



## TITLE: E-waste Management

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*In an approach to bridge the digital divide, it is necessary to get an affordable, equitable and quality access to ICT. It is estimated that two third of world's population is still offline so there is a need to provide affordable access to internet for all. For developing countries, it has become a priority area to alleviate poverty by promoting access to ICT.*

*At the same time, tremendous growth in use of ICT devices and services, faster change of technology and frequent innovations in ICT sector, had left the world with a threat of deterioration in environmental conditions and human health as the-waste of electronic and electrical equipment, which contains hazardous components, is still handled in an environmentally unfriendly manner mainly in developing nations. It is huge challenge for the nations to handle e-waste in responsible manner and protect the environment.*

*In this paper an approach is made towards assessing the present situation of e-waste management globally as well as in India, considering the present regulations and guidelines. It is also a fact that major part of recycling of e-waste is being handled by informal sector who have little/no knowledge about the consequences of exposure to hazardous substances.*

*To address the issue of e-waste management in a sustainable method, the concept of EPR (extended producer responsibility) will be helpful if the regulations incorporate monitoring and penalty clauses. The reuse of EEE has greater environmental and social benefits than recycling as it increases the useful life time of the ICT equipment and enables greater resource efficiency and energy efficiency. In developing nations, it can help in uplifting the status of the informal sector with help of education and employment.*

**Index Terms:** e-waste, international union of e-waste, reuse etc.

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**1. INTRODUCTION**

It is a hard fact that with the voluminous increase in use of ICT devices to bridge the digital divide, there is also an alarming growth of e-waste worldwide. E-waste is defined as "waste electrical and electronic equipment, whole or in part or rejects from their manufacturing and repair process, which are intended to be discarded" whereas electrical and electronic equipment has been defined as 'equipment which is dependent on electrical currents or electro-magnetic fields to be fully functional'.

There is a need for e-waste management as e-waste components may cause severe health risks and environmental damage, when crude, unscientific methods are applied for recovery of useful components. There is a need to encourage recycling of all useful and valuable material from e-wastes to preserve the natural resources.

Most of the developing countries are suffering with the rapidly growing problems of e-waste and have to have sound e-waste management systems for end of life ICT products to avoid the threat on environment and mankind.

**2. AN ESTIMATE OF e-WASTE**

The exponential growth of internet users from 501 million in 2006 to over 1.3 billion in 2011 in developing countries clearly indicates that the sale of computers and other terminals has grown at a lightning pace. In 2006, 44% of internet users were in developing countries whereas in 2011, 62%, were present in developing countries. Personal computer sales has significantly increased from 2000 to 2010, from about 170 million units sold globally in 2000 to about 370 million units sold in 2010. It is projected that sales in 2014 will reach an estimated 470 million units which is more than double in the last 10 years. In India, it is estimated that approximately 1.42 million PCs are getting obsolete every year.

ITU data release of June 2012 indicates that total number of mobile cellular subscriptions reached almost 6 billion by the end of 2011, and in the developing countries, about 80% of the 660 million new mobile cellular subscriptions added in 2011 were generated.

The report "Recycling - from E-Waste to Resources" issued at a meeting of the Basel Convention estimated that, by 2020 in China and South Africa, the e-waste from computers would increase between 200 and 400% over 2007 figures and 500% in India. It was also estimated that by 2020 in India the amount of e-waste from mobile phones would be 18 times higher than the 2007 figures and 7 times higher in China. Basel Action Network stated that 50- 80% of

e-waste generated in USA is exported to India, China, Pakistan, Taiwan and African countries.

### 3. EFFECTS OF e-WASTE ON HUMAN HEALTH AND ENVIRONMENT

E-waste is highly complex to handle because of its composition. It is made up of multiple components some of which contain toxic substances that have an adverse impact on human health and environment if not handled properly that is if improper recycling and disposal methods are deployed. So there is a need for appropriate technology for handling and disposal of these chemicals.

Basel Convention characterizes e-waste as hazardous when they contain and are contaminated with mercury, lead, cadmium, polychlorinated biphenyl etc. Wastes containing insulation or metal cables coated with plastics contaminated with or containing lead, coal tar, cadmium, Polychlorinated Biphenyl (PCB) etc. are also characterized as hazardous wastes. Also precious metal ash from printed circuit boards, glass waste from cathode-ray tubes, LCD screens and other activated glasses are classified as hazardous wastes.

### 4. MANAGEMENT OF e-WASTE

There is no unique or ideal model for e-waste management in developing countries, each of which has its own specific environmental, social, technological, economic and cultural conditions.

Environmentally sound management of WEEE recognizes three Rs i.e. reduce, reuse and recycle. The aim would be to **reduce** the generation of e-waste through smart manufacturing and maintenance, **reuse** till functioning of electronic equipment by someone else and **recycle** those components that cannot be repaired.

A smart e-waste management system for developing countries have to assess the e-waste situation, recognize that e-wastes are a complex mixture of hazardous and non-hazardous substances and materials and need to define the integral e-waste management system taking into consideration the EEE market penetration, life cycle of ICT equipment, financing mechanisms etc.

The main aspects to be taken into account when framing ICT waste management guidelines for developing countries are:

- a Policy and regulations covering import and export of EEE and WEEE in accordance with the rules of each country and with international legislation
- b Defining responsibilities of prime stake holders at the level of government, supply chain, consumers of ICT equipment and entities for disposal of waste
- c Extended producer responsibility (EPR) where the manufacturer's responsibility for its ICT equipment extends throughout the various stages of that equipment's life cycle with internalizing the cost of managing the equipment at end of life
- d Responsible information system to have data on ICT equipment in market, disused EEE management and WEEE management and to have control on the monitoring and future planning

- e Promoting employment and training for the informal sector engaged in recycling and recovery of the materials.

### 5. INDIAN SCENARIO FOR e-WASTE MANAGEMENT

Last few years India has emerged as one major IT hub and the consumer electronic market has grown in an exponential rate. According to Manufacturers Association of Information Technology (MAIT) the Indian PC industry is growing by 25% compound annual growth rate. Study reports that in 2007, 2.2 million computers were made obsolete and 14 million mobile handsets replaced. The e-waste generated was estimated to be 3, 32,979, tons out of which 144,000 tons was recyclable and actually e-waste recycled was 19,000, tons. The e-waste processed contained 12000 tons of computers and 7000 tons of TV. It was also estimated that around 50,000 tons of e-waste was generated through import besides 3, 32,000 tons generated domestically.

**DoT's action towards greening the environment:** For handling e waste in an environment friendly manner following are some of the salient features DOT has included in NTP 2012 which need specific attention by the stake holders:

- a **NTP 2012 reference** : *To reposition the mobile device as an instrument of socioeconomic empowerment of citizens –*
- b The concept of reuse of ICT equipment in the direction of empowering the under privileged can be strongly adopted to following the concept of Brazil's Computer for Connection project which is one very successful application towards bridging the digital divide and towards reducing e waste.
- c Brazil's "Computers for Connection" Project is an initiative to tackle digital divide and promote reuse of ICT waste. The PPP model works on joint effort to offer fully operational refurbished computers in order to support the spread of community telecenters and computerization of public schools and libraries.
- d **NTP 2012 reference:** To promote Research and Development, Design in cutting edge ICTE technologies, products and services for meeting the infrastructure needs of domestic and global markets with focus on security and green technologies – this will be beneficial in the direction of manufacturing of universal accessories and reduction of RoHS in the products.

DoT's vision "to provide secure, reliable, affordable and high quality converged telecommunication services anytime, anywhere for an accelerated inclusive socioeconomic development" definitely urges for socio economic development in line with UNDP's MDGs (Millennium Development Goals) / SDGs (sustainable Development Goals).

#### 5.1. Towards Sustainability:

ITU-T has provided support and guidance for environmental sustainability for the ICT sector for maintenance and operation of ICT devices and services through number of standards and recommendations.

A toolkit has been evolved by ITU-T containing detailed discussions on topics like

Sustainable ICT in corporate organizations, Sustainable products, Sustainable buildings, End-of-life management, General specifications and KPIs, Assessment framework for environmental impacts including standards, guidelines and available methodologies. It is well understood that there is a need of having comprehensive strategy for sustainable electronic product design, production and e-waste management.

Presently the sustainability issues at the stages of product design or production mainly incorporated environmental sustainability and so fall short of social, economic and ethical sustainability. To have an e-waste management system which is environment friendly, the following aspects are to be taken into consideration:

- a Remuneration for research and development in the areas of green design/ development and maintenance of ICT products
- b Incorporation of enforcement clauses in national regulations in a rational way considering the economic conditions of the society
- c Recognition of the importance of the life cycle assessment to have proper estimation on the generation of WEEE
- d Consideration of ethical aspects while addressing the supply chain performances including handling the issues of the informal sector engaged in recycling stages of e-waste management in developing nations
- e Building up the confidence of civil society and consumers in the existing system of e-waste management through mass awareness

## 6. CONCLUSIONS

**Recommendations: A multi programmer approach is required to improve upon the e-waste management in the country which is summarized in the recommendation belongs:**

**7.1** Tax incentive may be considered to telecom product manufacturing companies which institute environmentally safe production systems and products, to offset any incremental cost involved in the process. Tax incentive may be given to companies engaged in scientifically recycling of e-waste till end of life of the product.

**7.2** There is an urgent need of generating awareness among the people about the best practices for collection mechanism of e-waste, to be followed to avoid dumping of waste in landfills, and to channelize the waste through standard methods of e-waste disposal management.

**7.3** All the equipment manufacturers, service providers and Government sectors should be mandated to spread awareness regarding hazards of e-waste. All the telecom equipment manufacturers

specifically mobile hand set manufacturers should disclose to the customer harmful materials used in their products so as to make customers aware of safe disposal methods, through different media. They are also required to include, in their user manual, all the details of health hazards due to use of different hazardous materials in the product (if, any) and the scientific methods for safe disposal at end of life product.

**7.4** Telecom equipment manufacturers and service providers may be advised to create a set up within the organization for safe disposal of e-waste. Providing training and education to the people engaged in recycling, recovery of material and safe disposal of e-waste may also be part of the duty of manufacturers and service providers under corporate social responsibility.

**7.5** The concept of donating used EEE to the poor/ backward children for developing their skills is to be encouraged, mainly among schoolchildren and youth, which in turn will help in cleaning the environment.

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