GAP ANALYSIS ON RESPONSIBLE E-WASTE MANAGEMENT EFFORTS IN INDIA:

Institutional, economic, and technological barriers and the potential role of a sustainability standard to build capacity and help foster solutions

O C T O B E R   2 0 1 8

**A joint collaboration between
Centre for Responsible Business
and the Green Electronics Council**

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Executive Summary

Given challenges in implementing the E-waste Rules to channel greater amounts of electronic waste (e-waste) into environmentally safe recycling channels, some stakeholders consider that a market-based mechanism could help foster greater sustainability in managing e-waste. Recognizing that the informal sector manages up to 95 percent of India's used and obsolete electronics, producers will likely need to foster a network that can help engage the informal sector to meet their recycling targets under India's 2016 EPR-based E-Waste Rules. Additionally, several of the United Nations' Sustainable Development Goals relate to building capacity among informal e-waste workers. Despite current barriers, opportunities exist to shore up and promulgate environmentally and financially sustainable management of e-waste in India. A voluntary sustainability standard can play a role in helping to overcome these barriers.

This report identifies the following current market gaps and barriers:
- Lack of financial and mass balance traceability of e-waste material;
- Lack of infrastructure to safely process metals extraction;
- Lack of awareness among bulk consumers and households;
- Lack of technical capacity among the Central and State Pollution Control Boards, and;
- Potential lack of integration of e-waste management into broader circular economy and sustainability efforts among producers.

The report proposes initial ideas for how criteria in a voluntary standard could address the gaps and posits potential roles for the Centre for Responsible Business (CRB) and/or the Green Electronics Council (GEC) and areas for future research.

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Introduction and Overview

Given current challenges in implementing the Indian E-Waste Rules to channel greater amounts of e-waste into environmentally safe recycling channels, some stakeholders consider that a market-based mechanism could help foster greater sustainability in managing e-waste. As such, the Centre for Responsible Business (CRB) has been working with Green Electronics Council (GEC) since May 2017 to assess current priorities of the government and industry practices pertaining to end of life (EoL) management of electronics in India. In the period 2017-2018, this partnership, in consultation with key stakeholders, explored the process of stakeholder discussions and development of a set of 'criteria' in a standard that could foster capacity building opportunities for EoL management of specific IT products, with an explicit link to the United Nations' Sustainable Development Goals (SDGs).

Recognizing that the informal sector manages up to 95 percent of India's used and obsolete electronics[1], producers will likely need to foster a network that can help engage the informal sector to meet their recycling targets under India's 2016 EPR-based E-Waste Rules. Additionally, three of the SDGs--*Goal 8 (promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all), Goal 9 (build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation), and Goal 12 (Ensure sustainable consumption and production pattern*)--entail building capacity of various actors, including informal e-waste workers.

Thus, as producers engage informal workers through various mechanisms to advance safe electronics recycling, they are also poised to help support or fulfill SDG commitments. In 2018, as a follow-up, GEC and CRB are exploring the feasibility of implementing a set of 'criteria' for end of life management of electronics, specific to India, under an eco-standard for electronic products. GEC and CRB envisage developing criteria that support 'capacity building' to strengthen safe e-waste management across India.

> **Definition:** In this context, 'capacity building' aims to strengthen capabilities among informal workers and formalizing their operations. However, it can also refer to building capacity among other stakeholders and institutions, such as government regulatory bodies and producers themselves, whose involvement is necessary to foster safe and robust electronics recycling infrastructure.

To support GEC and CRB's efforts to develop capacity building standards criteria for end of life management of electronics in India, this report assesses current on-the-ground efforts to implement the recently revised e-waste management regulations in India and identifies

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[1] Ragupathy, L., Krueger, C., Chaturvedi, C., Arora, R., Henzler, M. *E-Waste Recycling In India – Bridging The Gap Between The Informal And Formal Sector.* International Solid Waste Association. 2007. Available online: https://www.iswa.org/uploads/tx_iswaknowledgebase/Krueger.pdf

unresolved issues in driving sustainable e-waste management. To this end, producers and other stakeholders were consulted to learn which types of initiatives they support to meet electronics collection targets under the recently revised E-Waste Rules, especially those that engage informal workers.

The E-Waste Management Rules,[2] based on extended producer responsibility (EPR) principles, requires producers to finance and manage collection and recycling of designated amounts of electronics, based on their sales volumes in India. Yet, various actors contribute to managing electronics collection and recycling in India and numerous historic, socio-cultural, market, and institutional dynamics persist in impacting responsible e-waste management, even under the new regulations. Despite current barriers, opportunities exist to shore up and promulgate environmentally and financially sustainable management of e-waste in India. The role of a voluntary sustainability standard to help overcome these barriers could be explored.

The report first provides a brief overview of dynamics from the past decade until today that impact e-waste management in India. Second, it highlights key gaps in the marketplace, based on recent field experiences and insights from various Indian stakeholders provided from April through August 2018. This section also explores how a voluntary sustainability standard could alleviate such gaps, especially in generating transparency and accountability among all actors in the e-waste value chain to ensure sound EoL processing. This section also briefly explores the potential linkages between e-waste management in India and the Sustainable Development Goals on one hand and the India's Companies Act on the other. Section 135 of the Companies Act requires companies above a certain size and revenue to fund designated corporate social responsibility (CSR) activities (guidance provided in Schedule VII of the Act). Finally, the report proposes potential roles for CRB and GEC in engaging stakeholders to continue to foster solutions going forward and highlights areas for further research, possibly to be conducted by other stakeholders.

The subsequent two deliverables under the GEC-CRB project (2018) will i) propose how draft criteria for a sustainability standard could be revised to better address the current gaps and ii) identify how stakeholders, including government actors, would need to be engaged in a 'market-based incentive structure' to leverage and promulgate the uptake of such a standard for it to be effective. Where appropriate, a more detailed proposed role for CRB and/or GEC may also be further expanded in the final set of deliverables.

Background: Synopsis of E-Waste Management Efforts in India (2008-2017)

Regulatory Overview

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[2] Ministry of Environment and Forests, Government of India. 2018 E-Waste Management (Amendment) Rules. Available online: http://envfor.nic.in/content/gsr-261e22032018e-waste-managment-amendment-rules-2018

Indian stakeholders have been engaged in efforts to manage electronic waste in developing regulations for over a decade. First introduced in 2008, following awareness-raising campaigns by non-governmental organizations (NGOs), such as Toxics Link, and greater attention from multilateral institutions, the government-issued general waste management regulations called for responsible e-waste management. At this time the government also began focusing on efforts to 'formalize' the electronics recycling industry by issuing registrations and e-waste management guidelines. In 2011, the government issued new e-waste regulations,[3] introducing extended producer responsibility, whereby producers were required to collect and recycle electronics. However, no targets were established. By 2014 and 2015, NGOs and other stakeholders heavily critiqued producers for not raising awareness among stakeholders and not meaningfully recycling increased amounts of electronics from either bulk consumers or the general population.[4]

In 2016, the Ministry of Environment, Forests and Climate Change (MoEFCC) enacted revised E-Waste Rules,[5] this time requiring producers to meet targets of 30% in the first two years, with 70% collection rates by the end of seven years. However, industry opposed the benchmarks, and producers lobbied the government to relax the stringency of the required collection and recycling targets. Consequently, in March 2018, after extensive stakeholder input, the MoEFCC revised the Rules again to reduce the required collection targets in the first two years from 30 percent down to 10 percent, though still building up to 70 percent by the seventh year.[6] This time, the Rules also required manufacturers promote awareness so that bulk consumers (institutional purchasers and businesses) and individual households were aware of collection and recycling options. Producers had been working towards complying with the 30 percent collection targets due by end of March 2018. Since the e-waste targets for 2017 were retroactively reduced just two weeks before producers were required to submit documentation of compliance, it remains unknown if producers would have met the initial targets.

In March 2018, the government revised the Rules to reduce required collection targets in the first two years, but still building to 70 percent by the seventh year.

Several stakeholders in India spanning academia, NGO, policymaker and industry contacts relayed that revising regulations soon after they have been enacted is common in India's policy-making landscape (in this case after initial government enforcement actions and concurrent industry lobbying efforts to relax the e-waste collection targets took root). Several producers

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[3] Ministry of Environment and Forests, Government of India. 2011 E-Waste Management Rules. Available online: http://www.moef.nic.in/rules-regulations/e-waste-management-and-handling-rules-2011

[4] Toxics Link, *Time to Reboot I and II*. Toxics Link: New Delhi, India, 2014 and 2015. Available online: http://toxicslink.org/?q=content/time-reboot and http://toxicslink.org/?q=content/time-reboot-ii

[5] Ministry of Environment and Forests, Government of India. 2016 E-Waste Management Rules. Available online: http://www.moef.gov.in/sites/default/files/EWM%20Rules%202016%20english%2023.03.2016.pdf

[6] Ministry of Environment and Forests, Government of India. 2018 E-Waste Management (Amendment) Rules. Available online: http://envfor.nic.in/content/gsr-261e22032018e-waste-managment-amendment-rules-2018

who failed to register their EPR plans with the Central Pollution Control Board (CPCB) (often because they were not aware of the Rules or did not understand them) did so after their imported products were stopped at entry ports in early 2018.

In discussions with stakeholders in 2017 and 2018, many relayed that for years the CPCB and the State Pollution Control Boards (SPCBs) tasked with enforcing the Rules, lacked technical, personnel, and financial resources to do so effectively. The CPCB, for example, has only a small handful of staff to manage the enforcement of the Rules across India and many SPCBs are still not trained in how to enforce them with producers or what criteria to evaluate when issuing permits to entities seeking collection, dismantling or recycling registrations.

> **The Central Pollution Control Board and state pollution control boards tasked with enforcing the Rules lack technical, personnel, and financial resources to do so effectively.**

In late 2017 and early 2018, in response to the enactment of the Rules, producer responsibility organizations (PROs) began to form to help producers meet their requirements under the regulation. Modelled after PROs in Europe and the U.S., PROs in India offer comprehensive compliance services, from negotiating the most cost-effective regional collection and recycling contracts with different recyclers to helping producers meet outreach and awareness raising requirements. In some instances, producers chose to implement their own programs without a PRO, or to contract directly with recyclers. However, for others, PROs represented the most cost-effective way to meet their targets.

Since the concept of a PRO is new in India and different stakeholders do not yet recognize their value proposition, many recyclers bristled at their entry into the market and, as of this writing, view them as competition, not as a conduit for business. Complicating matters, until May 22, 2018, when the CPCB released guidelines[7] for PROs to register officially with the government, PROs were not government-authorized to bid for e-waste at recycling auctions, which are commonly held by informal aggregator-traders who have already collected material from their networks of bulk consumers. As only registered recyclers were authorized to bid for material, PROs needed to purchase e-waste on behalf of producers from the very dismantlers and recyclers with whom they needed to negotiate recycling contracts. Doing so did not lead to collection of new, untapped sources of e-waste from bulk consumers.

> **Producer Responsibility Organizations (PROs), formed to help producers meet their required collection and recycling targets, are new in India.**

With the establishment of the PRO guidelines, new PROs can enter the market, thus creating employment opportunities. Anecdotal feedback from one key stakeholder close to the CPCB

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[7] Guidelines were not available online as of September 5, 2018. Stakeholders should search online as the Guidelines were posted previously.

relayed that the regulatory body was inundated with applications from PROs seeking registrations shortly after the guidelines were released. Though the PRO guidelines outline the expected functions of a PRO, they do not outline the minimum core competencies a PRO should be required to demonstrate. While too many requirements risk stifling a nascent market for PRO services, the lack of clearly articulated core competencies and requirements to avoid conflicts of interest creates a vulnerability where 'fly by night' operators could receive registrations. A similar problem currently exists among unqualified dismantlers who received government-approved authorizations and are operating as 'formal' players in the market.

Producers' Collection and Recycling Programs

Producer-led collection and recycling programs in India aimed at both individual and bulk consumers vary. Some producers, especially the multi-national information technology brands, implemented options for individual consumers to drop off obsolete electronics at customer service centers and provided product takeback options for bulk consumers.[8] After the 2011 E-Waste Rules took effect, many producers also listed information on e-waste recycling options on their website and provided a call-in telephone number to speak with customer service representatives. However, as the NGO Toxics Link found, through its research in 2014 and 2015,[9] many gaps in producers' programs existed, with little consumer uptake and often a lack of awareness of producers' programs from their own employees. Of note, no known producer-led programs engaged informal workers directly.

However, since 2015, with the most recent 2016 (and subsequently revised 2018) Rules in effect, several producers have either contracted with one or several PROs, contracted directly with recyclers under independent producer responsibility schemes, or have participated in a combination of both. The PRO Karo Sambhav publicly lists Apple, Cisco, Dell, Flipkart, HP, Lenovo, and Nokia (HMD) as clients. RLG India also works with major brands but does not disclose their client list. Both PROs have launched additional outreach services on behalf of producers to help them meet their requirements. RLG's *Clean to Green* campaign,[10] financed by producers, seeks to "educate consumers on the benefits of professional recycling and create efficient take-back management systems for producers." Karo Sambhav's educational programs in schools[11] and trainings for bulk consumers seek to increase awareness on the benefits of, and options for, recycling.

Bulk Consumers and Households

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[8] Information based on additional discussions with representatives from two electronics producers in India in May 2017.

[9] Toxics Link (2014 and 2015) Time to Reboot I and II available at: http://toxicslink.org/docs/Time-to-Reboot.pdfand http://toxicslink.org/?q=content/time-reboot-ii

[10] https://cleantogreen.in/

[11] http://voiceofsikkim.com/2018/03/09/workshop-on-karo-sambhav-school-programme-for-teachers/

"The Indian consumer always sees value in a defunct product, even if it can't be repaired," relayed one electronics manufacturer interviewed in 2017, echoing the sentiment of most other stakeholders interviewed on a previous field visit in 2017 and again in 2018. "People expect to receive that value, either in [a manufacturer or retailer] exchange program where they receive a discount on the purchase of a new product, or via payment for their used goods directly from the kabadiwaala [collector]. This is done across the society, regardless of socioeconomic level," the stakeholder noted.

Consumer expectations- both among individuals and bulk consumers- to receive payment for their obsolete products create two challenges for fostering more environmentally sustainable recycling economies. First, as people retain used products for longer periods of time, reuse and refurbishment opportunities—which are often more lucrative than dismantling and recycling-- also decrease when older technologies lose value in secondary markets. Second, the need for collectors to pay consumers for their used products means that they will then sell the material on to dismantlers and aggregators who can also offer them the highest price. Since the dismantler or aggregator will favor the downstream informal recycler, who can also offer a comparatively higher price than can the formal recycler, the latter is limited in gaining a financially sustainable footing in today's marketplace.

Other stakeholders, such as one representative from Chintan, an NGO experienced in working with the informal e-waste sector, are more optimistic. Chintan found that consumers' minds could be changed, where (with the right communications and awareness raising efforts) individual consumers would turn in their obsolete electronics for recycling at collection points without needing payment.

The Informal Sector

Against this policy backdrop lies an informal collection, dismantling and recycling economy that has been managing the majority of India's e-waste for, at minimum, over a decade.[12] Much domestic and international attention has focused on the health and environmental hazards of crude recycling techniques, much of which happens 190km east of Delhi in the city of Moradabad, a former brass-making hub which has shifted to extracting valuable metals from printed circuit boards.[13] Increased attention on the negative impacts of informal processing succeeded in raising awareness among policymakers and the public. In tandem with international promotion of EPR-based legislation to Indian policymakers from EU-based international institutions, awareness-raising efforts helped lead to the evolution of e-waste regulations in place today.

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[12] Arora. R. *Informal to Formal Recycling Linkages: Experiences in India (GIZ)*. Presentation, World Resources Forum, Geneva, Switzerland. October 24, 2017. https://www.wrforum.org/wp-content/uploads/2017/11/2017-10-24-Arora-informal-sector-India-WRF.pdf

[13] Centre for Science and Environment. *Recommendations to Address the Issues of Informal Sector Involved in E-Waste Handling: Moradabad, Uttar Pradesh*. Centre for Science and Environment: New Delhi, India, 2015.

> **Multilateral institutions began funding pilots within the last decade to engage informal workers to collect e-waste and channel it to formal recyclers for safe processing.**

Approximately nine years ago, multilateral initiatives began to engage informal workers for their prowess in collection and light dismantling, with internationally funded pilots in Delhi and Bangalore in 2009-2011 and subsequent efforts supported by the World Bank Group's International Finance Corporation (IFC) to channel material from the informal sector to formal recyclers who would ostensibly process it safely.[14] Stakeholders today acknowledge the key role that informal collectors play; they are often called 'last mile collectors' due to their expert reach in gathering used electronics more efficiently from smaller sources (such as repair shops) than formal recyclers are able to do. Producers also recognize that they will likely need to engage informal workers under the revised E-Waste Rules, since current volumes managed by any contracts with bulk consumers do not suffice to meet their targets.

However, as pilots have shown[15] over the past eight years, informal networks are well-ingrained and stubbornly difficult to change for several reasons, making penetrating them to redirect e-waste away from informal harmful recycling an uphill task.

First, formal (or registered) recyclers often cannot match prices informal recyclers offer aggregators. Informal recyclers- often those based in the main Delhi and Moradabad scrap trading markets-- lack operating costs, overhead, or other administrative necessities that formal recyclers must undertake and therefore cannot compete on offering higher prices for material, especially high value electronics with precious metals content.

In 2009-2010, Germany's Deutsche Gesellschaft fuer Internazionale Zusammenarbeit (GIZ) fostered a pilot in Bangalore to improve e-waste management and collection by leveraging informal workers to collect electronics and direct material to safe processing by a designated registered recycler who received government support and funding. Lessons from the pilot found that formal recyclers faced challenges when working with informal partners as most informal collectors required up-front cash payment. The formal recycler further sold material to an overseas metals extraction facility and usually didn't receive payment for several months, thus making it difficult to maintain a positive cash flow.[16] Other formal

> **Formal (or registered) recyclers often cannot match prices informal recyclers offer aggregators.**

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[14] Deutsche Gesellschaft fuer Internazionale Zusammenarbeit (GIZ). Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management; GIZ: Eschborn, Germany, 2011. Available online: https://www.giz.de/en/downloads/giz2011-en-recycling-partnerships-informal-sector -final-report.pdf

[15] Lines, K.; Garside, B. Clean and Inclusive? Recycling E-Waste in China and India. Issue Paper. Toxics Link and IIED. March 2016. Available online: http://toxicslink.org/docs/IIED%20pub.pdf

[16] Based on May 15, 2018 interview with T.S. Krishnan, academic at IIM Bangalore, whose dissertation examines the formal-informal sector dynamic in Bangalore in 2009-2010.

recyclers also received either support from the government or multilateral institutions such as the IFC, where payments to aggregators were subsidized to be able to compete with informal recyclers. In all instances thus far, formal recyclers have struggled to expand their operations profitably because they cannot access the volumes needed at a price point they can afford.

> **Informal e-waste management networks are intricate and built on religious and kinship ties. Thus, outsiders seeking to work with informal workers must cultivate greater trust at the outset.**

Second, informal e-waste management networks are intricate and built on community trust and kinship ties. Many e-waste collectors, aggregators, dismantlers and recyclers are Muslim, are related through extended families, and have been engaged in the materials scrap trade since mid-last century (they helped start the e-waste trade in India within the last 20 years). Most business is conducted in cash only, where traders often travel long distances to complete deals, most of which occur in Delhi. Many use the informal Hawala system to transfer large sums of cash, otherwise too precarious to carry when traveling. Traders have deep linkages to other family members based in key aggregation hubs such as Mumbai, Bangalore, Chennai and Calcutta. The larger the aggregator, the more leverage he wields to conduct deals (aggregators and traders are usually men; few women traders exist in India's informal e-waste markets, although more women are found in the formal sector[17]). Recyclers from Moradabad venture into Delhi's Seelampur and Mustafabad neighborhoods for several days to conduct business, often returning with truckloads full of printed circuit boards and other high value materials. Since the trading community is close-knit, formal recyclers and those seeking to trade with them face additional hurdles of needing to establish trust as newcomers and outsiders to the community. While religious differences do not usually impede trade between Muslim informal aggregators and (usually) non-Muslim formal recyclers or PROs, greater trust needs to be carefully cultivated where kinship or religious ties do not exist.

Despite the insular nature of informal e-waste markets, all informal and formal stakeholders interviewed in 2017 and 2018 agreed that price and follow-through on payment remains the most important factor when conducting business. Though most informal workers still currently

> **With informal workers, price and follow-through on payment remains the most important factor when conducting business**.

operate under the radar in a cash-only economy, business as usual is changing with a new tax regime, GST, implemented in July 2017. The new tax framework eliminated the VAT and taxes goods throughout the value chain, such that now vendors need proof of sale, thus creating transparency and making tax evasion more difficult. In this way, some informal workers are (willingly or unwillingly) becoming formalized by registering with government authorities through the GST tax regime.

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[17] Based on a discussion with Chintan representative with over a decade of experience working with informal e-waste workers. August 22, 2018.

Informal aggregators drove up e-waste prices once the annual deadline for fulfilling producers' collection and recycling targets drew near.
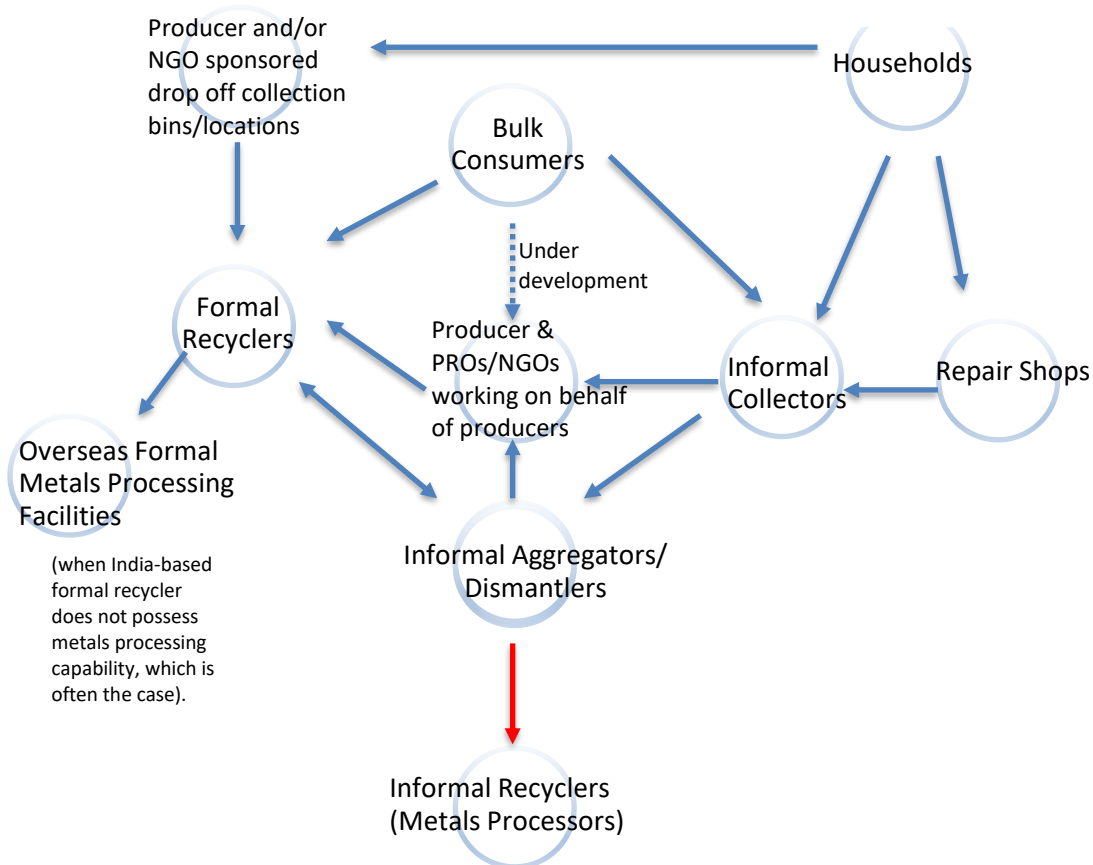
A recent market dynamic also emerged in late 2017, after informal aggregators learned that an infusion of producer funds entered the market to meet their EPR targets. Until then, informal workers were mostly unaware of the E-Waste Rules. With this new knowledge, informal aggregators often withheld material from recyclers and PROs seeking to purchase it on behalf of producer clients until March 2018, when the 2017-2018 targets were due to be fulfilled. In doing so, informal workers drove up the price, knowing they had a captive clientele. Some producers paid the higher costs; others faced internal challenges as they were not able to budget predictably to meet their collection and recycling requirements under the Rules.

Summary: Flow of E-Waste in India

Figure 1 demonstrates how e-waste is typically collected, aggregated and dismantled, traded, and recycled under current market dynamics in India. Some exceptions may also exist.

Figure 1. Flow of E-waste across Actors in the Value Chain (assessed mid-2018)

Potential Role of a Voluntary Consensus Sustainability Standard to Build Capacity

Over the past decade, voluntary ecolabels for electronics have given purchasers a mechanism to demand more sustainable products that exceed product-centered environmental regulations, namely ones that are even more energy efficient, made with fewer harmful substances, and recycled responsibly at end of life. These tools, such as EPEAT, a global ecolabel for the IT sector helped steer markets to supply more products that provide greater environmental benefit. According to GEC that manages the EPEAT program and product registry, "over their lifetime, the 1.12 billion EPEAT-registered electronics purchased globally since 2006 will deliver significant environmental benefits. Compared to products not meeting EPEAT criteria, these electronics will result in the reduction of 38.8 million metric tons of greenhouse gasses, elimination of 670,484 metric tons of hazardous waste, and will reduce solid waste by the equivalent of 291,913 U.S. households' annual waste."[18]

Dozens of governments, enterprises, and educational institutions worldwide specify EPEAT as a purchasing requirement or preference for all applicable device categories. EPEAT-rated electronics require sound EoL processing and call for products to be more easily disassembled. Much of the EoL criteria are adapted from existing recycling standards, primarily the R2 standard, managed by the Sustainable Electronics Recycling Initiative, or E-Stewards, managed by the Basel Action Network. The criteria focus on the sound management of e-waste at the facility level or limit exports, however they do not account for engaging informal economies to help in collecting and dismantling e-waste responsibly, nor do they build capacity among informal workers to help formalize them or improve their recycling infrastructure and practices.

Yet, a voluntary standard seeking to foster more sustainable electronics by including improved EoL management must account for the aforementioned realities to be relevant to the Indian market and regulatory environment. In addition, since the E-Waste Rules are mandatory, any voluntary standard in India would need to devise criteria that complement regulatory requirements and could potentially address larger issues related to circular economy, the SDGs, human rights impacts, and other broader priorities. Thus, different opportunities could exist for different users of a voluntary standard. Manufacturers may design products that provide additional benefits beyond compliance and institutional purchasers could leverage a standard to help them meet environmental goals.

> **Any voluntary standard seeking to foster more sustainable electronics by including improved end of life management must account for the aforementioned realities to be relevant to the Indian market and regulatory environment.**

However, stakeholders should note that for some Indian electronics producers, global voluntary standards and global procurement preferences may not provide enough incentives to support

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[18] http://greenelectronicscouncil.org/epeat/epeat-overview/

more sustainable e-waste management. Many IT and electronic products manufactured by Indian firms are only sold and consumed domestically, not traded overseas. Conversely, for multinational electronic producers, export considerations could play a stronger driver in considering e-waste management practices.

Gap Analysis Conducted in Spring-Summer 2018

Methodology

A gap analysis of current e-waste management by different stakeholders provides insights on what kinds of capacity-building criteria would most effectively promote sound EoL management of electronics and help spur greater environmental sustainability in India's electronics recycling markets. While the analysis initially explored how producers were implementing their compliance to the E-Waste Rules in ways that engaged informal workers (or not), on-the-ground observations and interviews with different stakeholders revealed some institutional and market dynamics over which producers have limited control to change. The author conducted primary research by interviewing via phone or in person stakeholders listed in Appendix A between April 2018 and August 2018. The author also consulted previous research and analysis listed in Appendix B.

Gap Analysis Findings & How Capacity Building Criteria Could Address These Gaps

The findings below highlight current gaps and posit ideas for how capacity-building criteria in a voluntary standard (to which producers would certify and that purchasers would use) could help ameliorate them. Findings demonstrate that 'capacity building' need not be limited to the informal sector, but also applies to formal market and regulatory actors to foster systems better equipped to deliver environmentally sound EoL management of e-waste.

Finding 1: The inflow of new funds from producers to meet their collection targets under the E-Waste Rules, coupled with missing enforcement, transparency, and traceability of e-waste flows has led to perverse market incentives. As a result, a potentially significant amount of e-waste is not being channeled to those who recycle it in an environmentally safe manner.

According to two PROs operating in the Indian market today, several formal (government-registered) recyclers with whom they are contracting—namely those who are government registered—procure e-waste from informal markets or from bulk consumers. These recyclers provide PROS and producers with certificates of destruction to verify that they collected and safely recycled e-waste. However, in reality, as the PROs discovered, several of these recyclers then re-sold the material back into the informal market, sometimes unknowingly to the same aggregators that sold them (or someone else) the e-waste in the first place. One informal aggregator based in the e-waste trading hub Seelampur and who works with one of the PROs

relayed, "I bought back my own e-waste. I recognized it from the way it was bundled. The recycler didn't even bother to remove the tags."

In these instances, several stakeholders surmised that a lack of traceability of waste flows make reselling e-waste easy to disguise. The PROs only learned of this activity due to their relationships with informal aggregators, not because of detecting aberrations in the documentation. As such, e-waste travels in a circular motion between aggregator and recycler, paid for potentially multiple times by producer funds. Some stakeholders point to a lack of trust among market actors and a proliferation of ingrained, short term-thinking as reasons why formal recyclers would subvert the market so early in the enactment of the E-Waste Rules. Given the influx of available funds, some stakeholders relayed that it may be too tempting for recyclers not to try to take advantage of the cash flows, especially in the context of weak regulatory enforcement.

PROs began to discover a second problem. In limited instances, some formal recyclers issued certificates of destruction for processing the same pile of e-waste on behalf of different producers. Thus, multiple producers would have paid for recycling one pile of e-waste, thereby all laying claim to the same pile, not multiple piles. In India, over the past few years, several recyclers have claimed capacity to process a certain amount of e-waste tonnage when they lack the ability to do so. As part of the government registration process, many formal recyclers have received permits to operate their facilities based on future-looking capacity, not current conditions. For example, some recyclers have permits for processing up to 20,000 tons of material per annum, when, in reality, their facilities may only be able to process 5,000 tons.

Previously, stakeholders relayed that government registrations were given based on the assumption of more rapid growth in the formal sector, where companies were expected to expand their operations. Less optimistic stakeholders cite corruption and bribery as reasons for why some recyclers have operating permits that do not reflect their capacity. As such, some formal recyclers are able to demonstrate on paper to potential producer clients that they are able to process a certain tonnage, despite not being able do so. Since certificates of destruction that producers receive currently do not demonstrate traceability of financial flows to a dedicated pile of e-waste, recyclers are more easily able to mask any double counting.

Instituting both a financial tracking and mass balance tracking system would help reduce corruption in the formal sector. Improving the traceability and transparency of recyclers' destruction claims would help ensure that specific amounts of processed e-waste are correctly allocated to each producer.

How Could Capacity Building Criteria Help Solve this Problem?
Any standard for EoL processing criteria in an eco-standard designed for the Indian market should require recyclers to participate in a financial and mass balance reporting system for EOL processing. 'Capacity building' today in India does not only apply to formalizing the informal sector, but also to improving business practices among registered, 'formal' recyclers.

Finding 2:   Lack of metals extraction capability among formal recyclers coupled with the current government-issued stay on e-waste exports to foreign smelters is channeling e-waste back into harmful informal, local recycling markets.

Where e-waste flows are not circulating between recyclers and aggregators, when sold to EoL metals processors, the material usually ends up in the Moradabad market, the very place regulatory, NGO, producer and multilateral efforts have long sought to contain. Two reasons explain why this is happening: lack of sufficient formal metals processing infrastructure and a premature ban on exports.

First, most formal, registered recyclers in India are dismantlers in practice, with no capabilities to extract precious metals. Three known recyclers in India have claimed to extract the gold, palladium and other metals from printed circuit boards or other materials: one which is no longer operating in India; another, which has a small-scale metals processing pilot facility, has not been known to extract large quantities of metal from e-waste; and a third, foreign-owned facility with whom several producers contract. Different stakeholder representatives, including one producer and one PRO, relayed that they witnessed the third facility's metal extraction in operation. All other recyclers are either trying to build the capacity to extract metals, a venture that could cost billions, or they mostly export their material to global smelters, of which five exist globally.

Starting in late 2017, one overseas smelter relayed that recyclers experienced difficulty accessing the government issued waivers necessary to export material to the facility. Since India is a signatory to the Basel Convention, where e-waste exports are banned, the MoEFCC must grant a waiver to allow certain e-waste material to be exported. In Spring 2018, several stakeholders also confirmed that e-waste exports were delayed, and surmised that the government's interest in ensuring greater metals security motivated the new policy. Since India is a significant gold consumer, any gold containing e-waste material, namely the PCBs, could ostensibly contribute to greater metals security in the country. Given the focus on materials security by Niti Aayog,[19] the National Institution for Transforming India (a government entity), an opportunity exists for stakeholders to discuss how policy makers can help foster better extraction of valuable materials from e-waste.

Thus, a stay on e-waste exports to safe overseas processing facilities before India has built the infrastructure that can safely process the material in country has created a funnel back to Moradabad, where informal recyclers continue to extract metals under hazardous conditions. Under these conditions, informal recyclers, who already offer competitive prices for the material, do not have international competition from smelters for processing the e-waste. Paradoxically, as noted by stakeholders, the MoEFCC is both responsible for enacting the E-

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[19] Niti Aayog. NITI Aayog and EU delegation to India release the Strategy on Resource Efficiency (RE), November 30, 2017. Available at http://pib.nic.in/newsite/PrintRelease.aspx?relid=174013

Waste Rules and for issuing a stay on exports, which has resulted in a greater supply of material to informal recyclers.

Stakeholder Proposals for Potential Solutions
Government and multinational institutions have explored different ideas to strengthen environmentally safe EoL metals extraction, especially ones involving informal workers, and to create stronger linkages between scrap markets to improve domestic resource efficiency.

- *Small-Scale Processing Capacity*

For years stakeholders have wrestled with how to bring informal metals extractors (recyclers) into the formal sector. The dearth of metals processing capability limits how many informal workers could work directly for formal metals processors. Most informal workers also prefer to remain independent entrepreneurs and would not want to work for formal sector employers. As an alternative, the Ministry of Electronic and Information Technology (MEITy)'s Centre for Materials for Electronics Technology (C-MET) developed a small-scale machine[20] based in Hyderabad that can ostensibly process approximately 100-150kg of PCBs and other metals-containing material at a time. MEITy has suggested, in public stakeholder fora, that informal workers bring material for processing to the facility at no charge. Informal workers would be able to resell material refined at a higher yield. At this time, the proposal lacks a viable business model, as most informal metals recyclers reside in Delhi or Moradabad, hundreds of miles from Hyderabad, and most workers would not want to wait their turn for their yields to be processed. In August 2017, MEITY held stakeholder consultation sessions with informal recyclers in Moradabad to explore an interest in bringing small scale processing capacity to their community. In May 2018, MEITy officials relayed positive feedback from informal recyclers and indicated they plan to hold future consultation sessions in Moradabad, however, they have not yet proposed business models to transition informal recyclers to use environmental sound infrastructure. Some stakeholders have suggested that MEITy, or another governmental or non-governmental entity, develop a program that offers low or no interest financing to informal workers to establish small recycling units, allowing them to develop their own revenue models.

- *Formal Sector Support*

For years, government subsidies supported the development of a few recyclers with metals extraction capabilities. New recycling companies seeking to build out metals extraction capabilities quickly encounter high costs and complexity in developing viable processing equipment,[21] such that they often remain focused on dismantling, sending the materials overseas for further processing. Despite government investment, one recycler, allegedly, has not been able to scale up operations and output. A representative at a foreign-owned recycler and metals processer with a large operation India relayed that, despite its processing capacity, inconsistent quality of the e-waste collected limits quality metals output. Much of the material purchased from the informal sector has been picked over, where scrap with higher metals

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[20] http://meity.gov.in/content/electronic-components-materials-division-projects
[21] Based on discussions with one Bangalore-based recycler and a PRO corroborating the information in May 2018.

content is sold to informal processors instead. Formal recyclers must also process lower value scrap, such as plastics, which add operational costs, potentially offsetting revenue generated from metals sales. Finally, though the foreign-owned recycler maintains direct contracts with bulk consumers, its facility nonetheless receives more limited quantities of high value material.

- *Ecoparks*

For several years, stakeholders identified 'eco-parks,' or designated industrial and manufacturing zones, as a potential solution to coalesce informal activities into a more formalized infrastructure. Eco-parks could also co-locate different scrap industries to leverage similar recycling processes for different waste streams and thereby create trade efficiencies.

Currently, as part of broader efforts to promote resource efficiency and greater circularity in the economy, the EU is exploring the viability of fostering ecoparks within informal communities to manage e-waste, since informal workers may be unlikely to re-locate their activities to new industrial parks far from their homes from which many operate.

A second approach would co-locate different production and processing industries, including e-waste, into designated eco-parks. Newer stakeholders to the resource efficiency and circular economy discussions, such as Niti Aayog, are examining together with the EU and other stakeholders how to improve India's production capabilities and recycling economies of scale from various scrap sectors[22,23] that include e-waste and auto scrap. Based on anecdotal discussions with multilateral institutions, stakeholders consider that initiatives to improve e-waste management would garner greater support if incorporated into more comprehensive production strategies. They expressed concern over 'issue fatigue,' especially now that India's E-Waste Rules are in effect, which may mislead stakeholders to conclude that problems in safely managing e-waste have been resolved (when this is not yet the case).

Both approaches—bringing eco-parks to informal communities and creating eco-parks for diverse waste processing capacities—would require government support, namely developing conducive policies and financial incentives to offset investment risks and coordinating among federal, state and local governments to build the eco-parks. Yet, unlike the public-private partnerships and government incentives which helped create IT parks and special economic trading zones in cities such as Bangalore and Hyderabad, the government has not, to date, engaged the waste management and scrap processing and trading sectors to replicate such economic development. The scrap industry is often dominated by small, independent informal workers, whereas large multinational corporations provided resources to help develop India's current industrial zones.

How Could Capacity Building Criteria Address this Gap?

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[22] http://pib.nic.in/newsite/PrintRelease.aspx?relid=177893
[23] http://niti.gov.in/writereaddata/files/document_publication/StrategyOnResouceEfficiency_0.pdf

Given the need for government support to foster the development of eco-parks, producers are currently limited in their ability to help coalesce scrap processing industries into concentrated production zones or to transfer technology to informal workers due to high administrative costs, regulatory hurdles, and other barriers. Some producers expressed that fostering such initiatives and helping to develop stronger recycling infrastructure is not their responsibility nor their strength. However, should eco-parks be developed in the future, producers could engage their PROs or other organizations to help with skilling informal workers to use specific technologies. In the near term, absent the growth of eco-parks, producers could still assist informal collectors and dismantlers in business development, accessing financing, and acquiring other key skills necessary to develop sound e-waste handling options. However, for informal recyclers (metals processors) producers could support and help finance any pilot efforts that seek to bring new technologies into informal communities to test out the possibilities for creating safe metals processing capacity. Any such efforts would need to address challenges in curtailing pollution and reducing health and environmental externalities given weak local institutional enforcement.

Finding 3. Despite previous subsidized market-based pilot interventions, informal collectors, dismantlers, and aggregators continue to generate higher profits selling material to informal recyclers instead of formal recyclers. Based on one PRO's work with informal collectors, dismantlers, and aggregators, specific interventions can begin to shift selling behavior into formal channels. Interventions should be tailored to the informal worker's role in the e-waste management hierarchy and the geographic market in which he or she operates. Any NGOs with whom producers, PROs or recyclers partner to reach informal workers may need initial training to understand India's e-waste trading markets.

Targeting Informal Workers Lower in the E-Waste Value Chain Hierarchy

The e-waste value chain reflects intricate relationships between collectors, dismantlers, aggregators and recyclers. The aggregator market is well established and difficult for newcomer dismantlers and aggregators to penetrate since trading ties are often kinship-based or long-standing. Lower level aggregators may specialize in gathering and dismantling one or two e-waste items, often lower value ones, such as keyboards or CRTs. They often have smaller warehouses or dismantle material from their homes. Larger, more powerful aggregators may specialize in several e-waste items, usually trade in large quantities, and often store material in larger warehouses. Smaller aggregators can take three to five years to establish a firm footing in the market, whereas others never grow their business beyond trading a few types of e-waste.

Starting in late 2017, Karo Sambhav, a PRO with e-waste management contracts with large producers including HP, Lenovo, Dell and Apple, began to foray into informal markets to try to purchase material from lower level aggregators. More powerful aggregators can charge higher prices due to a steady supply of buyers, whereas smaller, less established workers may have fewer buyers and might be willing to sell material at a lower price. Karo Sambhav staff found that while they still needed to match the prices of other buyers with smaller aggregators, other interventions helped solidify trading relationships.

Karo Sambhav began experimenting with ways to engage informal workers and build trust among them. Several of Karo Sambhav's field staff have a background in social work, community organizing, or international development and leverage their expertise to build relationships. (Note: the PRO RLG was also interviewed, where staff relayed that the company was not, at the moment, engaged in social transformation).

Most transactions in the informal 'gray market' are cash-based. Smaller aggregators shared stories of being short-changed by traders, who sometimes disappeared before making the final cash payment. Thus, once Karo Sambhav had made a few initial small trades, they eventually convinced some workers to transition to digital payments, and helped workers establish bank accounts and register their GST tax information. Some workers began to prefer digital payments once they saw money deposited immediately into their bank accounts, thus alleviating stress over the security risks when carrying large sums of cash. In this way, Karo Sambhav has helped 'formalize' these aggregators and dismantlers, (depending on how one defines 'formal').

Once smaller aggregators began to work more exclusively with Karo Sambhav, staff helped some with business development and public presentation skills as several aggregators sought to expand their businesses. Aggregators interviewed relayed the spillover benefits of accessing digital bank accounts, new business development skills acquired, and, in some cases, confidence they gained that they can apply to other areas of their lives. Some aggregators are currently expanding their businesses to trade in different kinds of e-waste and/or are seeking to set up dismantling facilities.

Geographic Differences in E-Waste Markets May Impact Effectiveness of Interventions

India's e-waste markets differ geographically, and therefore interventions to engage informal workers will vary in their effectiveness. For example, since Delhi is the largest e-waste trading market in the country, aggregators of all sizes converge in the Seelampur and Mustafafad neighborhoods and trade with Moradabad-based recyclers who come into Delhi for several days. Material traded in other markets, including larger e-waste hubs such as Calcutta, Mumbai, Chennai, and Bangalore, eventually leads to Delhi, where most of the workers also converge. In the large IT hubs of Bangalore, fewer small aggregators exist, as attested by Karo Sambhav's on the ground e-waste NGO partner. As such, in Bangalore, Karo Sambhav staff found it more difficult to engage larger aggregators who already had established relationships with bulk consumers in the IT sector. Such aggregators did not need assistance such as setting up digital bank accounts or tax identification. Thus, opportunities to implement interventions to help formalize smaller aggregators may be limited outside Delhi, unless they also exist in untapped markets. At the time of this writing, Karo Sambhav has been seeking to engage smaller aggregators in other cities across India.

NGOs need training

In addition to working with smaller aggregators to collect and process e-waste on behalf of producers, PROs can also engage informal waste collectors directly. In India, several NGOs--such as Saahas and Hasirudala in Bangalore, Urmul in Jaipur, Nidan in Patna, and Chintan in Delhi--have extensive experience working with waste pickers or different kinds of informal workers and providing them an organizing platform to advocate for formal pay and a more structured work environment. Such organizations traditionally have worked in municipal solid waste, including food waste/organics and paper, plastics and other valuables. Often waste pickers are women; e-waste collectors tend to be male and may not necessarily collect other kinds of waste. As such, though NGOs may have experience organizing informal workers, some lack an understanding of the intricacies of the e-waste market and need time to understand nuances in pricing, which material is higher value, and how to develop relationships with the aggregators who already have an established clientele.

In Patna, Bihar's capital, which is not an e-waste trading hub and generates less e-waste than other cities in India, Karo Sambhav is partnering with an NGO known for organizing wastepickers into womens' self-help groups. In such an untapped market, PROs and recyclers may find opportunities to work directly with collectors, who would need to learn new skills as they develop new knowledge of e-waste. Currently, the NGO is helping women waste pickers in Patna collect e-waste from local repair shops, however, Karo Sambhav and the NGO are seeking ways for them to collect higher volumes from government and other bulk consumers.

Several stakeholders also noted the need to create aggregation and dismantling 'hubs' in India in places far from the Delhi markets, such as the Northeast to reduce transportation costs to Delhi. Fostering more e-waste collectors in other cities could help unearth more material and justify the creation of such hubs.

How Could Capacity-Building Criteria Help Formalize Informal Workers, or otherwise improve their livelihoods?

Initial lessons in developing capacity-building criteria for informal workers point to the need for a PRO or a recycler to have their own staff or work with organizations that have established strong relationships with collectors (wastepickers) and/or aggregators (ostensibly, once such formalization begins to occur, the Government can link informal workers, especially wastepickers, with relevant government welfare programs). Partner organizations with expertise in engaging wastepickers will likely require time to learn about the e-waste market to be able to participate in it effectively. E-waste trading is a unique market and actors and lessons learned from other municipal waste streams may not always readily translate into collecting and purchasing e-waste. Karo Sambhav's initial learnings include: start small with purchasing smaller quantities with cash to build trust with aggregators, after several transactions work up to digital payments, and, where necessary, help informal workers become digitalized and realize the benefits of digital payments.

Producers seeking to work with PROs or recyclers that strive to help informal workers formalize their operations and/or improve their livelihoods should:

- *Depending on which intervention is most helpful to develop capacity among informal workers, retain staff with demonstrated skills in community organizing, social work, local economic development or other skills necessary to overcome an identified concern. What skill sets are most critical? This type of requirement may be difficult to codify into a standard and may be best communicated via guidance or best practices.*

    and/or

- *Partner with an NGO with demonstrated experience (minimum 3-5 years?) working with targeted informal workers (i.e. wastepickers). What criteria should be employed when selecting NGOs? This type of requirement may also be difficult to codify into a standard and may be best communicated via guidance or best practices.*

Finding 4: Bulk consumers lack awareness of their responsibilities under the current E-Waste Rules; consumers also appear to lack awareness of collection and recycling opportunities.

Producers are required under the current E-Waste Rules to conduct outreach and awareness to the public, including both bulk consumers and households. However, no metrics within the E-Waste Rules currently exist to hold producers accountable.

According to several stakeholders, many bulk consumers lack awareness of their responsibilities to safely dispose of their e-waste. While many bulk consumers (e.g., hospitals, governments, IT companies) have established connections to informal collectors, most do not have an e-waste management policy. Instead, bulk consumers often sell their equipment directly to informal collectors and aggregators, either knowingly or unwittingly sending it to informal processing. In Bangalore, Karo Sambhav's NGO partner found that many IT companies already have established contracts with recyclers or with informal sector who purchases equipment. Bulk consumers also expect to be paid for their used IT equipment, not themselves pay for collection and recycling services.

While PROs or other producer-financed collection efforts may find it challenging to engage those bulk consumers with existing contracts with formal recyclers, bulk consumers without established contracts in place represent an untapped market. Many bulk consumers are unaware of the E-Waste Rules and require assistance understanding their role and obligations. As Bin Bag, an e-waste service provider in Bangalore, found, bulk consumers often require extensive customer service to navigate their responsibilities and therefore could present a good opportunity for accessing large volumes of e-waste to meet producers' collection targets.

The government could also help educate bulk consumers on their responsibilities. As one of the largest consumers of high-value IT products in India, it can considerably sway producers to offer collection and recycling services and spread awareness of such services to local businesses.

Federal, state and municipal governments can visibly work with informal and formal entities to channel material to safe recycling operations, serving as a model to other bulk consumers subject to the E-Waste Rules. Implementing projects that first aim to recycle obsolete electronics from within India's municipal entities could provide an influx of material to recyclers adhering to safe practices. Municipalities could partner with, or challenge, bulk consumers operating in their cities or regions to also participate in government-driven collection and recycling efforts and reward their participation with public recognition.

Most stakeholders interviewed also relayed that producers and PROs are not currently focused on creating awareness among households since bulk consumers can provide greater e-waste volumes to meet collection and recycling targets. Household e-waste eventually makes its way to repair shops and then to aggregators, hence PROs' efforts to engage aggregators directly thus far.

How Could Capacity-Building Criteria Improve Awareness of E-Waste Recycling under the Current Rules Among Bulk Consumers and Individual Households?

Criteria could strengthen producers' outreach and awareness efforts with both quantifiable metrics and qualitative descriptions. For example, for bulk consumers who are customers of their products, producers could engage procurement officers, offer trainings, and report annually on the number of customers trained. Alternatively, for outreach to households, producers could demonstrate ad campaign metrics, number of media impressions, local community groups engaged, and estimated number of households reached in their outreach and awareness campaigns.

Finding 5: India's Central Pollution Control Board and State Pollution Control Boards (CPCB and SPCBs) lack technical capacity and resources to screen and enforce registrations of recyclers and PROs. Some SPCBs lack understanding of the E-Waste Rules.

The Central and State Pollution Control Boards continue to lack resources to evaluate and monitor the operations of dismantlers and recyclers who apply for registrations. In late May 2018, the CPCB released registrations for PROs to allow PROs license to participate more fully in e-waste trading markets. However, the CPCB did not provide clarity on what qualifications are necessary for PROs to operate in the market, which could create more challenges going forward if unscrupulous PROs, namely those who may sell equipment into informal markets, are able to receive government approval. Additionally, as one PRO has experienced in engaging SPCBs in Bihar and Assam, many SPCBS are not aware of the E-Waste Rules and therefore lack technical knowledge to enforce them.

How Could Capacity-Building Criteria Improve Technical Capacity Among Federal and State Regulatory and Enforcement Entities?

Building capacity among CBCP/SPCBs is necessary to better allocate registrations for and conduct audits of both recyclers and PROs. Standards and guidelines are needed to help CPCB/SPCBs understand what criteria to examine when providing e-waste registrations for dismantling and recycling facilities. Guidance may also be needed on minimum technical and operating capabilities PROs should demonstrate when applying for registrations. Some stakeholders considered that CPCB and SPCB officials would benefit from a checklist or other auditing criteria and minimum guidelines for evaluating recyclers and PROs. In proposing capacity-building criteria, stakeholders could examine existing global standards currently used in India or India-specific standards, and determine if they can be leveraged. For example, could the internationally used R2 standard, as administered by the Sustainable Electronics Recycling Initiative (SERI), be adapted or modified into a checklist for Indian regulators? Would developing a checklist specific to India created by Indian stakeholders provide greater value?

Finding 6. Following the enactment of India's E-Waste Rules, producers are beginning to view e-waste management as an issue of regulatory compliance, missing potential opportunities to link e-waste efforts to broader sustainability dialogues including circular economy, SDGs, sustainable procurement and corporate social responsibility (CSR) initiatives. Only some stakeholders are in the early stages of considering linkages between e-waste management, SDGs, and CSR requirements under the Companies Act.

Several stakeholders, including one producer, relayed the concern that producers were beginning to view e-waste management only as a compliance issue, not tying it to wider opportunities to foster sustainability within the electronics industry. Key stakeholders in multinational organizations, PROs, and producer companies explained that most compliance departments seek to meet the E-Waste Rules at the lowest cost, thus creating incentives for compliance officers to contract with PROs or recyclers that quote recycling services the lowest cost. Often such low costs do not accurately reflect true processing costs in environmentally-sound facilities, indicating that the recycler could be leaking material back into the informal sector. Since compliance officers receive a certificate of destruction from the recycler noting fulfilled of their recycling commitments, they are not further incentivized to ensure that EoL services deliver on environmental and social improvements.

As such, a timely opportunity exists for stakeholder engagement on the role of sustainable IT and how sound e-waste management connects to circular economy and specific SDGs. Engaging other internal departments within producer companies, such as CSR, procurement, and supply chain, on sustainable electronics could help garner support for innovative e-waste management solutions. Should several departments be engaged in discussions including e-waste management, additional pressure to demonstrate progress toward SDGs could help incentivize producers to seek greater transparency among their contracted recyclers and PROs.

India is unique in requiring corporations above a certain size to donate two percent of annual revenue to CSR activities via the 2013 Companies Act.[24] The Act's Schedule VII[25] denotes eligible CSR activities, including ensuring environmental sustainability, employment enhancing vocations skills, promotion of education, and promoting gender equality and empowering women (slum development also appears in revised documentation[26] in 2014).

Electronics producers are beginning to consider how CSR funds can also further SDG goals (of note, electronics producers are not permitted to use CSR funds for compliance towards the E-Waste Rules, namely e-waste collection and recycling).

Some electronics companies interviewed have not integrated these links internally across departments. Yet, other companies are beginning to consider how CSR funds can apply to the designated activities under Schedule VII and also fulfill SDGs (e.g. one producer's recent project providing rural communities with e-learning opportunities).

Thus, how can producers leverage CSR funds to support efforts that do not relate directly to compliance with the E-Waste Rules, but nonetheless help empower informal e-waste workers (i.e. setting up digital bank accounts, helping develop business skills) and thereby also link to specific SDGs? Could efforts to improve awareness and education of informal sector workers on mitigating the health risks of unsafe recycling be recipients of CSR funds? Additionally, could bulk consumers (i.e. institutional purchasers) leverage CSR funds to build informal workers' capacity indirectly?

How Could Capacity-Building Criteria Strengthen Linkages Between E-Waste Management Efforts and SDGs?

Capacity-building criteria can advance sound electronics recycling practices and strengthen efforts to formalize and improve the livelihoods of the informal sector. The criteria itself could align with specific SDGs. For example, efforts to formalize the informal sector could align with SDG 8, which focuses on decent work and economic growth. What metrics could stakeholders develop to demonstrate measurable progress towards a specific SDG? How would such metrics be reported? Should criteria be reporting-only criteria (which could be more qualitative)? Should performance-based metrics be considered, given that not all interventions in engaging informal workers are uniform? Greater dialogue among stakeholders is needed to assess if or how capacity-building criteria could be explicitly linked to advance SDGs.

Bulk consumers could also procure products that meet the criteria to demonstrate how their purchasing activities are helping their companies meet the SDGs. A dialogue and potential

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[24] http://www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf

[25] http://www.mca.gov.in/SearchableActs/Schedule7.htm

[26] http://corporatelawreporter.com/companies_act/schedule-7-of-companies-act-2013-activities-which-may-me-included-by-companies-in-their-corporate-social-responsibility-policies/

initiative to advance sustainable purchasing of IT and other electronic products among institutional purchasers could explore how to best leverage capacity building criteria.

Benefits of, and Opportunity for, Developing Capacity-Building Criteria in a Voluntary Consensus Standard

Voluntary consensus standards (VCS) for more sustainable electronics exist globally alongside both EPR regulatory frameworks and in countries lacking national EPR regulations. In examining the feasibility of creating a voluntary consensus standard in India, stakeholders must consider how criteria complements or bolsters regulatory action. Many producers, bulk consumers, policymakers, NGOs, and other key actors are still in the early stages of implementing the EPR-based E-Waste Rules to achieve collection and recycling targets, a first for e-waste regulation in India. Thus, what gaps can a voluntary consensus standard fill in India that addresses India's market dynamics?

Based on initial stakeholder discussions,[27] a VCS would provide market value and interest from key actors if it advanced their goals as follows:

- For producers, a VCS could enhance their fulfillment of their targets and provide added value for shareholders, customers, or other key audiences.

- For government officials, a VCS could complement and support monitoring and enforcement efforts and improve public reporting and public outreach and awareness.

- For multiple stakeholders, a VCS could promote shared societal value by helping to formalize and educate the informal sector.

Proposed Future Actions under the GEC-CRB Project:

To determine which value propositions in developing a VCS resonate most for key stakeholders, CRB, with support from and/or participation from GEC, could undertake the following efforts:

- **Foster a multi-stakeholder dialogue on how a VCS could achieve different objectives in fostering a more transparent, robust, and environmentally sustainable e-waste management system in India.** CRB, potentially with support and participation from GEC could introduce strawman criteria for stakeholders to consider. CRB and/or GEC could identify an appropriate standards development organization (SDO) within India to lead the process for creating a VCS.

In addition, CRB, with support from and/or participation from GEC, could undertake the following initiatives to bolster or complement the development of capacity-building criteria:

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[27] Interviews conducted with the IFC, two producers, and one PRO.

- **Develop best practices for PROs (or other third parties working on behalf of producers to meet their targets) to partner with organizations with on-the ground-experience helping to build capacity among informal workers to improve livelihoods**. CRB, potentially with GEC, could convene NGOs and other relevant organizations to assess and disseminate best practices and create guidance for organizations seeking to become PROs or otherwise work directly with producers to collect and recycle e-waste. Best practices could be developed into standalone guidance or be incorporated into criteria for a VCS.

- **Foster dialogue among producers and bulk consumers to create linkages between CSR/Sustainability/SDGs/e-waste management within their own companies.** Given GEC and CRB's expertise engaging corporations on supply chain improvements and sustainability standards, CRB, potentially with GEC, could convene different departments within companies to assess where CSR funds could be spent on initiatives compliant with Schedule VII requirements that improve the livelihoods of communities involved in e-waste management (such activities would be undertaken to comply with the Companies Act, rather than the E-Waste Rules). Such a dialogue may also unearth additional value propositions for how a VCS could benefit producers if it helped them meet their CSR obligations and/or SDG goals.

- **Lead a Multi-Stakeholder Forum on Sustainability and the Circular Economy within the IT Sector in India.** CRB, with support from organizations such as GEC, is currently proposing to develop a multi-stakeholder forum on sustainability and the circular economy within the IT sector in India, building on lessons learned in adopting measures to address e-waste in India. The focus seeks to take a wider approach to explore the contribution that the electronics/IT sector can make towards achieving specific SDGs and embodying 'circularity' within India. Such a forum could serve as a repository of information and knowledge transfer of 'good practices' and facilitate networks which can help the private sector and other relevant organizations learn from each other and motivate actions by various supply chain actors. An output of the forum could also include a Green Electronics Council Purchaser Guide on Circular Economy for emerging markets. Such a forum on integrating e-waste/sustainable electronics/circularity/IT could be held at CRB's 5th Annual Conference on 14-16 November 2018 in New Delhi.

Background on Idea for a Multi-Stakeholder Forum:

A circular economy has been defined as one that seeks to rebuild capital (financial, manufactured, human, social or natural) which ensures enhanced flows of goods and services.[28] Three principles underpin circularity: designing out waste, keeping products and materials in use, and regenerating natural systems. Much opportunity exists for encouraging a circular economy within the electronics/IT sector, building upon over a decade of global efforts to design out hazardous components to regulations that

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[28] An overview of 'circular economy' is available from the Ellen McArthur Foundation at
https://www.ellenmacarthurfoundation.org/circular-economy/overview/concept

mandate recycling. Since, in India, efforts to address sustainability in the IT sector, have thus far largely focused on increasing responsible e-waste recycling (now seen as a compliance matter), an opportunity exists to foster circularity through recovery of material through supply chains. Stakeholders (including government entities) are also turning their attention to sustainable procurement of IT, resource efficiency that include other sectors in addition to electronics, sustainability standards in the IT sector, and how organisations can help achieve the SDGs. These issues relate, in different but complementary ways, to fostering circularity within the IT sector. Therefore, a forum that addresses circularity in IT/electronics can incorporate discussions of these topics under a broader, more holistic, and interconnected framework.

A forum can also help stakeholders define what circularity looks like in the IT sector within India by discussing issues in design, consumer behavior, repair, reuse, and recycling as they uniquely pertain to India. Unlike other economies also grappling with encouraging greater circularity in different sectors, India retains a robust, though informal, workforce engaged in both managing EoL electronics and in repairing used electronics.

A forum can explore the following questions:

What role can existing reuse and repair networks play in foster greater sustainability in the IT sector via reuse? How might their involvement be improved?

What new business models might producers seek to develop to encourage greater recovery of products and components for reuse and recycling, such that e-waste recycling moves beyond being considered a compliance-only issue?

What policy signals and market incentives are needed to encourage circularity, perhaps in tandem with policies seeking to foster greater resource efficiency?

What technological and social interventions are also needed to realize circularity in India?

What issues are global and therefore require international coordination and partnerships to solve them and which ones are specific to India?

A forum, and potential ensuing network, can engage relevant actors on such questions and begin to build a vision and framework that bridges concepts in sustainability, resource efficiency, and circular economy thinking in the IT/electronics sector.

Opportunities for Future Research

Finally, based on the field research, the following issues would benefit from further research and analysis by academic institutions and/or practitioners to improve understanding of best practices in managing e-waste:

- **Audits for financial and mass balance traceability claims.** To ensure financial and mass balance traceability to limit e-waste leakage from formal to informal recyclers, what types of audits or verification criteria are necessary? What might be the role of other organizations engaging in India, such as the Sustainable Electronics Recycling Initiative (SERI), in providing auditor trainings to ensure facilities are safely processing electronics?

- **Formal processing.** Assess metals processing capabilities in India in the formal sector. How much capacity truly exists among formal metals recyclers to process and extract valuable metals from e-waste in India? According to one recycler, a large foreign smelter has also been rumored to explore setting up facilities in India, however the lack of reliable access to e-waste with high metals content and informal sector competition pose veritable barriers. What other reasons might exist for why smelters have not been established in India?

- **Small Scale Processing for Current Informal Recyclers.** Evaluate the feasibility of bringing mobile small e-waste processing factories to India. Could mobile processing units be rented by informal workers to process e-waste in small batches, where metals extraction occurs? What would it take to implement such technology transfer? What funding opportunities and/or access to financing exist that could facilitate implementation?

- **Organizing the Informal Sector.** Evaluate lessons learned from how other sectors in India have organized informal workers. How have efforts to organize the informal sector in industries such as leather tanning, electroplating, and fruit selling succeeded or failed? What lessons can apply to informal communities involved e-waste management, who are already well networked and established?

- **Material Downstream Flows.** Examine end markets for materials in electronics within India (i.e. where do the plastic, copper, and other materials go?) Does material stay in India or is it exported? Some of this research may have been conducted, but could be updated or expanded due to multinational institutions' and the Indian Government's interest in creating production and recycling economies of scale across sectors.

Appendix A

Stakeholder Representatives Interviewed April-August 2018

Producers
- HP
- Ericsson
- Dell

PROs and Recyclers
- Karo Sambhav: HQ staff in Delhi and field staff operating in in Delhi, Jaipur, Patna, Mumbai, and Kerala
- Reverse Logistics Group (RLG), based in Delhi.
- Bin Bag, based in Bangalore
- Saahas Zero Waste, based in Bangalore
- Cerebra, based in Bangalore
- All India E-Waste Recyclers Association (5 of the founding members), based in Bangalore
- Tes-Amm, based in Chennai

NGOs and Wastepicker Collectives
- Chintan (Delhi)
- Nidan (Patna)
- Hasiru Dala (Bangalore)

Trade Associations
- MAIT

Government
- Ministry of Electronic and Information Technology (MEITy)

Multilateral Organizations
- Deutsche Gesellschaft fuer Internazionale Zusammenarveit (GIZ)
- International Finance Corporation

Academics
- T.S. Krishnan (IIM Bangalore)
- Kalyan Bhaskar (XLRI Jamshedpur)

General Waste Management Provider
- CitizenGage (Bangalore)

Appendix B

Works Consulted

Policy

Atasu, A.; Van Wassenhove, L.N. An operations perspective on product take-back legislation for e-waste: Theory, practice, and research needs. *Prod. Oper. Manag*. 2012, 21, 407–422.

Bhaskar, K.; Mohana, R.; Turaga, R. India's E-Waste rules and their impact on E-Waste management practices: A case study. *J. Ind. Ecol*. 2017, doi:10.1111/jiec.12619.

Borthakur, A.; Sinha, K. Electronic waste management in India: A stakeholder's perspective. *Electron. Green J.* 2013, 36, 1–21.

Borthakur, A.; Govind, M. How well are we managing e-waste in India: Evidences from the city of Bangalore. *Energy Ecol. Environ*. 2017, 2, 225–235.

Kojima, M.; Yoshida, A.; Sasaki, S. Difficulties in applying extended producer responsibility policies in developing countries: Case studies in e-waste recycling in China and Thailand. J. Mater. *Cycles Waste Manag.* 2009, 11, 263–269.

Ministry of Environment and Forests, Government of India. 2011 E-Waste Management Rules. Available online:
http://www.moef.nic.in/rules-regulations/e-waste-management-and-handling-rules-2011

Ministry of Environment and Forests, Government of India. 2016 E-Waste Management Rules. Available online:
http://www.moef.gov.in/sites/default/files/EWM%20Rules%202016%20english%2023.03.2016.pdf

Ministry of Environment and Forests, Government of India. 2018 E-Waste Amendment Rules. Available online:
http://envfor.nic.in/content/gsr-261e22032018e-waste-managment-amendment-rules-2018

Niti Aayog. NITI Aayog and EU delegation to India release the Strategy on Resource Efficiency (RE), November 30, 2017. Available at
http://pib.nic.in/newsite/PrintRelease.aspx?relid=174013

Toxics Link, V. *Time to Reboot I and II*; Toxics Link: New Delhi, India, 2014 and 2015.
http://toxicslink.org/?q=content/time-reboot and http://toxicslink.org/?q=content/time-reboot-ii

Informal Sector

Arora. R. *Informal to Formal Recycling Linkages: Experiences in India (GIZ)*. Presentation, World Resources Forum, Geneva, Switzerland. October 24, 2017. https://www.wrforum.org/wp-content/uploads/2017/11/2017-10-24-Arora-informal-sector-India-WRF.pdf

Chintan Environmental Research and Action Group. *Learning to Re-E-Cycle. What working with E-Waste Has Taught US.* 2013. Available online: http://www.chintan-india.org/documents/research_and_
reports/chintan-study-learning-to-re-e-cycle.pdf

Deshmukh, S.; Mahajan, K. Role of informal sector in e-waste management in Pune region. *Int. J. Comput. Appl.* 2015, 116, doi:10.5120/20333-2063.

Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ). Recovering Resources, Creating Opportunities: Integrating the Informal Sector into Solid Waste Management; GIZ: Eschborn, Germany, 2011. Available online: https://www.giz.de/en/downloads/giz2011-en-recycling-partnerships-informal-sector
-final-report.pdf

Gidwani, V.; Reddy, R. The afterlives of "waste": Notes from India for a minor history of capitalist surplus. *Antipode* 2011, 43, 1625–1658.

Harriss-White, B. India Working: Essays on Society and Economy. Cambridge University Press, Cambridge, UK, 2003.

International Labor Organization. "Resolution Concerning Decent Work and the Informal Economy". Available online: http://www.ilo.org/public/english/standards/relm/ilc/ilc90/pdf/pr-25res.pdf.

Lines, K.; Garside, B. Clean and Inclusive? Recycling E-Waste in China and India*. Issue Paper. Toxics Link and IIED. March 2016. Available online: http://toxicslink.org/docs/IIED%20pub.pdf

Laser, S. Why is it so hard to engage with practices of the informal sector? Experimental insights from the Indian E-waste-collective. *Cult. Stud. Rev.* 2016, 22, 168–195.

Laha, S. Formality in E-Waste Movement and Management in the Global Economy. Ph.D. Thesis, The University of Manchester, Manchester, UK, 2015. Available online: https://www.escholar.manchester.ac.uk/uk-ac-man-scw:263090 (accessed on 4 September 2017).

Ragupathy, L., Krueger, C., Chaturvedi, C., Arora, R., Henzler, M. E-Waste Recycling In India – Bridging The Gap Between The Informal And Formal Sector. International Solid Waste

Association. 2007. Available online: https://www.iswa.org/uploads/tx_iswaknowledgebase/Krueger.pdf

Sañez, R.; Silva, U.; Siripornprasarn, A.; Sinha, D. Presentations Discussing Projects Aimed at Integrating Informal Workers into Sound E-Waste Management Practices in Chile, India, Thailand, and Philippines. In Proceedings of the International E-Waste Management Network Workshop, Jakarta, Indonesia, 2–6 October 2017.

Sinha, S.; Mahesh, P.; Dutta, M. Environment and Livelihood-Hand in Hand; Toxics Link: New Delhi, India, 2013.

Waste Networks: Economics, Informality and Stigma. Kabadiwalla Connect. Available online: http://www.kabadiwallaconnect.in/blog/2015/3/23/waste-networks-economics-informality-and-stigma

Wang, F.; Huisman, J.; Meskers, C.E.M.; Schluep, M.; Stevels, A.; Hagelüken, C. The Best-of-2-worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies. *Waste Manag.* 2012, 32, 2134–2146.

Williams, E.; Kahhat, R.; Bengtsson, M.; Hayashi, S.; Hotta, Y.; Totoki, Y. Linking informal and formal electronics recycling via an interface organization. *Challenges* 2013, 4, 136–153.

World Business Council for Sustainable Development; World Resources Forum; Swiss Federal Laboratories for Materials Sciences and Technology (EMPA). Informal Approaches Towards a Circular Economy-Learning from the Plastics Recycling Sector in India; WBCSD: Genf, Switzerland; EMPA: Dübendorf, Switzerland, 2016.

WorldLoop's Approach Best of Two Worlds (Bo2W). Available online: http://worldloop.org/e-waste/worldloops-approach-to-e-waste-management/

Health and Environmental Impacts of Informal Sector Activity

Centre for Science and Environment. Recommendations to Address the Issues of Informal Sector Involved in E-Waste Handling: Moradabad, Uttar Pradesh. Centre for Science and Environment: New Delhi, India, 2015.

Mahesh, P.; Jena, A.; Sharma, V. On the Edge—Potential Hotspots in Delhi; Toxics Link: New Delhi, India, 2014. http://toxicslink.org/?q=content/edge-potential-hotspots-delhi

WEEE Plastic and Brominated Flame Retardants: A Report on WEEE Plastic Recycling; Toxics Link: New Delhi, India, 2016. http://toxicslink.org/docs/Report-WEEE-plastics.pdf

Mahesh, P.; Jena, A.; Sharma, V. Looking Through Glass: CRT Glass Recycling in India; Toxics Link: New Delhi, India, 2014.

Park, J.; Hoerning, L.; Watry, S.; Burgett, T.; Mattias, S. Effects of electronic waste on developing countries. *Adv. Recycl. Waste Manag.* 2017, 2, 1–6.

Media Depictions

Abbasl, N. 18 Quintals of E-Waste Seized in Moradabad, 3 Persons Held—Times of India. The Times of India. Available online: https://timesofindia.indiatimes.com/city/bareilly/18-quintals-of-e-waste-seized-in-moradabad-3-persons-held/articleshow/58184761.cms

Abbasl, N. 214 Sacks of E-Waste Seized in Moradabad. The Times of India. Available online: https://timesofindia.indiatimes.com/city/bareilly/214-sacks-of-e-waste-seized-in-moradabad/articleshow/62434803.cms

Bhowmick, N. Is India's E-Waste Problem Spiraling out of Control? Available online: http://content.time.com/time/world/article/0,8599,2071920,00.html (

Jain, G. Where Computers Go to Die. Tehelka Magazine. Available online: http://archive.tehelka.com/story_main48.asp?filename=hub150111WHERE_COMPUTERS.asp

Mishra, P. This is Seelampur: India's digital underbelly where your phones go to die. Available online: https://factordaily.com/seelampur-indias-digital-underbelly/

Newton, J. Fascinating Images Show Children Sifting through India's E-Waste Market in Seelampur. Available online: http://www.dailymail.co.uk/news/article-3663707/Life-working-computer-graveyard-Fascinating-pictures-children-sifting-India-s-biggest-electronic-scrap-heap-just-2-day.html

Radulovic, V. Informal but Integral. E-Scrap 2017, 17, 26–32. https://resource-recycling.com/e-scrap/2017/09/18/informal-but-integral/

Radulovic, V. Portrayals in Print: Media Depictions of the Informal Sector's Involvement in Managing E-Waste in India. *Sustainability.* 2018, *10* (4), 966. https://doi.org/10.3390/su10040966

Wani, I. Photo Story: How E-Waste Workers in Delhi Jeopardise Their Health to Earn a Living. Available online: https://thewire.in/economy/photo-story-the-e-waste-workers-of-delhi