GREEN-MY-TECH **TIPS 2**

Did you know:

That a tonne of used mobile phones contains 80 times as much gold as a tonne of gold ore? Manufacturing, using and discarding complex devices is (in many ways) not sustainable and disrupts ecological and natural resource systems, but new regulations and standards are emerging to help users make informed choices.

About 2% of carbon emissions are caused by computer and phone equipment, and this number is on the rise. People around the world are talking about climate change and how they can be more environmentally friendly, or "greener". There are many ways to reduce our ecological footprint, but one that is often overlooked is how we as consumers can use technology in a sustainable way. These fact sheets offer practical information and suggestions on what you can do to "green your tech".

BUYING AND DISPOSING OF ELECTRONICS

So what is wrong with getting a new computer, phone or MP3 player?

Firstly, technology uses a surprisingly large quantity and variety of resources. Manufacturing tiny silicon chips, for example, uses a great deal of electricity and fuel, which contribute to pollution and climate change. It also uses tiny quantities of rare chemical elements that are increasingly hard to extract from the earth. And should also be edAdditionally, Some devices such as servers, desktops and top-of-the line games machines that are on most of the time consume more electricity (see sheet 1). Improperly discarded equipment is also hazardous to people and the environment – the e-waste problem. And the often-poor working conditions of people producing devices should be considered.

What exactly is e-waste and what's the problem with it?

E-waste is also called Waste Electrical and Electronic Equipment (WEEE). Much of it is old televisions and computer equipment, which were manufactured in a high-tech way and need high-tech disposal. Toxins in e-waste include heavy metals that cause brain and nerve damage: mercury, cadmium in batteries, lead (both in solder and in CRT screens) and brominated flame retardants. Although e-waste is hazardous waste, which according to the Basel Convention should not be shipped to other countries, most end-of-life equipment is exported as "second-hand" and quickly ends up in dumps in developing countries despite the EU directive on WEEE meant to ensure responsible recycling.

Metals that can be recovered from e-waste include steel, aluminium and copper, which is usually taken care of by the low-tech "informal recycling" industry, involving 25,000 people (mostly children) in Ghana, 80,000 in India and probably millions in China - some paid as little as USD 0.22 a day. PVC-coated cables and components are burned on open fires to get at the copper, releasing brominates, dioxins, furans and other persistent organic pollutants (POPs). Not only do these toxins directly affect the people, they also pollute the air, ground, and waterways, affect marine life and find their way into the food chain. Valuable palladium and indium could be recovered if there was sufficient investment in safe, regulated recycling facilities in countries where waste is produced. There are calls for concerted cooperation and better enforcement and regulation to close the loopholes that allow end-of-life equipment to be dumped.

What are the problematic elements used in production?

These include gallium, germanium, antimony and hafnium used to modify the electrical properties of silicon, and rare earth elements used to provide the colour in screens (such as yttrium) or in lasers for fibre-optics (such as erbium). As the price of these essential commodities rise, "dirtier" methods of extraction tend to be used, just like with oil and gas. Another hard-to-recover element is tantalum for high-density capacitors used in mobile phones, which comes from "coltan" ore. The high prices coltan sometimes fetches (still over USD100/kg) are regarded by the UN as a major factor fuelling conflict in the Democratic Republic of the Congo. Mining also encourages clearing of the forest habitats of endangered mountain gorillas and elephants. Some manufacturers have taken steps to ensure their tantalum is responsibly sourced, but there is as yet no uniform way for end-users to check.

So then, is re-use always better than recycling?

The best overall approach to waste is "reduce, re-use, recycle". First, reduce consumption, and if that is not possible find the best use of the "waste". In electronics, it could be described as "retain, re-purpose, repair, refurbish, recycle, recover". Many repairs and upgrades to computer equipment, such as upgrading RAM or hard drives, can be done easily and cheaply, but when passing equipment on for reuse, refurbishment, take-back or recycling, care should be taken over its final destination. In the EU, organisations risk prosecution if they dispose of e-waste to landfill or a non-approved collector without a receipt, and any decent collection facility or refurbisher should be able to answer legitimate questions about how e-waste and working components will be processed. "Re-use" can mean passing on working equipment for education or saving buying new equipment, but if old equipment is left in operation for a purpose that is not essential or that can be done with existing equipment, it may be better to find a responsible method of disposal.

Reducing means that any contracts that involve regular replacement of phones or other equipment should be reviewed. Some devices have their designed lifetime physically enforced, a form of "planned obsolescence", although with research and skill it is possible to prolong this. For example, some ink-jet printers and cartridges have a "counter chip" that can be reset with software or a tool. Some faults do not make equipment completely inoperable and can be minimised - most circuit board faults are blown capacitors that can be replaced by a skilled hardware technician. Obsolescence in computers is supposedly due to increasing processing power, but can now be seen more as a fashion. Each new version of Microsoft Windows, almost always pre-installed on new computers, requires two or three times the hardware requirements of the previous version (although Windows 7 has slightly slowed this trend). Older versions of Windows are not

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maintained with security updates, but there are lightweight free distributions of Linux that can be used instead, practically indefinitely, such as Puppy and Damn Small Linux.

What happens if my used hardware contains confidential information, and so I cannot pass it on for reuse?

There are various utilities for Windows or Linux to securely "shred" files and free disk space by writing over it a few times so data is impossible to recover (Heidi's Eraser is free software for Windows, or there's SDelete from Microsoft.) Alternatively, reputable channels for re-use like Computer Aid International will do this as part of their recycling service. Firmware in devices like network switches should be reset to factory settings. Also remember to attach or pass on any software licences that came with the hardware.

OK, no one wants my old gadget (or it's completely broken). What do I do?

Check whether the manufacturer will take it back (particularly in the EU if you have their WEEE registration number). If you're replacing it, check if the new supplier has a take-back facility; in the EU, suppliers must either offer to take back a functionally equivalent item or make alternative arrangements. There will usually be some kind of free collection, at least for mobile handsets. Failing that, ask the nearest municipal authority for advice as they may have special collection points where they collect or separate e-waste from general recycling. If it seems the only option is the landfill, you may want to retain the equipment and press for safer recycling facilities. Used batteries should not be allowed to go to landfill, and may be collected separately or with other e-waste or recycling programme. Suppliers should take back used printer cartridges; if refilling, some vegetable-based inks may be available.

If tech is getting more energy-efficient, how do I decide when to replace my equipment?

If you're just concerned with minimising greenhouse emissions, you would need good estimates of "embodied" energy in the new equipment to decide this: typical figures are 800 kWh for a desktop PC, and 300 kWh for an LCD PC screen. You also need a good estimate of the amount of time the new device will be used for -hopefully at least the lifetime of the previous equipment. Calculate the difference in power usage over the year from replacing the device (see sheet 1), and if that is greater than the embodied energy divided by the lifetime in years, there is an energy-efficiency case for replacement. This calculation can also be used, for example, to decide whether to replace multiple servers with one. But there is rarely a case for upgrading on power efficiency alone, and a computer should probably be kept in use for at least six years. However, many sources suggest replacing old but working CRT screens with LCD; we think there is a case if the new screen will be used for five years for more than 25 hours per week. If you buy refurbished products, whether computers, screens or mobile handsets, the embodied carbon is naturally much less.

What environmental considerations should I look for if buying a brand-new computer?

Two things to consider when buying any electrical equipment are whether the manufacturer provides its own take-back scheme (a WEEE number in the EU) and the expected lifetime of the product. The guarantee included can be a guide to the lifetime. When buying a computer, you may want to look at the product specifications to see what capacity there is for future expansion, at least in RAM (and possibly the processor). An "economical and ecological" choice might be a mid-sized laptop; smaller netbooks include a cost premium because of the compact technology and are usually harder to upgrade or repair, while larger laptops use more resources in manufacture and use. Product specifications also include rated power consumption, but remember this is only indicative and the machine will only draw a proportion of that. (Power Supply Unit (PSU) efficiency is also sometimes quoted, Energy Star (see below) requires 80%, and there is an 80 Plus certification.)
Some level of energy efficiency of office equipment has been indicated by Energy Star programme since 1995, and any new equipment should comply with version 5.0, which is used in the US and EU. However, a more comprehensive standard is EPEAT®, which includes both the Energy Star rating, an indication of reduced use of hazardous substances (RoHS) compliance, as well as information on the end-of-life of the device and packaging. As of 2012, EPEAT certified 2800 PC and displays. Over half of most categories are now rated "Gold", but the EPEAT website also shows which criteria are met by each registered device. Some manufacturers, such as VeryPC, are dedicated to better hardware, but beware of dangerous "greenwash" when there is no independent certification (particularly with vague claims or emphasising just one "environmentally-friendly" aspect without looking at the entire product life-cycle). Greenpeace also produces a "Guide to Greener Electronics", currently rating HP first, followed by Dell, partly because of its buy-back and refurbishment policies.

And for a screen?

The same certifications, EPEAT and Energy Star, apply for monitors. LCD screens use about 60% less power than old CRTs and LCDs with an LED (light-emitting diode) or HCFL (hot-cathode fluorescent display) backlight and are supposedly more energy-efficient, but this may be a relatively small gain.
Televisions have been covered by an EU energy labelling scheme since 2010. This shows F and G as least efficient, and A and A++ as most efficientt, meaning usage of less than 7 W + 1.5 W per square decimetre of display. EPEAT® will cover TVs from 2012 (in standard IEEE 1680.3).

Does all this really make a difference?

Yes! We all make a difference together. It may be an effort to do the work and convince other people now, but it pays off in the long run. Consider how you can make small changes in your life and encourage friends, colleagues or decision-makers to do the same, perhaps using the information in these sheets. Remember, don't break the biosphere -- someone else might want it!

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