Empa Academy Science Forum on 29 October 2002

Information Technology – the key to sustainability?

Sustainable development is a difficult ideal to achieve in practice, as shown once again at the World Summit in Johannesburg. The Empa Academy Science Forum discussed the extent to which information technology is able to satisfy human needs while using considerably fewer material resources.

Information technology (IT) accounts for a significant proportion of current resource consumption. One of the reasons for this is that the actual service lives of electronic devices are a lot shorter than their technical lifespan. When a PC is replaced by a next-generation model, it is just left to gather dust, apparently worthless, until, like 90% of electronic waste in Europe, it either ends up in an incinerator or on a landfill site, or it is exported to Asia as scrap. This is sheer waste because valuable raw materials such as gold, silver and copper are also destroyed in the process. Surprising though this wasteful approach to precious metals may be, the fact that toxic metals such as nickel, bromine and lead, and pollutant chemical compounds (PVC, PCB, etc.,) are thrown away with the PCs, is far more worrying. Some of these chemicals then enter the environment unchecked.

Recycle, repair, re-use, upgrade

Legislation in Switzerland (electronic scrap ordinance, VREG) and the EU (WEEE, RohS) governing the environmentally compatible handling of used electronics represents an important step forward. This is no small matter – Germany alone, for example, is estimated to have produced no less than 1.8 million tonnes of used electronics in 2002. Of all environment-friendly methods of disposal, material recycling is the most widely preferred. For various reasons, however, this is not the optimum solution, as Günter Grossman from Empa Dübendorf explained in his presentation. In his opinion, a combination of repair, component re-use, upgrading of existing equipment, use of harmless materials and recycling would make more



sense. Only an approach linking these various facets would ensure sustainable management of used electronics.

In a drive to find the best sustainable solution for used electronics, one Empa team is focussing on RRR – Re-use, Repair and Recycling. It also questions the way devices are designed: what use are devices from an ecological standpoint if they are so badly designed that they cannot be taken apart for repairs?

Environment-friendly materials for electronic devices

Apart from practical solutions for disposal, vision is also required in manufacturing. As of mid-2006, the use of environmentally polluting lead solder in electronic devices will be banned throughout the EU. While the adoption of tin-silver-copper compounds for solder would solve the environmental problem of lead pollution, it would also increase industry demand for silver – a commodity that is not available in the same amounts as lead and is very expensive to mine. For this reason, Empa is researching lead-free solders consisting of a more environmentally compatible tin/zinc alloy (SnZn9).

Information technology issues unresolved for 20 years

The low awareness of energy and environmental issues in the information technology industry is disturbing. As Dr Bernard Aebischer from the Centre for Energy Policy and Economics (CEPE) at ETH Zurich explained in his presentation, energy and the environment will not feature on the agenda of the upcoming UNO World Summit on the Information Society taking place in Geneva in 2003, despite the fact that IT accounts for a growing proportion of total energy and raw materials consumption.

In the 80s, when information technology first started to become widespread and PCs began to conquer the market, a range of different development options arose. It was assumed that a reduction in energy consumption would be possible if IT was specifically implemented to spare natural resources. Unfortunately, the path chosen back then has led to today's increased energy and raw material consumption. In highly industrialized countries such as Switzerland and the United States, annual electricity consumption by information and communications technologies lies at approx. 1MWh per person and is rising. By comparison, this is only slightly less than *total* electricity consumption per person in China. However, it cannot yet be said today how IT will continue to affect the *overall* energy consumption of *one* country.



Sustainability in the information society

The material and energy costs of information technology are offset by its benefits. These may consist in actually "dematerializing" other processes. This results in considerable savings in natural resources. Prof. Lorenz Hilty and Claudia Som from Empa St. Gallen reported on the opportunities and obstacles presented by IT-related dematerialization. One option they envision is the optimization of processes through IT, e.g. intelligently controlled goods transport ("dynamic vehicle routing"). A further example is to be found in digital book publishing, where a copy of a book is only printed if there is a buyer for it ("print on demand"). And in farming, fertilizer will be spread exactly the right amounts for the soil conditions thanks to satellite surveillance ("precision farming").

However, it is not sufficient simply to optimize materials processes and products – extensive dematerialization effects can only be achieved if information processes and services are *substituted* for them. One of the things investigated by Empa is the ecological potential of electronic media as a substitute for printed media, and video-conferencing as a substitute for business travel. While the ecological effect of substitution in media is greatly dependent on circumstances and user behaviour, it is incontrovertibly positive in the area of telecommunications.

The opportunities and risks of sustainable information technology development are under investigation by the "Sustainability in the Information Society" research program supported by the ETH Board. The project takes into account the fact that technical solutions alone cannot bring about sustainable development. The greatest obstacle lies in the so-called rebound effect. The time or money savings made possible by technological progress are offset or even overcompensated by additional demand. For example, telecommuting does not necessarily result in a reduction in road traffic. The teleworkers may no longer drive to work, but they use their cars to go to the gym or other leisure activities instead. By the same token, although business people save a flight to a business meeting on the other side of the world by taking part in a videoconference, the total number of business trips they make increases rather than declines.

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What is the Science Forum?

At its regular Science Forums, the Empa Academy addresses topics of scientific and social relevance. In three or four half-hour presentations, speakers from research, politics and business present findings and views on a given topical subject. Afterwards they answer questions from professionals and lay persons alike, either during the discussion session or drinks party. The next Science Forum will take place on 16 December 2002 at 4.30 p.m. on the subject "The Bridge of the Future".



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Why does the option of virtual travel not lead to a reduction in business flights?



Will the information society take the opportunity of dematerialization or continue its trend towards material and energy intensity?

The photos are available in electronic form from martina peter@empa.ch

