International Journal of Advanced Research and Development
ISSN: 2455-4030
Impact Factor: RJIF 5.24
www.advancedjournal.com
Volume 3; Issue 2; March 2018; Page No. 1088-1092

E-waste: Impact and solutions in India

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Abstract
The popularity of consumer electronics and home appliances is likely to continue in years to come with a constant stream of iPhones and iPads, other smartphones and computers, refrigerators, e-readers and other devices. Hence, the main challenge is the continuous global growth of e-waste. It is predicted that, by 2020, more PCs will be discarded in countries in the developing than the developed world, and the prevailing assumption that trade is the main driver of informal recycling might soon become obsolete. The volume of e-waste from discarded mobile phones will be about seven times higher in China and 18 times higher in India. E-waste from televisions will be 1.5 to 2 times higher in China and India, and, in India, e- waste from discarded refrigerators will double or triple. When adding the vast amounts of e-waste that are still being imported to these countries, both legally and illegally, it is evident that the problem is exploding, with many dangers for human health and the environment. This paper presents challenges ahead in all the aspects of e-waste in India.

Keywords: E-waste, green channel, electronics devices

Introduction
The control of pollution and management of wastes are twin challenges confronted by virtually all countries of the modern world. Although empirical researchers concede that reliable data with respect to the amount of waste being generated worldwide is costly and time-consuming to obtain, it is estimated that 20 to 50 million metric tonnes of electronic waste are generated worldwide every year, with the United States alone discarding some fourteen to 20 million personal computers every year, while Asia discards an estimated twelve million tonnes of electronic waste each year. With the increase in population, urbanisation, capacity, economic growth, and lifestyle orientations, it is anticipated that developing countries will triple their electronic waste production over the next few years. When left untreated, accumulated waste poses grave environmental risk and threat to human health, the juncture at which scholars and commentators have drawn the nexus between environmental pollution via hazardous electronic wastes and human rights. Hazardous wastes can be in form of materials contaminated with dioxins and heavy metals, such as mercury, cadmium, or lead, or organic wastes from industrial activities. These wastes come in many forms ranging from barrels of fluid waste to sludge, old computer parts, used batteries, or incinerator. A part from urging a reconceptualization of the electronic waste dimension to the global waste challenge in regulatory and trade terms, the underpinning thrust of this essay is that developing countries should find pragmatic ways of handling electronic waste because of their often toxic and hazardous substances that pollute the environment, expose people to diseases, and invariably violate a whole range of human rights.

Sources of e waste
Electronic waste especially computer waste is growing exponentially in volume because of increasing demand of information technology and its application in the national growth process. Various government departments, public as well as private sectors are fast feeding old electronic appliances such as computers, telephones, etc, into the waste stream.

- Individual household and small business
- Large business, Institutions, government houses and Foreign Embassies
- PC manufacturers and retailers
- E waste from imports
- Secondary market of old PCs

Risk to human health and environment
The main risks to human health and the environment arise from the presence in e waste of heavy metals, POPs, flame retardants and other potentially hazardous substances such as lead and mercury, cyanide, dioxins. If improperly managed, such substances may pose significant human and environmental health risks. E-waste is a complex and difficult form of waste to recycle, and problems such as elevated concentrations of heavy metals in the air have even been found in state-of-the-art facilities in developed countries. Workers and local residents are exposed to toxic chemicals through inhalation, dust ingestion, dermal exposure and oral intake. Inhalation and dust ingestion impose a range of potential occupational hazards including Electrical shocks are another occupational hazard (Prakash & Manhart, 2010). Overall, human health risks from e-waste include breathing difficulties, respiratory irritation, coughing, choking, pneumonitis, tremors, neuropsychiatric problems, convulsions, coma and even death (Yu, Welford & Hills, 2006). E-waste workers are also exposed to other hazards leading to physical injuries and chronic ailments such as asthma, skin diseases, eye irritations and stomach disease (Raghupathy, Krüger, Chaturvedi, Arora, Henzler, 2010).

Pollution generated by e-waste processing brings about toxic or genotoxic effects on the human body, threatening the health not only of workers but also of current residents and future generations living in the local environment.

The global impact of e waste: addressing the challenge

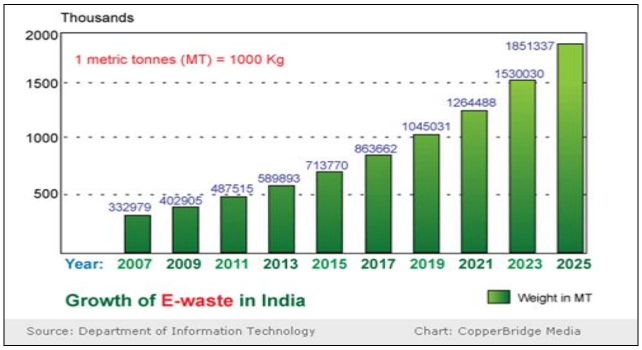

Fig 1

Menace of e-waste in developing countries

Group B (India, China): This group includes countries featuring an established informal and formal sector. These countries would have the technological and economical capacity to adapt sustainable recycling technologies. Group B is classified as having a significant potential for the introduction of pre- and end-processing technologies with a strong support in capacity building in the informal sector.

Sources and volumes of e -waste in china: Sources of e-waste in China include both imports and domestic generation. The importing of e-waste was formally banned by the government in 2000. Meanwhile, domestic generation of e-waste has risen rapidly as a result of technological and economic development. A great variety of electrical and electronic products has been put on the domestic market in China. However, due to data availability, this report focuses only on the quantities of the major home appliances, including televisions, refrigerators, washing machines, air conditioners and computers (desktop and laptop).

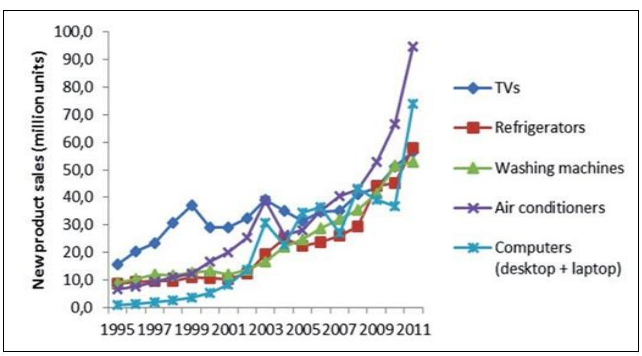

Fig 2

Sales of five major home appliances in china (1995-2011)

E-waste collection in china

Both the formal and informal sectors participate in the collection of e-waste in China. Because there is relatively little environmental impact associated with the collection of e-waste, the central government has not explicitly banned informal sector involvement in e-waste collection. Most collection activities are carried out in urban areas because of their high population density and large volumes of broken, obsolete and discarded EEE available for collection. E-waste collectors and collection systems currently have very little presence in rural areas because home appliances were only introduced on a broad scale in many rural areas in the recent 10-15 years, so the rate of obsolescence is still low. In the meantime, due to relatively low penetration rate of home appliances and slow replacement for new technologies, it would take time for the equipment in the rural areas to become e waste in large quantities. This chapter introduces the collection activities and characteristics of both informal and formal collectors. It also summarizes and discusses the results of a survey of Beijing residents on their e-waste disposal habits and preferences.

Informal collectors: Informal collectors are often self-employed migrant workers from rural areas who travel door-to-door in urban areas, using cash to purchase a variety of used and waste household items ranging from plastic, paper and metal scraps to household appliances and other electrical and electronic equipment. These informal collectors serve as brokers between consumers and medium-level scrap dealers, refurbishers and recyclers. Once the material has been collected and undergone a simple sorting and classification process, the usable second-hand home appliances and valuable components that have been collected are sold to the local second-hand market.

Formal collectors: The boundary between informal and formal collectors is not always clear. In principle, at least, anyone in China can sell or buy e-waste within the country. Nevertheless, formal collectors are generally defined as those collectors who work in a formal, tax-paying business entity and who deliver the collected e-waste to legitimate recyclers for environmentally-sound treatment. The Chinese government implemented a national “Home Appliance Old for New Rebate Program” (hereafter referred to as the "Old for New Program") in order to stimulate both the buying of new home appliances and the proper recycling of old appliances per cent. The “Old for New Program” achieved impressive collection rates for home appliances and set an important precedent for future e-waste management plans.

E-waste in India: state wise

Fig 3

Delhi: NCR likely to generate 50,000 metric tonnes of e-waste by 2015 India's capital is emerging as the world's dumping capital for e- waste, with hazardous activities taking place and like to generate e-waste to an extent of 50,000 metric tonnes (MT) per annum by 2015 from the current level of 30,000 metric tonnes per annum, growing at a compound annual growth rate (CAGR) of about 25%, accordingtoan Assochamestimate.

The Assocham latest study on "E-waste in India by 2015" revealed that currently e-waste of Delhi is approximately 30,000 metric tones per annum and employs more than 1.5 lakh workers in city's various organised and unorganised recycling units. As many as 8,500 mobile handsets; 5,500 TV sets and 3,000 personal computers are dismantled in the city everyday for reuse of their component parts andmaterials. "While the list is growing, so is the quantity as these products are getting more affordable and more and more people are using them. Large e-waste centres exist in Delhi, NCR, Meerut, Firozabad, Chennai, Bangalore and Mumbai, with 85,000 recyclers working in Delhi-NCRalone. Workers are poorly- protected in an environment where e-waste from PC monitors, PCBs, CDs, motherboards, cables, toner cartridges, light bulbs and tube-lights are burned in the open, releasing lead, mercury toxins into the air. Metals and non-degradable materials such as gold and platinum, aluminium, cadmium, mercury, lead and brominated flame-retardantsareretrieved. Delhi alone gets around 85% of the electronic waste generated in the developed world. In terms of total e-waste produced internally or brought from outside for recycling, Delhi's e-waste weighs between 25,000 and 30,000 metric tonnes per year. The study highlights that though Mumbai and Chennai are the top importers of junk computers and electronic waste in India, Delhi has emerged as the main hub of e-waste recycling in India, and perhaps the world. The e-waste imported from Mumbai, Bangalore and Chennai makes its way to Delhi, as there is a ready market for glass and plastic in the NCR. Also, the wastes from Mumbai constitute a bulk of the 1,500 tonnes discarded electronics that land in Delhi's scrap yards everyday. Ssocham has also strongly advocated the need to bring out effective legislation to prevent entry of child labour into its collection, segregation and distribution. As per the estimates, more then 35,000-45,000 child labourers in the age group from 10 to 14 years are observed to be engaged in various e-waste activities, without adequate protection and safeguards in Delhi's various yards and recycling workshops. Printed circuit boards, for instance, contain heavy metals like Antimony, Gold, Silver, Chromium, Zinc, Lead, Tin and Copper. The method of extracting these materials from circuit boards is highly hazardous and involves heating the metals in the open.

Maharashtra: According to a study, among the 10 largest e-waste generating states, Maharashtra tops the list while Uttar Pradesh ranks fourth. Similarly, a study by E-Parisaraa revealed an average middle class family generates nearly 19 kg of e-waste annually in India.

UP: Experts said toxic elements such as cadmium and lead in the circuit boards, mercury in switches and flat screen monitors, cadmium in computer batteries and brominated flame retardants on printed circuit boards (PCBs) are present in electronic appliances. The circuit boards are sourced from computer monitors, CPUs, keyboards, television and remote control sets, radios, cell phones and other electrical appliances. The study of CPCB estimated that about half the circuit boards used in appliances in India end up in Moradabad, UP. Officials from Uttar Pradesh Pollution Control Board, however, said the E- waste (Management and Handling) Rules, 2011, notified by the Ministry of Environment and Forest (MoEF), came into effect on May 1, 2012, hence they are gearing up to begin the exercise for safe disposal of e-waste in some cities of western UP like Noida, Ghaziabad, Agra and Mathura.

Bangalore: Tonnes of e-waste from Bangalore and across India are shipped to Singapore, Belgium and Japan. For the country doesn't have a single fullfledged unit capable of extracting precious metals like gold, silver and platinum from it. According to industry sources, approximately 200 tonnes are sent annually to these three countries. S Nanda Kumar, chief environmental officer, Karnataka State Pollution Control Board (KSPCB), said though the central government implemented the E-waste Management and Handling Rules in 2012, it requires huge investment to establish a unit to extract expensive metals. These can be extracted from printed circuit boards, mobile phones and other computer components. P Parthasarathy, MD, E-Parisara Pvt Ltd, the only firm extracting precious metals partially from e- waste in the country, said: "We can extract them from visible parts like motherboards and mobile phones," he said. He added India doesn't have a smelting unit to extract precious metals from e-waste which are not visible to the eye in computer processors, etc, and this is sent to Belgium and Japan. Billions of dollars are required to establish a smelting unit, he added.

Step (solution to e-waste problem)

Fig 4

The past ten years have seen increased concern over the problem of used and end-of-life electronics. Governments, multilat-eral organizations, environmental justice NGOs, the media, industry and the general public have become increasingly sensitized to this issue. In addition to concerns over this material stream's sheer volume and potential danger to human health and the environment through improper manage-ment, the theme that has evoked the most concern is the transboundary movement of discarded electrical and electronic equip-ment, which media and NGO reports re-peatedly characterize as the newest form of toxic waste dumping from the rich to the poor. Equating the export of discarded equip-ment with toxic waste dumping brings much-needed attention to the uneven glob-al patterns in the distributions of wealth and pollution associated with the digital revolution. However, it is becoming in-creasingly evident that such dumping nar-ratives offer only a partial representation of the problem. They tend to oversimplify the global trajectory of used and end-of-life electronics. That is, they put forth a simple yet inaccurate story in which this equip-ment travels in a straight line from the global North to the South. Increasingly, environmental NGOs and the media have begun to recognize that dump-ing alone cannot entirely capture the com-plexity of the transboundary movements of used and end-of-life equipment. Careful studies reveal that e-waste flows most of-ten take a regional, not a North-South tra-jectory (EEA, 2009; Fischer *et al*., 2008; Lepawsky & McNabb, 2010; Sander & Schilling, 2010; Secretariat of the Basel Convention, 2011; UNODC, 2009). More-over, neither export countries nor import countries are homogenous. The quantity and type of e-waste exported and imported varies significantly, as does the ability of individual import countries to process e-waste in an environmentally sound manner.

Regulatory frameworks

In response to the exponential growth in the amount of e-waste generated world-wide and the international controversy over its export, the past decade has seen a burgeoning of used and end- of-life electronics regulations at the local, national, regional and international levels. These policies encompass provisions for the production of EEE, as well as the collection, treatment and export of discarded EEE. This section provides a brief overview of some of the key regulations and policies relating to discarded used and end-of-life electronics

A green channel

Given the potential value of used and end-of-life electronics, many observers contend that a total ban on export is unrealistic, economically disadvantageous, and potentially environmentally disastrous. These actors challenge the Basel Convention's insistence on localized waste management of such electronics, and thus the minimization of export of used and end-of-life electronics on three grounds. First, they point out that most countries lack the technological sophistication to safely and efficiently handle materially complex waste streams. Second, the unique physical make-up of used and end-of-life electronics necessitates both manual and high-tech disassembly. Finally, labor is significantly cheaper in the developing world than in the industrialized world, and established informal collection systems in the developing world are highly efficient. The StEP Initiative proposes that the over-simplified story of e-waste export frus-trates attempts by policymakers to regulate and manage the transboundary flows of discarded equipment. A more nuanced un-derstanding of drivers, mechanisms and the global trajectory of discarded equipment is a necessity if efforts to regulate and man-age transboundary flows of e-waste are to be effective (Wang *et al*., 2012).

Exit strategies and flow patterns

Despite this cluster of conventions and guidelines, e-waste continues to be export-ed. This section outlines the legal and ille-gal ways in which e-waste exits countries, using Germany as an example. E-waste is exported for three reasons: for re-use, for recovery and for disposal. Instead of fol-lowing the "formal" and "informal" chan-nels of export, which often overlap, this section examines the three primary sets of actors who do most of the exporting: de-velopment organizations, immigrants and waste processing firms. Development agencies collect used and end-of-life equipment and ship it to devel-oping countries in an effort to bridge the digital divide. In exporting the equipment, the agency has to declare the goods-if, as is often the case, they are being shipped outside of the EU-using the Customs Of-fice's IT system ATLAS, on paper docu-ments, on data carriers or over the Internet (Wang *et al*., 2012). Interestingly, as Sander & Schilling have pointed out, "in the case of EEE, the goods codes do not dis-tinguish between used and new equipment "(Sander & Schilling, 2010, p. 20). The shipments are then scanned upon leaving the harbour for export.

Loopholes and leakages

This section describes and analyzes some of the key loopholes and leakages that make export possible. There are two ways to think about the issue of unwanted ex-port. The first way is to see export as the outcome of a series of tech-nical/bureaucratic errors or shortcomings. In other words, from this perspective the overall system is fine, but a few leaks must be plugged. An alternative way to conceive of the problem of transbounda-ry flows, however, is as a manifestation or symptom of a larger problem. This larger problem is the tension between national formulations of environmental policies and an uneven, globalized, profit-driven econ-omy. That is, laws formulated from the perspective of one country are often ill-fitted to the realities of a global economy. Before engaging with these broader issues of interpretation in the conclusion, howev-er, a look at the key loopholes and gaps in the existing e-waste regulations and infra-structure is necessary.

Monitoring and enforcement

In addition to the difficulty in defining e-waste, there is also the problem of operationalizing existing regulations. Among the most significant challenges is the monitoring of the export of used and end-of-life electronics. A lot of e-waste is exported illegally and without record, making it administratively invisible and unable to be traced. Legal shipments are almost equally challenging to monitor. In other words, coordinating monitoring activities internationally is a logistical nightmare. Not only is communication between international agencies challenging, but cooperation and communication between and among local, regional and national agencies is often also wanting (Fischer *et al*., 2008; Grossman, 2007; Hieronymi, Kahhat, & Williams, 2012; Pellow, 2008; Secretariat of the Basel Convention, 2011; Wang *et al*., 2012).The enforcement of e-waste regulations presents yet another challenge. A container full of discarded "broken" equipment, it could be argued, is not waste because it may have value in the import country A bigger problem still is that of testing. Items can be shipped abroad for re-use. In this case, the cargo is “outside of the waste regime” so to speak (Willke, 2012). That means that it is not subject to the laws out- lined above that seek to stop illegal toxic dumping. Since anyone can say that they are exporting things for re-use and compe-tent authorities simply do not have the re-sources to check every container, waste items are frequently exported as items for re-use.What has recently changed, how-ever, is that Annex 6 of the new WEEE Di-rective states that it is incumbent on the exporter to prove that the items for export are functional. In the old formulation of the law it was the responsibility of the compe-tent authority to test functionality. This should improve the situation somewhat, though it is unclear how this will work in practice. Some products are easier to test for functionality than others. A cell phone, for example, is easier to test than a base station, which can only function as part of a larger system and cannot simply be plugged in and run on its own.

Conclusion

Currently, most waste management strategies are largely technical and focus on environmental aspects, leaving out underlying social problems and relevant solutions. The ILO has thepotential to bring a more holistic approach to waste management, contributing its expertise in labour. The ILO could work on social concerns and improve environmental management through building understanding of labour dynamics. Prior to intervention, it is important to study a country’s labour dimensions on the ground to develop sound understanding of key issues. The ILO can intervene in a variety of ways, using technical assistance along with a host of social programmes, and assist in putting in place national tripartite coordinating bodies to assist e-waste recyclers in both the informal and formal sectors. It can also share information through launching an e-waste code of practice and publicizing best practices, cooperate closely with other organizations and promote green jobs. Pilot projects could encourage alternative economic activities and green jobs in the e-waste recycling sector, build organizational capacity such as microenterprises and cooperatives, form public–private partnerships and, at the same time, work on poverty reduction. The ILO could assist in the work of capacity building and the formalization of the e- waste recycling economy, avoiding single-sector approaches. The ILO’s work and recommendations regarding the informal economy should be considered in this context of formalization of the waste management sector. The ILO could also work on building appropriate labour standards and regulatory frameworks, OSH interventions and awareness raising in the sector.

Future challenges and opportunities

The popularity of consumer electronics and home appliances is likely to continue in years to come with a constant stream of iPhones and iPads, other smartphones and computers, refrigerators, e-readers and other devices. Hence, the main challenge is the continuous global growth of e-waste. It is predicted that, by 2018, more PCs will be discarded in countries in the developing than the developed world, and the prevailing assumption that trade is the main driver of informal recycling might soon become obsolete (Betts, 2010). It is predicted that, by 2020, in both China and South Africa, there will be 200–400 per cent more e-waste from old computers than in 2007, and a staggering 500 per cent more in India. The volume of e-waste from discarded mobile phones will be about seven times higher in China and 18 times higher in India. E-waste from televisions will be 1.5 to 2 times higher in China and India, and, in India, e- waste from discarded refrigerators will double or triple. When adding the vast amounts of e-waste that are still being imported to these countries, both legally and illegally, it is evident that the problem is exploding, with many dangers for human health and the environment (McCarthy, 2010). There are challenges ahead in all the aspects of e-waste covered in this paper. They include the unwillingness of consumers to return and pay for disposal of used electronic products; the uncoordinated, high level of importation of e-waste disguised as secondhand devices; a lack of awareness among consumers; a lack of awareness of the potential hazards of e-waste among collectors and recyclers; a lack of funds and investment to finance improvements in e- waste recycling; the absence of recycling infrastructure or appropriate management of e-waste.

References

1. CHEAA, Advisory on the developing planning of the home appliance industry (2011-2015)2011, China Household ElectricalAppliances Association (CHEAA): Beijing.
2. CNBS, Statistical Yearbook of 1996-2012,Beijing: China National Bureau of Statistics.
3. Associated Press. 2008. “Recycling factory gives Mexican workers reboot.”Available:http://ktar.com/?nid=6&sid=987582&r=1 [2 Oct. 2012].
4. M.D. Felton. Mineral Commodity Summaries: Steel. US Geological Survey: January2008.
5. World Steel Association. Via:www.worldsteel.org
6. World Steel in figures 2008, 2nd edition. World Steel Association, Brussels 2008.
7. Sims Recycling Solutions. Via: http://www.simsgroup.com/srs/solutions/en_crttreatment_sc.asp
8. Times of india October 2013