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IN THE SPOTLIGHT

Green IT and communication technologies – Potential to boost environmental performance

Information and communication technologies (ICT) are used in many areas of life and the economy today. Online shopping, the electronic processing and storage of data, the management of entire operations – computers, the Internet and mobile communication have become commonplace.

From an environmental perspective, however, the ICT industry remains highly ambivalent. Many technologies – such as smart management of power grids (smart grids) and the linking of different mobility options – can save energy and thus reduce greenhouse gas (GHG) emissions. Technical innovations, digitalisation and the use of eco-friendly materials can cut climate-damaging GHG emissions from IT operations and thus lessen their environmental impact.

Resources and energy: The environmental impacts of IT

At the same time, the production, use and disposal of devices involve sometimes substantial negative environmental impacts. Essential resources such as cobalt, tantalum, silver and gold are often mined under dangerous conditions in countries which lack adequate social and environmental standards. Severe environmental pollution caused by incorrect disposal and significant global resource losses during recycling are also common.

However, it is not only ICT product manufacturing which consumes large amounts of energy. In Germany, ICT-related power consumption amounted to some 47.8 terawatt hours in 2014 – 8% per cent of the country's total electricity consumption. Energy demand for data centres, server infrastructure and all the various mobile and static end-user devices continues to rise, despite the efficiency increases achieved in some sectors as a result of Germany's GreenTech initiative and the European Union's Ecodesign Directive, for example.

The Oeko-Institut's holistic approach

The Oeko-Institut conducts research on the various factors to enable an integrated and comprehensive analysis of the environmental impacts of information and communication technologies. The researchers aim to identify opportunities and risks at an early stage and keep the entire life cycle – from resource extraction to recycling – in view.

The Oeko-Institut experts' work includes providing advice and information to policy-makers, businesses, industry and consumers. Their research and the information they provide are sound, practical and solution-oriented. Some Oeko-Institut projects which focus on sustainable information and telecommunication technologies are introduced below.

Promoting sustainable ICT policy in the European Union

Saving electricity, promoting recycling, reducing pollution: there are numerous opportunities to mitigate ICT-related environmental impacts. Great potential can be unlocked by improving resource and energy efficiency. This can be achieved by reducing manufacturing impacts, realising additional energy savings during the use of IT and recovering scarce resources under safe conditions.

Key topics, in this context, include optimal product design from an environmental perspective, identifying substitutes for critical metals, harmonisation of the methodological basis for determining life cycle-based GHG emissions, and measures for extending products' service life and for safeguarding social and environmental standards in the primary production of materials.

For all these areas, regulations and incentives are required from policy-makers; the Oeko-Institut is developing ideas and strategies for this purpose. Its experts always take into account today's heavily globalised processes, which can only be improved in conjunction with international partners or through EU guidelines or international agreements. For many years, the Oeko-Institut has therefore been advising the European Commission on the implementation of the Ecodesign Directive, which sets minimum environmental standards for energy-related products.

The principles behind the EU's Ecodesign Directive (European Commission website)

Study: Resource Efficiency in the ICT Sector: An analysis of the resource related issues of smartphones and tablets, with relevance for the environment and human rights

Basis for a green ICT policy

One of the European Commission's stated aims is to reduce energy consumption and GHG emissions in the IT sector and thus make a contribution to protecting the environment and climate. On behalf of the Commission, the Oeko-Institut – together with TU Berlin – is therefore identifying and assessing promising methods and standards to determine the GHG and energy footprints of IT and telecommunications products and services. The Institute is thus contributing at a global level to the future harmonisation of the framework methodology.

Study on the practical application of the new framework methodology for measuring the environmental impact of ICT – cost/benefit analysis (SMART 2012/0064) (European Commission website)

Obsolescence: Strategies against the throw-away mentality

The shortened lifespan of electrical and electronic equipment, known as obsolescence, is a much-discussed topic among experts and the public at large. Nowadays, product lifetimes are steadily decreasing and appliances are rarely repaired. The resulting waste – especially in the case of smartphones, digital cameras and notebooks – has risen sharply in recent years. In addition, increasing quantities of resources, including rare metals, are required to manufacture new products.

A study by the Oeko-Institut on behalf of the German Federal Environment Agency (UBA) analyses what effect this has on the environment and resource consumption and which policy and technological options exist for extending appliances' useful life. The aim was to analyse and increase the information available on the various forms of obsolescence with reference to specific product examples before making recommendations to policy-makers.

On this basis, the Oeko-Institut developed recommendations on ways of keeping home appliances in use for as long as possible, with comprehensive facts and figures to answer fundamental questions relating to durability and repair. The key advice is that from an environmental perspective, it is almost always worth repairing faulty home appliances and keeping them in service for as long as possible, with very few exceptions. This saves energy and resources that would otherwise be used in the complex process of manufacturing new products.

[Repair or replace? Extending the life-span of your home appliances – FAQs and helpful hints, by the Oeko-Institut](#)

[Oeko-Institut background paper: What are my rights if I want my product to have a longer useful life?](#)

[Study: Influence of the useful life of products on their environmental impact: Creation of an information database and development of strategies against obsolescence](#)

## Reducing the environmental impacts of the manufacture of ICT products

On behalf of the German Federal Environment Agency (UBA), the Oeko-Institut experts have tackled the question of when, from the overall perspective of production, use and disposal, it is genuinely worth replacing an old notebook with a new, more energy-efficient device. They found that the environmental impact of manufacturing a notebook is so high that the increased energy efficiency during its utilisation cannot compensate for it within a realistic timeframe.

Assuming an (unrealistic) 70 per cent increase in energy efficiency from one notebook generation to the next, it is only worth replacing an old notebook after 13 years from an environmental perspective. If a new laptop is 10 per cent more energy-efficient, it is only worth replacing several decades after purchase. Against this background, the Oeko-Institut makes various recommendations to policy-makers, showing how ICT products' lifetimes and usage can be extended.

[Results and policy recommendations can be found in the "Timely replacement of a notebook under consideration of environmental aspects" study conducted by the Oeko-Institut and Fraunhofer IZM](#)

Extending the life of your home appliances: Recommendation

Figure: Extending the life of your home appliances: Recommendation
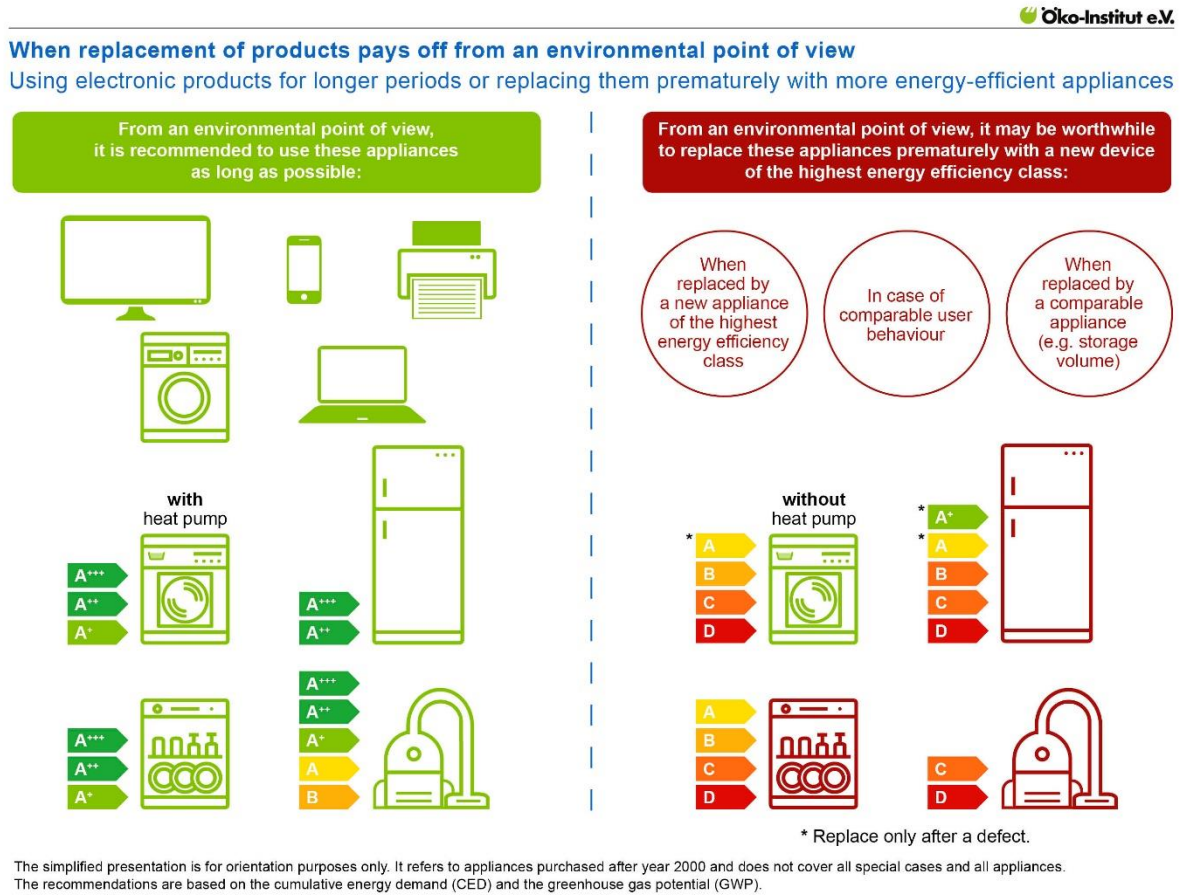
Source: Oeko-Institut

Sustainable product design for companies

Beyond the optimisation of specific products, the Oeko-Institut also advises companies on the sustainable design of entire product portfolios. The goal is to show them possible courses of action for improving their product range as a whole and for optimising their internal processes. On this basis, companies can then increase their overall sustainability performance in the long term.

The Oeko-Institut has developed a comprehensive sustainability matrix for Deutsche Telekom AG, for example. It enables the sustainability of products and services to be assessed and conclusions to be drawn for their continued strategic development. The Call & Surf service was analysed in detail, as was a speedport router for WLAN access.

The matrix incorporates the following criteria in the sustainability assessment: benefits for customers; product features such as accessibility, life-cycle costs and climate-friendly design; company-specific criteria such as vehicle fleet, production and supply chain; toxicological issues and cost and innovation issues. The bases were the Oeko-Institut's PROSA methodology (Product Sustainability Assessment) and the Telecommunications Sector Supplement by the Global Reporting Initiative (GRI).

Further information on the sustainability matrix is available in the Oeko-Institut's 2012 annual report (PDF, p. 12)

Website Sustainability Assessment Framework (SASF) by the Global e-Sustainability Initiative (GeSI)

Software also influences energy consumption

On behalf of the German Federal Environment Agency (UBA), the Oeko-Institut, in cooperation with Trier University of Applied Sciences and the University of Zurich, conducted a study on energy and hardware efficiency associated with typical software applications. Other criteria relating to sustainable IT solutions were backward compatibility, platform independence, offline capability, portability and transparency of data formats and source code.

Although manufacturers of computer hardware are increasingly attempting to make their devices more energy-efficient, the influence of software on the energy consumption of hardware and its potential useful life has rarely been investigated. The differences revealed in the study were substantial. For example, an inefficient word processor requires four times as much electricity as the most efficient one studied, while an inefficient web browser used a staggering 12 times more processing power than an efficient equivalent.

The checklist of 25 criteria and 76 indicators can be used by companies to develop energy- and resource-efficient software. It also has potential for use as a set of criteria for Blue Angel eco-certification so that the scheme covers software products in future.

Study: Sustainable software design – Development and application of criteria for resource-efficient software products with consideration of existing methods, by the Oeko-Institut, Trier University of Applied Sciences and the University of Zurich

Criteria for sustainable software (with the involvement of the Oeko-Institut)

Further information

Brochure: Computer am Arbeitsplatz: Wirtschaftlichkeit und Umweltschutz - Ratgeber für Verwaltungen (Computers in the workplace: Cost-effectiveness and environmental protection – a guide for public authorities), on behalf of the UBA

Study: Kennzahlen und Indikatoren für die Beurteilung der Ressourceneffizienz von Rechenzentren und Prüfung der praktischen Anwendbarkeit (Key figures and indicators for assessing data centres' resource efficiency and testing practical applicability), on behalf of the UBA

Study: Ermittlung und Erschließung des Energie- und Ressourceneffizienzpotenzials von Geräten der Unterhaltungselektronik (Determination and exploitation of the energy and resource efficiency potential of consumer electronics devices) on behalf of the UBA

Study: Paradigmenwechsel in der Green-IT notwendig! Nutzungsdauer von Arbeitsplatzcomputern in der Bundesverwaltung – Wirtschaftlichkeit und Umweltschutz (Paradigm shift in Green IT necessary! Useful life of workplace computers in the federal administration - economic efficiency and environmental protection) on bhalf of the UBA

Study Ökologische und ökonomische Aspekte beim Vergleich von Arbeitsplatzcomputern für den Einsatz in Behörden unter Einbeziehung des Nutzerverhaltens (Öko-APC) (Ecological and economic

aspects in the comparison of workplace computers for use in public authorities, including user behaviour (Eco-APC)) on behalf of the UBA

Excel tool: Ökologische und ökonomische Vergleichsrechnung von Computervarianten für die Verwaltung (Environmental and economic comparative calculation of computer variants for public authorities), on behalf of the UBA

Technical Support on Best Environmental Management Practice; Lot 1: in the Manufacture of Electronic and Electrical Equipment Sector

Technical support for the revision of the European Ecolabel and Green Public Procurement (GPP) criteria – Lot 1: Desktop and notebook computers

Technical support for the revision of the European Ecolabel criteria – Lot 4: Televisions

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Oeko-Institut is a leading independent European research and consultancy institute working for a sustainable future. Founded in 1977, the institute develops principles and strategies for realising the vision of sustainable development globally, nationally and locally. Oeko-Institut is represented at three locations in Germany – Freiburg, Darmstadt and Berlin.