

TIPPING POINT: AUSTRALIA'S E-WASTE CRISIS



Executive Summary

The Problem

- There will be 234 million items of e-waste in or on their way to landfill by the end of 2009.
- Without the introduction of an e-waste recycling program the amount of e-waste in Australian landfills will treble by 2020 and be close to 700 million items.
- The 4.5 million assembled PCs and laptops sold in 2007/08 amount to 6.3 million tonnes of embodied greenhouse gas emissions.
- 484,000 tonnes of potentially avoided greenhouse gas emissions were lost in 2007/08 when 88,000 tonnes of televisions and computers were dumped in landfill.

The Solution

- A national recycling scheme for televisions and computers, administered by the federal government, should begin on 1 July 2010.
- This scheme should be expanded to include all other e-waste in subsequent years.
- A national recycling scheme for all e-waste would create 5,100 new jobs by 2015. This includes 1,440 direct jobs in the recycling of e-waste, and another 3,660 indirect jobs.

The e-waste pile

There will be 234 million items of e-waste in or on their way to Australian landfill by the end of 2009. This is 41 million more items than was estimated would be the case in the 2008 version of this report.

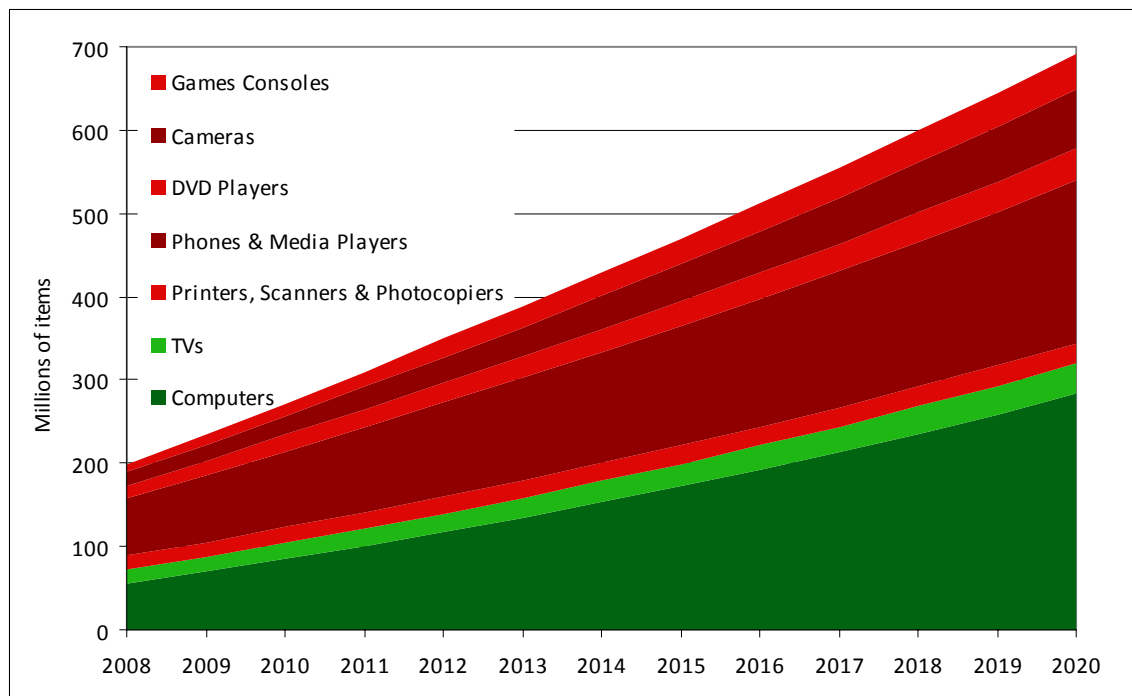
This increase is in part due to the unexpected increase in retail sales. The global financial crisis was expected to reduce Australia's expenditure on electronic goods. Instead, with the assistance of the Federal Government's stimulus package, "Australians purchased more digital lifestyle products in 2008 than in any other year".¹

The increase is also due to the use of new figures from the federal government that show a more rapid rate of disposal of televisions and computers. The consultation Regulatory Impact Statement (RIS) for televisions and computers says that "year-on-year growth in end of life arisings" will be 5% per annum.² Without the introduction of an e-waste recycling program, the amount of e-waste in Australian landfills will have trebled by 2020, and be close to 700 million items.

There are 18 million televisions and 70 million computers and computer peripherals in or on their way to landfill. These constitute 38% of current e-waste items in landfill.

The majority of e-waste items going to landfill are printers, phones, DVD players, cameras and a host of other electronic items for which there is no plan to start recycling. Recycling rates for these items are estimated to be 4%, well below the combined total for televisions and computers of 9%.

Projected amount of e-waste in landfill



¹ Consumer Digital Lifestyle Index, Reporting Period: 2nd Half, 2008, GfK Retail & Technology Australia for Canon.

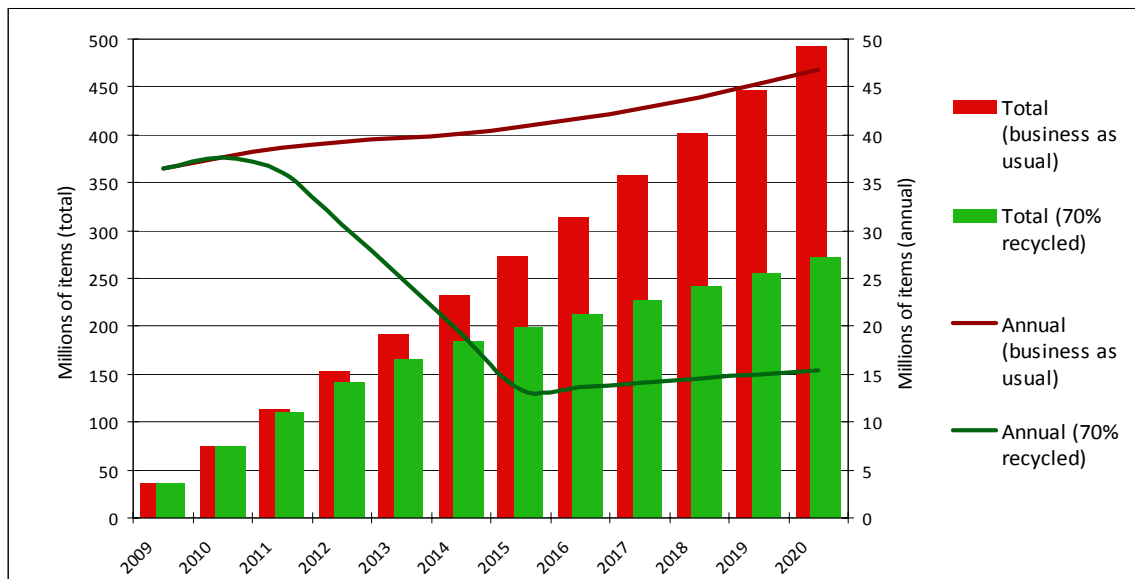
² Consultation Regulatory Impact Statement: Televisions and Computers, EPHC, July 2009.

The solution – Extended Producer Responsibility

Extended Producer Responsibility (EPR) is a policy approach that makes manufacturers responsible for collecting and recycling their products when consumers are finished with them. This gives manufacturers an incentive to design their products to be more durable, more easily repaired, or recyclable. It also ensures that consumers have a safe way of disposing of e-waste.

The government estimates that the introduction of an extended producer responsibility (EPR) scheme for televisions and computers would increase the rate of recycling to a minimum of 70% by 2015.³ If such a scheme were introduced for all e-waste, it would halve the amount of e-waste sent to landfill over the next 10 years.

**Projected amount of e-waste in landfill and rate of e-waste to landfill:
comparison between business as usual and a recycling rate of 70%**



The Total Environment Centre and Environment Victoria have prepared a detailed response to the consultation Regulatory Impact Statement (RIS) for televisions and computers⁴. This RIS will inform environment ministers when they decide on the introduction of a recycling scheme for televisions and computers in November 2009.

The Total Environment Centre and Environment Victoria recommendations include:

- An EPR scheme administered by the federal government and starting on 1 July 2010.
- One central administrative body covering both televisions and computers.
- A customs import model that requires all importers of televisions and computers to collect and recycling end-of-life equipment.
- The provisions of a seamless point of interaction for consumers.
- The introduction of landfill bans by state governments for televisions and computers.
- Expanding the scheme to include all other e-waste in subsequent years.

³ Consultation Regulatory Impact Statement: Televisions and Computers, EPHC, July 2009.

⁴ Submission to the Consultation Regulatory Impact Statement: Televisions and Computers, Boomerang Alliance, September 2009.

A job creation opportunity

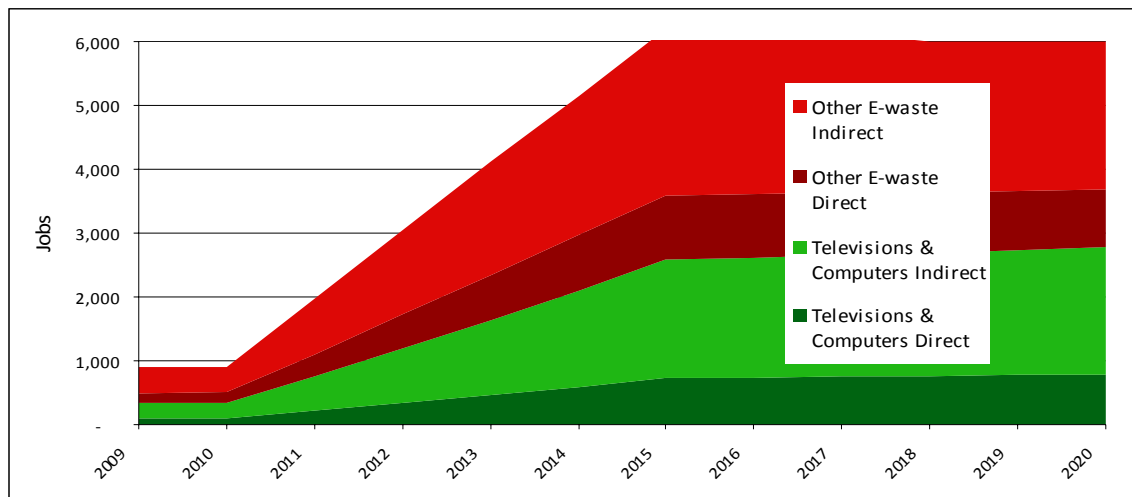
A national recycling scheme for all e-waste would create 5,100 new jobs by 2015.⁵ This includes 1,440 direct jobs in the recycling of e-waste, and another 3,660 indirect jobs as the result of the increased economic activity.

The majority of the costs associated with the introduction of e-waste recycling translate into the creation of new jobs. The consultation RIS for televisions and computers makes the point that “given the labour intensive nature of the recycling industry, the majority of...costs (50-70%) are estimated to be labour costs.”⁶

These extra jobs can be counted as additional economic activity, resulting in a multiplier effect, given that there is a much lesser rate of employment in the stockpiling or landfilling of e-waste.

Employment would grow rapidly over five years following the introduction of an extended producer responsibility scheme.⁷ After that time, employment rates would stabilise as the amount of material going to landfill and recycling reaches equilibrium.

Projected job creation with a recycling rate of 70% for e-waste



There are already a number of e-waste recyclers in operation around the country that are ready to take much greater volumes of material than they currently are.

Sims’ opened a new plant in Villawood, Sydney in November 2008. Sims’ plant is the first automated e-waste recycling operation in the country and has the capacity to recycle 20,000 tonnes of e-waste every year – roughly equal to all of NSW’s e-waste.

MRI and the TiC Group have been operating in Melbourne for a number of years, recycling all manner of e-waste. CRT Recycling is a recently opened facility in Adelaide that recycles cathode ray tubes from old computers and televisions.

Tes-Amm Australia, which is part of the Tes-Amm group, also operate full recovery, ISO certified facilities for e-waste in Australia.

⁵ Using tonnages and a 70% recycling rate from Consultation Regulatory Impact Statement: Televisions and Computers, EPHC, July 2009; and employment rates from WEEE Recycling a Remarkable Success Story, Department of the Environment, Heritage, and Local Government, Ireland, 2006; population data from the Australian Bureau of Statistics and www.wikipedia.org; and using the indirect jobs multiplier from Australian Recycling Values – a net benefits assessment, The Australian Council of Recyclers (ACOR), 2008.

⁶ Consultation Regulatory Impact Statement: Televisions and Computers, EPHC, July 2009.

⁷ Consultation Regulatory Impact Statement: Televisions and Computers, EPHC, July 2009.

Why divert electronic products from landfill?

Toxicity

A variety of toxic materials can be found in electronics that can leach out from landfills and damage ecosystems and human health, and create a toxic legacy for future generations.

Toxic Materials Contained in Computers⁸

- Lead in Cathode Ray Tubes in monitors, and used as a solder on circuit boards
- Cadmium in computer batteries and cadmium sulphide in televisions and monitors.
- Cathode ray tubes with lead oxide & sometimes barium
- Brominated flame-retardants used in printed circuit boards, cables and plastic casing.
- Poly Vinyl Chloride (PVC) coated copper cables and plastic computer casings that release highly toxic dioxins & furans when burned
- Mercury switches
- Mercury in back-lamps for LCD screens and some batteries
- Poly Chlorinated Biphenyls (PCBs) present in older capacitors & transformers
- Beryllium in switches, motherboards and electrical conductors
- PVC as casing and in circuit boards, connectors and cables

Toxic Materials Contained in Mobile Phones⁹

- Lead solder
- Cadmium in NiCad batteries
- Mercury for screen illumination
- Chromium to plate metal to prevent corrosion and create a shiny appearance
- Beryllium as an alloy for copper and nickel in springs and electrical contacts
- Antimony an alloying agent in solders and as a flame retardant
- Arsenic used in microelectronic circuitry
- Copper with beryllium used in electronic circuitry
- Nickel used as an alloying agent in steel parts, also in NiCad and NiMH batteries
- Brominated flame retardants to slow combustion
- PVC as casing and in circuit boards and connectors

E-waste dumped in landfill may come in contact with co-disposed acids, and the substances that are soluble in those acids may leach out. Several studies show that electronic circuit boards will leach lead under simulated landfill conditions.¹⁰ An Australian Government test reported that most circuit boards tested exceeded occupational standards set by Worksafe Australia.

A value of 1.0 mg/L had been set for lead in leachate, based on the practice of State and Territory governments in controlling disposal of wastes to landfill and all of the circuit boards tested exceeded this value by at least two orders of magnitude.¹¹ Where landfills are unlined, toxic materials may migrate into ground waters, threatening human and environmental health.¹²

⁸ Silicon Valley Toxics Coalition, Poison PCs, Toxic TVs, 2004, p. 14 (Sources: Microelectronics and Computer Technology Corporation, 1996 and Electronics Industry Environmental Roadmap)

⁹ United Nations Environment Program and Basel Convention, Guideline on Material Recovery and Recycling of End-of-Life Mobile Phones, 2006, pp. 19-20

¹⁰ Ibid

¹¹ Environment Australia, Hazard Status of Waste Electrical and Electronic Assemblies or Scrap, Guidance Paper, para 46, 1999

¹² The exception is with lead, which does not tend to migrate in soil, but remains fixed to soil particles.

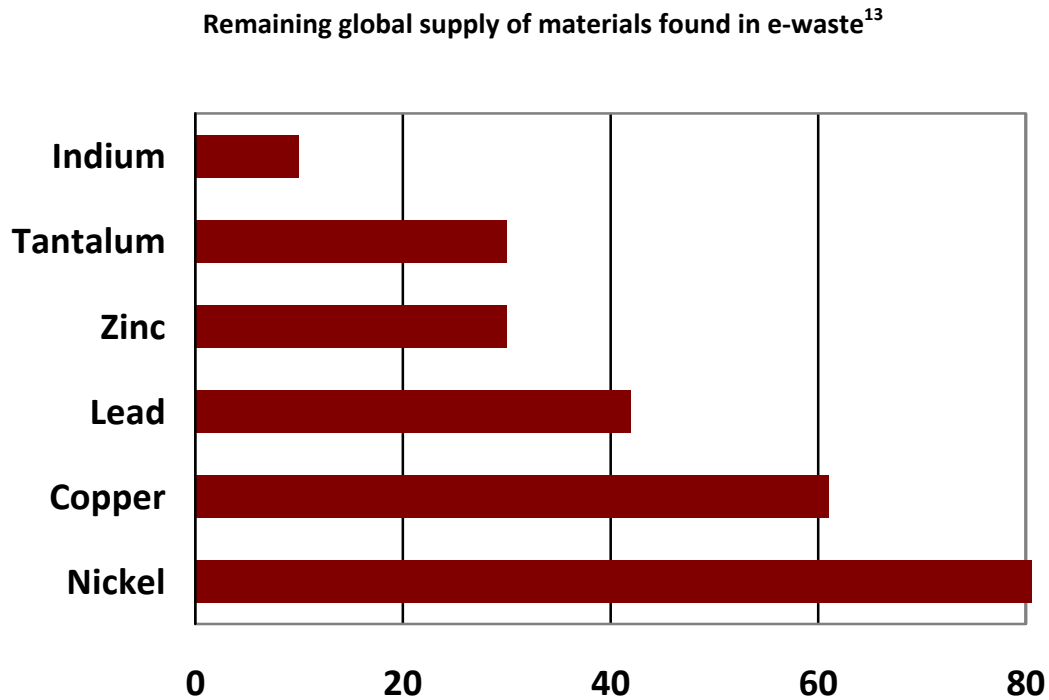
Human health and environmental impacts of materials found in e-waste

- Antimony:** Antimony, in short-term exposure levels above the MCL, leads to gastrointestinal disorders, nausea, vomiting, and diarrhea. Antimony, when left on the skin can irritate it. In long-term exposures at levels above the MCL, decreased longevity, cardiovascular problems, and altered blood levels of glucose and cholesterol can be expected.
- Arsenic:** Arsenic is classified as a carcinogen.
- Beryllium:** Inhalation of beryllium or beryllium-containing dust, mist or fume may cause a chronic lung disorder called beryllicosis in susceptible persons, and beryllium is a probable human carcinogen.
- Brominated Flame Retardants:** When e-waste is oxidized during smelting, bromine will be released. The released bromine may then recombine with unoxidized carbon under certain conditions in smelter emissions in the form of brominated dioxins and furans.
- Cadmium:** Cadmium is cancer causing to humans. Within environmental systems it rapidly degrades soil health causing flow on effects to local ecosystems; it is also released to the atmosphere if burnt.
- Chromium:** All forms of chromium can be toxic at high levels, but Cr (VI) is the most toxic. At short-term exposure levels above the MCL, chromium causes skin and stomach irritation, or ulceration. Long-term exposure at levels above the MCL can cause dermatitis, damage to the liver, kidney circulation and nerve tissue damage, and death in large doses. Skin contact with liquids containing Cr (VI) may lead to allergic reactions.
- Lead:** This toxic material has a well documented history of negative health effects including brain damage, which has lead to its removal from paints, and petrol. The creation of a human induced lead cycle has increased the accumulation of lead in water and soils. Health is negatively affected by lead poisoning, disrupting the natural functions of water and soil systems. The introduction of lead to the food chain and the introduction to the atmosphere through lead combustion are the primary causes of health problems in humans.
- Mercury:** Mercury has a toxic effect on both human and environmental health. If these lamps are crushed as part of waste transfer processes the elemental form of mercury is easily transferred into local environments. Once in landfill when combined with organics, anaerobic breakdown takes place leading to the production of highly toxic methyl-mercury.
- Polyvinyl Chloride (PVC):** Hazardous chemical additives (like phthalates) can leach when PVC components of electronic products are sent to land fill.

Resource Depletion

E-waste contains many rare and non-renewable materials. The landfilling of e-waste results in increased pressure being placed on the existing reserves of these materials.

The known reserves of some of these materials are extremely low and, in some cases, close to running out. The timeframes shown below highlight the need for diversion of e-waste from landfill and to resource recovery operations. The current rates of electronic product consumption cannot be sustained without massive adjustments to the way electronic waste is currently managed.



- Nickel is contained in rechargeable batteries for electronic products including mobile phones, laptop computers and cordless tools.
- Copper is used in circuit boards, wiring and computer chips for electronic products.
- Lead is used in monitors, televisions and batteries.
- Zinc is used in cabling, circuit boards, televisions and monitors.
- Tantalum is used in capacitors found in mobile phones, laptop computers and digital cameras.
- Indium is used in flat screen monitors and televisions.

¹³ Earth's natural wealth: an audit - earth - 23 May 2007 - New Scientist Environment; These calculations have assumed a static rate of growth in the consumption of these materials.

Greenhouse gas emissions

Burying e-waste in landfill is a lost opportunity to reduce greenhouse gas (GHG) emissions. 484,000 tonnes of potentially avoided greenhouse gas emissions were lost in 2007/08 when 88,000 tonnes of televisions and computers were dumped in landfill.¹⁴

The raw materials that go into making electronics require lots of energy during their extraction and refining. This energy, and the GHGs that are emitted, becomes 'embodied' into the electronics.

If e-waste is sent to landfill then more energy is needed, and more GHGs are emitted, to extract and refine new, virgin materials. If e-waste is recycled, then most of this energy is recovered, and less GHG emissions are required to make new products.

The GHGs embodied in electronics are largely emitted outside Australia. However, this is no reason to ignore them. Just as the conservation of raw materials is a valid goal independent of the geographical source of raw materials, the reduction of global greenhouse gas emissions is in the interests of Australia's long term sustainability.

It does, however, make it difficult to quantify the exact amount of embodied energy in electronic waste and the GHG abatement opportunity available in recycling.

The Carbon Reduction Institute in Australia has conducted a lifecycle analysis of a number of laptops for a large manufacturer which shows an average of 1.4 tonnes per laptop. Leaving out televisions, separate monitors and computer peripherals, the 4.5 million assembled PCs and laptops sales in 2007/08¹⁵ contain around 6.3 million tonnes of embodied greenhouse gas emissions.¹⁶

In 2008 the Total Environment Centre released the first version of this report detailing the spiralling electronic waste (e-waste) problem in Australia.

This update includes end of year figures for 2008, which was a record year for the sale of electronic goods. It also includes preliminary sales figures for 2009.

This update also builds on Environment Victoria's examination of the job creation potential of recycling of e-waste.

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¹⁴ Using EPHC, Consultation Regulatory Impact Statement: Televisions and Computers, July 2009 and 1 tonne computer waste equating to 5.46 tonne of CO₂e from www.sustainability.vic.gov.au

¹⁵ EPHC, Consultation Regulatory Impact Statement: Televisions and Computers, July 2009, p. 1.

¹⁶ Carbon Reduction Institute (available on request)