

## Press release

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***Growing need for recycling precious elements in high-tech scrap – often incinerated in poor countries***

### **Empa teams up with industry and academic partners in UN-led initiative for E-scrap recycling to salvage valuable components**

***Under the auspices of United Nations University (UNU), an international initiative called «Solving the E-Waste Problem» (StEP) is officially launched Wednesday, March 7. Its goals are extending the life of computers and other electronic equipment as well as markets for their reuse, reducing pollution and improving the salvage of increasingly valuable components in electrical and electronic scrap (E-scrap). Empa and the State Secretariat for Economic Affairs (SECO) are Swiss StEP partners, joining UNU and other governmental and academic institutions as well as major high-tech companies such as Hewlett-Packard, Microsoft, Dell, Ericsson, Philips and Cisco Systems.***

Valuable resources in every scrapped product with a battery or a plug – computers, TVs, radios, telephones, MP3 players, household utilities, to name but a few – are being trashed in rising volumes worldwide. Worse, items charitably sent to developing countries for reuse often remain unused for a host of reasons, or are shipped for illegal disposal. And, too often, E-scrap is incinerated, not only wasting needed resources but adding toxic chemicals to the environment. «There's more than gold in those mountains of high-tech scrap,» says Rüdiger Kühr of UNU, which will host the StEP Secretariat in Bonn. «This partnership is committed to salvaging these increasingly precious resources and preventing them from fouling the environment.»

In addition to well-known precious metals such as gold, palladium and silver, unique and indispensable elements have become increasingly important in electronics. Among them: Indium, a by-product of zinc mining used in more than 1 billion products every year such as flat-screen monitors and mobile phones. In the last five years, indium's price has increased six-fold, making it more expensive than silver. Though known mine reserves are limited, indium recycling is so far taking place in only a few plants in the U.S., Belgium and Japan, which recovers roughly half its indium needs through recycling.

In a similar vein, the market value of other important minor metals used in electronics such as bismuth (for lead-free solders) has doubled since 2005, and ruthenium (used in resistors and hard disk drives) has increased by a factor of seven since early 2006. «The large price spikes for these special elements underline that supply security at affordable prices can't be guaranteed indefinitely unless efficient recycling loops are established to recover them from old products,» says Mr. Kühr.

#### **Unqualified recycling methods can cause a myriad of environmental and health problems**

It's not only the scarcity of resources, though, that makes an efficient recycling loop mandatory; unqualified or unscrupulous treatment of E-scrap leads to numerous environmental and health problems, such as emissions of highly toxic dioxins, furans and polycyclic aromatic hydrocarbons (PAHs), caused by burning PVC plastic and wire insulation or soil and water contamination from chemicals such as brominated flame

retardants (used in circuit boards and plastic computer cases, connectors and cables), PCBs (in transformers and capacitors), as well as lead, mercury, cadmium, zinc, chromium and other heavy metals (in monitors and other devices). Studies have shown rapidly increasing concentrations of these heavy metals in humans, which can cause neuro-developmental disorders and possibly cancer.

In many industrializing and developing countries, growing numbers of people earn a living from recycling and salvaging E-Waste. In most cases, though, this is done through so-called «backyard practices», often exposing workers – men, women, children – to extensive health dangers. A global guide to dismantling E-scrap and maximizing the recovery and controlling recovered substances is a major StEP objective. A large-scale project to help e.g. China safely dismantle and dispose of its domestic E-scrap is also in the works.

The StEP initiative is the offspring of UNU, the UN Environment Programme (UNEP) and the UN Conference on Trade and Development (UNCTAD). Inter-related StEP task forces will help shape government policies worldwide and address issues related to redesign and product life expectancy, reuse and recycling, and help build relevant capacity in developing nations. Empa's «Technology and Society» laboratory, which has been running the SECO program «Knowledge Partnerships in E-Waste Recycling» in countries such as India, China and South-Africa, will be leading the StEP task force «Recycling». «StEP enables us and our partners to kick-off and fund urgently needed research projects. Only recently, for instance, did an Empa diploma student finish her thesis on recovery efficiency for gold from computer circuit boards through «backyard» recycling in Bangalore, India», says Rolf Widmer, Empa scientist and leader of the StEP «Recycling» task force. This project, he adds, could only be realized due to the active collaboration between numerous StEP members, especially from industry. «This is exactly the reason why we set out, about two and a half years ago, to launch the StEP initiative.»

### **Annually, E-scrap today would fill a line of dump trucks spanning half the globe**

E-scrap is one of the fastest growing components of the global waste stream and, arguably, one of the most troublesome. The European Environmental Agency calculates that the volume of E-scrap is now rising roughly three times faster than other forms of municipal waste. The total annual global volume of E-scrap is soon expected to reach roughly 40 million metric tons – enough to fill a line of dump trucks stretching half way around the world.

Rapid product innovations and replacement, especially in information and communication technologies (ICT) and office equipment – the migration from analog to digital technologies and to flat-screen TVs and monitors, for example – is fuelling an increase of E-Waste. OECD figures show global trade in ICT amounted to €1.33 trillion in 2004, 7.7 per cent of the gross world product. In 2004, every other German household was equipped with a personal computer, a figure that jumped to three-quarters by the end of 2006. The same 75 per cent rate also applies to households in Japan (compared with just 0.07 per cent in Niger, 1.2 per cent in India, 2.3 per cent in Bolivia and 4.1 per cent in China). The market for electronic products is expected to continue growing in developing markets and industrialized ones, where there is a rising tendency to own more than one computer, telephone etc.

### **Manufacture of a single desktop PC uses 1.8 tons of raw materials**

Improved reuse and recycling would also lessen the environmental impacts caused by producing new electronic equipment in the first place. A 2004 UNU book, «Computers and the Environment», found that an average 24-kg desktop computer with monitor requires at least 10 times its weight in fossil fuels and chemicals to manufacture. This is much more materials-intensive than for the manufacture of an automobile or refrigerator, which only require 1–2 times their weight in fossil fuels. In absolute numbers, the manufacturing of a desktop computer with a 17-inch monitor uses at least 240 kg of fossil fuels, 22 kg of chemicals and 1500 kg of water – a total of 1.8 tons of materials – roughly the weight of a sports utility vehicle (SUV) or a rhinoceros.

«There is a clear need and opportunity now to address the resources, health and environmental concerns being created by a surging increase in E-Waste. We hope that the StEP initiative will point the way for governments, companies and consumers alike to reverse this growing international problem,» says UN Under-Secretary-General and UNU Rector Hans van Ginkel. «Consumers will benefit through knowing what to do with their obsolete machines, less pollution and longer lasting electronic equipment. Companies involved in StEP will benefit through globally standardized, safe and environmentally-proven processes for disposal, reduction or reuse and recycling of E-scrap. Member manufacturers will work to design products more easily upgradeable because we all agree buying an entirely new product is wasteful when what's really wanted are upgraded components.» The StEP logo will signal to consumers that E-scrap processes associated with a company's products conform to agreed international standards and guidelines, he adds.

### **Technical Information**

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### **Further Information**

- E-Waste homepage, hosted by SECO and Empa: <http://www.ewaste.ch>
- United Nations University: <http://www.unu.edu>



burning of printed circuit boards



Chinese worker plucking printed circuit boards



Indian woman segregating copper after burning printed circuit boards



woman preparing printed circuit boards for copper leaching



Indian children digging for e-waste on dump sites

Images are available from [sabine.voser@empa.ch](mailto:sabine.voser@empa.ch)

In addition to UNU, UNEP and UNCTAD, charter members of the StEP initiative are:

**Academic and research:**

- Federal Laboratories for Materials Testing and Research, Empa (Switzerland)
- Chinese Academy of Sciences, Research Center for Eco-Environmental Sciences (China)
- Fraunhofer Institute for Reliability and Microintegration, FHG-IZM (Germany)
- French National Institute of Telecommunication, INT (France)
- GAIKER Foundation (Spain)
- Korea Institute of Geoscience & Mineral Resources, KIGAM (South Korea)
- Massachusetts Institute of Technology (MIT), Material Systems Laboratory (USA)
- Regional Environmental Centre for Central and Eastern Europe, REC (Hungary)
- Technical University Vienna (Austria)
- Technical University Delft (Netherlands)
- University of California, Berkeley, Consortium on Green Design and Manufacturing (USA)
- University of Melbourne, Faculty of Engineering (Australia)

**Government:**

- Swiss State Secretariat for Economic Affairs, SECO (Switzerland)
- German Technical Cooperation, GTZ (Germany)
- Minnesota Pollution Control Agency (USA)
- United States Environmental Protection Agency, US-EPA (USA)

**Private-sector:**

- AER Worldwide (USA)
- Cisco Systems (USA)
- Dataserv Ltd. (UK)
- Dell (USA)
- Earth Protection Services (USA)
- Ericsson (Sweden)
- Flection (Netherlands)
- Hewlett-Packard (USA)
- MicroPro (Ireland)

- Microsoft (USA)
- Philips CE (Netherlands)
- promotion team wetzlar (Germany)
- Rifer Environmental (USA)
- SIMS-MIREC (Netherlands)
- Taizhou Chiho Tiande (China)
- Umicore Precious Metal Refining (Belgium)

**NGOs:**

- INFORM (USA)
- Öko-Institut (Germany)
- 3P Consortium for Sustainable Management (Germany)

**Other members:**

- AEA Technology, AEAT (United Kingdom)
- Japan External Trade Organization – Institute for Developing Economics (Japan)
- Micro Industries Development Assistance & Services, MIDAS (Bangladesh)
- Thai Electrical and Electronic Institute; EEI (Thailand)