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ENVIS Newsletter

Status of Environment and Related Issues

DEPARTMENT OF FORESTS, ECOLOGY & ENVIRONMENT, GOVERNMENT OF KARNATAKA

Vol.3 No. 1 April 2007

Del key for e-waste

E-waste is a common, informal name for electronic products nearing the end of their 'productive life.' Electronic waste comes from computers, entertainment electronics, mobile phones and other products that have been discarded by their original users. Many of these products can be reused, refurbished, or recycled. Unfortunately, electronic discard is one of the fastest growing segments of our nation's waste stream.

A decade back, the amount of waste generate d was considered small enough to be diluted in the environment. With massive industrialization and urbanization, the quantity of waste gener ated has increased many fold. As the garbage pile gets higher and the environmental conscience sharpens, i t is now recognized that producing waste at this rate is no longer acceptable.

Electronic waste or e-waste is the most rapidly growing waste problem in the world. It is a crisis not only of quantity but also a crisis born from toxic ingredients such as the lead, beryllium, mercury , cadmium, and brominated-flame retardants that pose both occupational and environmental health threats. But to date, initiatives taken by various countries have been woefully inadequate. Even developed countries like the US have tried to skirt the problem. Continued negligence from all quarters has led to this issue snowballing into a major environmental problem today.

How e-waste has grown

The last decade has seen tremendous growth in the field of information technology all over the world. The benefits of the IT revolution have been proved and well-enumerated. But just beneath the glamorous surface of the benefits and the wealth created by the information technology revolution looms a darker reality . Vast resource consumption and waste generation are increasing at alarming rates. The electronics industry is the world's lar gest and fastest growing manufacturing industry, and as a consequence of this growth, combined with rapid product obsolescence, discarded electronics or e-waste, is now the fastest growing waste stream in the industrialized world.

Is e-waste hazardous?

The vast amount of computers, televisions, mobile phones and the like that are disposed of every year all contain a variety of toxic substances. When electronics are dumped in landfills, or when the waste is incinerated, contaminants and toxic chemicals are generated and released into the ground or airGiven the sheer magnitude of e-waste generated each year , the problems that these toxins present increase exponentially as they progressively pollute the environment and threaten to enter the food chain.

Sources of e - waste

Electronic waste is generated by three major sectors

Individuals and small businesses:
Due to the new technologies, the rate of obsolescence is very high. Thus, electronic equipment, and computers in particular, are often discarded by households and small businesses, not because they are broken but simply because new technology has rendered them obsolete.

Large corporations, institutions, and government:
Large corporate and institutional users upgrade employee computers regularly , say every 3 to 4 years. Such corporate policies lead to huge amounts of e-waste.

Original Equipment Manufacturers (OEM):
OEMs generate e-waste when units coming off the production line do not meet quality standards, and must be rejected.

Every year 20 to 50 million tonnes of e-waste are generated worldwide.

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10th August 2007

Message

Progress is a double-edged weapon. Increasing use of computers, entertainment electronics and mobile phones has resulted in alarmingly large quantities of discarded electronic waste littering the environment.

The problems facing disposal of e-waste cannot be swept under the carpet. Proper regulations and monitoring systems coupled with safe e-waste handling processes can generate wealth from waste.

It is time every enlightened Indian adopted the 'Reduce, Reuse, Recycle' ma ntra in letter and spirit.

10/08/07

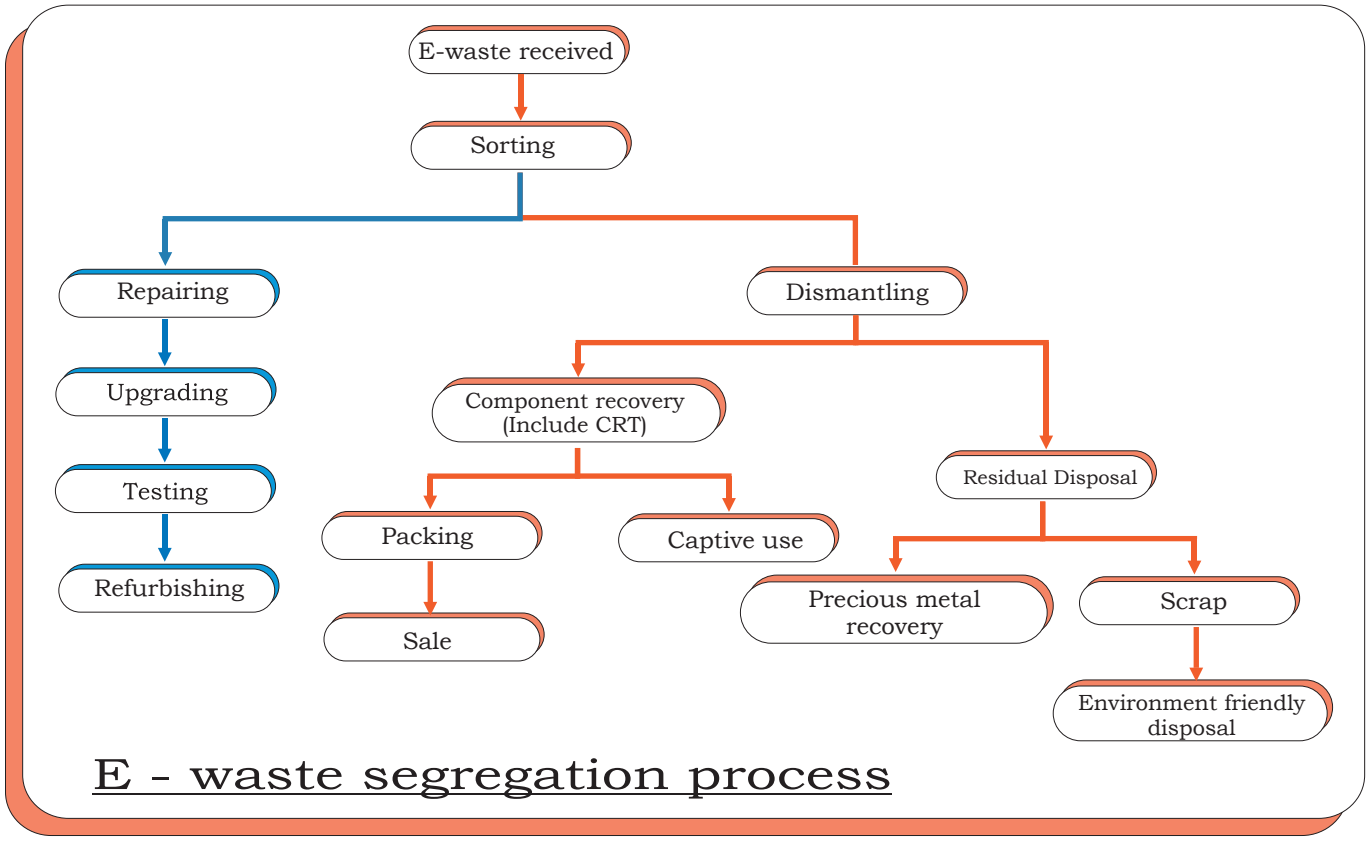
(M. N. VIDYASHANKAR)

E-waste segregation and disposal method

The e-waste generated is usually segregated and disposed of in the following ways:

Landfill: A landfill is a disposal area where garbage i s piled up and eventually covered with dirt and topsoil. E-waste is most often dumped into landfills, mostly by small businesses and households. Over time the e-waste leads to certain amount of chemical and metal leaching. This can very often lead to groundwater contamination.

Incineration: Sometimes, e-waste is burnt in incinerators. This leads to the formation of harmful toxic gases like dioxins and furans, which escape to the



E - waste segregation process

E-waste is generated 3 times faster than any other waste streams.

atmosphere and contaminate it.

Re-use: About 3 to 5 per cent of the computers that have been discarded by their users are re-used. Re-use constitutes direct second-hand use or uses after slight modifications are made to the original functioning equipment, memory upgrades, etc. Often, non-working old computers are repaired and resold for a profit in developing countries.

Non-scientific method of recycling e-waste

These older units obviously have a limited life span and end up as waste sooner or later in these developing countries.

Recycling of e-waste

In order to combat the environmental impact of improper electronic waste disposal, many organizations have opted to recycle their old technology. But while recycling is growing in popularity, rates are still low. After all possibilities for re-use are exhausted and a computer is slated for disposal, it is sent for recycling. This means that the old raw materials are reclaimed to be made use of in making new products. However, the costs of recycling are high. Thus, most recyclers are not willing to take computers for recycling unless the owner is willing to pay them to take it. Dealing with the disposal of non-recyclable parts involves high cost. The cost of dealing carefully with recycling of toxic waste components of old computers is also high

Hazards in e-waste

E-waste contains a witches' brew of toxic substances. Some of the potentially hazardous metals that are part of this e-waste are lead, barium, cadmium, tin etc. These heavy metals are mostly toxic and heavy exposure to them can cause diseases like silicosis, respiratory irritation, pulmonary edema and even death in some cases.

The impact of e-waste may be broadly classified into two categories:

- **Downstream impact** : Hazardous waste trade is fundamentally unjust and environmentally damaging since it victimizes the poor , burdening them with toxic exposure and environmental degradation. This is especially egregious when victims get little benefit from the industrialization that created the waste in the first place.
- **Upstream impact**: The hazardous waste trade allows waste generators to externalize their costs, creating a major disincentive to finding true solutions upstream for the problems they create. As long as one can cheaply dump their waste problems on poorer economies, there will never be incentives to minimize hazardous waste at the source.

Exporting e-waste to developing countries

Industrialized nations like the US are the lar gest consumers of electronics goods. Consequently , the overwhelming majority of the world's hazardous waste is generated by these industrialized market economies. But these industrialized countries very often conveniently dispose of their e-waste by exporting these to underdeveloped and developing countries in Asia and Africa.

E-waste exports to Asia and Africa are motivated entirely by brute global economics. Market forces, if left unregulated, dictate that toxic waste will always run downhill on an economic path of least resistance. A free trade in hazardous wastes leaves the poorer peoples of the world with an untenable choice between poverty and poison - a choice that nobody should have to make. In an effort to counter the unsustainable and unjust ef fects of free trade in toxic wastes, an international treaty known as the Basel Convention was created in 1989. And it was also for this reason that the Basel Convention in 1994 agreed to adopt a total ban on the export of all hazardous wastes from rich to poor countries for any reason, including for recycling.

The Basel Convention calls on all countries to reduce their exports of hazardous wastes to a minimum and, to the extent possible, deal with their waste problems within national borders. Indeed, this is an obligation of the Basel Convention regardless of the level of waste management

technology in the importing country

How much e-waste is exported?

The answer to how much e-waste is actually exported is anybody's guess. However, there have been some serious studies, which provide estimates of the amount of US computers that go or will go to recyclers each year. One such study compiled by the Graduate School of Industrial Administration of Carnegie Mellon University, concludes that 12.75 million computer units went to recyclers in the US in the year 2002. Based on this estimate, and with a rate of 80 per cent moving offshore to Asia, the total would amount to 10.2 million units. This is the equivalent of a tightly stacked pile of computer waste one acre square and 674 feet high. (The amount of e-waste exported to Asia in 2002 based on the assumption that 80 per cent of the material collected by recyclers was diverted to export)

Main ports where India and Subcontinent receives e-waste

E-waste and theAsian perspective

Vulnerability ofAsia

Asia is booming. Asia has the lar gest population among all the continents of the world. Nearly two-thirds of the world population growth is inAsia. Approximately 50 million people are being added toAsia every year

The Asian economy is also poised for a magnum leap in the coming years. A GDP growth forecast by the World Bank estimates that in the coming 10 years, the Asian economy is poised to grow at an annual average growth rate of 6 per cent, which is double the world annual average growth rate of 3.1 per cent. This implies that the per capita income of individuals in these countries is going to increase many fold. It will lead to a burgeoning middle class with lar ge disposable income, which they will use to purchase goods like television, mobile phones, etc. The number of people in the middle class pool for China itself increased fivefold between 2003 and 2006, according to one estimate. Consequentlythere is going to be a huge market for electronic goods in this region.

However, since most of the Asian countries are either underdeveloped or developing, they depend for most of their technological needs on countries l ike the US. This makes them very vulnerable to phenomena like e-waste dumping by the industrialized nations.

Current status

Already, a few countries like Japan, Malaysia and Singapore have taken steps to manage e-waste. Some of these countries already have laws and regulations in place that ban the import of hazardous e-waste. Domestic recycling has also been adopted. In fact, Malaysia has a plant that is dedicated to handling e-waste.

At the same time, some countries have yet to wake up to the perils of e-waste. In countries like Sri Lanka and Vietnam, there is very little awareness and initiatives on e-waste management.The challenge for these countries is therefore to first create awareness about the subject. For this, they can look for technical assistance and inter - governmental co-operation. A comprehensive strategy for e-waste management aiming to enhance the capacity of countries for implementing responses should be drawn up. Only a concerted ef fort by all the stakeholders can help to fight this problem.

E-waste :The Indian context

The Indian economy has been growing at a fast rate for the last decade. This growth has been on the back of globalization and the IT revolution. In terms of production, internal consumption and electronics export industries have emerged as the fastest growing segments of Indian industry. Over the last five years, the Indian IT industry has recorded a Compounded Annual Growth Rate of more than 42.4 per cent, which is almost double the growth rate of IT industries in many of the developed countries. In the IT action plan, the government has targeted to increase the present level of penetration, from

In India, 14 million computers, 39 million telephones and 18 million televisions are projected to reach end of life by 2010.

1 per 100 people to 1 for 50 people, by 2008. This envisages applying IT in every walk of the economic and social life of the country

When compared with the US, the Indian configuration of 1 PC per 100 people does not represent any sign of massive rise in PCs' obsolescence rate. But of the nearly 5 million PCs in India, 1.38 million are either 486s or below. This figure represents a vast amount of equipment soon to be added to the waste stream as upgradation beyond a point becomes uneconomical and incompatible with software in demand. In any case, this invisibility has started blurring, with the huge import of junk computers that, in turn, creates ugly situations for solid waste management in India.

The biggest source of PC scrap are foreign countries that export huge quantities of computer waste in the form of monitors, printers, keyboards, CPUs, typewriters, PVC wires, etc. Due to the hazards involved, disposing and recycling of e-waste have serious legal and environmental implications. These materials are complex and difficult to recycle in an environmentally sound manner even in well-developed countries. The recycling of computer waste requires sophisticated technology and processes, which are not only very expensive, but also need specific skills and training in their operation.

In India, most of the recyclers currently engaged in recycling activities do not have this expensive technology to handle the waste. Computer scrap is managed through various management alternatives such as product reuse, conventional disposal in landfills, incineration and recycling. However, the disposal and recycling of computer waste in the country has become a serious problem since the methods of disposal are rudimentary and pose grave environmental and health hazards. Besides handling its own computer waste, India now also has to manage the waste being dumped by other countries. Solid waste management, which is already a mammoth task in India, has become more complicated by the invasion of e-waste, particularly computer waste.

The problems associated with e-waste in India started surfacing after the first phase of economic liberalization, after 1990. That year witnessed a shift in economic policy, in turn triggering off an increase in the consumption pattern. This period also witnessed a shift in the pattern of governance. It ushered in an era of infrastructure reform and e-governance. This shift is marked by the application of information technology in a big way in all areas. These developments, along with indigenous technological advancement, have led to an addition of a wide gamut of e-waste churned out from Indian households, commercial establishments, industries and public sector industries, into the waste stream.

Solid waste management, has become more complicated by the invasion of e-waste, particularly computer waste to India, from different parts of the world. Indigenous as well as imported computer waste has led to the emergence of a thriving market in computer waste products and processing units for material recovery in different parts of India. So the trade in e-waste is camouflaged and is a thriving business in India, conducted under the pretext of obtaining 'reusable' equipment or 'donations' from developed nations.

Status in Karnataka

India's first scientific hazardous waste dump faces an eviction threat for a new township. A joint Indo-German hazardous waste management unit (HAWA), set up to treat and handle e-waste at Dobbespet, about 45 km north of Bangalore, faces eviction just a year before it was to become operational. The eviction is because the unit is too close to some of the temples and mutts.

HAWA has been designed to treat and handle e-waste, besides hazardous chemicals and minerals by adopting advanced scientific methods. GTZ, Germany's environment protection wing, has given financial and technical assistance for the project and cleared the location for the new unit. After nearly six years of preliminary work, this scientific waste dump would have been ready to treat electronic waste from 2007. The delay would now violate a ruling in January by the Supreme Court's Monitoring Committee on Hazardous Waste that every state should have a scientific unit to dispose of hazardous waste. The pollution board had urged tech firms in Bangalore and Mysore to store the computer waste they generated within their premises and hand them over to the new waste treatment plant.

- Bangalore has 1,322 software companies and 36 hardware companies
- They generate 8,000 tonnes of e-waste each year
- 30 per cent of their electrical equipment becomes obsolete each year
- Electrical equipment worth Rs.15.6 crore were destroyed last year

Regulations

To combat the ever-growing e-waste problem, India needs to have strong rules and regulations in place. Over the years, the government has instituted a number of regulations for better management of hazardous waste in the country. Some of these regulations are given below:

- Hazardous Wastes (Management and Handling) Rules, 1989/2000/2002
- MoEF Guidelines for Management and Handling of Hazardous Wastes,1991
- Guidelines for Safe Road Transport of Hazardous

Chemicals,1995

- The Public LiabilityAct, 1991
- Batteries (Management and Handling) Rules, 2001
- The National EnvironmentalTribunal Act, 1995
- Bio-Medical Wastes (Management and Handling) Rules, 1998
- Municipal Solid Wastes (Management and Handling) Rules, 2000 and 2002

Unfortunately, none of these regulations deal directly and specifically with e-waste.

There are no specific laws or guidelines for electronic waste or computer waste. Flexible interpretat ions of the rules

A SUCCESSFUL E-WASTE MANAGEMENT MODEL - A CASE STUDY OF HP

Original Equipment Manufacturers (OEMs) such as Dell and Hewlett Packard (HP), recycle thousands of tons of computers and peripherals annually , and thus already have incredible influence over how the recycling infrastructure evolves in local communities. In the future, OEMs, by their contracting decisions, will largely control how and under what circumstances their materials are recycled.The case study presented here describes the e-waste disposal management systems of HP. Later in the study, a typical disposal carried out by an Indian firm in New Delhi has also been included to illustrate the differences and the need for improvement. Hewlett Packard, which reported $72.3 billion revenues, entered into a joint venture with Micro Metallics in 1996 to recycle materials recovered internally and to recover parts from products returned by customers.

The company was evaluated on the basis of the following parameters:
1. Disassembly processes
2. Development of efficient material processing systems
3. Worker and environmental protections

According to experts, disassembly is the first and most important point in the recycling process, and it will be a key component of the recycling industry's rate of expansion. Disassembly requires the removal of plastic housing and the recovery of toxic components and often entails the recovery of metals, chips, and parts for reuse. While engineered for efficient assembly-line production, electronic products generally have not been designed for efficient disassembly-line dismantling. Products received by recycling facilities are not uniform and represent diverse product brand names, models, and years.

Currently, disassembly for recycling, if performed at all, relies heavily on manual labour . But with the enormous increase in products to be recycled and therefore to be disassembled, it will increasingly be necessary to automate some aspects of disassembly .According to industry experts, the two main goals of disassembly should be :

1. Reduce the cost of disassembly for optimizing the recycling process
2. Create a humane working environment in disassembly factories.

The results of the study have been presented below. They suggest the necessary steps to be adopted by an e-waste management company by standardizing the best practices.

The HP-Micro Metallics system sets the following standards:

- Eliminate tools, such as hammers, that cause injury and health hazards
- Hire union workers and pay a living wage
- Develop efficient warehousing systems that electronically track materials through recycling process
- Install mechanized systems, such as crushers, that reduce worker exposure to toxins
- Develop work stations designed to reduce ergonomic hazards
- Develop intranet database that allows workers to access information on hazardous materials and best methods for disassembly to avoid exposure
- Provide non-management representation on the company's health and safety committee
- Develop transparent health and safety programmes that welcome public inquiry and
- Respond to state and local regulatory agencies.

Discarded electronic components contain over 1,000 different toxic substances.

framed by the DGFT enables the Customs authorities to take on-the-spot decisions and provide rules exemption. There is no Exim code for trade in second-hand computers for donation purpose or for resale. Exim code for both new and old computers, under chapter 84 of the Indian Customs Tariff Act is same. Exporters sometimes club old and junk computers along with new ones.

Flexibility in the interpretation of rules makes a distinction between capital goods and non-capital goods; e.g. old computers imported as donation to educational or charitable institutions come under the 'capital goods' category. Being capital goods, they are then under the free list and access various tax benefits.

E-waste management

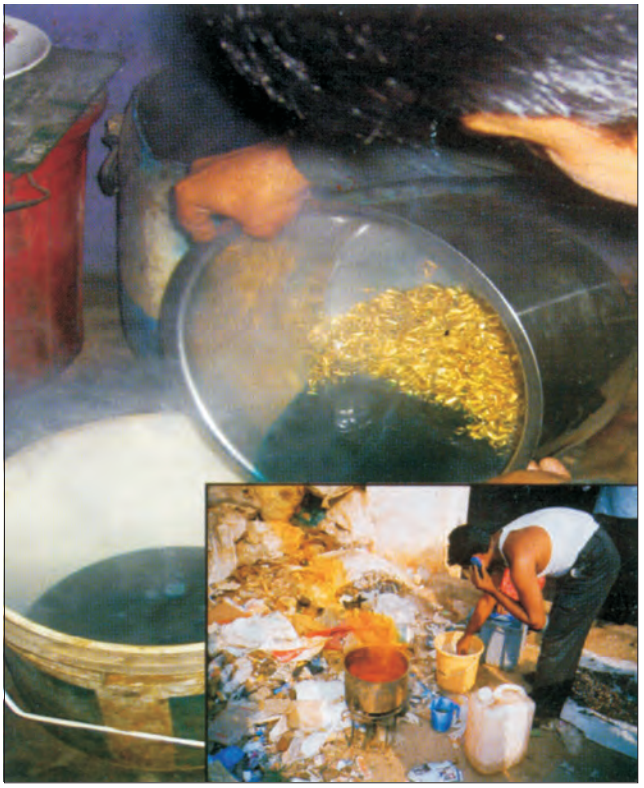
The current e-waste management and disposal methods suffer from a number of drawbacks like inadequate legislation, lack of funds, poor awareness and reluctance on the part of governments the corporate houses to address the critical issues. A plan of action for e-waste management has to address such issues in order to come up with a sustainable solution. The most important participants / stake holders in any action plan would be:

- Society, represented by NGOs and Environmental activists / scientists
- Government - policy makers
- Corporate houses - R&D teams
- Media - for awareness and public education

The extension of customer support services by the IT industry to cover the management of redundant IT equipment from the commercial sector could help tackle two related environmental and economic concerns. These are: the environmental effects of resource consumption and materials disposal from the production of IT products, and the development of more enduring customer relationships through the provision of full product life-cycle services.

General compliance with occupational health and safety standards

Observance of health and safety standards in the workplace is important for protecting workers from exposure to toxics. It is also a powerful indicator of broader compliance with environmental requirements. Well-trained workers, who are fully protected by the law to seek advice and take action to protect their health and the environment without fear of reprisal from their employers, are the most effective environmental protection. Operations that expose workers to hazards also frequently fail to protect communities around their facilities from dangerous emissions. Seldom does an



Informal recyclers extracting gold

industrial facility with a well-managed occupational health and safety programmes, and workers who are fully empowered to initiate corrective actions, violates environmental standards.

Use of best recycling practices and their potential for wide adoption by the private sector

Electronic waste is a fairly new category of resource recovery. As the nation responds to this growing challenge to waste management systems and the environment, we must quickly develop the infrastructure required to handle huge volumes of e-waste.

Conclusion

The e-waste disposal methods prevalent in the advanced countries today are heavily dependent on the non-recyclable parts being dumped into the developing countries. In developing countries, the disposal and recycling systems suffer from an inherent lack of proper regulations and monitoring systems. A sustainable solution for e-waste disposal and recycling systems should take into account the interests of all the stakeholders. An end of lifecycle service approach, which has become popular in the recent past, offers a close to sustainable solution, if integrated with environment-friendly product designs and marketing methods.

Another trend is to export waste to other regions of the world. As one example, hazardous electronic waste, such as old computers, old computer monitors, etc primarily from wealthier nations, are also being exported to places

like China, India and Pakistan, where they are processed in operations that are extremely harmful to human health and the environment. However, minimal or non-existent environmental and working standards and regulations, old technologies for recycling and processing, etc. are putting a lot of people and surrounding environment at risk due to the sheer amount of waste to be processed.

Frequently Asked Questions

Is e-waste considered hazardous?
Certain components of some electronic products contain materials that render them hazardous, depending on their condition and density . For example, non-functioning cathode ray tubes (CR Ts) from television sets and computer monitors are hazardous.

What should I do with my electronic discards?
The mantra of 'Reduce, Reuse, Recycle' applies here. Reduce your generation of e-waste through smart procurement and good maintenance. Reuse still functioning electronic equipment by donating or selling it to someone who can still use it. Recycle those components that cannot be repaired.

What is the concern with cell phones?
There is a large volume of cell phones retired each year (130 million per year till 2005) Plus, in their circuitry , batteries and liquid crystal displays, cell phones can contain toxic substances like arsenic, beryllium, cadmium, copper and lead. Their plastic casings have also been treated with brominated flame retardants.

What are the contaminants of concern in old electronics and what are their pathways?
Electronic equipment contains metals and other materials that can be hazardous to human health and the environment if they are not properly managed.

Cadmium - found in chip resistors, infrared detectors, and semi-conductors

Lead - found in glass panels in computer monitors and in lead soldering of printed circuit boards

Mercury - found in thermostats, position sensors, relays and switches (e.g., on printed circuit boards), discharge lamps, and batteries. It is also used in medical equipment, data transmission, telecommunications, and mobile phones.

Hexavalent chromium or chromium VI - used to protect against corrosion of untreated and galvanized steel plates

Brominated flame retardants - found on printed circuit boards, components such as plastic covers and cables as well as plastic covers of televisions.

Additional concerns

Plastic - Because manufacturers use many types of plastic in electronic equipment, it is the most challenging to recycle. Plastics often include conta minants such as metal screws and inserts, coatings and paints, foams, and labels. Currently, plastics from electronic equipment are both difficult and costly to sort for single resin fedstocks markets and there are limited markets for the mixed plastics stream. Plastics treated with brominated flame retardants, make them harder to recycle.

Are consumer electr onics manufactur ers doing anything to make the situation better?
Manufacturers are taking action to counter e-waste in a number of ways, from changing product design to offering reuse and recycling programmes. Many manufacturers are working to 'design out' haza rdous materials and 'design in' environmentally-sound materials, including recycled content. They are also continuously innovating product designs in order to make consumer electronics product components more easily recyclable. Finally, many manufacturers of fer recycling services free of chage or for a nominal fee.

How much e-waste is pr oduced each year?
The National Safety Council predicted in 2003 that in the US, between 315 million and 680 million computers will become obsolete within the next few years. In California alone, 6,000 computers become obsolete each day. Less than ten percent of discarded computers are currently recycled, with the remainder stockpiled or improperly disposed of in landfills, incinerators or as exported hazardous waste.

Is it expensive to have my electr onic equipment recycled?
Bear in mind that if your equipment is still functioning, or even if it is not but it is less than 5 years old, you may be able to sell it for reuse, or donate it. If it needs to be recycled, many consumer electronics manufacturers and other recycling services will pick up your equipment at your home or ofice for a nominal fee.

Source:
www.ewaste.com
www.wikipedia.org
Www.envfor.nic.in
e-nam newsletter, May 2006

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