E-WASTE MANAGEMENT – A CALL FOR FUTURE

Santosh R Gore [1], Manoj Kulkarni [2]
[1]ASM'S Institute of Business Management & Research, Chinchwad, Pune
[2] Sinhgad School of Business Studies, Pune
Email: [1]goresir@gmail.com

Abstract —

Electronic waste, commonly known as e-waste, is comprised of discarded computers, television sets, microwave ovens and other such appliances that are past their useful lives. As managing e waste becomes a priority, countries are being forced to develop new models for the collection and environmentally sound disposal of this waste. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and ground water. Many of these products can be reused, refurbished, or recycled in an environmentally sound manner so that they are less harmful to the ecosystem. This paper highlights the hazards of e-wastes, the need for its appropriate management and options that can be implemented.

Key words: E-waste, Effect of E-waste.

I. INTRODUCTION

These days computer has become most common and widely used gadget in all kinds of activities ranging from schools, residences, offices to manufacturing industries. E-toxic components in computers could be summarized as circuit boards containing heavy metals like lead & cadmium; batteries containing cadmium; cathode ray tubes with lead oxide & barium; ruminated flame retardants used on printed circuit boards, cables and plastic casing; poly vinyl chloride (PVC) coated copper cables and plastic computer casings that release highly toxic dioxins & furans when burnt to recover valuable metals; mercury switches; mercury in flat screens; poly chlorinated biphenyl's (PCB's) present in older capacitors; transformers; etc. Basel Action Network (BAN) estimates that the 500 million computers in the world contain 2.87 billion kgs of plastics, 716.7 million kgs of lead and 286,700 kgs of mercury. The average 14-inch monitor uses a tube that contains an estimated 2.5 to 4 kgs of lead. The lead can seep into the ground water from landfills thereby contaminating it. If the tube is crushed and burned, it emits toxic fumes into the air. Industrial revolution followed by the advances in information technology during the last century has radically changed people's lifestyle. Although this development has helped the human race, mismanagement has led to new problems of contamination and pollution. The technical prowess acquired during the last century has posed a new challenge in the management of wastes. For example, personal computers (PCs) contain certain components, which are highly toxic, such as chlorinated and ruminated substances, toxic gases, toxic metals, biologically active materials, acids, plastics and plastic additives. The hazardous content of these materials pose an environmental and health threat. Thus proper management is necessary while disposing or recycling e-wastes

II. THE INDIAN SCENARIO

While the world is marveling at the technological revolution, countries like India are facing an imminent danger. E-waste of developed countries, such as the US, dispose their wastes to India and other Asian countries. A recent investigation revealed that much of the electronics turned over for recycling in the United States ends up in Asia, where they are either disposed of or recycled with little or no regard for environmental or worker health and safety. Major reasons for exports are cheap labour and lack of environmental and occupational standards in Asia and in this way the toxic effluent of the developed nations 'would flood towards the world's poorest nations. The magnitude of these problems is yet to be documented. However, groups like Toxic Links India are already working on collating data that could be a step towards controlling this hazardous trade. It is imperative that developing countries and India in particular wake up to

the monopoly of the developed countries and set up appropriate management measures to prevent the hazards and mishaps due to mismanagement of e-wastes.

REASONS FOR E-WASTE GENERATION

There are different assumed life spans of computers and mobile phones. The average life span of computers is three to five years and in case of mobile phones, it is only two to three years. Due to innovative products and offers, the life cycles of products are shrinking. Attractive market offers push customer to buy new product rather than upgrading new one. The customers, who like to replace their computer and mobile as they see a new product with improved and innovative features, known as early adopter of technology, contribute to more e-waste generation (7, 3, 13). Indian people generally use pirated operating systems and software. The new computer is purchased sometimes not due to improper functioning but for upgrading system or software [13]. Customers these days don't upgrade the computer; they prefer to replace it and very few customers like to send products for repair and service. Moreover, some of the new software present in the market can be run smoothly on new operating systems. They also require high Random Access Memory (RAM) as well as more space on hard disks. Therefore new operating systems and changing software in computers are also a major reason for more e-waste generation. The components of the mobile and computers are so costly that customers prefer to buy new products. For example, the cost of battery in case of mobiles and laptops, and cost of cartridge in case of printers, etc. So, customers don't think to replace the component and prefer to replace the product with new one

III. ELECTRONICS WASTE HAZARDS

'The cathode ray tubes (CRTs) in computer and television monitors contain lead which is poisonous to the nervous system as do circuit boards. Mercury like lead a neurotoxin, is used in flat-panel display screens. Some batteries and circuit boards contain cadmium, known to be a carcinogen.' 'When disposed in landfills, these products have the potential to contribute significant levels of toxic materials to the leach ate produced in landfills. These include lead, polychlorinated biphenyls (PCBs), mercury, cadmium, arsenic, zinc, chromium, and selenium. 'PVC is a chlorinated plastic used in some electronics products and for insulation on wires and cables. Chlorinated dioxins and furans are released when PVC is produced or disposed of by incineration.' 'PVC is a chlorinated plastic used in some electronics products and for insulation on wires and cables. Chlorinated dioxins and furans are released when PVC is produced or disposed of by incineration.'

HAZARDOUS ELEMENTS

Americium: smoke alarms (radioactive source).Mercury fluorescent tubes (numerous applications); tilt switches (pinball games, mechanical doorbells, thermostats). There are no liquid mercury switches in ordinary computers, and the elimination of mercury batteries in many new model computers is taking place. Sulphur: lead-acid batteries.PBBs: Predecessor of PCBs. Also used as flame retardant. Banned from 1973-1977 on PCBs: prior to ban, almost all 1930's–1970's equipment, including capacitors, transformers, wiring insulation, paints, inks, and flexible sealants. Banned during the 1980's.Cadmium: light-sensitive resistors, corrosion-resistant alloys for marine and aviation environments, nickel-cadmium batteries. Lead solder, CRT monitor glass, lead-acid batteries, some formulations of PVC. A typical 15-inch cathode ray tube may contain 1.5 pounds of lead, but other CRTs have been estimated as having up to 8 pounds of lead. Beryllium oxide: filler in some thermal interface materials such as thermal grease used on heat sinks for CPUs and power transistors, magnetrons, X-ray-transparent ceramic windows, heat transfer fins in vacuum tubes, and gas lasers. Polyvinyl chloride third most widely produced plastic, contains additional chemicals to change the chemical consistency of the product. Some of these additional chemicals called additives can leach out of vinyl products. Plasticizers that must be added to make PVC flexible have been additives of particular concern. Burning PVC in connection with humidity in the air creates Hydrogen Chloride (HCl) and acid.

IV. E-WASTE RECYCLING

All tables many discarded machines contain usable parts which could be salvaged and combined with other used equipment to create a working unit. It is labor

intensive to remove, inspect and test components and then reassemble them into complete working machines. Institutional infrastructures, including e-waste collection, transportation, treatment, storage, recovery and disposal, need to be established, at national and/or regional levels for the environmentally sound management of e-wastes. These facilities should be approved by the regulatory authorities and if required provided with appropriate incentives. Establishment of e-waste collection, exchange and recycling centers should be encouraged in partnership with governments, NGOs and manufacturers. Environmentally sound recycling of e-waste requires sophisticated technology and processes, which are not only very expensive, but also need specific skills and training for the operation. Proper recycling of complex materials requires the expertise to recognize or determine the presence of hazardous or potentially hazardous constituents as well as desirable constituents (i.e. those with recoverable value), and then be able to apply the company's capabilities and process systems to properly recycle both of these streams. Appropriate air pollution control devices for the fugitive and point source emissions are required. Guidelines are to be developed for environmentally sound recycling of E Wastes. Private Sectors are coming forward to invest in thee-waste projects once they are sure of the returns.

V. E-WASTE POLICY AND REGULATION

The Policy shall address all issues ranging from production and trade to final disposal, including technology transfers for the recycling of electronic waste. Clear regulatory instruments, adequate to control both legal and illegal exports and imports of e-wastes and ensuring their environmentally sound management should be in place. There is also a need to address the loop holes in the prevailing legal frame work to ensure that e – wastes from developed countries are not reaching the country for disposal. The Port and the Custom authorities need to monitor these aspects. The regulations should prohibit the disposal of e-wastes in municipal landfills and encourage owners and generators of e-wastes to properly recycle the wastes. Manufactures of products must be made financially, physically and legally responsible for their products. Policies and regulations that cover Design for Environment (DfE) and better management of restricted substances may be implemented through measures such as

- specific product take-back obligations for industry
- financial responsibility for actions and schemes
- greater attention to the role of new product design
- material and/or substance bans including stringent restrictions on certain substances
- greater scrutiny of cross-border movements of Electrical and Electronic Products and e-waste
- Increasing public awareness by labeling products as 'environmental hazard'

The key questions about the effectiveness of legislation would include:

- What is to be covered by the term electronic waste?
- Who pays for disposal?
- Is producer responsibility the answer?
- What would be the benefits of voluntary commitments?
- How can sufficient recovery of material be achieved to guarantee recycling firms a reliable and adequate flow of secondary material?

A complete national level inventory, covering all the cities and all the sectors must be initiated. A public-private participatory forum (E Waste Agency) of decision making and problem resolution in E-waste management must be developed. This could be a Working Group comprising Regulatory Agencies, NGOs, Industry Associations, experts etc. to keep pace with the temporal and spatial changes in structure and content of E-waste. This Working Group can be the feedback providing mechanism to the Government that will periodically review the existing rules, plans and strategies for E-waste management. Mandatory labeling of all computer monitors, television sets and other household/industrial electronic devices may be implemented for declaration of hazardous material contents with a view to identifying environmental hazards and ensuring proper material management and E waste disposal. The efforts to improve the situation through regulations, though an important step; are usually only modestly effective because of the lack of enforcement. While there has been some progress made in this direction with the support of agencies such as GTZ, enforcement of regulations is often weak due to lack of resources and underdeveloped legal systems. Penalties for noncompliance and targets for collection or recycling are often used to ensure compliance.

VI. CAPACITY BUILDING, TRAINING AND AWARENESS PROGRAMMES

The future of e-waste management depends not only on the effectiveness of local government, the operator of recycling services, but also on the attitude of citizens, and on the key role of manufactures and bulk consumers to shape and develop community participation. Lack of civic sense and awareness among city residents will be a major hurdle to keep e- waste out of municipal waste stream. Collaborative campaigns are required to sensitize the users and consumers should pay for recycling of electronic goods. Consumers are to be informed of their role in the system through a labeling requirement for items. Consumers to be educated to buy only necessary products that utilize some of the emerging technologies (i.e. lead-free, halogen-free, recycled plastics and from manufacturers or retailers that will `take-back' their product) to be identified through eco-labeling. Awareness raising programmes and activities on issues related to the environmentally sound management (ESM), health and safety aspects of e-wastes in order to encourage better management practices should be implemented for different target groups. Technical guidelines for the ESM of e-wastes should be developed as soon as possible.

VII. CONCLUSION

The present study reveals that the e-waste are going to become a great challenge for environmentalists and technologists as the rate of growth is much higher than the rate it is disposed, reused or recycled. There is an urgent need for improvement in e-waste management covering technological improvement, operation plan, implementing a protective protocol for the workers working in e-waste disposal and educating public about this emerging issue posing a threat to the environment as well as public health. Model facilities employing environmentally sound technologies and methods for recycling and recovery are to be established. Criteria are to be developed for recovery and disposal of E Wastes. Policy level interventions should include development of e-waste regulation, control of import and export of e-wastes and facilitation in development of infrastructure. An effective take-back program providing incentives for producers to design products that are less wasteful, contain fewer toxic components, and are easier to disassemble, reuse, and recycle may help in reducing the wastes. It should set targets for collection and reuse/recycling, impose reporting requirements and include enforcement mechanisms and deposit/refund schemes to encourage consumers to return electronic devices for collection and reuse/recycling. End-of life management should be made a priority in the design of new electronic products.

.

REFERENCES

Freeman M. H. 1989, Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Company, USA.

Third World Network. 1991, Toxic Terror: Dumping of hazardous waste in the third world, The Third World Network, Malaysia.

A K, Sahoo, G K, Roy, E-waste: A growing menace, CSI magazine July 2009.

Prashant, Nitya. 'Cash For Laptops Offers 'Green' Solution for Broken or Outdated Computers'. Green Technology (Norwalk, Connecticut: Technology.

Nnorom, I C, Osibanjo, Overview of electronic waste management practices and legislations, and their poor applications in the developing countries resources.

Conservation and Recycling. December2008 .E-waste and its management in India. TERI Information Digest on Energy and Environment, 160-164.

Pinto, V N, E-waste hazard: The impending challenge, Indian Journal of Occupational and Environmental Medicine, 2008

Basel Action Network and Silicon Valley Toxics Coalition (2002-02-25). 'Exporting Harm: The High-Tech Trashing of Asia' (PDF). Seattle and San Jose.

Monika, Kishore J, E-waste management: As a challenge to public health in India. Indian J Community Med.

Marketing Corporation. http://green.tmcnet.com/topics/green/articles/37567-cash-laptops-offers-green-solution-broken-outdated-computers.htm. 17-03-2009