Chapter 5
Electronic Waste:
Implications on Environs and Management Strategies

Moonisa A. Dervash
Sher-e-Kashmir University of Agricultural Sciences and Technology, India

Syed Maqbool Geelani
Sher-e-Kashmir University of Agricultural Sciences and Technology, India

Rouf Ahmad Bhat
Sher-e-Kashmir University of Agricultural Sciences and Technology, India

Dig Vijay Singh
Sher-e-Kashmir University of Agricultural Sciences and Technology, India

Akhlaq Amin Wani
Sher-e-Kashmir University of Agricultural Sciences and Technology, India

ABSTRACT

Electronic waste (e-waste) is one of the swift waste streams and comprises of end of life electronic products. The Western countries as alternative destinations for disposal ship the wastes to underdeveloped and developing countries where labor cost is reasonably meager and environmental laws are feebly implemented. When not recycled, the e-waste is either incinerated or landfilled. These methods involve not only wasting valuable metals but also creating potential risk for the environment. These substances are detrimental to nervous system, kidneys, bones, reproductive system, and endocrine system, and some of them are even carcinogenic and neurotoxic. Thus, extensive research is needed to evolve sophisticated technology which may help to curb environmental pollution and contribute towards sustainable development in terms of recycling of precious metals.

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INTRODUCTION

"Waste of electrical and electronic equipment; includes all the machinery, subassemblies and consumables which are part of the product at the time of discarding" (ED, 2012). E-waste encompasses multiple arrays of electronic appliances ranging from large household electronic gadgets (like refrigerators, AC's, cell phones, stereo systems and consumable electronic items) to computers discarded by their respective users (Kumar & Singh, 2019). The 'Organization for Economic Co-operation and Development' (OECD) defines E-waste as "any appliance using an electric power supply that has reached its end-of-life" (DTIE, 2007). In general, "domestic machinery represents the largest proportion of E-waste (50%), followed by information and communications technology equipment (30%) and consumer electronics (10%)". The E-waste characterization is reasonably diverse which varies throughout the scheme of products. Overall, it contains more than 1000 diverse substances which plunge into "hazardous" and "non-hazardous" groups. Considerably, the toxicity of majority of the chemicals in E-waste is indefinite (Kumar and Singh, 2019). Generally, "electronic products consist of ferrous and non-ferrous metals, plastics, glass, wood and plywood, printed circuit boards, concrete and ceramics, rubber and other items, whereas, iron and steel constitutes about 50% of E-waste followed by plastics (21%), nonferrous metals (13%) and other constituents" (DTIE, 2007). E-waste constitutes end of life electronic and electrical gadgets (Sankhla et al., 2016) which contains toxic elements and has to be treated in an environmentally friendly approach (Sankhla et al., 2016). E-waste comprises of "electrical gadgets such as fridges, air conditioners, washing machines, microwave ovens and florescent light bulbs; and electronic products such as computers and accessories, mobile phones, television sets and stereo equipment" (Radha, 2002). Data security concerns are also associated with E-waste handling and management in order to safeguard extraction of commerce, economics and legal data by unscrupulous recyclers; therefore, it should be handed over to recyclers/operators who have the mandate for E-waste management (Radha, 2002). Besides, E-waste is less energy intensive and cheaper source for base and precious metals like silver, gold, palladium and platinum (Lucier & Gareau, 2006) thus it is often referred to as urban mine. Moreover, as the demand for metals is growing (Lucier & Gareau, 2006) recycling would play a major part in ensuring sustainable development (Schluep *et al*., 2009).

In the last 20 years, the worldwide development in electrical and electronic equipment production and consumption has been exponential (Schluep *et al*., 2009). This is chiefly because of escalating marketplace dissemination of products in developing countries (DTIE, 2007); progression of a alternate marketplace in developed countries which is usually high product obsolescence rate (DTIE, 2007), coupled with a price drop and the drift towards internet access. Currently, E-waste is the fastest growing waste stream (4% growth a year) (Radha, 2002; DIT, 2003; Sankhla et al., 2016). Approximately 40×10^6 tonnes of E-waste is created each year (Schluep *et al*., 2009). Environmentally accountable waste management strategies are hi-tech that entail high monetary speculation.

There is currently a high level of trans-boundary, often illegitimate, movement of E-waste into developing countries for affordable recycling (Strategic Approach to International Chemicals Management, SAICM, 2009). Trans-boundary movement of E-waste is principally profit oriented. Waste recyclers are taking due advantage of lower recycling expenditure in developing countries and at the same time avoiding disposal at home. It is estimated that up to 80% of all E-waste sent for recycling in developed countries ends up in informal E-waste recycling sites in developing countries, primarily in Africa and Asia. In receiving countries, crude and hazardous methods of recycling are used, jeopardizing people's health and the environment (Smith *et al*., 2006). This raises the coherent issues pertaining to a dispropor-