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Comparative Examining and Analysis of E-waste Recycling in Typical Developing and Developed Countries

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Abstract

The aim of this study is to comparative examining and analysis of electronic and electric waste (e-waste) between developing and developed countries. In fact, most of the developing countries are suffering from informal recycling, because of enormous number of unemployed people engaged in the collection and recycling at family workshop. They are working in different level of community for collection of refused electronic products directly from consumer, followed by sell it to refurbishers and recyclers. These are completely recycled through "backyard recycling" or primitive or crude methods includes open burning to extract metals, acid leaching for precious metals at family level workshop. These activities are running due to lacking of legislation, treatment standards, environmental protection measures, recycling infrastructure and awareness. Due to absence of updated data of WEEE generation in India with respect of other two countries China, USA and Europe, it cannot possible to make effective control system. The study is based on literature survey by using different database science direct, google scholar with several keywords such as key words e-waste or electronic waste or WEEE recycling or management in India, China, USA and Europe etc. The obtained output from this comprehensive work will make a strong contribution to scientific knowledge and valuable for scientists and policy-makers to solve the e-waste problems towards best available techniques and best environmental practices in future.

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Keywords: WEEE, recycling, environmental impact, assessment, problem;

1. Introduction

Electrical and electronic equipment is becoming e-waste when they are deemed at the end of their useful life

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leads to an emerging and most critical as well as fast-growing waste issues (Zeng et al., 2015a; Zeng et al. 2015b; Zeng et al., 2015c; Li et a., 2015; Jiang et al., 2012). It mainly included computers, printers, cell phones, photocopiers, TVs, fax machines, home appliances, and lighting equipment (Zeng et al., 2013). Recently, it was reported that 41.8 million metric tonnes (Mt) of e-waste generated at global scale and expected to lead up to around 50 million tons in 2018 (Balde et al., 2015). This huge portion of e-waste is covered about 12.8 Mt of small equipment (such as toasters, electric shavers, vacuum cleaners, video cameras, microwaves, etc.), 11.8 Mt of large equipment (such as dishwashers, clothes dryers, electric stoves, washing machines, photovoltaic panels, etc.) 7.0 Mt of cooling and freezing equipment (temperature exchange equipment)., 6.3 Mt of screens type materials, 3.0 Mt of small IT (such as mobile phones, pocket calculators, personal computers, printers, etc.), and 1.0 Mt of lamps. However, rapid e-waste generation is a serious and significant issue for sustainable development that covers the technical, ecological, socioeconomic, and legal components (Chang et al., 2011). The presences of highly valuable materials such as metals and plastics in e-product have encouraged the recovery of these materials from e-waste (Reck et al., 2012; Xanthos, 2012). But it should be much concerned because e-waste can be regarded as hazardous waste. A number of environmental pollution problems arose with crude dismantling and informal recycling in some developing countries (Duan et al., 2011; Shingkuma et al., 2010). Consequently, a large amount of money and effort has been gone into e-waste treatment research in the past many years (Li et al., 2015). Although recycling is a better way to reuse the raw/resource materials from any product, because hazardous materials of e-waste can harm workers who associated with in the recycling yards, along with near communities and local environment. In order to develop an ecofriendly process for efficient recovery of precious metals from WEEE, in both terms economic feasibility and environmental impact. In this regard, it is notice that biotechnology approach has been become most promising technologies (Bas et al., 2013). However, limited research was carried out on this aspect electronic waste processing.

In developed countries, electronics recycling considers in purpose-built recycling plants under controlled manner. For example, many EU states, they avoid brominated furans and dioxins released into the atmosphere by do not recycled plastics from e-waste. In another hand in developing countries, there are no such controls facility and almost recycling is carrying by hand scraping in small family yards by children (Greenpeace, 2009). In this regard, such facility also affected their recycling capacity. Therefore, in this study we examine e-waste issue in developed and developing countries.

2. E-waste Generation of in these countries

2.1. India

Most of the e-waste was generated in Asia: 16 Mt in 2014. This was 3.7 kg for each inhabitant (Balde et al., 2015). According to National WEEE task force, reported that total E-waste or WEEE generation was about 146,000 tonnes/year in India in 2005 (Wath et al., 2010). Another hand, Central Pollution Control Board (CPCB) estimated that 1.347 lakh MT of E-waste was generated in the country in the year 2005, which can be expected to reach 8.0 lakh MT by 2012. In addition, GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit)-MAIT (2007)[1] had estimated and suggested that huge amount (3,30,0000 tonnes) of WEEE generated in 2007 in India. However, other researcher also estimated as 420,000 tonnes/year (Wath 2010), and 382,979 tonnes/year generated in India (Skinner 2010). Although, E-waste flows complexity in India along with inadequate record-keeping pushing its estimation more difficult (Streiche-Porte et al., 2007).

2.2. China

The total amount of e-waste was estimated as 3.6 million tonnes in 2010 and nest to 5.5 million tonnes in 2013, and is expected to reach 11.7 million tonnes by 2020 and 20 million tonnes by 2040. This e-waste, mainly includes air conditioners (26%), televisions (24%), computers (14%), refrigerators (12%), washing machines (7%), printers (9%) and fluorescent lamps (7%) are produces respectively (Li et al., 2015). On January 1, 2015, a new Catalog of