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Survey on Environmental Issues of Green Computing

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Introduction
Computer equipment recycling and refurbishing is an important part of an organization's sustainable waste strategy. Businesses are encouraged to dispose of their IT equipment in an environmentally responsible way, and there are government regulations, such as the WEEE directive, designed to deal with hazardous waste.

Computer equipment recycling reduces the volume of waste which ends up in landfill sites, or gets dumped illegally. It cuts down on the amount of raw materials needed for the manufacture of new products, and it also means more users. In addition, if computing equipment is refurbished, this can benefit people and organizations that cannot afford to buy new IT equipment.

RECYCLING OF COMPUTER EQUIPMENT
It is possible to recycle many parts of an IT system, particularly monitors, PCs and servers. Computer peripherals, such as printers and scanners, can also be recycled, as can landline and mobile phones. However, some elements of an IT system may need particular expertise to recycle, with PCs, for example, tending to have heavy metals in their circuit boards.

MATERIALS IN PC
An average PC contains plastic (23%), ferrous metals (32%), non-ferrous metals (18%), electronic boards (12%) and glass (15%). A single computer can contain up to 2kg of lead, and the complex mixture of materials make PCs very difficult to recycle.

PRODUCTS OF WASTE AND BENEFITS OF E-WASTE RECYCLING
Barium: Present in the CRT (cathode ray tube) in order to help prevent exposure to radiation. Short-term exposure to barium can lead to muscle weakness, brain swelling, and damage to the liver, spleen, and heart.

Beryllium: A human carcinogen that is often included in motherboards and connectors.

Brominated Flame Retardants: These retardants are likely endocrine disrupters. They can reducts thyroxin levels in animals and can be dangerous for pregnant women.

Cadmium: Can harm fragile bones and has been found to be linked to kidney damage. This is often present in semiconductors, infrared detectors, in SMD chip resistors, older cathode ray tubes and some plastics pieces of equipment.

Hexavalent Chromium: Used as a hardener for the shape of the sytems and to protect steel plates from corrosion. Exposure can lead to asthmatic bronchitis as well as DNA damage.

Lead: The CRT (cathode ray tube) displays often contain anywhere from 4 to 8 pounds of lead. Lead can delay or inhibit mental development of young children and fetuses, and can be toxic to the kidneys, reproductive and nervous systems.

Mercury: Commonly found in wiring boards, switches, light bulbs, and flat panel displays. It has been found to be linked with kidney and brain damage as well. It is extremely harmful to developing fetuses and can be passed through fish and breast milk.

Plastics: The average computer contains around 13.8 pounds of plastic in the connectors, covers, and cables. Burning plastic can emit toxins and recycling it can be extremely difficult is plastics are combined.

HOW DO YOU RECYCLE YOUR COMPUTER EQUIPMENT
Firstly, the Department for Environment, Food and Rural Affairs (Defra) advises companies to contact their waste contractor to get advice on how they need handle their waste, as it may vary from company to company. That said, there are a large number of disposal specialists geared up to recycle computer equipment, and these are easy to find either from local council web sites, or through a search engine.

It can also dispose of computer waste by returning the product to the manufacturer, with computer makers such as Dell and HP offering recycling and asset recovery services to organizations to recycle unwanted computer equipment securely and responsibly. Goods are 'de-manufactured', and sorted according to type or material. Materials like steel and aluminium can then be recycled to make new products, from car parts to plastic toys. Meanwhile non-reusable substances are disposed of in an environmentally sound manner.

WHAT HAPPENS WHEN COMPUTERS ARE RECYCLED?
Computers and accessories that are in working order can often be refurbished with new software and some replacement parts. These repackaged computers are generally made available to low-income communities, individuals and community organizations. Electronic waste that is collected for recycling generally undergoes a manual dismantling process. The individual materials such as printed circuit boards, cabling, glass and plastics are recovered and then processed so that they can be used as raw materials to produce new products.

WHY RECYCLE COMPUTERS?
Older style cathode ray tube (CRT) monitors contain high levels of toxic materials that need to be disposed of responsibly.

When disposed to landfill, the materials and chemical components used to make computer equipment such as lead, mercury, cadmium and arsenic can leach into and harm our environment.

SECURE COMPUTER DISPOSAL AND RECYCLING Reuse
A computer should be recycled only at the end of its life, when it has very limited or no remaining usefulness. An old computer that is still functional can be refurbished and reused by a new owner. Even an obsolete computer that's still operating and not in need of major repairs is a good candidate for reuse as an alternative to recycling. Reuse, in fact, is

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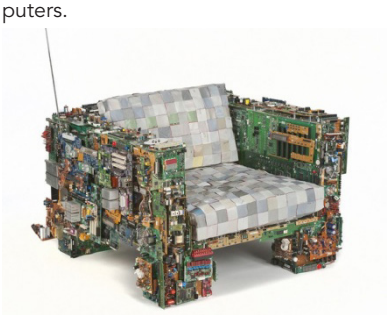
better for the environment than recycling because it extends the life of a computer and reduces the need for manufacture of new ones

MATERIALS
Computers that are recycled typically are taken apart and the components are sold as scrap parts or commodities. Computers contain components such as precious metals, base metals, glass and engineered plastics that can be reused in other electronics. Computer recyclers must manage the hazardous materials that are contained in most computers, such as the lead present in the cathode ray tubes that are the video displays of computer monitors.

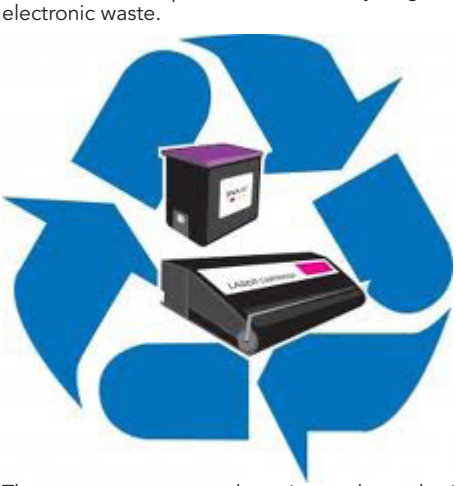
BENEFITS
Computer recycling reduces pollution, manages hazardous waste and limits the energy required to produce new computers.



The recycling and reuse of the pieces and materials inside computers reduces the energy required to produce new electronics products because those materials do not need to be either manufactured or mined.

2) THE DISPOSAL AND RECYCLING OF OFFICE PRINTERS AND COPIERS
Hazards of E-Waste in Printers
If printers aren't disposed of properly, printer components containing potentially toxic materials are placed in landfills or incinerated, allowing these materials to leach into the soil or enter the air as ash. In addition to chemicals in the ink and toner used by printers, circuit boards and other components can contain hazardous metals such as lead and mercury.

Proper Disposal
Once the printer is prepared for disposal it should be taken to a center that specializes in the recycling and disposal of electronic waste.



These centers process the printers they take in, disassembling them and cleaning the parts to remove any ink or corrosion that may have accumulated during the printer's lifetime. Recyclable plastic, metals and other materials will be separated so they can be properly recycled while any materials that cannot be recycled will be disposed of safely.

3) DISPOSAL OF MONITOR, CRT
Computer monitor recycling is especially important because monitors contain harmful chemicals like lead, cadmium, and mercury.

When monitors are crushed in landfills, these chemicals are released into the air and water, and have been linked to serious respiratory and neuropsychological disorders. Most trash haulers won't pick up old monitors or computers for these reasons.

***CRT Monitor Recycling**:*
The separation of components inside CRT and TFT monitors and Televisions to BATRRT (Best Available Treatment Recovery and Recycling Techniques).

The removal of Cathode Ray tubes, their granulation and use of the leaded glass as a feedstock in blast furnace works.

Flat Screen Monitor Disposal:
The separation of mercury filled back lights from TFT monitors, their granulation and dry treatment for removal of mercury powders.

The recovery of constituent materials including ferrous metals, aluminium, plastics and copper. Treatment of PCB bearing capacitors.

4) HARD DRIVE DISPOSAL
A basic HDD format does not insure that your data cannot be recovered by someone with the correct tools and knowledge. Therefore, deleting your old data permanently is especially important for a HDD that has sensitive material. For how to dispose of hard drives there are plenty of different options.

Three Ways to Dispose Of Hard Drives

a) MAGNETS
One way to dispose of hard drives is to use magnets. Since data is stored and read using magnetic fields, hitting your disk with a magnet will effectively wreck much of the data on it.

b) SCREWDRIVER
Disassemble the HDD and remove the platters. As an added bonus, you can see the inner workings of a hard-drive! Break-

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ing the platters will make the data nearly unrecoverable.

c) INDUSTRIAL SHREDDER

Probably the most effective way is to dispose of hard drives is to chuck the drive into an industrial shredder. It's also highly entertaining. Getting access to one of these is something of a barrier though. As well this method will destroy the HDD, therefore, you will not be able to reuse it in another system.

5) IT HARDWARE DISPOSAL

Disposing of old computer hardware

Technology can date quite quickly these days and you may find there comes a time when your business wants to sell, recycle or dispose of old computers. Make sure you've taken the necessary steps to delete off business information so that old computer can't be used as a potential source of information to steal your customer data.

Backup or copy off all the important data and then wipe the hard disk using a suitable piece of software – just deleting files and emptying the bin will not erase your data securely

If you auction off old hardware without permanently deleting the hard disk you could find the buyer has access to your data. Searching the internet turns up lots of software for erasing your hard drive. These programs work by overwriting your deleted files several times with meaningless data to ensure that they are completely erased. Even then, it may still be possible to retrieve the original data, but only by dedicated experts

CONCLUSION

Recycling computers conserves natural resources by ensuring valuable resources such as metals, glass, and plastics are not wasted. Recycling is a great way to cut down on greenhouses gases and other forms of pollution associated with manufacturing new materials. Recycling one million computers saves an amount of energy equivalent to the electricity used by nearly 4,000 homes. Recycling electronic waste is the only way to prevent these toxic materials from affecting human health and the environment in the future.

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