

E- Waste: A Global Problem and related issues

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Abstract

Electronic waste or e-waste is an emerging problem of today's time. Basically e-waste is any refuse created by discarded electronic devices and components as well as substances involved in their manufacture or use. The disposal of electronics is a growing problem because electronic equipment frequently contains hazardous substances. Around the world, a number of initiatives have arisen to address the issue of e-waste, by promoting the reuse of electronic devices (e-cycling). The UN research predicts that in South Africa and China, e-waste from old computers may jump by 200 to 400 per cent from 2007 levels and by 500 per cent in India.

The USA discards 30 million computers each year and 100 million phones are disposed of in Europe each year. The Environmental Protection Agency estimates that only 15-20% of e-waste is recycled, the rest of these electronics go directly into landfills and incinerators. Electrical waste contains hazardous but also valuable and scarce materials. Up to 60 elements can be found in complex electronics. In the United States, an estimated 70% of heavy metals in landfills come from discarded electronics.

Key words e-waste, Asia, global trading, recycling, e-waste management.

1. Introduction

Electronic waste, e-waste, e-scrap, or waste electrical and electronic equipment describes discarded electrical or electronic devices. There is a lack of consensus as to whether the term should apply to resale, reuse, and refurbishing industries, or only to product that cannot be used for its intended purpose. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, though these countries are also most likely to reuse and repair electronics. Some electronic scrap components, such as CRTs, may contain contaminants such as lead, cadmium, beryllium, or brominated flame retardants. Even in developed countries recycling and disposal of e-waste may involve significant risk to workers and communities and great care must be taken to avoid unsafe exposure in recycling operations and leaching of material such as heavy metals from landfills and incinerator ashes. Scrap industry and USA EPA officials agree that materials should be managed with caution.



1.1 E-FAQs

Is "e-waste" clearly defined?

The term "e-waste" is loosely applied to consumer and business electronic equipment that is near or at the end of its useful life. There is no clear definition for e-waste; for instance whether or not items like microwave ovens and other similar "appliances" should be grouped into the category has not been established.

Is "e-waste" considered hazardous?

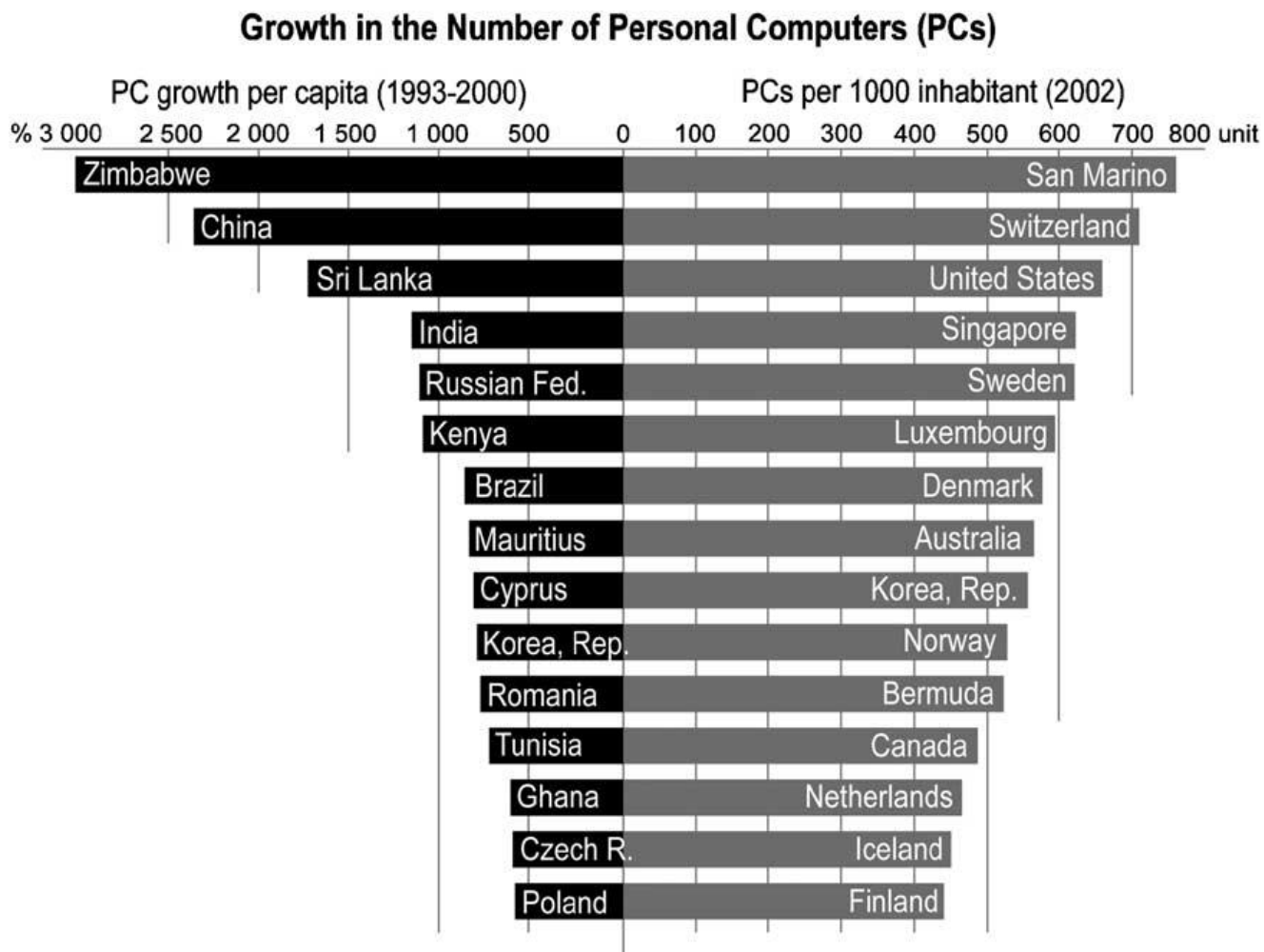
Certain components of some electronic products contain materials that render them hazardous, depending on their condition and density. For instance, California law currently views nonfunctioning CRTs (cathode ray tubes) from televisions and monitor as hazardous.

1.2 Definitions on E-Waste

E-waste is any refuse created by discarded electronic devices and components as well as substances involved in their manufacture or use. Table 1 lists selected definitions.

Table 1

Reference	Definition
EU WEEE Directive (EU, 2002a)	“Electrical or electronic equipment which is waste. . . including all components, sub-assemblies and consumables, which are part of the product at the time of discarding.” Directive 75/442/EEC, Article 1(a) defines “waste” as “any substance or object which the holder disposes of or is required to dispose of pursuant to the provisions of national law in force.”
Basel Action Network (Puckett and Smith, 2002)	“E-waste encompasses a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos, and consumer electronics to computers which have been discarded by their users.”
OECD (2001)	“Any appliance using an electric power supply that has reached its end-of-life.”
SINHA (2004)	“An electrically powered appliance that no longer satisfies the current owner for its original purpose.”
StEP (2005)	E-waste refers to “. . .the reverse supply chain which collects products no longer desired by a given consumer and refurbishes for other consumers, recycles, or otherwise processes wastes.”



Data source : The World Bank, World Development Indicators 2004

Fig. 1. Top scoring countries in PC growth rates (cumulated 1993 – 2000) and market saturation (2002) (Schwarzer et al., 2005).

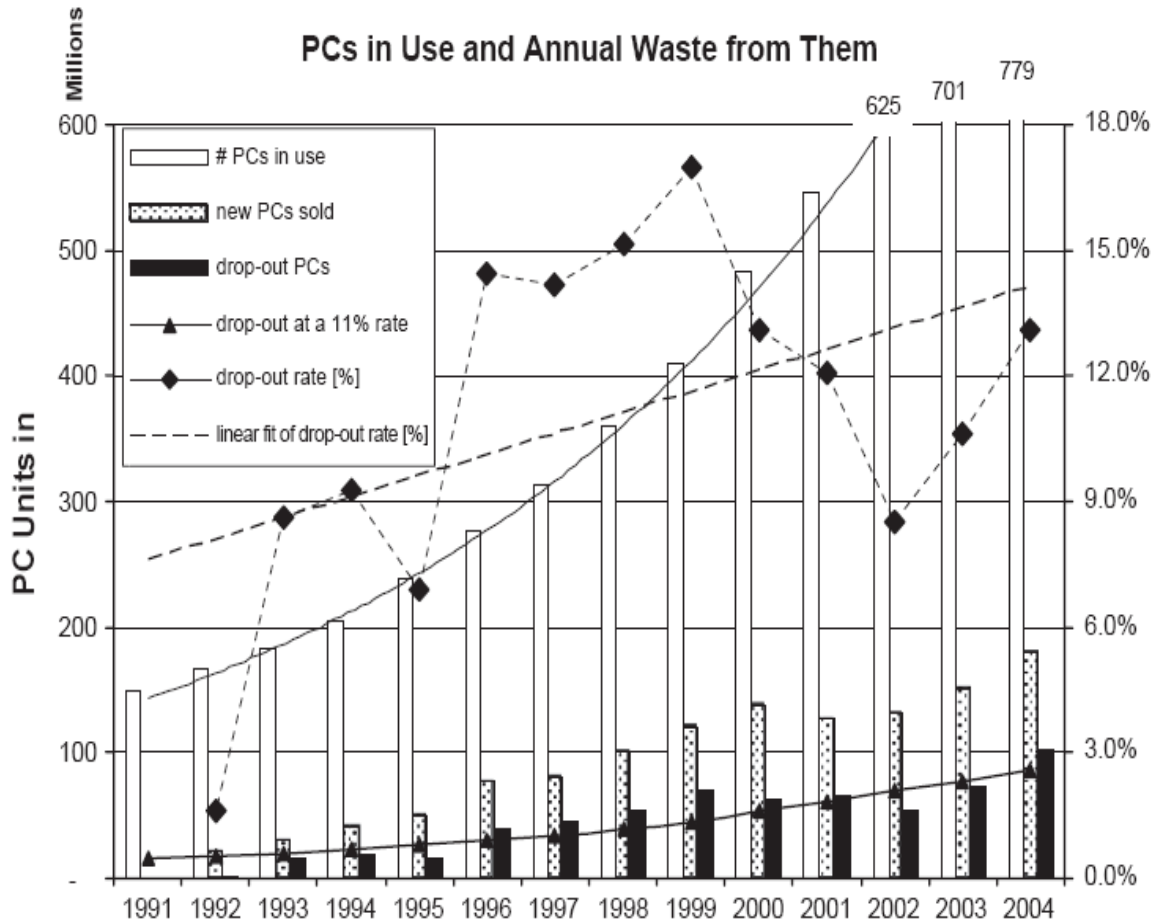


Fig. 2. Some facts and trends of the PC market over the last decade (all input data from The World Bank online statistics www.worldbank.org)

Additionally some developing and industrializing countries import considerable quantities of e-waste, even though the Basel Convention restricts transboundary trade of it. Fig. 3 indicates the main e-waste traffic routes in Asia. There are, however, no confirmed figures available on how substantial these transboundary e-waste streams are. From nonratifying countries, such as the USA, estimates have been made that 50–80% of the collected domestic e-waste is not recycled domestically but rather shipped to destinations such as China (Puckett and Smith, 2002). China, India and other countries have recently adjusted their laws to fight e-waste imports.

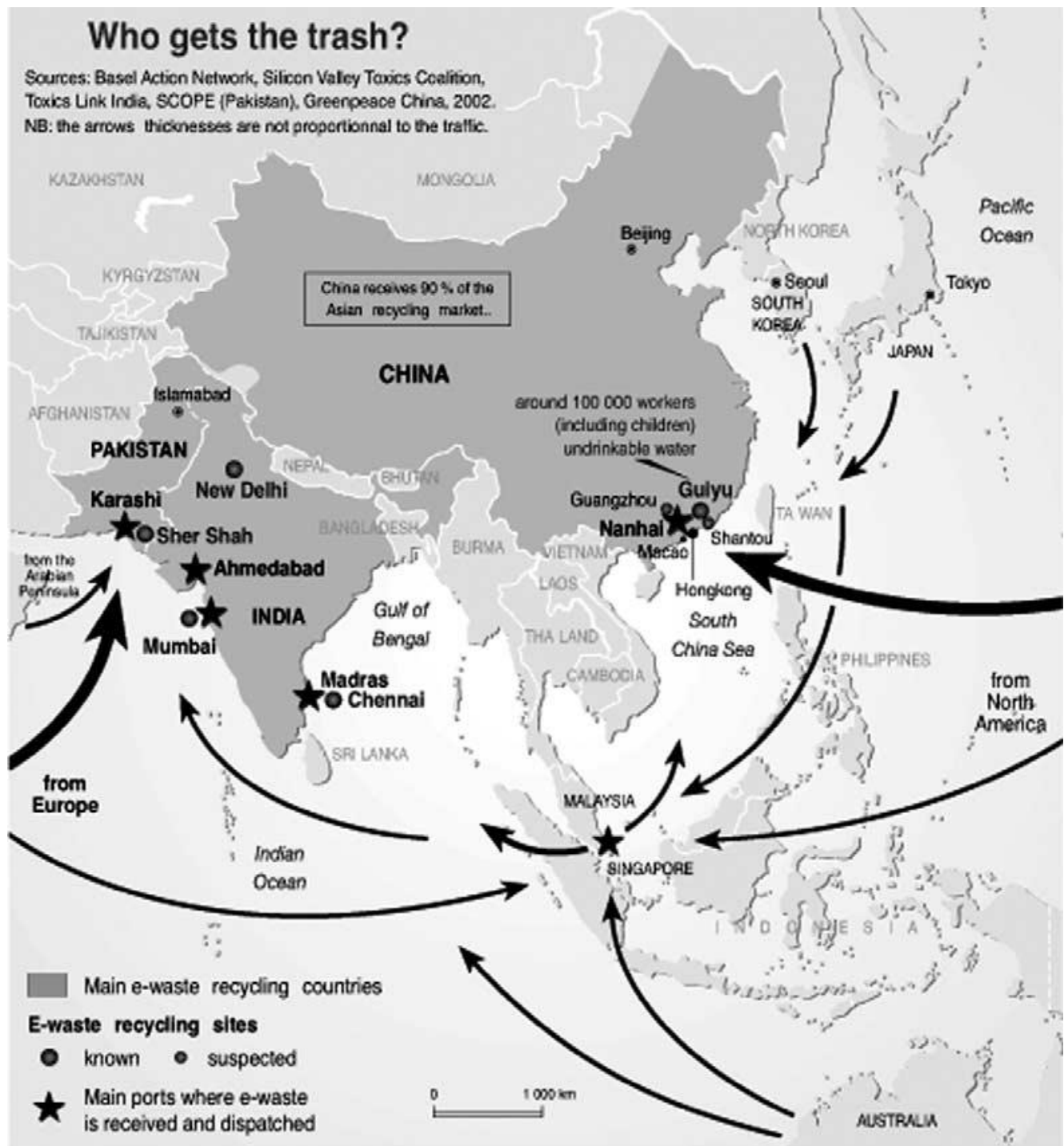


Fig. 3. Asian e-waste traffic (Schwarzer et al., 2005).

1.3 Environmental Issues Raised by Data Centers

The issue of e-waste has grown as the amount of hardware being thrown away has skyrocketed: The federal Environmental Protection Agency (EPA) estimates that more than four million tons of e-waste hit landfills

each year. There is also the problem of e-waste's sometimes-toxic ingredients. Data centers, meanwhile, are stuck with the question: What should they do with used servers and other electronic equipment if they want to get rid of it?

1.4 E-Waste Management

Some strategies are prepared to deal with this problem like recycling, processing techniques, benefits of recycling.

1.4.1 Recycling



Fig. 4 Computer monitors are typically packed into low stacks on wooden pallets for recycling

Today the electronic waste recycling business is in all areas of the developed world a large and rapidly consolidating business. Part of this evolution has involved greater diversion of electronic waste from energy-intensive down cycling processes (e.g., conventional recycling), where equipment is reverted to a raw material form. This diversion is achieved through reuse and refurbishing. The environmental and social benefits of reuse include diminished demand for new products and raw materials (with their own environmental issues); larger quantities of pure water and electricity for associated manufacturing; less packaging per unit; availability of technology to wider swaths of society due to greater affordability of products; and diminished use of landfills.

Audiovisual components, televisions, VCRs, stereo equipment, mobile phones, other handheld devices, and computer components contain valuable elements and substances suitable for reclamation, including lead, copper, and gold.

One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit boards contain such precious metals as gold, silver, platinum, etc. and such base metals as copper, iron, aluminum, etc. Conventional method employed is mechanical shredding and separation but the recycling efficiency is low. Alternative methods such as cryogenic decomposition have been studied for printed circuit board recycling and some other methods are still under investigation.

1.4.2 Processing Techniques



Fig. 5 Recycling the lead from batteries

In developed countries, electronic waste processing usually first involves dismantling the equipment into various parts (metal frames, power supplies, circuit boards, plastics), often by hand, but increasingly by automated shredding equipment. The advantages of this process are the human's ability to recognize and save working and repairable parts, including chips, transistors, RAM, etc. The disadvantage is that the labor is cheapest in countries with the lowest health and safety standards.

An ideal electronic waste recycling plant combines dismantling for component recovery with increased cost-effective processing of bulk electronic waste.

Reuse is an alternative option to recycling because it extends the lifespan of a device. Devices still need eventual recycling, but by allowing others to purchase used electronics, recycling can be postponed and value gained from device use.

1.4.3 Benefits of Recycling

Recycling raw materials from end-of-life electronics is the most effective solution to the growing e-waste problem. Most electronic devices contain a variety of materials, including metals that can be recovered for future uses. By dismantling and providing reuse possibilities, intact natural resources are conserved and air and water pollution caused by hazardous disposal is avoided. Additionally, recycling reduces the amount of

greenhouse gas emissions caused by the manufacturing of new products. It simply makes good sense and is efficient to recycle and to do our part to keep the environment green.

2. E-Waste Rules

The Manufacturers' Association for Information Technology (MAIT) has incubated an Electronics Recyclers' Association (ERA) to organize electronic waste (e-waste) handling in an environment- friendly manner. ERA will initially comprise nine members, of whom six are e-waste processors and three executive members. "Besides the amount that is generated in the country, e-waste is also illegally imported and there are only 10 formal recyclers who are collectors as well as dismantlers of this e-waste," said ERA Secretary-General Lakshmi Raghupathy.

The formation of ERA is significant given that the government had prepared the draft rules for managing, dismantling or recycling e-waste and will be called the E-waste (Management and Handling) Rules, 2010.

The rules ask the producer to ensure all electrical and electronic equipment are provided with a unique serial number or individual identification code for tracking their products in the e-waste management system. These rules define e-waste as waste electrical and electronic equipment scraps or rejects from their manufacturing process, which is intended to be discarded.

3. Action Against E-Waste

Every day, tonnes of electronic waste (e-waste) are sent to developing countries. It is illegal to trade in e-waste and despite this almost all e-waste is dumped in places where no facilities exist for safe recycling with a minority of e-waste being repaired and reused.

Countries like China, India, Pakistan, Ghana and Nigeria receive thousands of old electronic goods on a daily basis from Europe and America.

In these developing countries, the lowest paid people, and in many cases children, earn money by breaking up monitors, servers, PCs, laptops and other electronic devices in order to get certain components inside.

By doing so they are exposed to highly toxic chemicals, including mercury, which damages the brain; lead, which can damage reproductive systems; and cadmium, which causes kidney damage.

For years, the western world has been sending mountains of e-waste to developing countries at the expense of people and the environment.

Improvement to the Waste Electrical and Electronic Equipment (WEEE) Directive is clearly needed: a 2008 review of its performance showed only one third of WEEE collected in the EU is treated according to legal requirements; the rest goes either to landfill or to sub-standard treatment inside or outside the EU. We need to change our ways and act against e-waste.

4. Conclusion

E-waste is an emerging issue, driven by the rapidly increasing quantities of complex end-of-life electronic equipment. The global level of production, consumption and recycling induces large flows of both toxic and valuable substances. The international regulations mainly developed under the Basel Convention, focusing on a global ban for transboundary movements of e-waste, seem to face difficulties in being implemented effectively; however, a conclusive account of the situation and trends is not yet possible. On a global scale some attempts have been made to identify past, present and future e-waste streams. The focus has been laid on quantities and in some cases on routes and spatial distribution, but a global perspective is still lacking.

Debate continues over the distinction between "commodity" and "waste" electronics definitions. Some exporters are accused of deliberately leaving difficult-to-recycle, obsolete, or non-repairable equipment mixed in loads of working equipment (though this may also come through ignorance, or to avoid more costly treatment processes). Protectionists may broaden the definition of "waste" electronics in order to protect domestic markets from working secondary equipment. The high value of the computer recycling subset of electronic waste (working and reusable laptops, desktops, and components like RAM) can help pay the cost of transportation for a larger number of worthless pieces than can be achieved with display devices, which have less (or negative) scrap value. In A 2011 report, "Ghana E-Waste Country Assessment", found that of 215,000 tons of electronics imported to Ghana, 30% were brand new and 70% were used. Of the used product, the study concluded that 15% was not reused and was scrapped or discarded. This contrasts with published but uncredited claims that 80% of the imports into Ghana were being burned in primitive conditions.

4.1 What can be done?

- Companies can help end this trade by removing hazardous components from their products.
- Individuals need to take responsibility and find out what happens to their e-waste.

- Proper recycling of e-waste and measures to stop exposing people to highly toxic chemicals.
- To raise awareness about the dangers of e-waste and expose poor practices.
- To help individuals and companies understand what behavioral changes need to be made.
- To show companies and individuals what changes can be made to stop e-waste.

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