized, step-by-step approaches to participatory development. Thus, the methods and values embedded within participatory development can be reinvigorated by lessons from more slow and prudent PAR practices.

SUMMARY OF MANUSCRIPTS

This dissertation is organized into three manuscripts, each of which details a central finding in my research. Below, I provide a brief synopsis of each manuscript and emphasize how each links to and builds off of the results of the previous manuscript.

1. **Recovering the Complexity of Community Futures in E-waste Processing Hubs: Lessons from Stewarding Tailored Slow Participation in a Palestinian Context**

Community participation has evolved from being a challenge to conventional development projects to becoming a required component, accompanied by a suite of familiar 'best practice' methods for its achievement. In parallel, a critique has emerged of the dangers of overly simplified conceptions of 'participation' and 'community' embodied in this mainstreaming of participation. This manuscript draws on community-based efforts to upgrade the social and environmental conditions of a Palestinian e-waste hub to contribute to this critique and calls to recover the original impulse and impacts of community participation. I discuss the importance of and pathways to this recovery of participation through a more nuanced understanding of the cleavages and suppressions of the target community and describe a unique adaptation of the Delphi-method that allowed us to facilitate a broadly endorsed development trajectory within a heterogeneous and conflicted community.

The participatory process revealed that this long-term informal e-waste hub has grown economically dependent on imported e-waste, and in contrast to mainstream solutions that seek to ban North-South e-waste trade, the local community articulated a development trajectory to formalize and transition this industry in an equitable and environmentally-friendly manner. This focus on livelihoods revealed how international narratives emphasizing the adverse impact of North-South e-waste trade and environmental injustice occlude local realities and have stymied community development visions. This participatory process was more time consuming than some participatory shortcuts, and, ironically, required intensive outsider engagement. Yet, it elicited a robust program for e-waste hub upgrading that was broadly endorsed by a diverse representation of stakeholders both within and outside of the West Line community, offering a method towards recovering participation in complex development settings, and an example of more widely informed stances to informal e-waste hub reform.

2. Quantifying the Flows and Economy of E-waste Hubs: Learning from the Israeli-Palestinian Case

This manuscript exposes gaps in the e-waste literature regarding systematic empirical data portraying the quantity and economic impacts of imported e-waste to some of the more notorious and well-studied informal e-waste hubs, and introduces a method to comprehensively analyze a lesser known informal e-waste hub in South-West Hebron, West Bank. This multi-method study triangulated information from extensive qualitative interviews (>300), field observations, and a structured interview from a systematic

stratified randomized sample drawn from all operating e-waste businesses in the area to quantify refined estimates of e-waste imported to this region and the resultant economic gains of this cross-border informal industry. This study reveals the economic significance of the West Line e-waste industry, which in 2015 supported over 380 businesses, 1,000 jobs, imported 17,000 – 25,000 metric tons of e-waste and generated roughly USD $28.5 million. This study reveals the magnitude of a largely hidden, yet vital industry, challenging policy responses to preserve, invest in and improve this industry, rather than stomp it out. More broadly, this study details an adaptable method to analyze the quantity and financial gains of analogous e-waste processing hubs.

3. A Dis/articulations Perspective on Extended Producer Responsibility: Lessons from the Israeli-West Bank E-waste Trade

The final manuscript introduces a dis/articulations perspective to analyze the inclusionary and exclusionary impacts of Israel's new Extended Producer Responsibility (EPR) policy. Coined by Bair & Werner (2011), the dis/articulations project criticizes conventional commodity chain studies for holding an inherent inclusionary bias, which overlooks the historical and spatial processes that "reproduce the uneven geographies" that link and delink particular regions to transnational production networks. This manuscript employs a dis/articulations approach to analyze the exclusionary impacts of Israel's EPR policy and subsequent regulation of e-waste commodity chains to show how such processes have legally displaced a deep-rooted Palestinian informal e-waste hub. Through a detailed historical analysis of the West Line e-waste industry, I reveal the

geopolitical and economic forces that delinked this region from an economy dependent on Israeli employment and subsequently linked it to the Israeli e-waste commodity chain. While the West Line e-waste hub has been intertwined with Israeli markets for decades and developed extensive collection networks and industry specializations, they have remained invisible to EPR policy makers. Thus, pre-existing e-waste economies challenge conceptions of "extended" and "responsibility" in establishing EPR-based regulated commodity chains. This manuscript recommends an integration of the Palestinian e-waste sector into Israel's EPR law and details one pathway to do so through a pilot project our team facilitated addressing the cable segment of the e-waste stream as an example of one re-imagined policy structure that a dis/articulation perspective can inspire.

Conclusion

A common thread linking all three manuscripts has challenged commonly held perceptions of informal e-waste hubs as "digital dumpsites" for "developed" countries, and has questioned widely held conceptions that North-to-South e-waste trade is inherently wrong and should be banned. These stereotype breaking conclusions arose from the use of different qualitative and quantitative research methods that point to a more complex reality than "toxic dumping", in which the local community is more heterogeneous and has more volition. In the West Line e-waste hub, I reflect on the process to achieve the community articulated development goal of regulating the current e-waste industry and identify the varying levels of friction encountered from various

Israeli and Palestinian stakeholders. I conclude with a proposition to alter current international e-waste trade laws from regulation based on binary "developed"/"developing" country categorization, to basing the legality of trans-border e-waste movement on the operational standards and certification of the destination facility, regardless of the state location.

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Co-authorship Statement

This dissertation emerged out of a long-term research partnership with Dr. Yaakov Garb on the Israel-West Bank e-waste industry over the past five years. This joint research extends beyond the scope of this dissertation and includes human-environment studies of e-waste contamination, spatial-temporal mapping of e-waste burn sites, legal analyzes of cross-border e-waste management, among various other research projects.

During this five-year partnership, there have been research projects where Dr. Garb has taken the lead in the design, data collection and preparation of manuscripts, and research projects where John-Michael Davis has taken the lead. Concerning this dissertation, the research design and proposal, implementation of the research, data analysis and manuscript preparation were all principally carried out by John-Michael Davis. However, since each component of the dissertation was developed in deep consultation with Dr. Garb, who gave intellectual support beyond the traditional role of a supervisor, he has been included as a second author on all dissertation manuscripts.

Recovering the Complexity of Community Futures in E-waste Processing Hubs: Lessons from Stewarding Tailored Slow Participation in a Palestinian Context

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Abstract

This paper describes an unconventional participatory development approach carried out in an informal e-waste hub in South-West Hebron, an area that has collected and processed the bulk of Israeli e-waste for over a decade. Our approach contributes to the critique and recovery of community representation in participatory development and the search for ways to facilitate representative community engagement, detailing a unique adaptation of a novel Delphi-like method that allowed us to facilitate a broadly endorsed development trajectory within a heterogeneous and conflicted community. Results from our participatory approach challenge international policies that ban e-waste trade from 'developed' to 'developing' countries in favor of building capacity and regulating

existing informal trades to preserve livelihoods in communities dependent on these inputs.

Key Words: Community Participation, Economic Development, E-waste, West Bank, Israel, Palestine

1. INTRODUCTION

Since its emergence in the mid-1980s as a counter-hegemonic antidote to top-down development approaches and institutions, participatory development has been popularised and even routinized into development practice. What began as a radical, even threatening, impulse is now associated with a set of intentions and techniques endorsed - indeed, required - not only by grassroots NGOs and their funders, but by larger mainstream international development institutions (Leal, 2007), including the World Bank (World Bank, 1996).

The once radical goals of participatory development have now become commonplace: empowering the marginalised and poor to analyse their own circumstances and needs and make their own decisions; providing an opportunity for mutual learning between community and development practitioners; and increasing the efficiency, effectiveness and sustainability of development projects (Chambers, 1997; Hickey and Mohan, 2005; Michener, 1998). These typically manifest through partnerships with a local social group advocating on behalf of the community, and often employ visual and tangible consensus-based participatory methods intended to identify needs and develop projects emerging from, and agreeable and beneficial to the entire community (Chambers, 2008; Francis, 2002).

Increasingly, however, scholars have criticized assumptions that community participants adequately represent the entire community; tokenistic selection processes can

depreciate local community realities, exclude marginalised populations, and at worst, are manipulative and constitute a dangerous form of co-optation (Botes and Van Rensburg, 2000; Cleaver, 1999; Eversole, 2003; Funder, 2010). Recent studies have demonstrated the importance of countering unrepresentative community participation by taking local political and social contexts into account when designing community participatory methods (Agarwal, 2001; Brett, 2003; Lange, 2008; Mansuri & Rao, 2013).

Our current study enters into and elaborates upon this tension. In particular, we address well-founded fears regarding the forums, modalities, and facilitators of participation, in which even well-intentioned outsiders may tap primarily the most accessible and powerful community members, unintentionally fostering a process of 'elite capture', where development projects benefit the powerful in the community and further entrench the marginalization of others. Drawing on our work with local communities in South-West Hebron, West Bank, we underscore the dangers of unrepresentative participatory approaches and present an approach we used to lessen this tendency in a community of 35,000 residents that is heterogeneous, conflicted, and challenging to assemble diverse perspectives. Specifically, we describe an iterative 'spoke and hub' Delphi-like procedure in which, paradoxically, community semi-outsiders (the researchers) conducted a slow and careful study of the cleavages within the community, and then took on a fairly overt selective and centralizing facilitative role designed to lessen the effects of these cleavages. We suggest that this process allowed the inclusion of diverse interests and social groups, which produced a robust and broadly

endorsed development trajectory. This effort and its outcome contradicted the more familiar and ostensibly less representative participatory approach carried out by national and international development NGOs working in this same setting.

Our paper begins with a brief review of the origins and evolution of participatory development, highlighting the foundational influence of Participatory Action Research (PAR). We then summarise some of the emerging critiques of the (mis)use and limitations of these approaches, and, in particular, of notions of 'communities' as bounded and homogenous, and of participation as benign and transformative. We discuss two correctives proposed in these literatures: 1) a more nuanced understanding of the community and, 2) an active process of negotiation in designing locally appropriate participatory approaches. We then describe the context of our case study, an e-waste and used materials economy in South-West Hebron, West Bank, and the multiple cleavages relevant to the e-waste industry and its future. Next, we detail the participatory method we utilised in this context in an attempt to forge and give voice to a 'community-defined' development trajectory that included and was broadly acceptable to as broad a set of diverse interests as possible. We contrast this with the trajectory and development projects that emerged with less consideration of local political and social contexts, and by solely relying on a partnership with one active social group in the community and a seemingly representative trade association. Finally, we end with reflections on the process and the development trajectory it yielded. In particular, we suggest that this case study contributes to current debates in the critical participation literature on the irony and

dilemmas in boosting local participation though an increase—rather than withdrawal—of external facilitation, and offers a development approach that may be suited to other e-waste hubs internationally.

2. THE EVOLUTION, PROBLEMATIZATION, AND RECOVERY OF PARTICIPATORY DEVELOPMENT

The emergence of participatory development is conventionally portrayed as a reaction to the structural distortions, not to mention ineffectiveness of externally imposed forms of top-down development approaches, locating the roots of these in the exclusion of local populations from processes related to design, formulation, implementation, and evaluation (Rahnema, 2010). A key influence on the theoretical and practical elaboration of participation and its eventual mainstreaming was a cluster of antecedents and practitioners, broadly known as PAR, which marked a conceptual shift for research and action to be done 'with' the community rather than 'on' or 'for' them. Presenting an alternative to positivist-based social research, PAR shifted the researcher's role from an objective outsider describing and explaining phenomena to one that actively works with disempowered communities to effect positive change (Brydon-Miller et al., 2003; Shantz, 2008). In the context of development, several widely influential volumes such as Robert Chambers' *Rural Development: Putting the Last First* (1983) and Michael Cernea's *Putting People First* (1991) popularised PAR values and methods outside of academic

practice and inspired a stream of publications that spurred a shift towards community participation in international development projects.

By the 1990s, community participation and its PAR embodiment had become an increasingly codified and mainstream practice in international development projects (Kendall, 2015; Leal, 2007). Government agencies, development-oriented NGOs, and international development agencies such as the United Nations and the World Bank began demanding 'participation' as a requirement in the assessment, delivery and evaluation of their projects (Brydon-Miller et al., 2003; Cooke & Kothari, 2001a).

The growth and increasingly obligatory use of participatory methods was received with cautious optimism by PAR purists who were wary that the radical ideals of community empowerment and political change inspired by PAR could become eroded by the institutional constraints of the large development organizations in which they were increasingly embodied (Hildyard et al., 2002). Indeed, the initial exuberance of including communities at all allowed a simplified and idealised conception of them and of the participation process. The popularity of and demand for participatory methods made it tempting to streamline and package these in a way that could be readily transmitted and replicated. Best practice manuals proliferated and participation techniques were taught and applied in diverse community settings (Chambers, 2008), often in a way that gained priority over more differentiated and critical reflections of community representation, and threatened the original ideological meanings of participation (Leal, 2007).

Over the past 15-20 years, development scholars have challenged simplified conceptions of community participation and asserted that pressures to produce these led to stereotyped (indeed, caricatured) tokenistic participatory approaches that seemed to undercut processes of community empowerment by partnering with certain social groups in the community, retaining considerable control in the participatory process, thus channelling change in directions resonant with the developer's interests, but under the name of the community (Eversole, 2003; Guijt & Shah, 1998; Michener, 1998; Mosse, 2001). The banner of participation could, therefore, allow a kind of collusion between development donor, broker, and interest-group in the community to generate 'local knowledge' (Mohan and Stokke, 2000) and apparent ownership in support of development interventions.

2.1 Some Core Critiques of Unreflective Community Participation

Some of these shortcomings and the critiques of superficial method-driven participation revolve around a set of simplifying assumptions, of 'myths of community' (Guijt & Shah, 1998) as bounded and homogenous, and of participation as intrinsically benign and transformative.

'Community participation' is founded on an image of a pre-existing and definable community - a distinct bounded entity, defined by administrative, social and natural

boundaries - that development practitioners can tap into and participate with. Yet, such convenient geographic or other demarcations rarely map onto the relevant populations (Sihlongonyane, 2001), as shown by a growing body of literature demonstrating the permeability of borders and the overlapping, shifting, and subjective nature of communities (Cleaver, 1999).

An allied simplification is that communities are homogenous with the role of participatory methods being to tap into their unified voice. Various scholars have analysed the heterogeneity of communities, identifying key differences that disrupt the myth of the homogeneous community. Some of these differences include: age, gender, ethnic or social group, wealth, disability, education, livelihood strategy, language, land ownership, pedigree, religion, political affiliation, class, types of assets, among others (Botes and Van Rensburg, 2000; Hickey, 2008; Parfitt, 2004).

The contingent, conflictual, and complex social landscape that underlies the neat appearance of 'community,' and the selective processes through which these intersect with and appear in 'participation' processes, means that we cannot assume, as is sometimes done, that its means and ends are intrinsically benign and transformative, articulating and motivated by the good of the collective rather than individual or sectoral interests (Cleaver, 1999; White, 1996). Misconceptions of personal incentives or the community allow participatory processes to entrench inequalities by reinforcing power in dominant groups through unrepresentative community inclusion (Funder, 2010; Mosse,

2001; Platteau, 2004; Rigon, 2014; Sesan, 2014). Kumar and Corbridge (2010) show that the gap between a project's declared inclusivity and the subsets of society whose participation is, in fact, enrolled in it, can cause failure, at least in terms of the ambitious goals built upon uncritical assumptions about participation, and Cleaver (1999) argues that there is little evidence supporting the long-term effectiveness of participation towards creating social change or improving the quality of life for the participating community.

In this paper, our emphasis is on processes of community engagement that can implicitly or explicitly produce an unrepresentative community voice, and a procedure we employed to address this. Needless to say, if 'communities' are not pre-existing monolithic and static entities to be tapped, but are constituted, shifting - and, even within a snapshot moment - riven along multiple and often nuanced lines of tension and fragmentation, the notion of community participation through the kind of rapid streamlined procedures often applied is in question. The locations and actors of this kind of participatory contact and elicitation are not transparent windows into the single and pre-existing heart of a community, but sites of selection, power, and exclusion.

Challenges accounting for diverse social divisions in communities are manifest in some of the strategies development practitioners use to recruit community participants, which often favour existing more powerful networks and loci and accessible villagers that are vocal, educated, and articulate to speak for the entire community (Botes and Van

Rensburg, 2000; Eversole, 2003). At public community meetings or convened forums, for example, divisions of the community can be overlooked because participation is selective, whether due to active exclusion, or to the more mundane filtering effect of work, time, logistic or cultural conflicts (Cornwall, 2003; Mayoux, 1995), while even those present at the meetings may be inhibited in speaking or in what they can say. Community-based organizations that seem to be natural partners for sustained participation programs may have leaders that are not democratically elected or may represent the voice of a particular segment of the community (usually more well-off) with specific interests that can diverge from the needs of marginalised populations (Hayward et al., 2003). The consensus-based group decision-making methods, such as voting or ranking, often used as a participation tool have been argued to produce apparently unified problem framings and descriptions of practical needs that mask divergent definitions and interests (Cooke and Kothari, 2001b; Green, 2010). Especially when conducted in 'open' real-time contexts, these can reinforce patterns of dominance and exclusion, yielding an apparent community expression of practical goals without addressing underlying diversity and inequalities from which problems and solutions arise and are voiced (Mayoux, 1995).

2.2 Recovering Representative Participatory Development: Study First and Tailor Ongoingly

Despite a breadth of vigorous critiques and even dismissals of participation as another form of tyranny (Cooke & Kothari, 2001a), many scholars critical of participation still recognise its transformative potential (Hickey and Mohan, 2004, 2005; Kyamusugulwa, 2013). More recent efforts are to wrest participation back from its simplified conception and the superficial way it has been embodied in development agencies. Recent studies have more critically assessed the functioning of the participation process and tools (Davis and Whittington, 1998; Nuttavuthisit et al., 2014; Simanowitz, 2000), with attention to discerning in which social, cultural and political circumstances particular participatory approaches will work most effectively (Aparicio and Garrison, 1999; Costa et al., 1997).

We build on these efforts in presenting the community-driven participatory approach we designed and implemented in South-West Hebron, West Bank, in order to better include the diverse interests of a heterogeneous and contentious community. We were guided by recent studies that emphasise two corrective stances, in which a nuanced understanding of the target community precedes ‘participatory’ engagement, as well as a more active process of engagement, tailored to the structures and cleavages within a given local context.

The first corrective is to pause before diving into the ‘nuts and bolts’ of implementing pre-selected participatory methods, in order to invest the time and resources needed to develop a more nuanced and more responsive understanding of the political and social divisions in the target community. This stands in contrast to the tendency toward the rapid participatory tools and reliance on community-based organizations (CBOs) that development organizations sometimes embrace to accelerate community engagement, and rapidly obtain the necessary information and apparent ‘buy in’ required to implement ‘community-owned’ projects.

Recent studies have shown how efforts to uncover the social structure, power relations, and the exclusionary effects of participation within each target community can lead to participatory approaches that seem unconventional, yet are more appropriate to the local context.

For example, Dill's (2009) study on participatory approaches in Tanzania showed how CBOs, which are traditionally favoured participatory partners for development agencies, achieve their upward/outward legitimacy at the expense of their downward/inward local legitimacy, increasing the obstacles for marginalised citizens to participate. He concludes that, paradoxically, democratically elected local authorities with downward accountability may be a more appropriate institution for development agencies to partner with (see, also, Ribot, 2003). Kyamusugulwa and Hilhorst’s (2015) analysis of elite capture in Congo showed that what is traditionally thought to be one of

the most significant threats to community-based development, may in some cases serve as an asset. Allowing ‘elite control’ through churches and chiefs was shown to ensure the provision of public goods through notions of moral obligation and interpersonal accountability that work to benefit the community.

A second corrective borrows dialogical and reflexive principles from PAR to embrace an active process of negotiation in tailoring the design and implementation of participatory approaches to the unique characteristics of the target community. Drawing on the processual emphasis of ‘analysis-action-reflection’ in PAR design, Parfitt (2004) noted the benefit of infusing a creative attitude in designing and implementing participatory development projects. The move away from mechanically implementing familiar participatory methods requires a more textured local knowledge (the previous point), as well as a more muscular engagement and negotiation of the participatory methods best suited to the target community. And, as discussed by Otsuki (2012), a dialectic process of action and reflection allows for changes in the original goals, and an evolution to account for changes to create and respond to new opportunities and constraints over time. To the extent that participant’s continual deliberation regarding the project and its intersections with (or divergences from) their aspirations and needs can dynamically reconfigure the project; there is less chance that these will splinter off into ‘side-conversations’ and eventual disenfranchisement.

The following section describes the context, processes, and outcomes of a participatory development project that incorporated the two correctives described above.

3. THE WEST LINE E-WASTE AND USED MATERIALS INDUSTRY

Over the past two decades, an informal transboundary electronic waste (e-waste) and used materials[2] industry has emerged in a cluster of villages, collectively known as the 'West Line[3]', in South-West Hebron, West Bank. The West Line villages have a population of about 35,000, within an area of about 45 km². Between 100-150 Palestinians from this region (with permission to work in Israel) have been entering Israel to collect e-waste and scrap metal among other used items that can be brought back to the West Bank and sold, refurbished or recycled. This livelihood can be found dispersed across the West Bank, but has largely concentrated in the West Line where the majority of households (some say up to eighty per cent) are directly or indirectly dependent on this economy. The West Line villages import between 45,000 - 55,000 tons of Israeli e-waste annually supporting over 380 businesses, more than 1,000 full time jobs, and generates over USD $28.5 million in gross value added annually, yielding the dominant source of income locally, and would appear as a substantial portion of all Palestinian exports to Israel were it registered in the official economic indicators (see Manuscript 2).

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[2] Throughout this article I use the descriptive term 'e-waste and used materials' to characterize this industry for strategic reasons. E-waste is the most significant (by quantity and value) second-hand resource imported to the West Line, but is not the only resource as other 'used materials' such as furniture, scrap metal, used automobiles, and so forth comprise a significant, and often overlooked, segment of the industry.

[3] The main villages in the West Line include: Beit Awwa, Deir Samet, Al Kom, and Idhna

This industry has operated as a safety net for the livelihood of many families unable to find employment in other sectors, particularly those that lost the ability to work in Israel with the hardening of the nearby boundary with Israel over the course of the last decade. Income gained from imported e-waste and used materials poses a fierce and increasing tension with environment and public health as crude dismantling processes (for example, open burning, informal landfilling, and so forth) have exposed local residents to elevated risks of a variety of health problems, creating strong divisions within the community. (For a more detailed account of the West Line e-waste and used materials industry, see: Davis, 2013; Davis & Garb, 2015; Davis & Garb, 2016).

While the Israel-West Bank e-waste trade occurs in an idiosyncratic geopolitical and social context (as do other informal transborder e-waste trades, each in their own way), it also represents a microcosm of the tensions and management stances embodying global North-South e-waste flows, making it an insightful case study to ascertain the perceptions of communities dependent on imported e-waste. Researchers and development practitioners have considered the tensions between the economic gains and environmental efficiencies of processing e-waste in the South and the health and environmental risks it poses, especially to the local communities, whether posed as part of a broader competing discourse of ecological modernization versus environmental injustice (Lawhown, 2013), or of the criteria and possibilities of discerning between e-waste recycling and trade as a positive opportunity or a form of exploitation (Gregson &

Crang, 2015; Minter, 2013). Current international e-waste management has leaned towards banning North-South trade, yet this debate has been advanced without direct input from the communities hosting e-waste hubs in the South, which are most directly impacted both economically and environmentally. Thus, community articulated e-waste management trajectories in the West Line can extend and enlighten e-waste management policies in analogous e-waste hubs.

4. IDENTIFYING SOCIAL DIVISIONS IN THE WEST LINE

At first glance, the rural West Line villages would appear to be largely homogenous – the population is almost entirely Palestinian and Muslim and much of the culture, architecture, and traditions seem identical from one household to the next. The deeper social and political divisions in the West Line emerged over the course of three years of immersion where I resided in the West Line villages, including over 300 semi-structured interviews with diverse stakeholders both within and outside of the e-waste and used materials industry, including a socio-historic mapping of all family and municipal leaders in the West Line. Below, we isolate some of the key divisions that polarize individuals to clearly demonstrate the heterogeneous and conflicted nature of this community, however it is important to consider the intersectionality of individual community members, which can create overlapping and interdependent divisions in the community and exacerbate forms of disadvantage.

4.1 Legal and Political Regimes

Several legal authorities (both formal and informal) operate in parallel within the West Line. At the formal level, the area is governed by the Israeli Civil Administration and the Palestinian Authority, with a legal regime that combines the laws of these entities with Jordanian law and international law applicable to occupied territories, with daily life affected by Islamic and deep-rooted customary or 'family' law, which overlap considerably but not entirely. The political geography of the West Line has been divided by the 1993 Oslo Accord into Areas B and C (see Figure 1), with the former under full Palestinian civil control and joint Israeli-Palestinian security control, and the latter under full Israeli control over security, planning and construction[4]. In practice, these divisions are not always salient as there are no physical demarcations of the extent of these jurisdictions. Many Palestinian police are unsure of the exact boundaries of Areas B and C, erring on the side of caution since Area C is more prone to potential clashes with the Israeli military.

4.2 Family Divisions

Customary law pertains as an alternative forum to the formal justice system in several domains, often revolving around mutual liability for the action of family members and a negotiation process between family heads of conflicting parties to amicably resolve

[4] 'Area A' represents the third main political division in the West Bank designating land that is under full Palestinian civil and security control, which is not present in the West Line.

disagreements. The extended family or clan is a key social structure in the West Line, especially in the domains of land ownership and marriage. For example, Beit Awwa's population has consisted exclusively of two extended families for over 100 years: the Masalma family living in the East and the Sweity family in the West. Inter-family marriage between the two families is considered dishonourable and condemned on both sides. These divisions are so taken-for-granted by locals that they are seldom mentioned, though they inform a variety of patterns. An outsider would most likely notice the prevailing force fields along gender or Israeli/Palestinian lines, but may not realise that it would be less acceptable for a Sweity man to marry a Masalma wife than a Jewish one.[5] Economic, religious, political, educational, and social orientations are inflected by these clan lines, and shape the development goals they articulate for the community. Attention to these divisions and even-handed inclusion across them is paramount to the viability of participatory development projects in the West Line. Even municipal councils, which consist of twelve elected community members, are mediated by careful informal agreements to assure that at least one member from each family is elected, and that key positions will be rotated or offset to accommodate clan divisions. In the past, unrepresented families have protested by refusing to pay taxes or electricity bills when they feel their concerns are overlooked in the municipal council. Family divisions are also often resonant with the political divisions, in particular between Hamas and Fatah supporters, which represent the two main political parties in Palestine and have been in active conflict since 2006.

[5] There have only been three instances of inter-family marriage between the Sweity and Masalma families, the first occurring in 2000.

Figure 1: Geo-Political and Family Locations in the West Line

4.3 Livelihood Divisions

Differing sources of livelihood present another layer of division within the community related, but not strictly tied to, family divisions. Historically, the West Line economy was based on agriculture and livestock farming, which still generates a significant income in the community. The emergence of the e-waste and used materials industry, while generating a much needed source of income for the majority of the

population, has come at the expense of agricultural production, generating new lines of tension, as many farmers complain that e-waste processing has negatively affected the health of their livestock and crops[6] (Davis, 2013). Farmers (mostly representing an older generation) would like to return to an agriculture-based industry, whereas those dependent on processing imported e-waste and used materials are more attuned to the enhanced economic gains of a 'scrap-based' economy which they would prefer to continue 'as is,' or in some more regulated and formalised version. The livelihood divisions interact with clan structures, as five to six extended families are economically supported from imported e-waste and used materials. These tend to be wealthier and less educated, each dominating a particular niche in the industry (for example, refurbishment, dismantling, metal trading). Within each niche, families are located differently with respect to ownership of the means of production (trucks and scrap yards), shaping their stakes in any intervention in this industry.

4.4 Gender Roles

As in most rural West Bank locations, the roles of men and women in the West Line are well defined - men are responsible for financially supporting the family, while women take care of the children and home. There is often a tension within households

[6] Many anecdotal stories speak of deteriorating agricultural and livestock health since the emergence of the e-waste and used materials industry. For example, low fertility rates in livestock, bee hives have collapsed so many times beekeepers have given up trying to recolonize them, chicken eggs are often yolkless and have fragile shells, agricultural production of stable crops such as olives, tomatoes, and cucumbers have produced lower quantities that are smaller in size, among many other complaints.

economically supported by the e-waste and used materials industry as women express a desire for family members to shift to another profession regardless of the economic sacrifice of such a move, while men want to provide for their family in an economic context in which there are few alternatives to earn a comparable income. Women often complain of the strenuous effort required to remove the grease and black soot that covers the skin and clothes of their family members, and women tend to be more concerned about the potential health consequences from the introduction of hazardous substances into the home, especially with small children present. However, cultural and social norms limit the influence and decision-making power of women in this region as men dominate municipal and community meetings in both numbers and voice.

5. INITIAL FRAMINGS OF THE WEST LINE E-WASTE INDUSTRY

Inspired by international framings of North-South e-waste trade as toxic dumping by international NGOs (for example, ban.org), some of the more visible and readily funded Palestinian NGOs initially extended a ‘stop toxic trade’ approach. While obviously inflected by the unique circumstances of the Israeli/Palestinian context, we find these tensions to be in many respects a microcosm of more global ones. We have seen internationally funded local NGOs enter the West Line and based on a few rounds of superficial visits and some discussion with visible spokespeople, launch this kind of effort. These overlooked the considerable and sustained Palestinian entrepreneurship that developed this industry in an extremely difficult and constrained economic context, and

the fact that the overwhelming majority of the local population is either supportive of the industry or, at least ambivalent about how best to balance its benefits and harms. Ironically, these apparently patriotic Palestinian calls to 'stamp out' the e-waste industry emerge from those least dependent on it, and they converge with the urgings of powerful Israeli stakeholders who now increasingly oppose the 'leakage' of valuable materials to the 'pirate' West Bank industries upon whose elimination services Israel has implicitly relied for many years.

The framing of imported e-waste and used materials as a hazardous contaminant dumped by Israelis resonates with some portions of the local population, as well as upwards to the realm of national Palestinian politics that is in a critical stage of struggle for ending Israel's crippling occupation of Palestinian areas. Declarations or even projects predicated on ending the importation and processing of e-waste and used materials in this region (ARIJ, 2012; GLSHD, 2013) emerge readily in this context, and in others internationally, and often can display some post-hoc trappings of a community-driven process. We suspect that in this case, the shallow form of participation was a by-product of a pre-established narrative imposed by these Palestinian NGOs to leverage the e-waste problem in the West Line villages as political ammunition to underscore the environmental harm the Israeli government has caused as a result of the prolonged occupation. We sense that they do not adequately reflect the kind of development approaches and proposal that would emerge through broader and more careful analysis and engagement of community development desires. In fact, over time, and in large part

due to the widely endorsed alternative framing we have evolved with the local communities, these NGOs have modified their efforts to align with the sector capacity-building and reform approach emerging from our own efforts, described below.

A question remains as to how might mutually agreed upon development goals and tangible projects for achieving an improved e-waste economy emerge from a diverse and sometimes divided and contentious community, such as the West Line villages described above? This question became quite real as our team shifted from our predominant emphasis on research on the West Line e-waste issues from late 2011 to late 2013, towards a more active effort to translate our findings and the desires expressed by the people we encountered into interventions. We have become increasingly alert to the ways in which the shortcomings of unrepresentative participatory methods (partnering with visible 'community' organizations, open meetings) would undermine or limit their use, and beginning in June 2014, began to actively explore alternative modalities for participation. In the next section, we describe our use of an adaptation of traditional Delphi technique and demonstrate the seemingly contradictory merits of an externally-selected key informant contribution to project design that ensures representation of core demographics and social divisions in the community.

6. METHODOLOGY: DETERMINING E-WASTE FUTURES THROUGH CHANGE-ORIENTED DELPHI

As shown by Kezar and Maxey (2014), over the last decade or so, the traditional Delphi method first developed in the 1950s by RAND for use in military contingency planning, forecasting, and policy analysis, has been adapted as a tool for facilitating community participation. The Delphi approach had shown its strength as a way to harness the collective intelligence of people (typically domain experts and practitioners) with diverse and sometimes conflicting perspectives on complex topics. Over the years there have been a variety of sustained and fruitful modifications of the core Delphi procedures, and Kezar and Maxey (2014) show how this can be done so as to align with participatory processes, which they refer to as 'change-oriented' Delphi. In this, the core Delphi elements are used (gathering data from experts and stakeholders, iterations of feedback, consensus, and perspective building, and facilitator aggregation of responses), but in a more sustained and committed manner designed to allow community members to address, rather than explore an issue.

In our adaptation of this method, a 'panel' of eight carefully chosen diverse 'community representatives[7]' was engaged over a period of eleven months in a series of

[7] 'Community representatives' was deemed the most appropriate term for local community members participating in the project as they were *representing* the diverse interests of the *community*. The term 'participants', commonly used in participatory development, denotes a more passive role. Whereas the term 'community researchers' or 'co-inquirers', commonly used in PAR, would indicate a research-centered role.

‘rounds of communication’ through a ‘spoke and hub’ form of communication between them and the facilitator. These rounds progressed through four phases designed to 1) Articulate an improved e-waste economy; 2) Identify physical and social assets within the community; 3) Brainstorm and select specific development projects; and 4) Develop and implement selected projects (see Figure 2). Each phase consisted of two sets of interviews, the first collected raw data from the selected questions, and the second allowed community representatives to comment on the anonymised responses of the others and rethink their own. This form of off-line and anonymised iteration allowed different, often conflicting, groups to have an equal voice and express their varying realities in a non-hostile environment, and, the range of proposals on the table converged on a mutually agreeable position. Moreover, the iterative and long-term engagement with community representatives encouraged a reflective disposition regarding the progress of community selected projects – identifying expected and unexpected barriers, reassessing original articulated desired development goals, and evaluating the progress and success of each project.

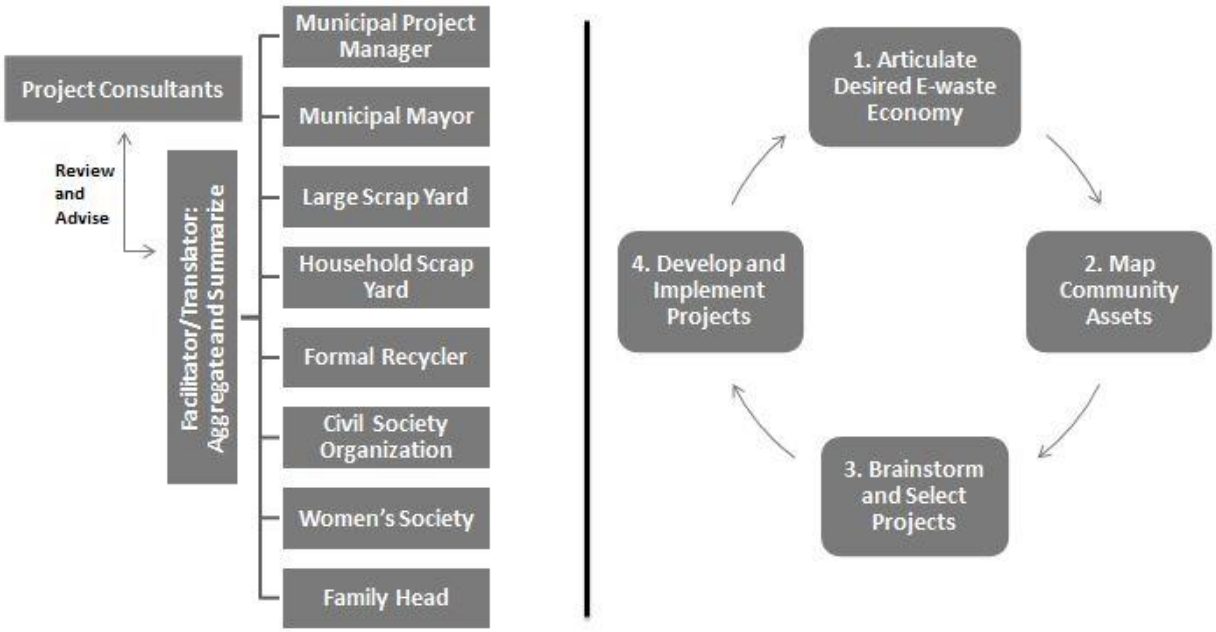

Figure 2: A visualization of the adapted "change oriented" Delphi method. The graphic on the left presents the flow of information for each round of interviews; and the graphic on the right presents the iterative progression through the four phases.

The number of community representatives was limited to eight to allow the meetings and analysis in a timely manner. Representatives were selected based on over 300 prior semi-structured interviews, which included a socio-historic mapping of all family and municipal leaders in the West Line, conducted from 2012-2014. Insofar as was possible for a group of only eight participants, a concerted effort was made to represent cross-cutting social divisions and divergent interests in the West Line, such as: individuals from different villages in the West Line, diverse families, both women and men, individuals working in different niches of the e-waste and used materials industry, individuals working outside of the industry, and representation embodying both secular (municipal authority) as well as traditional forms of authority (our resultant choices are described in appendix 1).

Beyond our attempt to adequately represent players across the diverse social divisions within the region, our selection of participants also weighed in PAR characteristics of good 'community researchers', which include: a strong knowledge of the community, a passion to improve the community, strong communication skills, ability to think creatively, and deep links within the community (Cameron and Gibson, 2005). As opposed to the traditional Delphi procedure, interactions with community representatives were face to face in their homes or places of business at times convenient for them to decrease the 'cost of participation' (Brett, 2003). These sessions typically took between one to three hours.

An additional element in the process was the inclusion of a wide circle of 'project consultants[8]' to review and advise project ideas and strategies developed by community representatives. This was seen as important to provide external reality checks and assist in the identification of external resources. Counter to the 'myth of community' that successful community development projects are possible solely on the basis of sufficient *internal* community mobilization, our engagement of these informal external 'consultants' fed important expertise, insight, and perspectives (including from outside the community) into the iterative community process, forging a more viable and informed identification of opportunities, barriers, and potential community projects. This information drew upon information, contacts, and inputs from a range of stakeholders in

[8] Recognizing that the term 'consultant' has a range of contested meanings in the development literature, we use this term to denote lay volunteer/pro-bono efforts as opposed to a paid or unpaid professional role.

the community or the e-waste and used materials industry: scrap yard workers and traders, government officials in the Palestinian Authority, the Civil Administration and the Israeli government, Israeli and Palestinian environmental activists, lawyers, and representatives from international government organizations. Through our mediation and 'cross-pollination,' these stakeholders reflected and commented on the impact and feasibility of various project ideas, the political, social, and legal barriers that might affect their implementation, and ways to improve strategies and proposals. The information from project consultants was included in project reports given to community representatives at the end of the second, third and fourth phases.

Our role as facilitators was to carefully choose and initiate this process with the community representatives, to serve as a catalytic go-between them and the external 'consultants,' and to synthesise and prepare inputs for the rounds of review by community representatives. In fact, the facilitator (Davis) acted as part of a dyad with a local English-Arabic speaker familiar with the area, who worked as both a translator and, increasingly over the course of the project, a co-researcher. This pairing balanced the advantages and disadvantages of each: our external positioning as foreign nationals and status as academics gave us some degree of exemption from certain of the local clan and other political force fields, and our obvious naiveté allowed us (and others) to pose (or simply voice) less obvious ideas or proposals. It also allowed us to reach outwards and upwards to Palestinian and Israeli decision-makers and stakeholders, and, subsequently, potential project funders, whom could not be readily accessed by the local community.

At the same time, having a local community member immersed in all aspects of the process assured an attention to linguistic and socio-cultural nuance, and an accountability between the community and the facilitator/researchers. Having a local Palestinian translator or community member present where possible even in meetings with Israeli stakeholders boosted the transparency of these meetings, pre-empting assertions that this outreach to external and potentially hostile stakeholders involved hidden transactions or agendas.

At the same time as we favoured inclusion and transparency, we also worked hard to buffer between the various actors we moved between, and preserve their anonymity (and we emphasised this to the local translator). As discussed further below, insofar as was possible, careful attention was given to bracket the researcher's (and translator's) personal visions of community development, so that these did not shape or direct the community representative's responses. In some cases, the proposals that emerged were not ones we would have raised or chosen, but we, too, were persuaded of their merit and partook in the convergence toward a shared set of understandings and proposals.

7. RESULTS

This section summarises the outcome of the participatory method described above, as it moved through the four phases through which an inclusive participatory community-driven vision and project package was evolved. Each phase took about 2-3

weeks to complete, which required two sets of interviews with all eight community representatives (thus 16 in-depth interviews per phase).

7.1 Phase 1: Articulating an Improved E-waste Economy

The first phase explored how community representatives wanted to manage the current e-waste industry. A key issue that emerged immediately in this phase was consideration of scenarios ranging from (1) the continuation of the status quo of an economy revolving around processing Israeli e-waste and used materials versus (2) one that moved towards creating a regulated or formal e-waste processing economy or (3) one that worked to stop the e-waste and used materials trade and shift the economic basis of the villages toward alternative forms of livelihood.

During this phase, community representatives generated a comprehensive list of the advantages and disadvantages of these alternatives. After a first round of questions, considerable differences were apparent between individuals on whether the benefits of imported e-waste and used materials outweighed their negative consequences. The considerable economic importance of imported e-waste and used materials was recognised by all community representatives, but the perception of the associated environmental and public health risk varied – particularly between those employed in this industry and those outside of it.

After community representatives reviewed each other's responses, however, there was a clear convergence on two points of shared understanding. The first was that the e-waste and used materials industry was too economically significant to this region to shut down, yet it could not continue in its current pollution-heavy form. As one community representative (employed outside of the e-waste and used materials industry) stated, 'had it not existed, the scrap industry would be the most beneficial development project that they could propose'. The second was that all community representatives believed the e-waste and used materials industry could be regulated and improved. The anonymised semi-isolated technique of the Delphi allowed a convergence that had not occurred in other forums, in which only one or another standpoint was present, or in which those present were browbeaten by the most voluble or persuasive. Thus, by the end of this first phase, the thrust of discussion had unanimously turned to identifying and developing projects to decrease the negative consequences and/or increase the benefits of the e-waste and used materials industry as the best way to improve their local economy.

7.2 Phase 2: Identifying Physical and Social Assets

The second phase worked through an asset mapping exercise inspired by McKnight and Kretzman (1996) to determine the physical and social assets available in the West Line towards regulating and improving the current e-waste economy. This exercise was aided by a one meter by one meter poster of high resolution satellite imagery of the West Line villages, which helped community representatives visualise and

share the location of various assets. Community representatives began by brainstorming all of the community assets they could think of independently, without facilitator interference. Once they had exhausted their personal list of community assets, the facilitator then prompted community representatives to consider other potential assets our team had identified in earlier discussions and years of research (for example, various individuals, associations, institutions, physical characteristics, and resources).

The assets identified in this way were then placed into three categories based on accessibility and ownership in the community (McKnight and Kretzman, 1996). The three categories and a sample of community identified assets are listed below:

1. Assets located in and controlled by the community

- Vacant land
- Community pressure to stop e-waste open burning
- Segments of the e-waste stream that are currently going to waste that can be collected, processed, and sold
- Safa Recycling (a formal cable-grinding business that provides an alternative to open-burning of cables)
- Civil society organizations in the West Line (e.g. the Yassaria women's society)

2. Assets located in, but controlled outside of the community

- Local Palestinian police

- An active municipal government (Yassaria and Idhna)

3. Assets located and controlled outside the community.

- Israeli Civil Administration
- Palestinian Environmental Quality Authority (EQA)
- Facilitators/research team
- Project consultants
- Accessible sources of external funding

This categorization helped community representatives internalise which assets were most accessible to support development projects.

7.3 Phase 3: Brainstorming and Selecting Development Projects

The third phase brainstormed how the community assets identified in the previous phase could be harnessed to develop various projects that could achieve the desired community economy identified in phase one. After a first round of interviews, project ideas were categorised into ‘desired outcomes’ and ‘projects to achieve desired outcomes’. For example, ‘reduce e-waste burning’ was a desired outcome and ‘burn awareness programs’, ‘community policing’, and a ‘community owned cable grinding

machine[9]' were specific projects to achieve the desired outcome. In this round, community representatives identified over 15 project ideas to implement, and a second round of interviews helped them use a ranking system to select which project(s) to prioritise for implementation. Participants rated each of the collective list of project ideas on two scales of one to five: its impact to the community, and the feasibility/likelihood of successful implementation, and these scores were averaged and visualised on a scatterplot. Based on these scores, the following five projects were selected by community representatives: 1) Develop and enforce a basic license scheme for scrap yards; 2) Organise a police force to patrol and arrest individuals burning e-waste; 3) Conduct new scientific studies examining the health and environmental damage of informal scrap processing in the West Line villages; 4) Create a 'scrap-themed awareness summer camp' for children processing scrap; 5) Research business models that can economically process various 'non-valuable' scrap waste (for example, certain plastics and foam).

7.4 Phase 4: Project Development and Implementation

During the fourth phase, community representatives began creating a detailed strategy to achieve selected projects and mobilised resources and support to begin implementation. In a rough equivalent of typical logical-framework efforts, they identified the anticipated results of each project, resources needed, potential risks, and

[9] The open-burning of copper cables as an extraction method is the most common hazardous material burned in the West Line (see Davis, 2013).

possible monitoring targets to measure progress. These project strategies were reviewed by various project consultants to gauge their feasibility, and impact, and to improve strategies to accomplish them. As community representatives began developing projects in this way, the meetings with them took on a more *ad hoc* character as they revolved around and advanced based on the needs of each individual project. A monthly update detailing the status of all projects was given to community representatives to maintain a connection and awareness between community representatives of ongoing projects.

With the exception of the "scrap-themed safety awareness camp", all of the selected projects required some form of financial, expert, or political support from outside the community. Some of the more ambitious projects requiring external support (for example, efforts to formalise and regulate e-waste processing) leveraged the expertise and network of the facilitators and 'project consultants' to advocate for and spearhead such projects, guided by and in continual dialogue with community representatives.

The most notable resource obtained was the financial and political support given by the Swedish Consulate in Jerusalem (SIDA), who invited the submission of a proposal to fund community-defined projects that regulate and improve the West Line e-waste industry. This led to an ambitious proposal that reflected the development trajectory and selected projects articulated by the community, based on three interlocking components, which included: 1) Clean e-waste burn sites in the West Line (of which there are over 250

in the West Line alone); 2) Prevent further e-waste burn sites via an environmental policing unit; and 3) Sustain the e-waste industry by supporting a transition to a regulated and sustainable recycling sector. Given the complexity of the proposed project, SIDA generously funded a "pre-proposal" grant that allowed a refinement of the proposed package of interventions and deepened the support for them from Israeli and Palestinian government branches. Remarkably, this led to a robust project proposal that gained the acceptance of both the Israeli Civil Administration and the Palestinian EQA, and as of June, 2017 we are currently in the process of submitting a two-year project proposal to SIDA that will carry out each of the three project components. A more detailed description of the projects developed and/or implemented from the participatory process falls outside of the scope of this paper, but can be found elsewhere (Garb & Davis, 2016).

8. DISCUSSION

In this section we reflect on the case study described above, emphasizing what we consider to be two findings of broader importance for informal transboundary e-waste economies more generally and for the recovery of a deeper participatory approach using techniques such as the change-oriented Delphi approach we employed.

Despite the complex and often contentious lines of division within the West Line communities, the participatory process we describe allowed the iterative and productive articulation of broadly shared understandings and suggestions for concrete projects that

matured into pilot projects and proposals for funding support. In particular, the process helped bypass a long-standing deadlock between the several small community groups and individuals that declared their polarised support or dismissal of environmental and health complaints regarding the e-waste industry. The fact that the overall thrust and package of proposed interventions has endured over time, including through various transitions in the leadership and structure of the local authorities, is testimony to the robustness of and broad support for the product of the process.

A similar polarization is found in other e-waste hubs internationally, and we suspect that the kind of slower iterative approach we employed might prove similarly useful in these contexts as well. Often, and especially in the past, the public and development discourse surrounding communities dependent on imported e-waste and used materials emphasises the environmental and public health harm of existing practices and 'solutions' that would shut these industries down by banning transboundary e-waste movement. While not wishing to dismiss the terrible dangers posed by improper e-waste processing, and the structural inequities that encourage the movement of such materials to contexts in which this occurs, we believe that, as in our own case study, a more careful and deliberative engagement of the community and its development desires might yield a more nuanced and, ultimately, productive approach. We believe that with the right facilitation, e-waste processing communities should and can forge broadly consensual development pathways that combine the elimination of unwanted processes and niches and the retention of livelihoods through building their capacities for cleaner and forward-

looking recycling. Otherwise these communities will find themselves doubly disadvantaged. First by the legacy of decades of improper treatment of waste when this was treated as an unwanted nuisance or even invisible, and then by their loss of their participation in international value chains of waste that is becoming an increasingly visible resource for industries that have the resources to capture and process it. Importantly, such a transition to clean and regulated operation does not necessarily require capital intensive investment, as basic occupational health and safety protocols (e.g. eye protection, gloves, steel-toed boots, mechanical separation of hazardous components, no open-burning, etc.) are readily available and relatively inexpensive.

We believe that a different and more broadly representative and shared account of the e-waste problematic is possible in other contexts, too, through the kind of prolonged prior analysis and community-driven participation procedures such as the iterative action-oriented Delphi process we employed in the West Line context. But while the process was exceptionally productive, we concur with other scholars and practitioners attempting to recover the spirit of community participation from its increasingly routinized performance: this kind of effort is demanding, and not without its own paradoxes and limitations.

The demands, paradoxes and limitations of this approach revolve around the fact that in a divided community, the path to broader and more authentic community participation seemed to require more, rather than less, engagement by outsiders. We are

acutely aware of the irony of an intervention in which we avoided elite capture and the exclusion or silencing of many community members from development discourses and processes by ostensibly limiting community engagement to a hand-picked selection of community representatives by an outsider facilitator. We studied and mapped the structures, cleavages and tensions within the community and, based on these, selected the community representatives in the Delphi process, rather than relying on an apparently open means of community recruitment, or partnering with one of the more visible local community organizations. And we inserted ourselves as a principal and necessary point of contact and interpretation in the iterative spoke and hub structure and process. In our defence, we can only argue that we did this with considerable awareness and trepidation that we employed a series of corrective measures, and that the results seem to validate that the hoped for dialog and engagement did, indeed, occur.

Our decision to externally select participants was taken out of a well-grounded sense that some of the more familiar 'participatory' selection and engagement mechanisms would produce a group or set of power interests biased towards a specific development trajectory on the one hand, and which, on the other, might lead to alienation or even hostility from unrepresented social groups (Cornwall and Jewkes, 1995). Our choice of a Delphi polling method, and the location of our role at its hub also involved a certain apparent sacrifice of participatory principles, and was not taken lightly. Open community meetings have the potential to build a sense of community and strengthen social ties among the local population (Ahmad and Abu Talib, 2014; Purdey et al., 1994), and also can increase the potential for the community to take control of development

projects, rather than putting the onus on the facilitator to organise and drive projects forward (Cornwall and Jewkes, 1995; Ritchie, 2000). Here, too, our choice was made after considerable observation of the community, of the stark, and at times hostile, divisions between families and different development desires in this region, and on how these played out in various discussion and decision-making fora.

There is obviously a danger that a facilitator will selectively approach and favour individuals, and interpret events and statements in a way that is biased by their own background and interests, or even become manipulative (Botes and Van Rensburg, 2000). Yet we judged this option would, still, yield a more productive and representative process than partnering with a local social group or hosting open community meetings, which allowed one dominant voice to speak on behalf of the community and produced questionable development trajectories. In addition, some of our own interests were bracketed, somewhat, by the fact that from most of this period we were not commissioned by an external donor or preparing a proposal for submission to them, but conducting this research as form of action research (Davis) or outgrowth of intensive research on the e-waste value chain and its impacts (Garb, Davis).

9. CONCLUSION

We hope that our review and case study expresses our own growing awareness of the importance of representative participation, and that facilitating such processes is

necessary, demanding, and fruitful, and can look quite different than what we have come to expect of a 'participatory' process, often ironically so. We have presented one tool through which we tried to achieve a deeper form of participation in a context that is heterogeneous, conflicted and challenging to assemble divergent views together, and where quick and unrepresentative forms of participation would most likely have produced a misleading illusion of participation masking complex patterns of exclusion and narrow interests. We are sure there are other tools that offer similar potential and paradoxes. Our intention is not to provide a model for superficial replication, but to suggest an example and its rationale, which may contain pointers for other participatory development practitioners, which may be useful after the careful prior analysis and attention to detail and difference in their own particular contexts.

There is no easy assurance that such participatory tools will not bias the playing field, rather than level it, as intended (Kezar and Maxey, 2014), or that this kind of 'slow participation' will be possible under the time, money, and bureaucratic constraints prevailing in many development institutions. Our long term engagement in the West Line villages was made possible by the luxury of working in a window of opportunity afforded by an academic context that supported unfettered research and was supported by limited but no-strings-attached funding. The participatory approach carried out in the West Line took two to three months just to define specific development goals and begin mobilizing resources and support for selected projects, involved extended and at times tedious iterations to ask repetitive questions, and was predicated on years of research

conducted in the community beforehand to gain basic awareness of the social dynamics in the community. Can this kind of approach be scaled up, taught, and replicated in a way that is efficient yet responsive to the idiosyncrasies of different target communities? Of this we are not sure. But we do know that the effort to explore such approaches is overdue and necessary.

Lastly, this paper introduces a long overdue perspective of the development desires of a community hosting an importation-based e-waste hub, which can enlighten broader management stances for North-South e-waste trade. In this case, efforts to ban e-waste trade were deemed to be harmful to the well-being of the community that has built up an economy dependent on this resource, and thus challenges commonly held narratives that focus exclusively on the harm of North-South e-waste trade. Clearly, in this case, a trajectory towards industry regulation and sustainability is a preferred management option compared to banning cross-border e-waste trade and economically gutting this region.

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Quantifying the Flows and Economies of Informal E-waste Hubs: Learning from the Israeli-Palestinian Case

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Abstract

Though e-waste processing hubs in the global South have emerged as an issue of pressing environmental and policy importance, systematic empirical data regarding the pathways, quantity and economic impact of e-waste flows through these is strikingly inadequate. This is largely due to difficulties acquiring reliable information on processes, categories and actors of the predominantly informal (and sometimes illegal) value chain that begin *after* the official life of products. In this paper, we review empirical deficits regarding even some of the more notorious e-waste hubs, and describe our analysis of a less known hub in the West Bank that has processed most of Israel's e-waste for more than a decade. Though inflected by its particular geopolitical context, this hub represents a microcosm of North-South e-waste transfers, and one that allows an especially comprehensive and robust quantitative assessment. Our multimethod study triangulated information from extensive sources to describe an industry annually importing between

16 and 25,000 tons of e-waste, creating an estimated 381 enterprises, 1,098 jobs, and USD $28.5 million gross value added to the national economy in 2015—down 40% below historical levels of the prior decade when metal prices were higher and border security laxer. This study describes and quantifies a massive, vital and differentiated industrial cluster that is almost entirely informal, leaving little traces in economic and trade data, and offers an adaptable method to analyze other hubs and even analogous informal industries internationally in a way that can inform more refined and effective policy responses.

Key Words: E-waste, Palestine, Israel, Informal Economies, Transboundary, Import, Material Flow Analysis, Industrial Clusters

Note: the authors contributed equally to this effort

1. INTRODUCTION

The e-waste crisis is a key and pressing environmental problem, with considerable attention focused on the transboundary movement of discarded electronics from the global North to informal e-waste processing hubs in the global South. Policy-makers, non-governmental organizations (NGOs), news media, and, increasingly, the scholarly literature underscore the extent of such flows and the grave consequences at their destinations. In particular, a series of e-waste processing hubs in Asia and Africa have emerged as galvanizing icons of the phenomena (60 Minutes, 2008; Frontline, 2009; Iles, 2004; Puckett et al., 2002). Initial, and still dominant, discussion of these flows and hubs consisted of a somewhat caricatured portrayal of the massive transfer of toxic refuse from overconsumption in the North to "digital dumps" in the South, with dramatic imagery of this "e-waste tsunami" backed by patchy and inconsistent empirical quantification.

Over the last decade, both the framing and empirical basis of discussion have matured. Thus, subsequent scholars discussed the tensions between the economic gains and environmental efficiencies of processing e-waste in the South on the one hand, and, on the other, the health and environmental risks it poses, especially to the local communities. These discussions were framed within broader competing discourses of ecological modernization versus environmental injustice (Lawhown, 2013) or policy deliberation regarding the criteria and possibilities of discerning between e-waste recycling and trade as a positive opportunity or a form of exploitation (Gregson & Crang, 2015; Minter, 2013). Other researchers have questioned the assumptions that such trade is dominated by North to South transfer (Lepawsky & McNabb, 2010), or that crude

extraction, rather than reuse is the dominant fate of transferred materials (Kahhat & Williams, 2009; Milovantseva & Fitzpatrick, 2015). Recognition of the environmental and economic benefits of manual dismantling, which are only viable with low labor costs, led to the emergence of calls for "win-win" e-waste management policies, combining manual dismantling and repair in the South with state-of-the-art recycling technology in the North (Rochat et al., 2008; Wang et al., 2012). More recently, scholars have emphasized the agency of informal recyclers and their dependence on this source of income, questioning e-waste management schemes that legally displace e-waste recyclers dependent on this source of income (Gidwani, 2015; Reddy, 2015). In reviewing the literatures on the interface of formal and informal e-waste sectors, Davis & Garb (2015) suggest that e-waste policies that ignore or suppress the informal sector will fail, and should be replaced by a deep partnership model for incremental improvement.

In parallel to the emerging policy urgency and conceptual valorization of post-consumer electrical and electronic commodities empirical assessments of the scale of e-waste flows between countries and of the economic actors involved have also matured. An initial monolithic conception of the trade and crude and sweeping figures was followed by increasingly detailed and reliable empirical studies, critical discussions regarding the nature and reliability of data, and a growing realization of the variegated composition of the e-waste value chain. Yet, we argue, there remains a lag in the empirical and methodological sophistication of the study of the afterlife of products, which is necessary to guide informed policies. As pointed out by Kahhat & Williams (2012: 67), "The development of appropriate social responses is hindered by critical data

gaps, which include lack of data on trade flows of used and scrap electronics, flows invisible to trade statistics of many countries."

The reasons for the relatively empirical thinness of transboundary e-waste flows and informal e-waste hubs are understandable. Not only are such studies new on the academic landscape, but they strive to capture processes occurring in the economic, geographic, legal, and organizational shadows. The ornate economic and accounting apparatus developed to track and analyze production, value, and trade was forged around the familiar production side of commodities. It rapidly loses its capacity (not to mention, motivation) to identify and analyze the processes and values of products as these pass through the information veil of their (apparent) end-of-life. The most mundane systems that track the movement of materials and value in space rapidly fade as we track the diffuse, heterogeneous, and informal actors and pathways that gather, transport, and process waste.

The issue is not simply informality, but, often, one of illegality. At the capillary margins of intake to the e-waste commodity chain (a curb-side discard, a waste picker or household dismantling workshop), the absence of formal traces is largely incidental. However, as one moves from these edges towards nodes that assemble and process increasingly larger volumes and values of waste, and, especially on the return cycle of extracted metals, this invisibility becomes not a byproduct of informality but a necessity of the trade: evasion of tracking and knowledge is what allows, indeed, produces and powers the system. Thus, serious study of e-waste flows and systems is hampered by the

fact that their survival depends on avoidance of the kind of empirical scrutiny that analysis requires.

This paper underscores the extent of these data gaps, with particular attention to the study of the flows and economies of e-waste hubs. We show that even the most notorious--and, therefore, most studied--informal e-waste hubs, data is inadequate and contradictory. We then present our own approach to and analysis of the flows and economics of one lesser known hub in the West Bank. We believe that our methods and the substantive findings they enable are important for placing our knowledge of other hubs on a sounder empirical footing.

The hub we examine is a string of rural villages with a population of 35,000 within an area of about 45 km², known as the "West Line[10]", in South-West Hebron, West Bank. Our research over the last five years has shown that over the past 15 years, the collection and processing of Israeli e-waste and used materials has become the main economic activity in these villages, through processes that have remained largely invisible to both Israeli and Palestinian authorities.[11] Similar to other e-waste processing hubs internationally, the West Line e-waste industry is economically significant yet environmentally destructive, and we have worked with the local community to define and marshal resources for a transition to cleaner recycling that prevents harm while

[10] The West Line villages consist of Beit Awwa, Deir Samet, Al Kom, and Idhna.
[11] Throughout this article we use the descriptive term "e-waste and used materials" to characterize this industry for strategic reasons. E-waste is the most significant (by quantity and value) second-hand resource imported to the West Line, but is not the only resource as other "used materials" such as furniture, scrap metal, used automobiles, etc. comprise a significant, and often overlooked, segment of the industry.

preserving livelihoods (Davis & Garb, 2017; Garb & Davis, 2015; Glausiusz, 2016). While the West Line hub occurs in an idiosyncratic geopolitical and social context (as do other hubs, each in their own way), it also represents a microcosm of the global cross-border flow of waste and shares similarities in the dynamics and structure of the industry, so our methods and findings should have relevance for other settings. Indeed, the proximity of origin/destination and almost one-on-one mapping of flows between them make this an exceptionally useful case on e-waste value chains that can guide inquiry in places where origin/destinations are multiple and flows more diffuse.

2. EXISTING EMPIRICAL STUDIES OF INFORMAL E-WASTE FLOWS AND ECONOMIES

Research quantifying the weight and value of North-South e-waste trade and informal e-waste hubs in particular, have addressed the issue from different angles, and using different empirical sources. Most studies tend to either examine e-waste generation, collection, or export in an originating country, map e-waste flows on a global scale, or analyze inflows to and processing within a specific e-waste importation hub. Typical methods and data sources include: analysis of import and durable good ownership statistics as well as surveys and obsolescence modeling to estimate e-waste generation; official import and export and taxation data to map global flows; and expert opinion, observations, and, sometimes, convenience or even systematic surveys of actors in the industry to characterize the activities in hubs or in recipient countries as a whole.

We find a range of problems in existing studies. Some are quite systematic and rigorous when applied to one part of the value chain or a single data source, but seldom do they link or triangulate data from complementary data sources or different links in the e-waste value chain. Flow assessments that rely on official statistics are limited by the striking partiality of these for capturing waste flows. Studies drawing on trade data tend to report by tonnage, whereas generation modeling studies tend to utilize the appliance as the main unit of analysis, deriving weight and contamination potential from these. Studies of prices and values (as opposed to weight or number of units) in the commodity chain are less common, especially in differentiated form, despite the fact that these drive the entire commodity chain, and determine the landscape of economic possibility. Quantities of less valuable but environmentally consequential byproducts, such as plastics, are seldom addressed. The majority of studies, even when carefully done, tend to be snapshots at a given point in time, despite the dynamic nature of an industry subject to volatile metal prices, varying access to and composition of waste streams, and the vagaries of transport and operation in informal value chains.

Against the background of these methodological challenges, data gaps are too often filled with opaque descriptions of non-triangulated convenience sampling, anecdotal interviews, unsubstantial media reports, or unreliable international trade data. The resulting characterizations of flows and economies of informal e-waste hubs, built on unreliable and vaguely described data sources, tend to travel and echo in various lay and academic forums, solidifying over time as accepted and unquestioned “facts”. Thus, analysis and policy interventions on e-waste often extend beyond the empirical basis of

available information. In the remainder of this section we illustrate typical empirical deficiencies by reviewing and critically assessing key data sources on the weight and value of e-waste flows to three of the more widely studied e-waste importation hubs: Guiyu – China, Lagos – Nigeria, and Agbogbloshie – Ghana.

2.1 Guiyu, China

While Guiyu is one of the most notorious e-waste hubs, and dominates the literature on the health impacts of e-waste processing, the corresponding economic analysis is far shallower. Remarkably, the search for foundational studies yields little, with even academic papers relying on and recycling information from unsubstantiated local media accounts, inaccessible secondary sources, uncited and inappropriately cited factoids, and general estimates from "local experts." The most widely circulated industry information originates from a few media reports that have been lazily used and reused in the literature until they become what Rekdal (2014) calls "academic urban legends" – rumors that appear so frequently in the literature they become misunderstood as accepted knowledge. For example, a media report by Xinhua Net (2005), based on a handful of anecdotal interviews with e-waste recyclers, estimated that Guiyu treats 1.55 million tons of e-waste annually, which generates a recycling output valued at RMB ¥800 million (USD $112 million) and supports more than 300 companies and 3000 individual workshops. This media report has become a "statistic" that is cited extensively in the literature (Chi et al., 2011; Xing et al., 2009; Yang et al., 2008), as an official summary of the Guiyu e-waste industry. A media report by the South China Morning Post, also based

on anecdotal interviews, estimates lower tonnage but higher values: 1 million tons of e-waste annually earning businesses RMB ¥1 billion (USD $150 million) (South China Morning Post, 2002). This statistic has been recited via secondary sources in the literature (e.g. Deng et al., 2006; Li et al., 2007; Wong et al., 2007; Yu et al., 2010b) so often its origins were difficult to reconstruct. Other articles document uncited or unverifiable estimates of e-waste processed in Guiyu ranging from 1.7 million tons per year (Wu et al., 2012), to as much as 20 million tons per year (Chi et al., 2011).

2.2 Lagos, Nigeria

Similar issues of data reliability appear in studies characterizing the informal e-waste industry in Lagos, Nigeria. As part of a series of investigations exposing developed countries "dumping" e-waste in developing countries, Puckett et al. (2005) investigated the origin and quantity of e-waste imported to Lagos. Their report estimated 500 containers of "used computer scrap" enter Lagos every month based on one anecdotal estimate from the Nigerian computer dealer's business association. Ogungbuyi et al. (2012) conducted a more rigorous analysis of imported e-waste into Lagos by analyzing shipping manifests of new and used electronics along with national import data. The study found that 600,000 tons of e-waste are imported to Nigeria annually, though the report was not able to link the national volumes to informal e-waste recyclers in Lagos. In a third study, as part of a socio-economic analysis of the Lagos e-waste industry, Manhart et al. (2011) estimated the Gross Value Added (GVA) of the refurbishment sector by multiplying the number of refurbishers by the average salary of the workshop owners,

employees, and apprentices in these. This indicated that the refurbishment sector generates USD $50.8 million per year, equivalent to 0.015% of Nigeria's GDP. However, this study's analysis was limited only to the refurbishment sector, which constitutes an unknown portion of the e-waste industry as a whole, which also includes collection and dismantling. In addition, estimates of key parameters (number of refurbishers and average salaries) were based on under-specified sources and methods (an "interview campaign" with an apparent convenience sample of knowledgeable people).

2.3 Agbogbloshie, Ghana

One of the more valiantly comprehensive studies on the informal e-waste industry focused on Agbogbloshie, Ghana, within a national context (Amoyaw-Osea et al., 2011). This drew on a literature review, customs and excise statistics, COMTRADE data, meetings, and field surveys to estimate that 150,500 tons of second-hand electronics and electrical equipment is imported to Ghana annually. However, the authors acknowledged several limitations to their analysis: the official trade statistics contradicted survey results; there is no breakdown of the overall national-level total of imported e-waste by destinations (reuse/dismantling, formal/informal); and the many assumptions required to obtain aggregate results and extrapolate the findings from the Accra-Tema region of Ghana to the national level introduced multiple sources of uncertainty. In another socio-economic analysis, Prakash et al. (2010) found e-waste processing at Agbogbloshie contributes USD $106 –268 million to the national economy, a figure obtained by

multiplying the number of e-waste "collectors", "recyclers", and "refurbishers" by their respective average salaries. While this is one of the most comprehensive economic analyses of an informal e-waste industry, it relies solely on anecdotal industry estimates from vaguely described "local experts" to determine the size of the workforce, and divides businesses into only three categories, which probably does not adequately capture the diversity of the value chain and the variability in the data.

In the following sections, we describe the context and methodology of our own study, which attempted to overcome some of these limitations in providing a systematic economic portrayal of the West Line e-waste hub.

3. THE CONTEXT

The West Line villages have a history of collecting and refurbishing second-hand products dating back to the Mandate period, with a massive growth after Israel occupied the area in 1967. This initial basis of this livelihood was *Alte Zachen*[12] drivers, who collect second-hand products, mainly used furniture, in Israel to refurbish and resell in the West Bank. Over time, electronic and electrical goods gradually became a greater and more valuable segment of the used products available to *Alte Zachen* drivers due to a combination of rapid advances in technology, planned obsolesce, and the absence of formal collection mechanisms in Israel. Soon, a complementary e-waste dismantling market emerged alongside the refurbishment dominated market, with direct collection channels in parallel to the generalist *Alte Zachen* collectors. The industry increasingly

[12] Alte Zachen, Yiddish for "old stuff", is commonly shouted from megaphones of these trucks to announce they are collecting e-waste and used materials in Israeli neighborhoods.

extracted and sold valuable metals (e.g. copper, aluminum, steel, motherboards, etc.) from scrap, and crudely discarded the remainder. Over the past 15 years, the rising amounts of e-waste in the waste stream, rising unemployment rates resulting from Israeli employment restrictions after the second Intifada, the erection of a separation barrier hampering informal access by Palestinian workers to jobs in Israel, and the rise in metal prices in the 2000s commodities boom, all coincided to transform the West Line e-waste and used materials industry from a peripheral economy into a massive industrial cluster. Similar to many such hubs internationally, the industry provided an immediate and much needed source of income while creating destructive and long-lasting environmental and health damages due to "backyard" or "informal" methods of extraction and disposal, such as open burning and unregulated landfilling.

Over the past three years, our own research activities and the intense quantity of e-waste open-burning has made what was an "invisible" cross-border e-waste and used materials industry more visible to the Israeli and Palestinian government authorities and local NGOs. As in other settings, an absence of empirical data has led to the circulation and recycling of spurious figures. For example, a 2014 policy report to the Palestinian government on the e-waste issue (and in a somewhat divergent one self-published on their website), the NGO ARIJ (ARIJ, 2012; 2014) reported that the northernmost West Line town of Idhna was "an electronic graveyard," containing "25 big scrap yards that recycle scrap and e-waste, about 60-70 middle sized scrap yards, and around 100 small scrap ones in addition to more than 200 scrap yards located inside houses, and also more than 200 hucksters [sic]." The report estimates that the town of Idhna alone received

200-500 tons of e-waste daily (equivalent to the upper estimate for all e-waste generated in Israel), generating approximately NIS ₪1 billion (about USD $264 million) annually – which would have been double the value of all Palestinian agricultural exports, and on par with the entire Palestinian export sector of all categorized manufactured goods combined. The sources and methods by which these estimates were obtained are not mentioned, and quite at odds with the same organization's detailed research portrait of the town some years earlier (ARIJ, 2009), which described a typical rural village with no indications of an e-waste sector[13].

The lack of solid information about the dynamics and scale of the trade combined with a singular focus on the industry's negative environmental and health consequences has sometimes led to strident policy declarations at odds with the realities of the industry and aspirations of the local communities closest to the phenomena. For example, this organization, and others, had initially called for an immediate end to e-waste transfer, which they see as a form of Israeli toxic dumping (ARIJ, 2012), while others (GLSHD, 2015) called for a reform of the industry to be based entirely on internally-generated Palestinian e-waste, rather than e-waste from Israel without having any viable absolute or relative estimate of the volumes involved, which, as we shall see, show that Israeli imports comprise 90% of the inputs to the industry.

[13] As part of an internationally funded development needs assessment, ARIJ conducted and published an extensive survey of each of the villages in the region. This assessment reported that Idhna (a northern village in the West Line) was a rural village ("30% of the households are rearing and keeping domestic animals") whose main public health concern was sewage from the nearby Israeli settlement of Adora. Asides from the mention of 20 junk stores (alongside 400 grocers and 30 clothing shops) there is no mention of the e-waste industry. Our research shows that the industry was already in its heyday at this point, with extensive environmental impacts already evident.

Framing the West Line villages as a toxic dump might be true in some deeper structural sense and limiting recycling to domestic e-waste is a legitimate policy option. However, these suggestions rested not on an analysis of structural violence nor on evidence-based considerations of policy alternatives, but emerged from inadequate data about the nature and extent of the industry. The empirical inaccuracy of the West Line e-waste hub has allowed Palestinian political impulses to construct a simplified narrative that resonates with dominant political narratives, evading a more complex story. Ironically, these Palestinian calls echo and play into the hands of initial claims taken by newly established Producer Recycling Organizations (PROs) as part of Israel's e-waste Extended Producer Responsibility (EPR) law initiated in 2014. However, Israeli PROs are motivated by their business need to stop the "leakage" of Israeli e-waste and achieve collection quotas subsidized by manufacturers and importers, which has suddenly transformed e-waste into a national resource rather than a nuisance.

Thus, a detailed value chain, industry analysis and community-based participatory research (Davis & Garb, 2016; Davis & Garb, 2017) shows that the industry emerged from and is dominated by Palestinian entrepreneurs, who with considerable ingenuity and against tremendous odds have developed the West Line's informal e-waste economy into one of the few forms of available livelihood in an oppressed and constrained economy, indeed one of Palestine's larger but least visible export sectors. Given that this industry obtains over 90% of its inputs from Israel, it would be gutted by the suggested ban on imports, not to mention the great difficulty in enforcing such a ban against the will of those engaged in it. Despite their internal differences, the overwhelming majority of the

local community would prefer a development trajectory in which the sector was reformed to clean operation, rather than eliminated. Here as elsewhere, the critical community and policy development choices with respect to e-waste hubs require much firmer and more systematic data.

4. METHODS AND DATA SOURCES

Our study of the West Line e-waste and used materials economy was informed and directed by over four years of deep immersion in this region including over 300 interviews with stakeholders working within the e-waste industry as well as various Israeli and Palestinian government agencies and NGOs that support or influence this industry. This served as a valuable qualitative precursor to discern the key dynamics of the industry and the geographic and institutional contours of its operation, the characteristics of e-waste dependent businesses, and the research methods that would be most reliable in the local context.

Following this extended reconnaissance period, multiple sources of information were used to analyze the West Line e-waste and used materials economy. At the core of the study was a stratified random survey in which a systematic sample of informal businesses in the West Line was visited to complete a structured business analysis questionnaire (described below). We supplemented these data with interviews and observations. These included direct observations of truck passages and contents, which provided data on the kinds and prices of items, as well as numbers of trucks with which to triangulate aggregated quantities reported by businesses. Also, semi-structured

interviews with the sellers and buyers of all metals collected from the West Line businesses allowed further triangulation of the aggregated sales information from the survey. These methods are visualized in Figure 1, and described in the sections that follow.

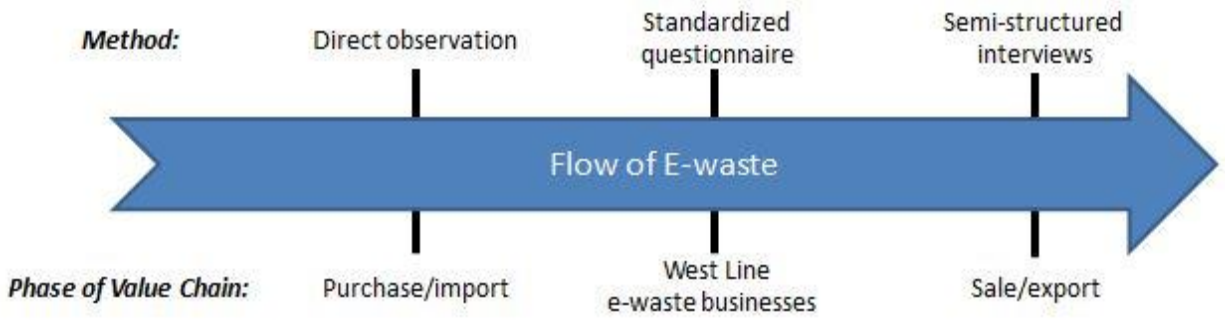

Figure 1: Methods used to triangulate data from three phases of the e-waste commodity chain

4.1 A Systematic Survey of Informal E-waste Businesses in the West Line

As in many developing countries, the informal sector comprises a large but hidden part of the economy (Massar Associates, 2003). The overwhelming majority of e-waste businesses in the West Line are not registered; the purchases of inputs, sale of products, and employment are not formally accounted for, and in many cases their operation is blurred with that of the household that heads them. In order to generate statistics on such enterprises we employed an area-based sampling frame, and adapted for our purposes a business analysis questionnaire suited for the informal sector (Cuevas et al., 2011).

We constructed our sampling frame as follows. An initial mapping of the West Line e-waste and used materials industry was conducted by slowly driving along every road in the entire West Line and visually identifying e-waste dependent businesses. Sub-meter resolution aerial photo maps spanning the West Line were used in the field to ensure coverage of all roads and to mark the location of e-waste dependent businesses. Local community members assisted in identifying hidden or unrecognizable e-waste dependent businesses and assigning each to one of the dominant business types, described below. The resultant sampling frame of 381 businesses identified and categorized in this way was then digitized into a GIS polygon layer containing the relevant attributes.

Six key business types had been identified by our prior research. Because these business types have such different sizes, characteristics and dynamics, it was important to stratify our sampling from the overall sampling frame on this basis. Each business in our sampling frame was classified into one of these businesses types based on visual cues and guidance by local inhabitants (see Figure 2).

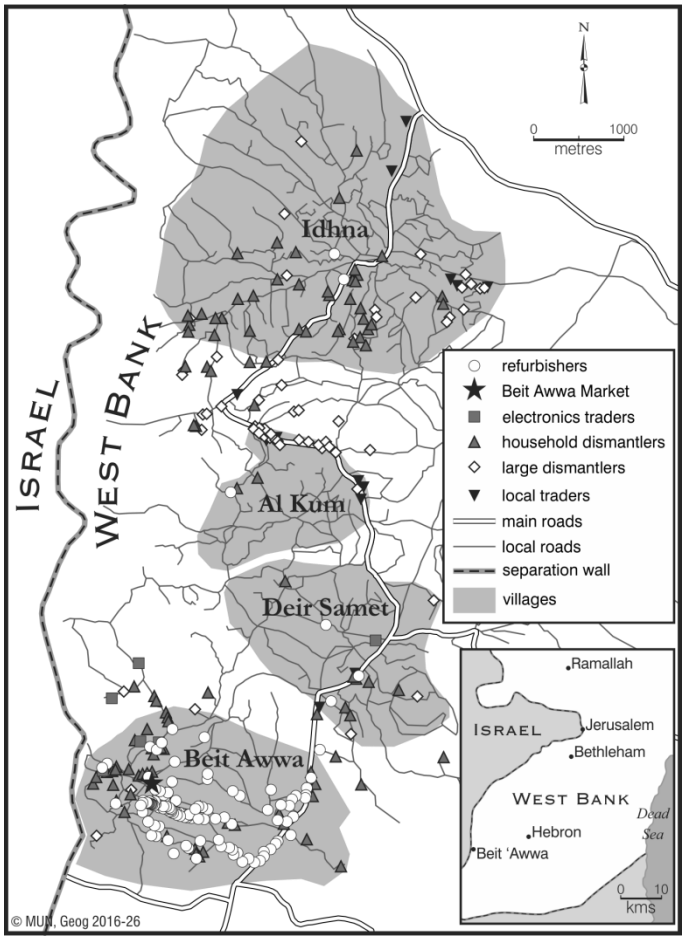

Figure 2: Map of e-waste dependent businesses in the West Line

The following are the key characteristics of these business types.[14] On the collection side of the value chain, "*Alte Zachen collectors*" own 3-ton trucks, which they use to collect e-waste and used materials from residential areas in Israel and they then sell these loads at a nightly auction in Beit Awwa where collected items are rapidly sorted,

[14] These distinctions are sometimes blurred by more than one activity (for example, a refurbishment business might dismantle unrepairable electronics, or a household dismantler might refurbish some purchased e-waste, or a large dismantler might sometimes purchase extracted metals from household dismantlers, etc.). Despite this, the categorization is fairly clear, as the bulk of the income from each kind of business derives from its primary function.

resold and then processed in a complex feeding chain consisting of refurbishers and household dismantlers. On the reuse side, "*refurbishers*" typically operate in residential areas of the villages, where they store large quantities of recognizably functional electronics. They usually specialize in one or two appliance types (for example, screens or electric exercise treadmills, etc.), and have a customer-friendly display of their products. "*Electronics traders*," on the other hand, operate outside of the home, and store large quantities of functional electronic and electrical goods (usually heavy machinery) in a kind of open-air warehouse. On the dismantling side, the "*large dismantlers*" operate in larger yards, outside of homes, and stockpile large piles of scrap. Large collection trucks are owned or outsourced by large dismantlers to transport loads of between 5-12 tons of e-waste and scrap metal purchased from institutional sources in Israel (most commonly scrap yards). "*Household dismantlers*" operate inside or adjacent to their homes, around which stored or remnant dismantled scrap is typically visible. On the output side, the extracted materials are collected and resold by "*local metal traders*," who operate outside the home, own a weighbridge, and stockpile large quantities of cleaned and sorted metals. A comprehensive analysis of the West Line e-waste commodity chain falls outside the scope of this article, but can be found elsewhere (See manuscript 3).

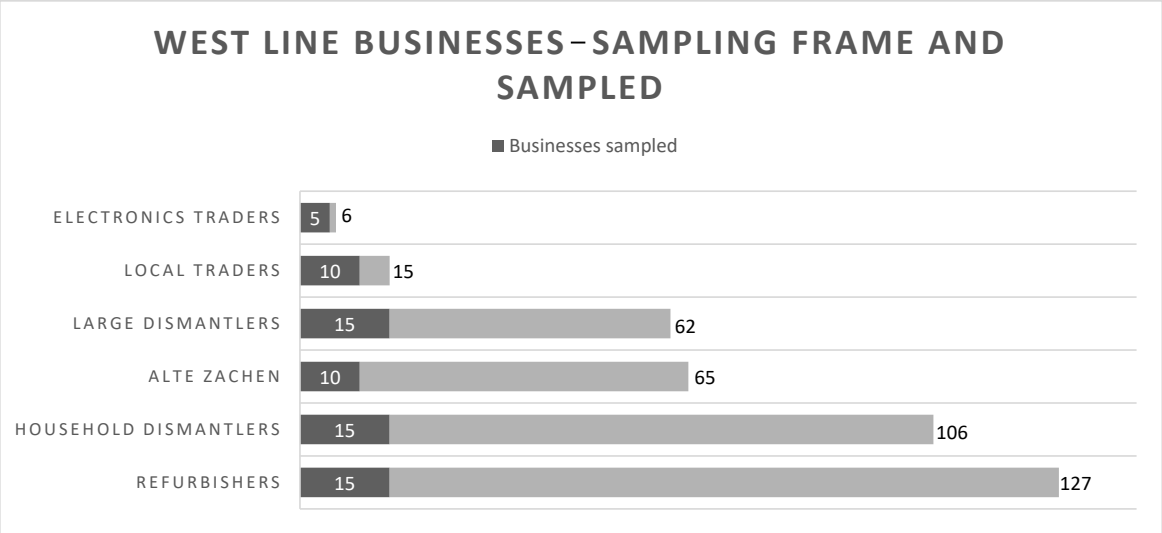

Figure 3: Breakdown of businesses sampling frame and sample

Our stratified sampling procedure was as follows. We initially randomly selected and then approached 15 businesses from each category, with the exception of electronic traders since only six were identified in the West Line. The use of disproportionate sampling was necessary to draw a large enough sample from business types with a small population. If all 15 randomly selected businesses in a given category could not be interviewed, additional businesses were randomly selected until 15 or all possible businesses were successfully interviewed. In this way, we interviewed a total of 70 businesses: 15 businesses in the three refurbisher and dismantler categories, the five (out of the total of six) electronics traders, and ten interviews were conducted in local metal trader and *Alte Zachen* categories, as owners of these businesses had little free time and were hesitant to disclose personal business information. The breakdown of the 381 businesses in the sampling frame and the stratified sample drawn from these is given in Figure 3.

For each of these 70 sampled businesses, we met for interviews of between 2-4 hours to complete the business analysis questionnaire covering the organization of the business, employment and compensation, expenditures, production, inventory, sales, capital, financial services, support structures, problems & prospects, working conditions, and general industry estimates. This detailed survey yielded useful data on many aspects of the operation of businesses within the West Line e-waste hub, but, as described in the results section, our focus in this article is quantifying the volumes and values of e-waste materials entering the hub, and the sector's overall contribution to the Palestinian economy.

Surveyed businesses shared monthly information regarding their expenditures, sales, employment and general industry estimates for both 2015 and 2014 to capture fluctuations in the industry. This was particularly important as 2015 saw a noticeable decline in the West Line e-waste industry due to decreasing international metal prices coupled with increased pressure from the Israeli Civil Administration[15] to ban certain e-waste contraband (e.g. cables, CRT monitors) from entering the West Bank. Because of this recent rapid decline, industry estimates from the earlier date of 2014 more accurately reflect the size of the industry over the past 5-10 years.[16]

[15] The Israeli Civil Administration is the Israeli governing body that operates in the West Bank.
[16] Our judgment was that business owners could not reliably estimate their monthly business data beyond one year, so we collected detailed monthly estimates of expenditures, e-waste tonnage processed, employment and compensation, and profits only for 2015.

4.2 Triangulating Business Survey Data with External Data on Regional Inputs/Outputs

Since the survey data described above on the weight and value of e-waste and used materials is from the perspective of businesses *within* the hub, this was triangulated and augmented through other data sources to quantify the *inputs to* and *outputs from* the West Line villages. On the input side, a series of strategically chosen direct observations in this relatively closed system allowed us to triangulate estimates derived from aggregating data collected in the systematic survey with direct measurements of entering flows and materials. On the output side, we cross-verified the value of extracted metals by drawing on centralized data from the handful of traders able to export metals from the West Bank to Israel on the purchases of metals extracted from e-waste originating in the West Line.

Our analysis of input flows proceeded as follows. Preliminary interviews with e-waste collectors revealed the majority of collection trucks smuggle e-waste from Israel into the West Bank through a particular checkpoint and appropriate days when e-waste collection is representative. By spending two typical days counting e-waste trucks at this crossing from 1:00 pm – 7:00 pm (times collection trucks claimed to cross the border), we obtained a low-end estimate of the amount of collection trucks entering the West Bank. Additionally, since nearly all of these trucks sell the goods collected every night at the Beit Awwa auction, our team interviewed the owners of the auction and on 25

separate occasions counted the amount of *Alte Zachen* collection trucks selling goods collected in Israel to determine a cross-verified estimate of the daily average.

To appraise the loads brought in by these trucks we took a convenience sample of 57 collection trucks at this auction, and with the permission of their drivers inspected the entire contents of these to determine the quantity and sale value of e-waste items. A convenience sample was used since the chaotic atmosphere of the Beit Awwa auction would not allow for a controlled and systematic sampling protocol. Each truck was slowly unloaded to record each electronic item.[17] The weight of each electronic item in the inventory was determined using an average weight inventory (StEP, 2009), while items not listed in the inventory were determined by weighing a sample of 20 representative such items to obtain an "average weight." The average value of each truck's load was obtained as the sum of the number of each item type multiplied by its sale value. The distribution and average of item values were derived from expert assessment we obtained from 21 businesses that regularly purchase used electronics from the Beit Awwa auction. These provided valuations on each item on the list of all e-waste items found in our truck survey, qualifying the dependence of their valuation on the brand, year, and quality of each item.

As an additional source of information on the output phase of the industry, we conducted 23 semi-structured interviews with Israeli and Palestinian metal traders that purchase extracted metals from the West Line to be sold onwards to buyers in Israel and

[17] While some items blur the definition of "e-waste", we adhered to the StEP initiatives definition of "any item with circuitry or electrical components with power or battery supply" (StEP, 2014).

internationally. As in the input phase, these flows were concentrated in a limited number of passage points within a closed system, allowing a remarkable opportunity to match and refine the survey-based estimates of the economic value of materials extracted with the interview-based estimates of materials purchased. For example, all copper, aluminum and steel are sold to two "export traders" located in Jerusalem; iron is shipped to two iron traders in the West Line who then ship this onward to one of three smelting facilities (one located in Jericho and the other two in Israel); and printed circuit boards are sold to three traders in the West Line who then sell to one of two Israeli settlers, who then ship this abroad.

Reassuringly, despite their very different derivations, these input-based, output-based, and business-based estimates were all remarkably consistent for both the 2014 and 2015 assessments; overall sector estimates of the value and weight of e-waste derived from sales, truck load, and business processing directions never diverged from each other by more than 23%, and often by considerably less. Compared to previously described estimates of the weight and value of e-waste entering the West Line and other hubs in Asia and Africa, which typically vary by more than an order of magnitude, our divergence of no more than 23% is well above standard.

4.3 Calculating the Sector's Imports and Economic Contribution

The weight and value of e-waste and used materials processed in the West Line villages were calculated as follows.[18] The estimated annual[19] weight of *Alte Zachen* imported e-waste was constant from 2014 to 2015 and was calculated using the following formula:

(Average weight of e-waste per truck) x (trucks per day) x (days per week) x (weeks per year) = tons/year

(306 kg) X (65) X (6) X (48) = 5,728 tons/year

The annual weight on scrap yard collection trucks for 2014 and 2015 was determined by creating a range based on two methods of estimation—one truck-based and the second facility-based:

Method 1: (average weight per load) x (average % of e-waste per load) x (number of collection trucks) x (days per week) x (weeks per year) = tons/year

2014: (7.2 tons) x (75%) x (40) x (5) x (48) = 51,840 tons/year

2015: (7.2 tons) x (75%) x (15) x (5) x (48) = 19,440 tons/year

Method 2: (number of large dismantlers) x (monthly quantity of scrap imported per large dismantler) x (average % of e-waste) x (months worked per year) = tons/year

2014: (62) x (115 tons) x (75%) x (11) = 58,823 tons/year

2015: (34) x (40 tons) x (75%) x (11) = 11,220 tons/year

[18] We describe here the calculation for the e-waste component alone; a similar procedure was used to derive the overall used materials component.

[19] Because Ramadan essentially shuts down the entire e-waste industry for a month every year, one month has been removed from all annual calculations (i.e. 4 weeks are subtracted from weekly estimates and one month is subtracted from monthly estimates).

The total amount of e-waste imported was the sum of these two channels (reported as a range between the figures yielded by the two methods):

(AZ collection) + (SY collection) = tons/year

2014: (5,728) + (51,840 – 58,823) = 57,568 – 64,551 tons/year

2015: (5,728) + (11,220 – 19,440) = 16,948 – 25,168 tons/year

Similarly, the total expenditure on purchasing Israeli e-waste in 2014 and 2015 was determined by summing the annual amount spent by *Alte Zachen* and Scrap Yard collection trucks. *Alte Zachen* collection was constant from 2014 to 2015 and was calculated by:

(average value of e-waste per truck) x (trucks per day) x (days per week) x (weeks per year) = NIS/year

(1,827 NIS/truck) X (65 trucks/day) X (6 days/week) X (48 weeks/year) = 34,201,440 NIS/year

Total expenditures by scrap yard collection trucks was determined by creating a range based on two methods of estimation, as before.

Method 1: (average purchasing price per ton) x (average weight per load) x (average % of e-waste per load) x (number of collection trucks) x (days per week) x (weeks/year) = NIS/year

2014: (1,727 NIS) x (7.2 tons) x (75%) x (40) x (5) x (48) = 89,527,680 NIS/year

2015: (1,727 NIS) x (7.2 tons) x (75%) x (15) x (5) x (48) = 33,572,880 NIS/year

Method 2: (number of large dismantlers) x (scrap imported per month) x (average % of e-waste) x (average purchasing price per ton) x (months per year)

2014: (62) x (131 tons) x (75%) x (1,727 NIS) x (11) = 115,720,226 NIS/year

2015: (34) x (35.5 tons) x (75%) x (1,727 NIS) x (11) = 17,197,034 NIS/year

And the total for both *Alte Zachen* and Scrap Yard collection:

(AZ collection) + (SY collection) = NIS/year

2014: (34,201,440) + (89,527,680 – 115,720,226) = 123,729,120 – 149,921,666 NIS/year

2015: (34,201,440) + (17,197,034 – 33,572,880) = 51,398,474 – 67,774,320 NIS/year

An analogous procedure was used to derive the overall waste stream figures, with intermediate calculation details omitted for the sake of brevity.

5. RESULTS

This section describes our findings on the key characteristics and dynamics of the West Line e-waste and used materials industry, and key aggregate quantitative parameters derived using the sources and methods described above. Our focus is on the quantities most directly important for policy purposes: the weight and value of e-waste and used materials imported into the West Line, and the GVA of the West Line industry to the national economy. Reliable estimates of these parameters must be the basis for emerging efforts at internal and cross-border regulation, reform, and investments in the e-waste sector in Palestine (and, by necessity and implication, of Israel). In presenting these we elaborate and deepen our efforts to date (Garb & Davis, 2015; Glausiusz, 2016), which have begun to provide stakeholders and decision-makers with an accurate portrait at more than one time of the sector's contribution to the Palestinian economy and export

portfolio, the extent to which it has mobilized potentially contaminating materials, and the large portion of Israeli e-waste that is processed informally, and through cross-border value chains in particular.

The input of Israeli used materials—and e-waste in particular— to the West Line are summarized in Table 1, and key data characterizing e-waste dependent businesses is given in Table 2. A key figure here is GVA, which was calculated using a basic income approach that sums employee compensation (salaries and wages) and operating surplus[20] (Cuevas et al., 2011).

Table 1: The weight and value of e-waste and used materials imported to the West Line in 2014 and 2015

Collection channel	E-waste tonnage imported (`**000** metric tons)		Expenditure on purchase of imported materials (Million USD)			
			All used materials		E-waste component	
	2014	**2015**	**2014**	**2015**	**2014**	**2015**
Alte Zachen	5.7	5.7	12.0	12.0	8.7	8.7
Scrap Yard Collection	51.8 – 58.8	11.2 – 19.4	30.5 – 39.4	5.9 – 11.4	23.0 – 29.5	4.4 – 8.6
Total	57.6 – 64.6	16.9 – 25.12	42.4 – 51.3	17.8 – 23.3	31.6 – 38.2	13.1 – 17.3

[20] According to Cuevas et al. (2011) the GVA income approach also incorporates contribution of employer to social insurance, indirect taxes net of subsidies, and depreciation of fixed assets, but these attributes were either not relevant to the West Line e-waste industry or were unobtainable in our surveys.

Table 2: Descriptive characteristics of e-waste dependent businesses in the West Line (2015).

Business Type	% of imported e-waste	Average Paid Employees	Average GVA per business (`000 USD)	Total GVA from all businesses (Million USD)[21]
Alte Zachen	--	0.9	44	2.8
Refurbishers	100%	0.7	63	8.0
Electronics Traders	100%	0.9	66	0.4
Household Dismantlers	85%	0.6	11	1.2
Large Dismantlers	90%	4.6	145	9.0
Local Traders	--	5.24	469	7.0
Total	**90%**	**580**	**--**	**28.5**

Data characterizing the West Line e-waste and used materials industry for 2015 portray a historically atypical representation of the industry as increasing border restrictions from the Civil Administration coupled with decreasing international metal prices have weakened this industry significantly. Our evaluation, based on responses from the 70 surveys with e-waste dependent businesses, is that the 2014 values, which are about 40% above the 2015 ones, are representative of the 5-10 years prior to 2014.[22]

6. DISCUSSION

We have shown that the empirical understanding of e-waste hubs and flows lags considerably behind the policy and academic interest in them, with scarce data and considerable conjecture regarding key parameters of even the more notorious and iconic hubs. We have described the methods we used to create a detailed and robust quantitative account of one barely known hub in the West Bank, and some of the key

[21] The total GVA from all businesses was calculated as follows: (average annual GVA per business) x (number of businesses) = USD/year

[22] With the exception of 2008 and 2009, which froze the industry after the financial recession.

findings. In this section, we discuss their potential broader methodological and substantive implications.

Methodologically, we demonstrate that even though these hubs are populated by an almost entirely informal industry, researchers can draw on prior immersive familiarity with the setting and community cooperation to draw up a systematic comprehensive sampling frame of e-waste businesses and then survey a stratified randomized sample to obtain detailed business information at the firm level as well as the basis for an aggregate assessment of hub flows and the sector's overall economic contribution. These business-based findings can be validated/triangulated by finding and examining quantities passing through key spatial or business nodes and obligatory passage points of flows in the input and output phases. In our case, these nodes were main roads, a central e-waste market, and the small number of major scrap metal purchasers, which provided centralized sources of data that validated the figures derived from bottom-up aggregation from survey findings. While the specifics of these nodes and passage points will be different for each e-waste hub, we suggest – and hope others can show – that in each case similar detailed robust quantitative portraits can be done.

Our results show that the weight and value of e-waste processed in the West Line villages is, indeed, very substantial, but lower than the fantastical figures given in previously cited claims. We can reliably estimate that the hub has historically processed close to half of Israeli e-waste, exporting metals whose value exceeds that of any other single Standard International Trade Classification 5-digit product category, constituting

over 10% of all Palestinian exports to Israel – by far the leading destination for Palestinian exports. These figures are particularly striking given that this activity is almost entirely informal (with no tax revenue accruing to the Palestinian Authority).

These robust and detailed empirical findings can inform more nuanced and viable policies. Our work in the area has shown the extent to which the sector has operated without regulation or the infrastructure and expertise needed for environmental processing, with disastrous health and environmental consequences. But this is not so much a simple issue of toxic dumping. Palestinian authorities and stakeholders (like their counterparts in other areas with large e-waste hubs) are torn between these damages and the livelihood the sector offers in a landscape of few alternatives. Despite the harsh restrictions of the occupation, this form of informal cross-border entrepreneurism has created a vibrant economic cluster for crude recycling—both extraction of valuable metals as well as a significant reuse and refurbishment component for local use—becoming one of the country's leading export sectors and a dominant source of employment and income in the immediate region.

Even in its reduced state in 2015, the West Line e-waste and used materials industry had an estimated 580 salaried positions and 518 business owners, whose wages considerably exceeded the national average. This industry directly generated approximately USD $28.5 million in 2015, which is equivalent to 0.29% of the West Bank's gross domestic product (GDP) (PCBS, 2014a), and equivalent to 2% of the GVA of all industrial activities in the West Bank (PCBS, 2013). The West Line's historical

contribution before 2015 was 40% larger than this and comprises most (about 75%), but not all of the West Bank's e-waste industry.[23] Beyond these direct contributions captured by our survey, the industry supported collection truck drivers, the central e-waste market, privately owned informal landfills, individuals hired to burn cables to extract insulated copper, and even restaurants and tool shops serving the e-waste businesses, so that the entire economy, from barber shops to vegetable stands, report fluctuations in sales based on rising and lowering metal prices.

Our findings also help contextualize the West Line hub within the Israeli economy. For many years the West Line processed somewhere between 42-47% of the estimated 138,000 tons of e-waste generated annually in Israel (StEP, 2016), which has now dropped to 13-18%[24]. While largely unaccounted for in official trade statistics, Palestinian purchases of e-waste and other used materials represented 1-1.3% by dollar value of Israel's exports to Palestine, dropping in 2015 to 0.5-0.6%, with extracted metals constituting a value of just over 10% of Palestinian exports to Israel (PCBS, 2014b).

Finally, our findings underscore the severe limitations of relying on international e-waste trade data to gauge the flows of e-waste, so that the kind of bottom-up differentiated and triangulated approach we outline is a methodological necessity, rather

[23]While the West Line is the dominant site for e-waste processing in the West Bank, our interviews suggest that dispersed mini-hubs in other regions (Yatta, Qalqilya, Ezaria, Anata, villages surrounding Nablus, among others) produce the remaining 25% of the scrap metal exported from the West Bank. The 2014 values recorded in our survey are reported to be the typical ones, except for the economic downturn of 2008-9.

[24] While significantly less e-waste has arrived in the West Line after 2015, the final destination of Israeli e-waste is unknown, but expected to either be accumulating in Israeli households, processed by Israeli scrap yards and certified recyclers, and/or simply landfilled.

than a luxury. For example, several studies rely on COMTRADE data, using "waste batteries and accumulators" (code 854810) (Lepawsky & McNabb, 2010) or an unspecified category of "electronic and electrical equipment" (Amoyaw-Osea et al., 2011; Tong & Wang, 2004) as a proxy for e-waste. All of the massive flows we have described do not appear at all in such data for Israel nor Palestine. Albeit the Israeli-Palestinian border is idiosyncratic, but we may be cautioned to treat formal statistics as indicative and supplementary rather than foundational for understanding e-waste flows.

Moreover, precisely because our case is arguably an upper outlier for outflows, it should give pause at claims that most e-waste in developed countries flows to developing countries (Puckett et al., 2002). Until recently, there was no formal e-waste collection system or regulation in Israel. At the same time, the Israeli-Palestinian border must be one of the more inviting borders for e-waste to cross: the two entities have starkly different incomes but share a common currency and a long and relatively porous land border, with all other borders being closed or by sea – a perfect storm for a trans-boundary e-waste industry. Yet, even here, the flows did not exceed 50% of Israeli e-waste, making us skeptical of reports estimating a higher percentage of e-waste moving from North to South in other less inviting circumstances internationally.

7. CONCLUSION

Our methods show the importance and possibility of creating a solid empirical understanding of cases of informal e-waste hub economies, and our findings demonstrate the importance of these not only in academic terms but, also, in sharpening the dilemma

facing Palestinian (and, to some extent, Israeli) decision-makers. The improved quantitative data leads to qualitatively different policy implications. We would suggest that despite the unique circumstances of the Israeli-Palestinian situation, these dilemmas must resonate with the quandaries of policies regarding e-waste flows and hubs internationally.

Our portrait of the West Line hub suggests that the central question for Palestinians is not simply how to stop Israeli e-waste dumping, but, to a large degree, how to selectively and carefully conduct a social and environmental upgrading of a recycling cluster so as to protect local lives, environment, and livelihoods. The West Line and similar informal e-waste hubs internationally emerged in economically marginalized areas that now face a legacy of severe contamination. If, somehow, their economic foundation were undermined by eliminating, rather than building up the sector, they would suffer a double devastation at precisely the moment when they most require the resources to move onwards. While many businesses and waste segments will not be able to be processed in a regulated safe manner, those that can will provide necessary continuity and cross-subsidy for the challenges ahead.

The empirical portrait also poses economic, regulatory, and ethical complications for any simplistic Israeli response to the Palestinian e-waste sector – whether ignoring it, on the one hand, or trying to stamp out the "leakage" of waste as a valuable resource on the other (Davis & Garb, 2015). For over a decade when Israel lacked any e-waste legislation, somewhere between 42-47% of Israeli e-waste was processed in the West

Line, though Israel's recently enacted and patchily enforced e-waste EPR law was drafted in relative oblivion to the dominance of this. The Israeli Ministry of Environmental Protection's ambitious goal under this regulation is that by 2021 50% of all Israeli generated e-waste will be collected and processed through certified e-waste collection organizations, funded by manufacturers and importers. This goal, which was achieved a decade ago without any subsidy by the informal system, seems out of reach of the formal system.

There is an ethical question of whether the informal cross-border flow that was so convenient for so long should be deemed illegal now that e-waste is recognized as a resource and/or hazard, whose collection is subsidized. There are regulatory questions of whether these flows can be stopped to the degree desired – years of extensive military and border checkpoint efforts have reduced, but not eliminated, the cross-border flows of e-waste. Thus, considerable flows continue – some of these are business as usual, while other flows consist of the less valuable materials that have been collected (for fees) by the formal system and then re-released to the informal one. There are economic questions of whether a formal system that has to pay people to collect and process e-waste material can compete with or be isolated from an informal one that operates on an independent business model. As we have documented elsewhere (Davis & Garb, 2015), both internationally and in the Israeli-Palestinian case, formal e-waste collection and recycling systems established in areas with a pre-existing and deep-rooted informal sector have failed to achieve modest e-waste collection quotas. Thus, we suggest that a partnership model that builds capacities of informal businesses rather than driving them further

"underground," which retains livelihoods at the base of the pyramid rather than relocating value to centralized capital-intensive larger recycling companies, and draws on the respective strengths of the existing informal and emerging formal systems. The former enjoys an impressive existing collection network and the agile careful dismantling and value recovery that is possible with lower wages, while the latter can provide the high levels of investment, technologies, and standards enforcement needed to process some of the more problematic waste streams safely. Importantly, many of the advantages of the informal sector (e.g. cheap labour, industry expertise, existing infrastructure) will remain with the informal sector even after they integrate into the formal system.

While it may seem that the forgoing discussion is directed to the Palestinian-Israeli case, we suggest that our study and its conclusions are broadly relevant for the dilemmas and dynamics of e-waste flows within and between developing and developed countries globally, and our methods are adaptable to quantify the flows and economies of analogous informal e-waste hubs in the global South.

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A Dis/articulations Perspective on Extended Producer Responsibility: Lessons from the Israeli-West Bank E-waste Trade

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Abstract

Since the early 90s, Extended Producer Responsibility (EPR) policies have been implemented in a variety of countries as a solution to the e-waste problem. Conceptualized as a tool to address e-waste both at the beginning of the pipeline (Design for Environment) and the end (regulated collection and recycling systems), in practice EPR policies have functioned exclusively as the latter. Employing a commodity dis/articulations approach, we analyze the exclusionary effects of Israel's recent EPR law to reveal how the establishment of regulated e-waste commodity channels have legally displaced a deep-rooted Palestinian informal e-waste hub. Based on over 21 months of deep immersion in a Palestinian e-waste hub in South-West Hebron from 2012 – 2017, we reveal the magnitude, collection networks and industry expertise of a Palestinian e-waste sector deeply intertwined with Israeli markets, but invisible to EPR policy makers. We demonstrate how international market forces coupled with the geo-political dynamics

of Israel's occupation have delinked this region from an economy dependent on Israeli employment and shaped the conditions in which this region subsequently linked to an economy dependent on Israeli e-waste. Our analysis problematizes conceptions of "extended" and "responsibility" embedded in EPR and argues that such policies should account for the livelihoods of actors and regions that have historically borne the environmental burden of national e-waste.

Key Words: Disarticulation, E-waste, Informal, Extended Producer Responsibility, Israel, Palestine, West Bank

INTRODUCTION

In the spring of 2014, the Israeli Ministry of Environmental Protection (MoEP) implemented a long awaited electronic waste (e-waste) extended producer responsibility (EPR) law – imposing responsibility upon the manufacturer and/or importer at the post-consumer stage of the product's life cycle. This law was driven by several environmental recommendations as part of the preparations for Israel's acceptance into the Organization for Economic Cooperation and Development (OECD), although not officially implemented until several years after Israel's acceptance in 2010, in an effort to break the link between economic growth and environmental deterioration. Based on European models, Israel's EPR law was premised on preventing hazardous e-waste from entering landfills, converting e-waste into a national resource, and encouraging the local recycling industry to create new "green jobs" (AdamTeva, 2012).

Consequently, this law set in motion a new economic market and formal e-waste industry as manufacturers and importers must finance the collection, recycling, and treatment of e-waste through one of two certified Producer Recycling Organizations (PROs) (i.e. MAI and E-community[25]). Within this structure, Israeli e-waste is legally owned by two certified PROs, who then sub-contract e-waste collection and recycling responsibilities to accredited companies. This government sanctioned marketization reinvents e-waste as a national resource, which was, at the time, believed to be accumulating in landfills or stored in the attics and basements of Israeli homes. However, interviews with the Israeli MoEP and the Israeli Union for Environmental Defense (an

[25] Several other entities have applied to become an accredited PRO, though to date, no others have received accreditation

environmental NGO that drafted and advocated for this EPR law) revealed that both institutions were unaware that the bulk of Israeli e-waste has been collected and processed by a deep-rooted Palestinian informal sector (Davis, 2013).

While this form of livelihood can be found dispersed across the West Bank, informal e-waste processing has concentrated in a cluster of villages known as the "West Line[26]" in South-West Hebron due to its proximity to Israel, history of importing Israeli used products, proportionally higher levels of unemployment following the 2nd Intifada, and geo-political location in Area B and C[27] allowing environmentally harmful e-waste processing to go undetected and unregulated by both Israeli and Palestinian authorities (Davis, Akese, & Garb, In prep). Here, in the area, known as Palestine's "scrap capital", between 57 – 64,000 tons of Israeli e-waste is imported annually supporting over 380 businesses, more than 1,000 full time jobs, and generates over $28.5 million in Gross Value Added (GVA), yielding the dominant source of income locally, and constituting over 10% of all Palestinian exports to Israel were it registered in the official economic indicators (see Manuscript 2).

With a rural population of 35,000 within an area of about 45 km², the West Line villages have borne the environmental burden of disposing Israeli e-waste, while generating a significant cross-border economy that has remained largely invisible to both Israeli and Palestinian authorities. The establishment of regulated e-waste collection

[26] The main villages in the "West Line" consist of Beit Awwa, Deir Samet, Al Kom, and Idhna
[27] Under the Oslo Accord, the West Bank had been divided into Areas A, B, and C: Area A is under full Palestinian civil and military control, Area B is under full Palestinian civil control and joint Israeli-Palestinian military control, and Area C is under full Israeli civil and military control.

channels via Israel's EPR law has not only legally displaced the West Line villages from a resource that has economically supported the local economy for over two decades, but also leaves a toxic legacy from years of crude 'backyard' recycling processes (e.g. open-air burning, informal landfilling, etc.). Moreover, this law now positions the West Line e-waste industry in competition with, and undermining, a less experienced formal Israeli e-waste collection network.

In this paper, we introduce a dis/articulations approach to unearth the exclusionary effects of regulated e-waste commodity chains established in EPR policies. Coined by Bair & Werner (2011a), the dis/articulations project criticizes conventional commodity chain studies for holding an inherent inclusionary bias, which overlooks the historical and spatial processes that "reproduce the uneven geographies" that link and delink particular regions to transnational production networks. Rather than tracing global commodity chains from input to final product, a dis/articulations approach focuses analytically to a particular region and asks how it's linkage to a commodity chain is intertwined with the development of the region itself. We extend this orientation to inquiry and fix our attention on the West Line e-waste economy to reveal the geo-political and economic forces that delinked this region from an economy dependent on Israeli employment, subsequently linked it to the Israeli e-waste commodity chain, and with the establishment of the new Israeli EPR law this region is now at risk of being delinked yet again.

We extend our analysis to advocate for inclusive e-waste management policies that take such pre-existing informal operations into account when establishing regulated e-waste channels, both because of their impressive ingenuity and effectiveness as well as the livelihoods that have become dependent on such e-waste flows, but also their worrying ability to mobilize environmentally consequential materials that can remain invisible to official systems for years. While EPR policies in OECD countries have been partially motivated by the perceived harm of North-South e-waste trade on marginalized informal e-waste hubs in the global South, they simultaneously function to exclude vulnerable populations dependent on these inputs. Thus, a consequential outcome of EPR policies disarticulates pre-existing informal recyclers from e-waste commodity chains by defining legal parameters for certified businesses to collect and recycle e-waste, subsidizing e-waste markets through advanced recycling fees distributed by manufacturers and importers, and mandating new regulated collection networks while outlawing informal networks.

By employing a dis/articulations approach on EPR e-waste policies we bring peripheral informal e-waste economies to the fore and problematize definitions of "extended" and "responsibility" to consider the livelihoods of actors and regions that have been historically dependent on this resource.

RETHINKING EXTENDED PRODUCER RESPONSIBILITY THROUGH DIS/ARTICULATIONS

This section brings EPR-based policies and the creation of regulated e-waste channels into conversation with an emerging literature that explores the economic geography of commodity chain dis/articulations (Bair & Werner, 2011a). Since the early 90s, EPR legislation has become the preferred policy option for e-waste management (Langrová, 2002; Oliveria et al., 2012). Increasing quantities of e-waste generation coupled with a growing awareness of the human-environment risks of landfilling and illegal disposal (both domestic and overseas) has given urgency to implement EPR-based e-waste policies. These human-environment risks are typically informed by studies analyzing informal e-waste hubs in the South (Chen et al., 2011; Grant et al., 2013; Sepúlveda et al., 2010; Zhang et al., 2012) and visualized by NGOs and media reports sharing compelling imagery of poor working conditions and excessive pollution of these hubs processing refuse of rich countries (60 Minutes, 2008; Frontline, 2009; Puckett et al., 2002), cultivating a global conscience towards national e-waste stewardship.

Under an EPR framework, the responsibility of e-waste is shifted upstream (both financially and physically) to producers and manufacturers by keeping the entire lifecycle of the product in mind. Encompassing a variety of diverse policy instruments, EPR ideally serves to both relieve municipalities of the financial burden of e-waste management and incentivize producers to improve product design in ways that reduces resource use and improves product recyclability (OECD, 2001).

While EPR is intended to address e-waste both at the beginning of the pipeline (Design for Environment (DfE)) and the end (collection and processing of discarded electronics), most EPR schemes focus exclusively on the latter (Plambeck & Wang, 2009). Several academic and policy reviews have criticized EPR schemes for having weak or non-existent incentives for DfE (Atasu & Subramanian, 2012; Gui et al., 2013; Rotter et al., 2011; Sachs, 2006) and Lepawsky (2012) points out that EPR policies place the financial burden of collecting and recycling e-waste on consumer-citizens, which further discourages producers to design environmentally-friendly electronics. Thus, EPR policies have functioned primarily to create regulated channels for e-waste collection and recycling.

Successful EPR legislation (which is often narrowly measured by obtaining high collection rates) tends to be the exception as the majority of EPR programs, especially in developing countries, have had little success collecting e-waste. Case studies from China (Akenji et al., 2001; Kojima et al., 2009), Thailand (Manomaivibool & Vassanadumrongdee, 2011), and Romania (Ciocoiu et al., 2011; Ciocoiu, 2012; Scheinberg et al., 2010) highlight some of the difficulties achieving high collection rates and, in particular, how competition with informal recyclers undermines formal collection. Even more, EPR policies are further handicapped by the ambiguous terms of e-waste, which simultaneously comprise economic value and socio-ecological risk, encouraging leakage of low-value/highly-hazardous e-waste components from formal collection channels to informal ones (Kama, 2015). In these contexts, EPR programs modeled along a “fool-proof” European structure, and introduced into a setting in which a robust

informal sector exists not only competes for the collection of e-waste with a more experienced and agile informal sector (Chi et al., 2011), but sets a legal precedent formally displacing a pre-existing informal sector that has based their livelihood on collecting and processing e-waste.

Without discounting the harmful working conditions and environmental pollution of informal e-waste recyclers that have played a key role in spurring national EPR e-waste management, recent literature has argued that the historic and future livelihoods of those processing e-waste have often been neglected by these policies (Gidwani, 2015; Reddy, 2015). The invisibility of informal e-waste workers livelihoods in the South is articulated by Jerald Schnoor (editor-in-chief of *Environmental Science & Technology)* in a brief commentary where he advocates the merits of EPR as a solution to North-South e-waste trade, stating:

> "Only poor people in developing countries are managing it, and the rest of us ignore it as 'out of sight, out of mind'. E-waste is a public health nightmare for workers recycling the material but also a prime opportunity for corporate responsibility…There is no justice when powerless migrant workers become exposed to toxic metals, PCBs, and flame retardants unknowingly. But the alternative is not good either – landfilling the e-waste" (Schnoor, 2012: 7927).

Schnoor's quote resembles mainstream narratives of the injustice of North-South e-waste trade and solutions premised on improving domestic e-waste management via EPR, whereas the "powerless migrant worker" becomes a symbol of wrongs done – yet does not merit reparations nor support upgrading recycling operations or transitioning to an alternative livelihood. Several scholars and activists have characterized informal e-waste hubs as an important source of employment for migrant labourers, often identified

as farmers seeking better wages (Laha, 2004; Li et al., 2011; Manhart, 2011; Puckett, 2002). Schnoor's notion of justice, which is reflected in EPR policies, overlooks the historical livelihoods of e-waste workers and fixates on solutions that remove e-waste from these informal hubs and into formal and regulated e-waste channels, thus alleviating the guilt of exporting countries. Such conceptions of justice fail to account for the livelihoods of marginalized populations that will inevitably lose their principle source of income if denied access to e-waste inputs. Moreover, informal e-waste hubs have developed expertise and agglomeration efficiencies from decades of industry development (not to mention pollution from e-waste recycling has tarnished the local environment, thus hampering a return to farming). The disarticulation of informal e-waste workers from e-waste commodity chains is implicitly embedded in EPR policies touting the creation of new "green jobs" that will enhance the local economy by processing e-waste domestically; with little thought of the "powerless migrant workers" these jobs replace (Gui et al., 2013).

Such inclusionary and exclusionary impacts of EPR-based e-waste commodity chains become apparent when analyzed through a dis/articulations perspective. Championed by Bair & Werner (2011a), the dis/articulations project complicates conventional Global Commodity Chain (GCC) and Global Value Chain (GVC) analyses, and in particular studies that focus on "upgrading" poor producers, by focusing attention on the "layered histories and uneven geographies of capitalist expansion, disinvestment, and devaluation" and how particular regions and actors "become disconnected or expulsed from commodity chains" (Bair & Werner, 2011a: 989).

Conventional GCC/GVC analyses consider regions and actors directly involved with moving physical products from input suppliers to the end consumer and the organization and management of production along the chain (Dolan & Humphrey 2000; Jordaan et al., 2014; Raikes et al., 2000). The differing terminology of GCC and GVC are used by researchers whose common ground is much greater than their divisions. GCC analyses tend to emphasize the role of lead firms in global production and the internal governance of supply chains, whereas GVC analyses emphasize the relative value of activities necessary to bring a product or service from conception through to production, use, and final disposal (Gereffi et al., 2001). Taken together, these analyses focus on the geography and character of linkages between stages of the value chain, how power is distributed and exerted among actors, and the role institutions play towards structuring business relationships and industrial location (Sturgeon et al., 2008).

GCC/GVC studies have been incorporated as a development tool and policy input to determine ways to upgrade poor producers to "move up the value chain." This is done by shifting poor producers to more rewarding positions in the value chain by improving coordination, changing or adding new functions, and/or improving products/processing (i.e. vertical upgrading) and considerations of poverty, gender, labour and environmental aspects of the value chain (i.e. horizontal upgrading) (Riisgard et al., 2010; Bolwig et al., 2010). The value chain image, while criticized for being overly simplistic (Coe et al., 2008), is argued to provide a useful heuristic tool as an orientation to inquiry and policy input to understand how industries and places evolve, and how they might evolve in the future (Gereffi et al., 2001; Sturgeon et al., 2008).

The dis/articulations project criticizes GCC/GVC analyses for holding an inherent inclusionary bias towards actors and regions that are connected to commodity chains, which prioritizes investigating the processes, people, and places that are inside commodity chains and strategies for drawing more people and places into chains in order to generate "development", while downplaying, if not ignoring, that changing geographies of global production reflect moments of inclusion and exclusion. The linking process, or "articulation", describes the various mechanisms by which agents and processes are integrated into place-bound systems of production that serve to incorporate that node into a given chain. Bair and Werner (2011a) point to the way in which the articulation of particular places into new commodity chains is often contingent on a prior moment of disarticulation. A dis/articulation approach is thus more attuned to the social and spatial processes by which commodity chains link to and delink from specific places – that is, how the connections tying people and places to a particular chain are severed, thereby excluding them from circuits of capital accumulation in ways that may be important for their later incorporation into new chains and circuits of accumulation.

The dis/articulations approach has since been applied by geographers and sociologists to a variety of commodity chains and regions to provide nuanced and contextualized explanations of local economies engagements with transnational production networks. Bair & Werner (2011b) introduce the dis/articulations approach in a case study of the cotton-textile-apparel industry in La Laguna, Mexico, to reveal that the "boom and bust cycle" of this region can be better explained by the layered history of

local interactions with this commodity chain, rather than conventional explanations of the global dynamics of contemporary apparel chains. Hough's (2011) historical analysis of the Lower and Middle Caguàn area of Colombia shows how this region has been articulated into and dis/articulated from three commodity chains over the span of 50 years. In each case, the articulation of the region into each new commodity chain was a function of state political interventions aimed at correcting unequal capital accumulation associated with that chain.

More recent studies have applied the dis/articulation approach to nuance and guide GCC/GVC based policy proposals by drawing on semi-structured interviews and long-term immersion in developing countries reliant on connections to GCC/GVCs. For example, Havice (2013) analyzes how island developing states have been dis/articulated from the global tuna industry to demonstrate how researchers can apply the dis/articulation approach to systematically assess the inclusionary bias in debates and policy proposals that advocate "upgrading" poor producers within a commodity chain. And Wilson (2013) refines conventional explanations and subsequent solutions of the Latin America coffee crisis, which rely on overproduction and devaluation, to emphasize the socio-historical circumstances of dispossessed farmers who lost land rights in the Sandinista-led agrarian reform in the previous decade. Thus, the dis/articulations approach adds an invaluable perspective to inform robust GCC/GVC policy proposals.

Bair & Werner (2011a) call for additional research that unearths the invisible processes of dispossession that exclude regional economies from transnational production networks. Our paper responds to this call and extends the analytical reach of the dis/articulations project by showing the range of realms in which dis/articulations can take place. In the West Line case, these include the ways state military intervention can shape the conditions of dis/articulation as well as the inclusionary bias inherent in EPR-based government-sanctioned e-waste commodity chains. We then leverage this analysis to re-imagine inclusive e-waste management policies that incorporate the livelihoods and built-up expertise of those that have been historically dependent on this resource. We focus analytically on the West Line villages that have collected and processed the bulk of Israeli e-waste for nearly two decades to explain how this region became informally articulated into (and formally disarticulated from) this commodity chain.

In terms of methods, our analysis is informed and directed by over 21 months from 2012-2017 of deep immersion in the West Line coupled with direct engagement with Israeli and Palestinian authorities towards managing the West Line e-waste industry. Discovering and analyzing an informal, and, at times, illegal cross-border e-waste industry presents unique challenges towards obtaining reliable information due to the sensitive nature of questions related to business models, buying and selling prices, quantities, tax evasion, illegal extraction and burning practices, bribery, among others. To address these challenges, we employed a multi-method strategy to cross-verify information sources utilizing participant observation coupled with structured and semi-

structured interviews with over 300 stakeholders including businesses in each link of the e-waste value chain as well as various Israeli and Palestinian government agencies and NGOs that support or influence this industry. A more detailed description of the methods used to inform this study can be found elsewhere (Davis & Garb, 2015; See Manuscript 1 and 2).

In what follows, we provide a cursory historical portrait of the West Line villages and focus on the geo-political and market forces that articulated this region into the Israeli e-waste commodity chain. We then detail a comprehensive analysis of the current West Line e-waste commodity chain to 1) analyze how the Israeli occupation has shaped the conditions in which the West Line villages are articulated into this commodity chain; 2) valorize the impressive expertise and agglomeration efficiencies this industry has developed over two decades; and 3) demonstrate how such a massive industry that is deeply intertwined with Israeli markets and government authorities had remained invisible to EPR policy makers. By revealing this existing, yet largely invisible, e-waste commodity chain we surface the harmful exclusionary consequences of Israel's EPR law and complicate notions of "responsible" and "extended" e-waste management to consider the livelihoods and expertise of the longstanding Palestinian e-waste sector.

ARTICULATING THE WEST LINE TO THE ISRAELI E-WASTE COMMODTIY CHAIN

Long before e-waste had become a matter of concern in Israel, the West Line villages had established an efficient infrastructure and network to collect and process the

bulk of Israeli e-waste. The West Line villages have a long history of collecting and refurbishing second-hand products in Israel. This livelihood has historically been supported by an informal profession of collection drivers, known as *Alte Zachen* in Israel (From the Yiddish phrase, which literally translates to "old stuff"), who collect second-hand products in Israel to refurbish and resell, increasingly in the West Bank. This kind of service has operated continuously since the pre-state period. Already then, almost a century ago, the trade was a site of Jewish-Arab blurring, and now the collectors are almost entirely Arab and to a large degree from the West Bank, who, ironically, connect MP3 players to a loudspeaker to issue the deeply familiar chanting Yiddish call of "alte zachen" to alert residents to their services.

The majority of *Alte Zachen* collectors transport their goods to an open air auction in Beit Awwa, which began in the 1960s and still operates today, for sale to local refurbishment businesses that repair or repurpose used products for resale to Palestinians throughout the West Bank. This region is a well-known hub throughout the West Bank for buying second-hand furniture and household items. Over time, electronic and electrical goods gradually became a larger and more valuable segment of the used products available to *Alte Zachen* drivers due to a combination of rapid advances in technology, planned obsolesce, the absence of formal collection mechanisms in Israel, and the rising prices of metals. In the early 2000s, e-waste dismantling became the mainstay rather than a by-product of this industry as unrepairable or unmarketable e-waste was dismantled to extract and sell valuable components (e.g. copper, aluminum, steel, motherboards, etc.). The substantially cheaper labour and industry experience in

Palestine coupled with a market for second-hand electronics made dismantling and refurbishing Israeli e-waste more economical in the West Bank.

From 2003 – 2007, a push of high unemployment rates and a pull of sky-rocketing international metal prices transformed the West Line e-waste industry from a peripheral economic activity into a massive industrial cluster. Beforehand, employment in Israel was the main economic activity in the region as blue collar jobs could earn salaries three times higher than skilled labour in the West Bank. However, employment restrictions resulting from the Second Intifada raised unemployment rates in the West Bank from 7.5% to 28.2% in 2002 (Palestinian Central Bureau of Statistics, 2003). Because of the close proximity and short commute to Israel, regions like the West Line held even higher unemployment rates (Miaari, et al., 2014). The long-term dependence on Israeli employment on the one hand, combined with minimal investments and growth in local businesses due to Israeli restrictions on Palestinian development and mobility on the other, made the Palestinian economy vulnerable to access to employment in Israel.

In parallel, another sphere of articulation was the international prices of metals commonly found in e-waste (e.g. copper, iron, aluminum, and steel), which rose to unprecedented levels from 2000-2008 spurred primarily by Chinese demand. For example, aluminum prices rose from USD $1,400 per metric ton in 2002 to $3,200 in 2008, and copper ballooned from USD $1,800 per metric ton in 2000 to $9,000 in 2008 (infomine.com/investment/metal-price/). The intensive rise in unemployment in the West Line villages acted as a catalyst for residents to search for any form of alternative

employment, and the historic roots in processing second-hand products from Israel coupled with a local awareness of the increasing value of dismantling e-waste fostered a natural transition for the surge of newly unemployed residents to shift from an economy dependent on Israeli employment to an economy dependent on Israeli e-waste.

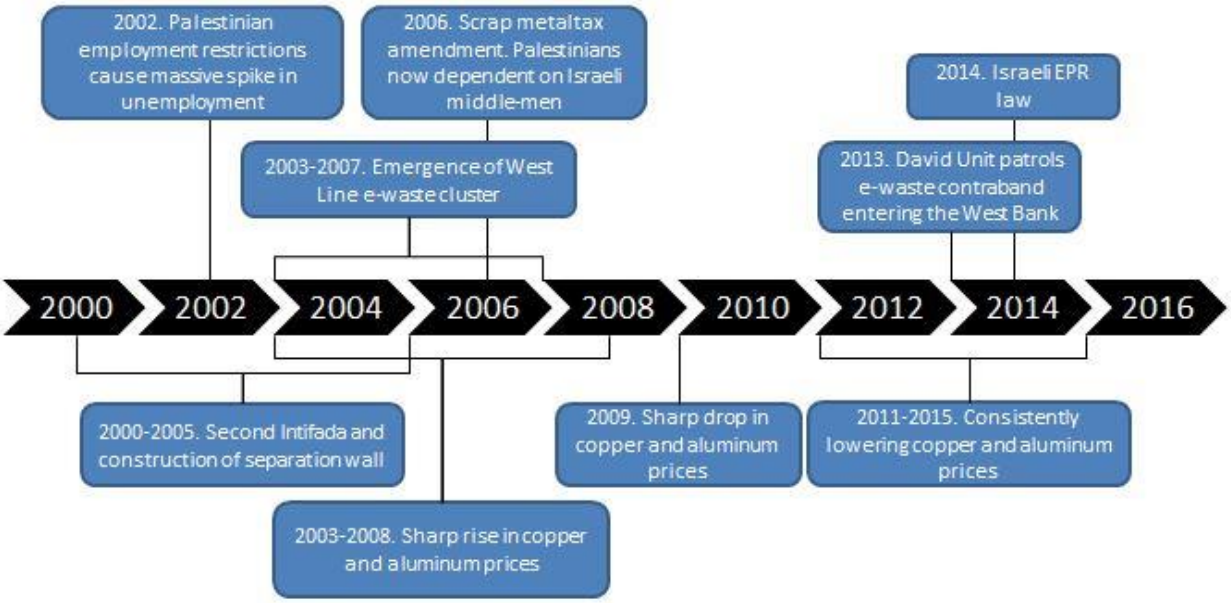

Figure 1: Timeline of significant events shaping the Palestinian informal e-waste sector

THE WEST LINE E-WASTE COMMODITY CHAIN

The entire flow and informal treatment of e-waste both feeds off of and depends on the geo-political situation between Israel and the West Bank coupled with fluctuating international metal prices. Israel and the West Bank share one of the most unique borders between two territories, entailing a massive (but incomplete) separation wall, thousands

of formal workers crossing the border daily (as well as considerable informal crossings), and a palpable complex geography of military occupation. In what follows, we map out the West Line e-waste value chain from collection to processing to the sale of outputs highlighting how the occupation shapes the conditions of articulation as well as the impressive infrastructure and network of this long-term e-waste hub that has surprisingly remained invisible to EPR policy makers.

Collection

Israeli e-waste is collected by Palestinian recyclers from either residential or institutional sources, each entailing unique business models. Residential e-waste is collected by the previously described *Alte Zachen* collection trucks. These collectors tend to have a uniform 3-ton truck small enough to maneuver on narrow residential roads, but large enough to haul 1-3 tons of e-waste and various used materials. *Alte Zachen* collectors have developed a massive informal collection network extending to all major Israeli cities – offering the kind of door-to-door collection Israeli e-waste policy now aspires to, and diverting e-waste that would most likely end up in Israeli landfills. E-waste from residential sources is normally collected for free or collectors will pay to the household a nominal amount of money to acquire materials, making door-to-door residential collection economically advantageous for both parties.

While the *Alte Zachen* is the primary collection mode from households, e-waste from institutional sources reaches Palestinian processing in larger and more uniform lots through Palestinian scrap dealers that have standing informal arrangements with key

individuals in the relevant institutions or, at one remove from the institutions themselves. Collection of assorted e-waste and scrap metal from institutional sources is typically done by larger transport trucks with a carrying capacity of 7-12 tons owned by "large scrap yards" (described below) in the West Line. These institutional sources range from small computer repair shops to some of the largest companies and recycling facilities in the country to municipalities and other government offices, with regular arrangements and single shipments sometimes consisting of hundreds of single items (computers, screens, refrigerators, entire inventories) when equipment is upgraded at an institutional scale. Notably, as EPR regulations increasingly direct e-waste to formally certified Israeli processors, some of the e-waste items arriving at these facilities that are costly to recycle are being sold to informal recyclers in the West Line.

Another source of growing importance is the Israeli recycling centers (scrap yards) that buy scrap directly from the public, as well as from impoverished individual collectors that pick through neighborhood rubbish bins. Since they aggregate from many smaller sources, these yards are more reliable sources for Palestinian buyers than sporadic loads from single large organizations. The pure e-waste loads from institutional sources do not come as cheaply as residential *Alte Zachen* collection, since the mediating seller is far more aware of its value, but such shipments are reliable and far more valuable per ton.

The transfer of e-waste from Israel into the West Bank is able to fly under the radar due to Palestine's inability to control its own borders and the presence of settlers

living within the West Bank allowing for ambiguity in determining the destination of trucks crossing the border. The legal inability of Palestinians to drive in Israel has forced scrap yards to hire drivers with Israeli residency to collect scrap on their behalf, most of whom are Arabs from the Jerusalem area. Since all collection drivers are Israeli residents and drive trucks with Israeli license plates, border guards can assume they are driving directly to an Israeli settlement, not invoking any tax or security checks as they may technically never leave the "country."

The lion's share of collected e-waste is transported to the West Line where it is rapidly sorted, resold and processed in a complex feeding chain of actors ranging from several large enterprises with million dollar annual turnovers to backyard operations in which families handle some sub-niche of the waste stream.

Processing

Alte Zachen trucks deliver their mixed loads of e-waste and used materials every evening to the Beit Awwa auction – a chaotic combination of a flea market and auction, and an important hub for the generalist scrap trade, visited by hundreds of buyers, ranging from families looking for cheap furniture and appliances, refurbishment businesses looking for electrical and electronic equipment to repair, and small scrap yards lacking the finances or access to collect large quantities of e-waste in Israel purchase unrepairable e-waste and scrap metal to dismantle. The *Alte Zachen* collectors are typically able to obtain higher profits from the differential between low purchase prices from uninformed residential sources and the high selling prices in the competitive

Palestinian market, and can take advantage of *ad hoc* opportunities. Compared to institutional sources, the amount of e-waste collected by *Alte Zachen* represents a small aspect of the e-waste economy, importing around 5,000 tons of e-waste[28] annually, which are primarily sold to electronic and electrical appliance refurbishers. Many of the shops along the main road to the Beit Awwa market specialize in refurbished items, purchased at the market and reconditioned. Some refurbishment is also done, on site, in small scrap yards, and in households. And, of course, unrepairable items re-enter the value chain, again, as material for dismantling.

The e-waste collected from institutional sources in large transport trucks is delivered directly to one of over 60 large scrap yards in the West Line, which collectively import 52,000 – 59,000 tons of e-waste[29] annually (See manuscript 2). These dismantling facilities are a dominant feature in the West Line villages, lining the main roads, with more remote yards and family operations dotting the landscape. The larger scrap yards typically employ 3-6 workers (some up to 20), processing between 2-10 tons of scrap metal and e-waste daily.

Most of the larger dismantling yards line an *ad hoc* industrial zone between Deir Samet and Idhna, are typically situated on a plot of 1-3 dunams, have heavy machinery (to move and compact scrap, strip cables, or shred plastics), and employ specialized staff (accountants, transport truck drivers, heavy machinery operators and someone with entry

[28] This figure does not include the thousands of tons of used materials Alte Zachen trucks sell at the market such as furniture, automobiles, scrap metal, etc.
[29] This figure does not include non-electrical/electronic scrap metal collected and processed in large scrap yards.

permission to Israel on collection trips). Most of these larger facilities evolved from small family operations through a virtuous circle of scale-up through a series of defining thresholds: larger operations have enough purchasing power and consistency to build relations with Israeli scrap yards that can provide large regular loads, to buy a larger truck that offers economy of scale, and to wait to sell metals until prices are favourable. This incremental growth trajectory is especially important for informal businesses; without access to formal capital markets they must lay out considerable start-up and operational costs in cash, and depend on ongoing sales to purchase new inputs so they can only gradually evolve to larger capacity.

The extraction of high value portions of the e-waste stream and disposal of the remainder is done in a context with little regulation, only basic infrastructure, and low incentives for incorporating environmental considerations into the process. The focus is on extracting metals and critical fractions and the methods are crude, and, likely to have significant and broad environmental consequences. After some occasional sorting for working machines and parts, hammers, axes, and grinders are used to retrieve metal-bearing components, while the remaining portions that cannot be separated from their insulation are burned in open air fires around the villages, and the metal retrieved after the insulation has been melted away. Plastic components currently have little intrinsic value and so are disposed of locally. Large scrap yards producing high quantities of non-valuable scrap can afford the expenses to cover the driver, truck and tipping fee to dump at the municipal waste transfer station in Tarqumiya. Smaller scrap yards, however, without the financial ability to pay for the transportation and use of the municipal landfill,

will either dump their waste on land they own or on vacant land they do not own, bury their waste for a small fee in a homemade landfill owned by local residents, or simply burn it.

Another kind of scrap yard is visible, especially in Idhna, belonging to the 15-20 local traders that purchase and aggregate extracted metals from small scrap yards that are not large enough to rapidly accumulate large quantities of metals to sell to Israeli middle men (described below). These scrap yards receive trucks full of a specific type of metal (copper, iron, aluminum, etc.) arrive from small scrap yards, are weighed with and without their loads, and the trader will offer cash for the difference. The rate offered depends on the cash the trader has on hand, the load's purity (for example, copper extracted by burning is considerably less valuable than by stripping), and the current (continuously updated) price of the metal on the international commodity exchange using JP Morgan (a multinational financial services company that analyses and displays current metal prices) as the industry standard. Local traders provide some basic processing of metals (e.g. compressing aluminum into cubes for efficient shipping or sorting grades of metal based on purity) and can negotiate better prices with Israeli middle-men than smaller dismantlers due to the large quantities they deal with. To increase their client base, some local traders loan cash upfront for small scrap yards to purchase e-waste to dismantle under the agreement that they will exclusively sell the metal extracted from these purchases back to the trader. The metal trading business requires a great deal of savvy, strong nerves and large supplies of cash continually on hand, but is regarded as the most profitable link for Palestinians in the scrap business.

Output

Palestinian scrap yards and local traders, partly due to their informal status, find it overwhelmingly difficult to ship metals into Israel or through Israel to other countries without Israeli mediation. Most metals and circuit boards are shipped abroad and direct export of goods by Palestinian companies is a grueling bureaucratic process that only the largest and most well established can consider, and certainly not informal operations. And passage of materials from the West Bank to Israel is more closely monitored than the reverse direction.

In order to overcome these barriers, fractions extracted from e-waste are filtered through Israeli middle-men in the West Bank, who are the gatekeepers to Israeli and global buyers. For example, a multifaceted transportation chain transfers motherboards from large and small scrap yards to one of three Palestinian motherboard collectors who accumulate motherboards in large quantities for sale to one of two Israeli settlers who then transport shipments across the border to Israeli traders who export to refineries in Europe. Though the Israeli settler acts as a buyer, he is merely transporting the motherboards from an Israeli settlement under the guise of 'Israeli products', which negates any importation taxes and excessive security hassles (Davis & Garb, 2013). Motherboards are then delivered to the actual buyer, an Israeli trader selling to refineries in Europe, while the Israeli settler has carved out a lucrative business for providing this service of mediation.

Interestingly, the phenomenon of using hazardous leaching processes to manually extract gold and silver from motherboards as witnessed in other informal e-waste hubs in India (Rochat et al., 2008) and China (Puckett et al, 2002) does not occur in West Bank. The idea and motivation to manually extract precious metals from motherboards is present, but essential chemicals required to conduct this operation are not easily available. This is likely because these chemicals (i.e. nitric acid) are possible precursors in the production of improvised explosive devices (IEDs). These chemicals would be extremely difficult to obtain as Israeli checkpoints on all sides of West Bank have a strict ban on these chemicals.

Other extracted metals (e.g. copper, aluminum, stainless steel, etc.) are sold to one of two Arab-Israeli traders in East Jerusalem. The dual-status of these traders permits them to own a sister business in Israel, which allows the export of metals from their Palestinian business to their Israeli business without making a “sale”, and thus, avoid taxation. Once the metals are in Israel, a Jewish-Israeli partner is required to ship the metals under his business, since Israeli laws restrict the quantity of scrap metal Arab-Israelis can export. Within this system, the East Jerusalem traders must open a business in Israel and pay for a Jewish-Israeli partner to export metals from the West Bank overseas. Beyond facilitating hassle-free transportation to Israel, the Israeli middlemen pay cash in hand allowing Palestinian scrap yards the financial flexibility to immediately purchase more e-waste to process. If Palestinian scrap yards sold directly to buyers in Israel or internationally they would receive a higher price for their metals, but would not receive

full payment for several weeks and many are nervous they may not receive full payment at all[30].

The necessity of Israeli facilitation to provide mobility, security, and tax evasion services for the sale of extracted metals back to Israel was not always required. Prior to 2005, informal Palestinian scrap yards would commonly sell dismantled metals directly to scrap metal traders in Israel through fictitious companies registered under the name of a deceased Israeli. In doing so, the Palestinian scrap yard could collect a 17% Value Added Tax (VAT) on metal sales, which is supposed to be reported and sent to the Israeli tax authorities, but is not disclosed and pocketed as extra profit instead. It was common for Palestinian scrap yards to have several fictitious company names at any given time to evade detection from the Israeli tax authority. This practice was so common that an unofficial office in Hebron connected Israelis and Palestinians to purchase fake company names, selling for around NIS ₪10,000 (USD $2,650) per company name. To the dismay of Palestinian scrap yards, this underground market ended in 2005, when the Israeli tax authority amended the tax on scrap metal to eliminate this loophole (Israel Tax Authority, 2005). This amendment made it nearly impossible for informal Palestinian scrap yards to sell their metals directly to Israeli exporters, creating a market for intermediary Israeli buyers who could facilitate the purchase of scrap metal from Palestinian scrap yards for sale to Israeli traders or export directly.

[30] Several interviewed Palestinian scrap yards have been taken advantage of by Israeli buyers who received scrap metal shipments, but never made the full payment, and operating as an informal business, there was little legal recourse.

(In)visibility and Absent Governance

The informality of the West Line e-waste hub coupled with its location in a governance vacuum allowed this industry to operate under the radar for nearly two decades, with both Palestinian and Israeli governments engaging with this industry at arm's length.

The fragmented and often chaotic state of Palestinian governance in the West Bank has allowed for the informal e-waste industry to exist in the West Line for well over a decade without Palestinian Ministry officials becoming aware of the full scope and seriousness of this phenomenon, and have been limited to address this issue once it had caught their attention. This fragmentation of the West Bank set out in the Oslo accords has made strict enforcement of regulations and laws in Areas B and C nearly impossible. This reality is exemplified in the location of e-waste burn sites, which occur mainly in Area C, where Palestinian police cannot access without Israeli permission. Palestinian efforts to police or regulate this e-waste industry are strained by a combination of poor administration, spatial restrictions on movement and jurisdiction, insufficient laws addressing e-waste management, community pressure and a competing family law to protect this source of income, and corruption.

On the Israeli side, the Israeli Civil Administration[31] has encountered the West Line e-waste industry from complaints of e-waste burning by settlers and Israeli villages located adjacent to the separation wall. In response, the Civil Administration banned

[31] The Israeli Civil Administration is the Israeli governing body that operates in the West Bank

certain materials such as cables, tires and CRT TVs from entering the West Bank in 2013. This ban was implemented by the David Unit, which was originally commissioned to prevent the illegal dumping of used construction material in the West Bank. Trucks found with e-waste contraband (typically targeting larger transport trucks collecting from institutional sources) are confiscated for about a month and fined NIS ₪7,000 (USD $1,850), although rumors circulate of special arrangements to circumvent such penalties for those willing to cooperate as informants[32]. Many Palestinian collectors are unsure what items are contraband, and when trucks are confiscated the rules are not clear on how, if, and when Palestinians will receive their truck back, how much the fine will be, and what they must do with the e-waste loaded in the truck. This uncertainty and inability of Palestinians to hold the David Unit accountable speaks to the unchecked power of the Civil Administration and the powerlessness of Palestinian recyclers of any recourse. The David Unit has added an element of risk for Palestinian collectors, but a risk most are willing to take. For the most part, Palestinian collectors can evade the David Unit by crossing less regulated borders, crossing borders at night, and/or sending a scout to see if David Unit officers are present. In addition to increasing border controls, the Civil Administration has sporadically pressured the West Line e-waste industry by demolishing scrap yards located in Area C or sending military jeeps to arrest those burning e-waste, although these efforts have made minimal impacts towards reducing environmental harm caused by this industry.

[32] Many Palestinians in the West Line believe that Palestinians granted permission to work in Israel, particularly Alte Zachen and large scrap yard collectors, have made arrangements with the Israeli military to work as an informant in exchange for permission to work in Israel.

EXTENDING THE "EXTENDED" OF EPR THROUGH A DIS/ARTICULATIONS PERSPECTIVE

By applying a dis/articulations approach to analyze the West Line e-waste industry, we challenge conceptions of "extended" and "responsibility" inherent in EPR policies to broaden beyond the lifecycle of current and future electronics and electrical equipment to consider the actors and regions that have historically "managed" national e-waste. Such considerations can open a space to re-imagine ways to structure inclusive EPR policies and formal e-waste markets to prioritize livelihoods that have depended on this resource for decades.

Existing applications of EPR policies infer how definitions of "extended" and "responsibility" are understood. As previously discussed, EPR has essentially functioned as a policy tool to relieve municipality's responsibility of the cost and logistical management of e-waste recycling by relegating this responsibility to producers. Thus, in practice "responsibility" has been constrained to the entity responsible for the collection and recycling of e-waste without broader considerations of the way in which e-waste management is conducted or the pre-existing livelihoods dependent on this resource. Moreover, interpretations of "extended" responsibility have been solely forward-looking to address e-waste management beyond the life of the product. Such exclusively forward-looking interpretations fail to reconcile the historic legacy of e-waste mis-management, whether it has accumulated in landfills where toxins slowly leach into the groundwater or has more intensively polluted informal e-waste processing hubs.

The consequences of how "extended responsibility" is interpreted are amplified in the Israeli-Palestinian case by the harsh reality of the Israeli occupation. In our analysis of the e-waste commodity chain the occupation has been the driving force shaping the conditions in which the West Line villages have been articulated into the e-waste commodity chain – the now dominant source of income available. These range from the more mundane pathways of e-waste movement across the border to avoid taxation and confiscation to the exploitative relations Palestinian recyclers endure on both the import and export side of the commodity chain. Even more, the geo-political administrative divisions of the West Bank have limited the ability of the Palestinian Authority to effectively regulate this industry.

Expanding definitional understandings of "extended responsibility" to account for the historic legacy of e-waste recycling can open a space to re-imagine ways to structure inclusive EPR policies that prioritize livelihoods dependent on this resource. Policy makers must be especially attentive to the social worlds, early eras, and economic processes operating outside of regulation, registration and taxation, both because of their impressive ingenuity and effectiveness, but also their worrying ability to mobilize massive and environmentally consequential flows of materials that can remain undetected by official systems for years. While Israeli policy makers had believed their e-waste was accumulating in landfills, the bulk of which has been conveniently collected and exported out of the country, where cleaned materials are sold back to Israeli buyers and the non-valuable and toxic remnants are disposed of in Palestinian burn sites directly upstream. Extending "responsibility" to account for the inequitable structural conditions in which

invisible actors and flows mobilize waste to harmful fates is essential to reform. Even more, by partnering with the pre-existing informal sector the EPR law, Israel can benefit from their years of experience and expertise (Davis & Garb, 2015).

For example, in terms of attaining collection quotas within Israel's current e-waste law, PROs could benefit from formally integrating the Palestinian e-waste sector. Since the inception of Israel's EPR law, PROs have struggled to obtain modest collection quotas, which initiated at 15% of the weight of electronic and electrical equipment sold by importers making use of their services[33] in 2014, increasing by increments of 5% until reaching 50% in 2021. Much of this can be attributed to competition with an unknown informal sector that is *already* nearly collecting the 50% e-waste quota of 2021. Our analysis of the West Line e-waste sector shows how Palestinian entrepreneurs with considerable resourcefulness, hard work and persistence have developed an e-waste industry as one of the few forms of available livelihood in an oppressed and constrained economy, becoming one of Palestine's largest yet least visible export sectors. Clearly, rather than continuing to compete with and exclude Palestinian recyclers that have proven resilient to Israeli pressure, transition to a more equitable integration and capacity-building can harness the strengths of this industry, boost Israeli PROs capacity to obtain increasing collection quotas, all while expanding the definition of "extended responsibility" by incorporating the historic livelihoods of those dependent on this resource into EPR management.

[33] Many importers of electronic and electrical equipment have yet to register with Israeli PROs, making collection targets much lower than the percentage of all Israeli e-waste.

By analyzing the Palestinian informal sector and how it intersects with and cuts across the Israeli formal sector, we can identify what Riisgard et al. (2010) call "action points" in the value chain that can be restructured to enhance Palestinian livelihoods dependent on imported e-waste, incorporate the strengths of the West Line e-waste industry to enhance e-waste management in Israel and Palestine, and minimize environmental and health damages of crude recycling processes. Integrating the Palestinian e-waste sector into Israel's EPR commodity chain does not require a complete overhaul and transformation of the current system, but, rather, small tweezer-like interventions to bring out of the shadows and formalize an existing cross-boundary economy.

For example, one could propose that Palestinian recyclers could apply to both the civil administration and one of the two Israeli PROs to collect and process e-waste adhering to the same standards as Israeli collectors and recyclers. Once certified, Palestinian recyclers can legally enter Israel to collect e-waste, but now receive payment for the quantity of e-waste collected (the same collection payment given to Israeli e-waste collectors). Collected e-waste will then be transported to the West Bank, where it will either be refurbished and resold on the second-hand market or dismantled to sell valuable metals to scrap metal traders in Israel or abroad and dispose of non-valuable waste in certified landfills in the West Bank or Israel in a way where all materials in the processing chain are accounted for. Thus, incentivizing the formalization of an e-waste processing industry in the West Bank stands to produce immediate environmental and health gains effecting the shared Israeli and Palestinian environment (reducing crude

dismantling and disposal processes), ensure Israeli PROs achieve collection quotas, while retaining the important economic role of the sector in the West Line villages, and Palestine as a whole. Even more, this would allow these businesses to take a legitimate place in the Palestinian economy as well to remain integrated with the Israeli markets they have been entwined with for so long.

CONCLUSION

This article borrows analytic tools from the dis/articulations project to challenge conceptions of "extended" and "responsibility" in EPR policies by bringing attention to the historical, social, economic and environmental impacts of pre-existing informal e-waste hubs that have grown dependent on collecting and processing e-waste. We extend the pragmatic applicability of the dis/articulations project by demonstrating the underlying inclusionary bias inherent in EPR policies to advocate for the inclusion of excluded actors. As identified in the West Line case study, cutting off inputs to such hubs have the potential to cause even more harm by displacing a marginalized economy while leaving a toxic legacy. We argue that responsible e-waste management must take into account deep-rooted informal hubs (whether domestic or international) that have historically managed national e-waste when creating government-sanctioned e-waste commodity chains. This inclusion not only stands to improve the livelihoods of marginalized populations, but also provides knock-on opportunities to enhance e-waste management by inheriting their experience and expertise. Thus, policy makers must be

especially attuned to the historical consequences of e-waste (mis)management with special focus to the actors and regions that have borne this environmental burden.

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Conclusion

The overarching objective of this dissertation has been to analyze the multi-faceted dimensions of the Israel-Palestine e-waste trade, discern whether or not the West Line villages deem this trade desirable, and explore strategies to improve livelihoods in these villages. These questions were addressed through a Participatory Action Research (PAR) methodology with representatives of the West Line community, which shaped the direction of research conducted in each manuscript. A central conclusion uniting each manuscript has challenged widely held conceptions that North-to-South e-waste trade is inherently wrong and should be banned, and advocated for alternative policy options that embrace capacity building and reform.

The Delphi-like mode of Participatory Action Research (PAR) described in the first manuscript demonstrated a method to facilitate heterogeneous and conflicted community members to converge towards a shared community development trajectory based on a regulated and clean operating e-waste industry. This PAR process adds volition to the West Line community and complicates simple narratives describing the West Line as a “digital dumpsite” for Israeli e-waste (ARIJ, 2012). More broadly, this exploration of the development desires of an e-waste dependent community adds an underrepresented perspective to debates and discussions in the e-waste literature. In contrast to arguments that speak to the injustice of North-South e-waste trade and the harm done to vulnerable populations on the receiving end, this study revealed that the

West Line community perceived imported e-waste as a development opportunity, as long as it is regulated and environmentally sound.

The second manuscript demonstrated the economic significance of the West Line e-waste industry by quantifying the amount of e-waste imported to the West Line villages and the resultant economic impact, both locally and nationally. This study made explicit the economic devastation a successful e-waste ban would have on both the local and national economy, giving further credence to policy options that reform rather than shut down this industry. Specifically, this analysis revealed that in the West Line villages alone, between 16 and 25,000 tons of e-waste was imported creating 381 enterprises, 1,098 jobs, and USD $28.5 million Gross Value Added (GVA) to the national economy in 2015—down 40% below historical levels of the prior decade when metal prices were higher and border security laxer. Moreover, this study introduces a robust multi-method approach to quantify the weight and value of e-waste in analogous e-waste hubs, which provides a pathway to obtain the necessary information to determine the economic impact of North-South e-waste trade bans to better inform appropriate policy measures. Thus, refined quantitative methods and data can give rise to qualitatively different policy options.

The third manuscript employed a dis/articulations approach to explore the inclusionary bias embedded in Israel's newly established Extended Producer Responsibility (EPR) law and the subsequent regulation of e-waste commodity channels that legally displaced a deep-rooted Palestinian informal e-waste hub. By fixating on the

linking and delinking of the West Line villages to the Israeli e-waste commodity chain a space opens to critique definitional understandings of "extended" and "responsibility" in EPR policies to include pre-existing livelihoods dependent on e-waste recycling. This reconceptualization beckons recent e-waste management policies to account for the legacy of historic e-waste negligence and "extend responsibility" to account for the Palestinian informal sector that is both dependent on this resource and has borne the environmental burden of historic e-waste mis-management.

Together, these three manuscripts comprehensively introduce the overlooked perspective and agency of communities dependent on imported e-waste to transboundary e-waste policy debates. Importantly, this dissertation argues that e-waste management policies must consider the development desires of pre-existing informal recyclers, the economic significance of informal e-waste hubs, and the inherent inclusionary bias embedded in the regulation of formal e-waste commodity channels.

In what follows, I extend these overarching conclusions by speculating the potential gains for both Israel and Palestine to regulate the West Line e-waste industry and the importance of sensitive framings to advance this unconventional arrangement. I reflect on and analyze the obstacles encountered with various Israeli and Palestinian stakeholders while working with the West Line community to regulate this industry. I then extend findings from the West Line case study to underscore the fundamental importance of including the perspectives and development desires of informal e-waste hubs to avoid echoing simplistic e-waste narratives based on shallow empirical

foundations. Such an approach produces qualitatively different, more complex narratives, and points to alternative transboundary e-waste policies and critical directions for future research.

Regulating an Israeli-Palestine E-waste Trade: The Importance of Sensitive Framings

The impulse to advocate for reform and capacity building of the West Line e-waste industry emerged over long-term and close consultation with the local community. Subsequent efforts to establish a regulated cross-border e-waste trade increased the visibility of the West Line e-waste industry to Israeli and Palestinian authorities prompting government reactions as well as broader media coverage. Directly collaborating in the shared management of e-waste recycling provides a unique and challenging opportunity for both Israel and Palestine. The intertwined economic and geographic boundaries provide a plausible positive gain for both. However, poorly informed and politicized governmental reactions of this complex phenomenon could shift Israeli and Palestinian policy responses in a variety of ways, some leading to counter-productive lose-lose results.

For example, Israel could focus on the environmental damage to shared watersheds due to crude e-waste dismantling methods in the West Line villages, and attempt to implement policies banning both e-waste transfer from Israel and e-waste recycling within the West Bank. This reaction would overlook the benefits from, and environmental debts to, Palestinians freely collecting, recycling, and disposing of the

majority of Israel's e-waste, both as a past service as well as one that Israel may still be unable to fulfill independently, at least in the short and medium term. Without sufficient capacity to recycle e-waste in Israel, shutting down the West Bank e-waste sector would lead to Israeli landfills receiving increased quantities of e-waste causing a new source of environmental pollution, while also driving any remaining Palestinian e-waste industry more deeply into "informality."

Unconsidered Palestinian reactions could hold Israel accountable for allowing e-waste to cross over a border that the Palestinian Authority cannot control. However, the West Line villages have built an entire industrial hub dependent on Israeli e-waste that dominates the local economy and makes a significant contribution to the national economy as well. If access to Israeli e-waste was suddenly eliminated, these e-waste dependent villages would economically collapse and suffer increased levels of unemployment and poverty.

Thus, an accurate and sensitive framing of the informal e-waste industry, highlighting how both Israel and Palestine are benefitting and suffering from its existence and the multiple perspectives of stakeholders involved in this industry, has significant policy implications. Rather than viewing each other through lenses of affront, both sides, albeit holding vastly unbalanced power differentials, could recognize the value they have received and the harm done. Israel could recognize the economic benefits they have received as well as the ecological and even moral debt accrued from exporting the majority of their e-waste to the West Bank for more than a decade. Moreover, as a

starting point for the development of their future e-waste management plans, partner with Palestinian authorities to certify businesses to process e-waste according to mutually agreed standards. Palestine could value e-waste as a resource that has provided the West Line villages with a job-creating industry and work independently and with Israel in developing and regulating this sector. Importantly, the longer term place of e-waste and other forms of scrap recycling within the Palestinian areas has been advocated for by the West Line villages.

While the cleanup and increased regulation of the shared e-waste system would bring mutual benefit, establishing a local Palestinian economy dependent on Israeli e-waste raises unique concerns and perspectives from stakeholders that influence the fate of this industry. The West Line industry, and its economic and environmental impacts, is entangled with and influenced by various stakeholders ranging from the local municipalities, the Environmental Quality Authority (EQA), and national NGOs on the Palestinian side to the Civil Administration and e-waste Producer Responsibility Organizations (PROs) (i.e. MAI and E-community) on the Israeli side. By embracing the pragmatic approach of PAR rooted in the epistemological groundings of "knowing through doing" (Brydon-Miller et al., 2003), we confronted various levels of friction with institutional stakeholders that impact, control or obstruct the local community's desired development trajectory. Each stakeholder can be classified falling along a "spectrum of friction" ranging from "assistance" to "resistance" (see Figure 1). The following section provides empirical examples that demonstrate the level of friction encountered with key stakeholders that influence the future of the West Line e-waste industry.

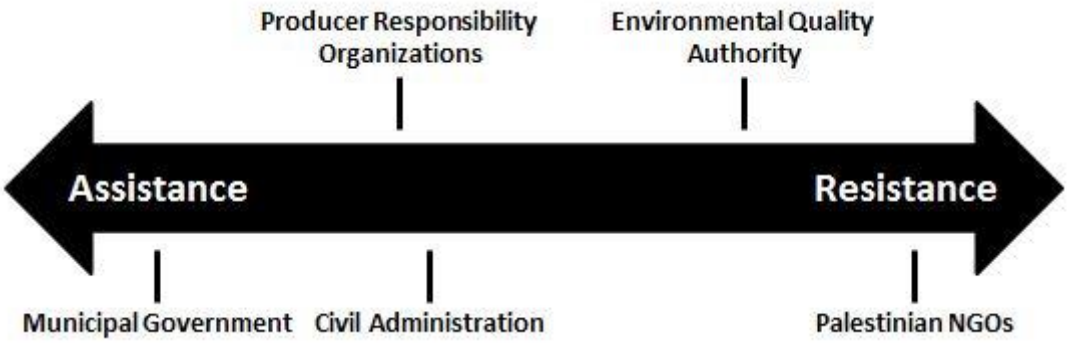

Figure 1: A spectrum of friction illustrating stakeholder's position on regulating the West Line e-waste industry

Stakeholder Friction

At the local level, the municipal governments of Yassaria (which, in 2016 sub-divided into three municipalities of Beit Awwa, Deir Samet, and Al Kom) and Idhna, have been the most supportive to reform the West Line e-waste industry. This supportive stance does not come as much of a surprise since the PAR method that defined the community development desires included representatives from the municipalities. The negative human-environment consequences and much-needed economic gains of the West Line e-waste industry most directly impacts the local municipal government. Thus, there is a clear awareness that if Israeli e-waste importation was successfully banned, then the toxic legacy of decades of e-waste processing would remain in the villages, yet the community would lose their most significant contributor to the local economy. The local municipality's supportive stance has materialized in oral commitments to supply land and electricity to formal operating businesses and police the industry in their limited capacity.

The two Israeli PROs, established under the new EPR law, showed an initial impulse to simply uproot the Palestinian e-waste sector. Under the Israeli EPR law, the collection of Israeli e-waste legally belongs to these two PROs exclusively, and they are mandated to collect 50% of the e-waste stream by 2021. Since the inception of the EPR law, the superior collection network of the Palestinian informal sector has undermined the PROs ability to collect mandated quotas. Thus, perceiving the Palestinian sector as unwanted competition, both PROs initially articulated positions to ban cross-border e-waste trade and eliminate this "pirate industry". This initial hostile stance in one of the two PROs slowly faded over the course of several conversations and meetings with each PRO, which emphasized the practical improbability of stomping out this industry and the opportunity for PROs to achieve collection quotas by formally integrating the Palestinian collection network with the Israeli EPR law. This realization led one of the PROs to actively support a formal integration of this industry, which has materialized in several situations where they have advocated for an integration of the Palestinian sector to various Israeli government authorities and have met with informal e-waste recyclers in the West Line to brainstorm various integration modalities.

Interestingly, the Israeli Civil Administration, through our many consultations and meetings with them and through the realization of their limited ability to eliminate the sector simply through force, have taken a more supportive position through the possibilities of supporting Palestinian e-waste businesses that could operate in a clean and regulated manner. Prior to our engagement, their initial stance was a "stomp them out" approach carried out by beefing up environmental police at the border, responding

periodically to large burn events, and demolishing informal scrap yards located in Area C. However, these efforts had minimal impacts towards limiting day-to-day operation and harmful environmental consequences resulting from this industry. Collection trucks found ways to sneak e-waste across the border, burning practices shifted to night, and scrap yards relocated to Area B where more legal obstacles exist for Israel to demolish such facilities. Faced with the realization that force alone could not effectively stop this industry, and with a growing awareness that increasing unemployment in the West Bank would likely lead to increased civil unrest, the Civil Administration has taken a cautious, and slow, change of heart to endorse a regulated and clean e-waste sector. This policy stance is evidenced by allowing one EQA-certified cable grinding business to import cables formally, and exploring modalities to link Palestinian e-waste collection systems with the Israeli EPR law. In addition, the Civil Administration has recently provided written support offering funding to remediate contaminated e-waste burn sites, work permits for displaced e-waste workers, and support to facilitate the legal transport of e-waste from Israel to regulated e-waste processing facilities in the West Bank.

The Palestinian EQA has been more hesitant to support a regulated cross-border e-waste industry since it requires legalizing Israeli e-waste importation. Officially, the EQA has based this policy stance on their interpretation of the Basel Convention, which is to restrict the transport of e-waste from ANNEX IIV countries (e.g. Israel) to NON-ANNEX IIV countries (e.g. Palestine). Complicating matters is the perceived stigma of Palestine functioning as a “digital dumpsite” for Israel. On a pragmatic level, the EQA recognizes the economic significance of this industry as well as their inability to

effectively enforce a ban on e-waste imports since they are under-staffed and under-resourced, and do not have the ability to monitor their own borders. Thus, the EQA has expressed a somewhat contradictory position to support a formalization of the West Line e-waste industry to process domestic e-waste alone and opposing e-waste importation from Israel that is, essentially, the overwhelming source of inputs for this industry.

On the far end of "resistance" on the friction spectrum are Palestinian NGOs based in major cities outside of the West Line villages (e.g. Hebron, Ramallah) that have engaged with the community sparingly over the past five years. As discussed in the first manuscript, Palestinian NGOs have framed the West Line villages as a dumping ground for Israeli hazardous waste and embraced apparent patriotic calls to resist normalizing relations with Israel, and have used this local instance as an opportunity to resist the occupation and forms of discrimination and oppression against the Palestinian people. While their claims hold some truth in a broad overarching manner, they stand in contrast to the articulated development trajectory of the West Line villages that prefer to regulate this industry and have not stated a desire to leverage their economic situation into political fodder. For outsider NGOs, the stakes are low in advancing these claims – if the industry shuts down, their livelihoods are not impacted, in fact, this apparent "win" may even increase their status as national patriots. Similar to the EQA, Palestinian NGOs have proposed that the West Line e-waste industry shift to treat only domestic waste, which currently represents only 10% of inputs and would essentially eliminate the industry (ARIJ, 2012; GLSHD, 2013).

These stakeholder's diverse perspectives speak to the complex strategic and ethical questions embedded in constructing long-term development plans for Palestinian villages to continue processing Israeli e-waste. Not only does this industry stigmatize Palestinians as living off of Israel's refuse, but it also presents an ongoing risk to the health and environment of both the local community and the shared Israeli-Palestinian environment if recycling is left unregulated. Furthermore, ongoing turbulent political tensions introduce fundamental trust issues inhibiting a regulated Israeli-Palestinian e-waste trade. On the one hand, Israel may not have confidence that the Palestinian government can independently regulate this industry, and on the other, Palestinian e-waste businesses may be reluctant to trust Israel to continue to allow the transfer of e-waste into the West Bank. In the presence of military engagements, disrupting the transfer of goods, including e-waste, to the West Bank adds one more means through which the Palestinian economy is vulnerable to Israeli whims. For instance, a dominant e-waste recycling industry existed in Gaza until 2005 when the borders were completely shut off, and goods were not allowed to enter or leave Gaza. Israel's position of control may lead Palestinian officials to feel uncomfortable becoming increasingly reliant on Israeli resources.

Currently, informal recycling is allowing the West Line villages to escape deep poverty while providing opportunities for economic growth. Moving towards formal and regulated methods of recycling provides a positive and clean source of income in a string of villages starved for the creation of viable new enterprises and entrepreneurship. While a cross-border e-waste management plan holds a wealth of environmental and economic

gains for both Israel and Palestine, the political tensions, long-term development goals and potential risks of continued improper recycling pose serious challenges to its implementation.

Including Local Voices in International E-waste Policy

The diverging layers of friction encountered in the Israeli-Palestinian case both reverberate and can inform international discourses of e-waste management. Recognizing that the Israel-West Bank setting holds distinctive geopolitical and social contexts, it also represents similar tensions and policy stances embodying global North-South e-waste trade. Major factors driving North-South e-waste trade such as discrepancies in environmental regulation and labour costs are intensified in the Israel-West Bank case by the geographic proximity and exclusive one-way transfer between e-waste importer and exporter. Moreover, burgeoning policy debates regarding the ethics and logistical procedures for North-South e-waste trade are directly engaged between importer and exporter in the Israel-West Bank case. Thus, this case study provides an insightful opportunity to deepen understandings of the tensions and dynamics of more dispersed and diluted instances of transboundary e-waste flows and extend lessons to analogous informal hubs dependent on e-waste importation.

Debates wrestling with the ethical questions of North-South e-waste trade have been driven by a mix of academics, journalists, NGOs, and national governments that are often distant from the environmental and economic impacts of informal e-waste hubs. Missing from these debates is the perspective and volition of e-waste dependent

communities that are most directly affected by international e-waste trade policies. Throughout this dissertation research, a clear divergence emerged between the policy stances of national governments and NGOs, which are distant and not directly affected by the economic or environmental repercussions of this industry, and the local community's desire to regulate and formalize an e-waste industry.

National and international policy stances on e-waste trade stem from the BAN Amendment to the Basel Convention, which has created rigid binary regulations that restrict the movement of hazardous waste (including several e-waste components) from OECD to non-OECD countries. A critical limitation of such universal solutions is that they tend to imagine everything being the same everywhere, overlooking the uniqueness and fluctuating dynamics of specific places and situations. For example, Lepawsky (2015) demonstrates the bi-modal imaginaries embedded in the Basel Convention, which crudely groups all countries into one of two categories based on inclusion in the OECD creating some strange outliers like Singapore and Hong Kong classified as "poor" countries. In the Israel-West Bank case, it was only in 2010 that Israel joined the OECD and in 2012 that the United Nations recognized the State of Palestine and granted the status of "non-member observer state". Thus, prior to this, the transfer of e-waste from Israel to the Palestinian Territories would not have violated the Basel Convention since Israel would have been a non-OECD country transferring e-waste to another non-OECD country.

To some, these bans have been labelled discriminatory, denying entrepreneurs access to valuable resources based on their ethnicity (see WR3A.com). If non-OECD countries manufacture the bulk of the world's electronics, is it appropriate to deny them access to recycle these same electronics to recover the much needed secondary resources as inputs for new products? An alternative and more appropriate approach might base trans-border e-waste movement on the merits of the destination facility, regardless of what state it is located in, rather than holding the state as the sole requirement. If e-waste processing facilities, whether located in OECD or non-OECD countries, can recycle e-waste adhering to national and international environmental standards then regulation at the scale of the state may become irrelevant.

Directions for Future Research

The conclusions presented in this dissertation open a range of questions for future research to refine and expand upon both the Israel-West Bank case and North-South e-waste trade more broadly. Regarding the Israel-West Bank e-waste trade, The West Line community's desire to regulate their e-waste industry raises questions relating to the viability of effectively formalizing a deep-rooted informal sector considering the challenging geopolitical climate. Even if previously discussed stakeholders unequivocally share the desire to regulate this industry, are there sufficient resources and administrative capacity to enable such a transition to occur? What forms of external support, if any, are necessary to facilitate a regulated cross-border e-waste trade? What incentives and penalties are available for Israeli and Palestinian authorities to drive informal e-waste

businesses to transition to formal operation? Future research that analyzes the practicality of an industry-wide formalization would make clear whether the development desires of the local community are mere fantasy or a feasible community development goal.

More broadly, while this dissertation adds the critical perspective of a community dependent on imported e-waste to debates and discussions in the e-waste literature, it only considers the perspective of one informal e-waste hub. Additional case studies that strategically define the development goals of the poor and unrepresented in international e-waste discourses will serve to determine whether or not the West Bank case is an anomaly or if such stances towards industry reform in e-waste dependent communities are a common occurrence. In line with the overarching thrust of this dissertation, discerning the development desires of e-waste dependent communities presents a fundamental moral compass to guide international e-waste trade policy.

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Appendix 1: Community Representative Profiles

Community Representative 1 (CR1)

CR1 resides in Deir Samet, has completed a Master's degree in non-profit organization management, and has been the head of a large community organization for three years, and has worked within the local municipal authority. This society delivers projects aimed at improving the environment, health and income of families in the Al-Yassaria region. Apart from her involvement in the organization, CR1 has first-hand experience of the economic benefits of the e-waste and used materials industry in her village as her husband has worked in dismantling e-waste for many years.

Community Representative 2 (CR2)

CR2 was born and raised in Idhna and is an active member of the society for higher education, which is a member organization of a conglomerate of civil societies working to raise awareness of the environmental and public health issues of e-waste processing in the West Line. Their efforts have produced a multi-pronged awareness campaign consisting of informational pamphlets detailing the dangers of improper scrap processing, lectures in schools, municipal conferences, and archiving photos and videos of environmental damage from the e-waste industry. CR2 has personally experienced many of the negative impacts of the e-waste industry as many active burn sites are located directly on and adjacent to agricultural land owned by her family, resulting in reduced production and deteriorating quality of many crops.

Community Representative 3 (CR3)

After spending over ten years in the USA, CR3 returned to Idhna three years ago to open a formal business that grinds copper cables as an alternative to burning them. CR3 began this business with the intention to reduce open cable burning in the West Line by operating a cable grinding machine as an alternative to burning. CR3 has been active contacting local scrap yards, the Idhna municipality, as well as the Israeli Civil Administration to promote the operation of his business as an alternative to burning cables.

Community Representative 4 (CR4)

CR4 has worked in the Al-Yassaria municipality for nineteen years as an accountant and public relations officer. This has equipped CR4 with knowledge of the strengths and limitations of the municipality as well as knowledge of past and current efforts the municipality is taking to improve the e-waste industry. Like many residents in the West Line, CR4 has worked in refurbishing and dismantling e-waste on a small scale in the past to earn extra revenue to supplement his salary. CR4 has shown a strong interest in improving the e-waste industry through various initiatives he has supported in the municipality (for example, facilitating improved waste collection, advocating for an e-waste dismantling industrial area), but has found it challenging to enforce changes with limited political control in Area B and C, where Al-Yassaria is located.

Community Representative 5 (CR5)

CR5 is currently the Mayor of the Al-Yassaria municipality (spanning Beit Awwa, Deir Samet and Al Kom). CR5's position as mayor allows for invaluable feedback on the capabilities (and, at times, incapability) of the municipality to enforce policies to improve the e-waste industry. CR5 is well-connected with mayors in other municipalities as well as relevant Palestinian ministries that are developing strategies to decrease the negative environmental and public health consequences resulting from the e-waste industry in the West Line. CR5 is also an owner of a large scrap yard in Deir Samet – one of the few formally operating scrap yards.

Community Representative 6 (CR6)

An elder in his village, CR6 brings a wealth of experience as a community representative as he has lived in Beit Awwa his entire life and has witnessed Beit Awwa transform from a small agriculture based village into the hub of a major e-waste and used materials industry. CR6 has been politically active throughout his life as he was the first mayor of Beit Awwa in the early 1990s and although he is now retired, he still serves as one of the head judges for family law disputes. CR6 and his sons own and operate a used furniture and electronics shop in Beit Awwa.

Community Representative 7 (CR7)

CR7 has worked in the e-waste industry for over ten years and owns one of the largest and most prominent scrap yards in his home town of Beit Awwa. His scrap yard has become a social hub for those who work in the industry where many people come to spend time, buy newly imported materials and socialise. CR7 has permission to enter Israel, which allows him to collect and transport e-waste and used materials from Israel to his scrap yard in the West Line where his sons work to refurbish restorable products and dismantle unsalvageable products to recover raw metals.

Community Representative 8 (CR8) (dropped out during phase 2)

CR8 has worked dismantling and refurbishing e-waste in his hometown of Beit Awwa for over seven years, ever since he was no longer able to obtain permission to work in Israel. CR8 began working for his brother in a dismantling and refurbishment scrap yard, where he acquired skills in refurbishing electronics. After several years of working for his brother, CR8 opened his own business specializing in repairing computers, computer screens and other electronics. CR8 dropped out of the participatory project after the second phase due to time constraints.