Full length article

A model for partnering with the informal e-waste industry: Rationale, principles and a case study

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A B S T R A C T

Various forms of informal activity have long played an under-recognized yet substantial role in solid waste management, especially in developing countries. In particular, informal activity is prominent in the electronic waste (e-waste) sector, whose volume and impacts have grown rapidly over recent decades. While the worrying aspects of informal e-waste recycling have been widely discussed, less attention has been given to its positive potential and to its relation to formal e-waste actors and policies. These topics have direct implication for pathways for transitioning from informality, and, in particular, ways in which informal recyclers can build on their strengths while beginning to operate in cleaner ways that retain livelihoods while reducing ill effects.

In this paper, we draw upon extensive field work as well as secondary literatures to offer a taxonomy of management stances towards informal e-waste practices. These range from hostility through disconnection to interaction and, finally, synergy. Our recommendation is for the latter since the informal sector has important strengths and merits, as well as its harmful aspects, while formal approaches that ignore or attempt to squelch the informal sector do not yield constructive outcomes. Specifically, we suggest an incremental ratcheting synergistic model that draws on the respective strengths of both sectors to forge a genuine partnership between them. We describe six key elements of this model, and illustrate it through application to the Israeli–Palestinian context we have studied in depth. In particular, we show how the treatment of copper cables, now one of this industry's largest and most harmful segments, can be improved through an incremental series of synergetic solutions that preserve or even improve livelihoods of informal recyclers while greatly reducing their health and environmental impacts.

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1. Introduction

While electronic and electrical waste (e-waste) is increasingly processed by formal and regulated institutions, much – and in many places, the majority – is processed in less formal channels. Historically, informal scrap networks have generated income by collecting, extracting and selling recyclable materials, thereby playing an important role in solid waste management, especially in developing countries (Medina, 1997; Wilson et al., 2006). In the past 10–20 years, increased electronic waste has become an important and profitable component of the 'scrap system' at domestic and international scales. The e-waste fraction of this informal scrap trade is of exceptional environmental and health concern as the

high inherent value and complex composition, including highly toxic materials, and lack of regulation or oversight make harmful dismantling, extraction, and disposal practices prevalent in the informal e-waste industry (Grant et al., 2013; Sepúlveda et al., 2010). For these reasons, and because of economic competition and underlying social cleavages, formal and informal e-waste sectors often have an uneasy relation. It is only recently that studies such as that of Estrada-Ayub and Kahhat (2014) are beginning to give us detailed accounts of the scope, complexity of stakeholders and decision-making, and frequently cross-border dynamics of the informal e-waste sector, and of its seamless interfaces with more formal channels.

While informal e-waste flows and processing are a global phenomenon, in this paper, we discuss an almost unknown local instance of this, the Israeli–Palestinian e-waste system. For over 15 years, Palestinians have been entering Israel to informally collect e-waste among other used items that can be sold, refurbished or recycled. This is brought to an extensive informal industry concentrated in three Palestinian villages in south-west Hebron (Idhna,

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Deir Samet, and Beit Awwa) where about 80% of the population is directly or indirectly dependent on this economy (Davis, 2013). This transboundary economy has created a longstanding and important source of livelihood in the West Bank, while developing a massive and efficient e-waste collection network in Israel. However, certain dangerous e-waste processing methods have had considerable environmental and health costs, with the tension between livelihoods and impacts now reaching a breaking point. At the same time, Israel has recently begun an attempt at regularizing its e-waste management, with a set of regulation and organizational structures, which are increasingly being enforced. This case, in which the conjunction of waste exporter and importer, formal and informal, are particularly close and stark, offers a useful window into the interfaces and dynamics of formal and informal industries in a critical point in time. While the distinctive geo-political context makes the case idiosyncratic in its details, we suggest that many of the dynamics and dilemmas (and, thus, the policy approach we suggest) are of global relevance.

The need for adequate management of e-waste is pressing. E-waste contains over 1000 substances, many of which can be directly toxic upon release or else create toxic chemicals through secondary emissions from open burning (Chan et al., 2007; Wen et al., 2009; Widmer et al., 2005). In particular, heavy metals and organic compounds such as dioxins, furans, and brominated flame retardants can negatively affect the environment and human health if they are not disposed of properly (Brigden et al., 2005; Gullett et al., 2007; Li et al., 2006; Wu et al., 2008), entering the food chain and creating long-lasting effects even after initial exposures have subsided (Bellinger et al., 1992, 1994; Ciesielski et al., 2012). Labourers working in this profession are often part of a marginalized community that are poor, uneducated, lacking basic knowledge of occupational and health risks associated with informal dismantling and have no alternatives to this risky form of employment (Wath et al., 2011). Income from informal e-waste recycling can benefit poor communities, over time, but the resultant disease and environmental degradation can worsen their situation greatly in the longer term.

Beyond the health and environmental consequences of informal e-waste processing, the industry is also often accompanied by the negative employment, spatial, and economic correlates of informality. While earnings can be relatively good in developing country contexts, especially for individuals without formal qualifications (hence the lure of working in a hazardous and often precarious industry), workplaces typically have poor health and safety conditions, job stability and social security benefits, and child labour is prevalent (Prakash et al., 2010; Umair et al., 2015). Regions that host informal recycling hubs often have uncontrolled dismantling and disposal sites, with noise, emissions, and rubbish marring the landscape and causing tensions within communities. The industry is often predicated on criminal and corrupt activities to assure the supply, transport, and sale of materials, and the operation of dubious facilities (Interpol, 2011), while tax avoidance means that revenues are not fed into systems intended to provide broader infrastructures, services, and investments.

While these numerous and worrying aspects of informal e-waste recycling have been widely studied and emphasized its positive aspects and potentials have received far less attention. Similarly under-examined are the pathways for transitioning from informality, and, in particular, the ways in which informal recyclers can build on their strengths while beginning to operate in cleaner ways that retain livelihoods while reducing ill effects.

Thus, e-waste recycling has been able to provide a much needed source of income to populations unable to find formal employment. For example, Duan and Eugster (2007) estimated that in 2005 5 million people were employed in the e-waste re-use industry in China, and in 2007 an additional 0.7 million in the e-waste recycling industry. Strikingly, 98% of these worked in informal businesses. For many, and especially the more vulnerable populations, this source of income provides the basic necessities of life, improving quality of life overall, despite exposure to harmful substances. And, without sidestepping the negative aspects of an unregulated industry, despite (and, partly, because of) their operation outside of formal frameworks, informal scrap workers offer some distinct advantages over their formal counterparts in many phases of solid waste management systems.

On the collection side, informal recyclers have built up extensive and street-tested knowledge of the industry including disposal patterns, current prices for metals, the metal content/value of piles of scrap, etc. and a bottom-up set of collection practices of very fine grained spatial and temporal resolution and responsiveness. In most countries, even ones with developed formal facilities, the informal sector collects an impressively large portion of the e-waste stream, despite operating outside of the formal infrastructures, and, in some cases, against pressures levelled at their "illegal" practices. On the extraction side, low labour costs make manual disassembly feasible, allowing separation of e-waste into purer fractions, with greater recycling efficiency than possible with mechanical separation. When coupled to state-of-the-art refineries, this efficient extraction can yield a high recycling efficiency that lowers demand for mining and extraction of primary materials (Li et al., 2007; Wang et al., 2012), drastically reduces e-waste entering landfills, and eases the costs of municipal waste collection. These benefits are, often, independently viable on the basis of waste sources that cannot be processed by formal systems, at least not in the absence of subsidies.

The challenge we tackle in this paper is how to harness these strengths while reducing negative environmental and health consequences, and, specifically, how to manage the increased and potentially fraught contact between formal and informal sectors that such a hybrid approach would require. On one side, such an arrangement would allow the e-waste management system to drastically increase collection and recycling rates (or, more accurately, increasingly bring existing informal collection under the umbrella of regulation). On the other, such an arrangement can provide a platform for informal recyclers to continue to derive much needed income from their trade at the same time that their contact with the formal sector spurs critically overdue health and environmental improvements. While policies that incorporate the strengths of the informal recycling sector into national and bi-national e-waste management plans are beginning to be discussed and developed (Chi et al., 2011; Rochat et al., 2008; Wang et al., 2012), the pathways, priorities, and processes through which such partnerships would occur are still far from clear. The goal of this paper is to begin fleshing these out, and offer a roadmap of incremental steps combining top-down and bottom-up approaches. Our work, thus, contributes to an emerging dialogue engaging informal recyclers with formal e-waste management (Chatterjee and Kumar, 2009; Chi et al., 2011; Gunsilius, 2010; Rochat et al., 2008; Wang et al., 2012; Yu et al., 2010).

For the sake of clarity, our description and model refer to e-waste processing businesses as either "formal" or "informal," though, in fact, there can be a range of intermediary and blended situations. One end point would be completely formal businesses which are registered and monitored by the government, adhering to a set of e-waste processing standards and paying taxes, while at the other would be completely informal businesses which adhere to none of these formal arrangements. Less clear-cut cases are businesses that are registered and pay taxes, to some extent, but obtain inputs from undocumented sources on a cash basis. Or a well-regarded formal recycling company may rely on informal partners to take and process certain fractions of the waste stream that are marginally profitable within the formal system. In the Israeli/Palestinian case study presented in this article, the informal sector in the West