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eco@work

Sustainable reading from the Oeko-Institut

GREEN IT

Information, communications and climate action

Large data volumes
Interview with Luis Neves

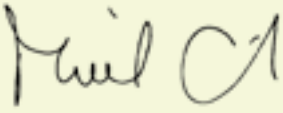
IT: environmental blessing or curse?

Nowadays, it's hard to imagine life without IT and telecommunications. Many of us here at the Oeko-Institut have smartphones and tablets, just like most of the people around us, who use them to upload their holiday snaps to the cloud or to play online computer games. All these mobile and stationary devices and applications consume precious resources and large amounts of energy in their production, use phase and end-of-life disposal. In our energy consumption projections back in the 1980s, we factored in an unknown variable – an economic sector with high energy consumption – without knowing precisely what that might be. Today, we see that this was a proxy for information and communication technologies (ICT) – a sector with potentially major impacts on the environment, but one which also offers a wealth of applications that could help to protect the climate and the environment; smart meters and smart management of power grids are obvious examples.

Today's ICT industry is located in this field of tension between environmental benefits and burdens. This applies both to the products themselves, whose design should be as efficient and pollutant-free as possible, and to the networks and data centres which comprise a vast industry and play a key role in determining the ICT sector's environmental performance and carbon footprint. This latest issue of eco@work explores various dimensions of green IT and discusses options available to policy-makers and businesses.

For me, one aspect is of particular concern: looking beyond the environmental and climate implications for a moment, it is clear that data acquisition and storage will be a key issue for the IT industry in future. Applying sustainability principles here, I believe that there is considerable scope for improvement in this sensitive area – firstly on the part of users, who should think very carefully about which data they wish to share and with whom, and consider the possible consequences of their online activities. And secondly, of course, the major IT companies have a particular obligation to manage their customer data responsibly. In my view, policy-makers also have a role to play here by creating the frameworks needed for responsible and, indeed, sustainable data management – not only by the IT companies.

I hope you find this January issue of eco@work interesting, and I wish you all the very best for 2015.



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In Focus

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"Intensive dialogue with ICT manufacturers is important to us"

Industry has a key role to play in reducing ICT-related electricity consumption and emissions. In this interview with eco@work, Luis Neves, Group Representative for Climate Change and Sustainability Officer at Deutsche Telekom AG, describes the steps the company is taking to make its products, networks and data centres more sustainable. He outlines some of the practical measures being adopted and the challenges ahead. Luis Neves is also Chairman of the Global e-Sustainability Initiative (GeSI), a business platform which aims to be a driver of the ICT sustainability agenda.

Mr Neves, what is Deutsche Telekom doing to reduce electricity consumption and emissions from its telecommunication networks and data centres?

At the end of 2013, Deutsche Telekom set a group-wide climate protection target of reducing CO_2 emissions by 20 per cent by 2020. We are deploying energy-efficient technologies in our network expansion and cutting emissions from our data centres, mainly by introducing new and efficient systems. Renewables use can also have a significant leveraging effect. That's an issue that we are exploring at present as we revise our climate strategy.

Can you tell us about some of the specific measures and how effective they are?

We are switching the landline network to the new all-IP standard, for example. We expect this to save around 260 kilotonnes of CO_2 by 2020 compared with the 2008 baseline. And in our data centres, we rely primarily on fresh air cooling systems and optimised air conditioning, and we are driving the global consolidation of our operations at a few highly efficient data centres. We are also modernising our mobile data network, making it more efficient. We expect this modernisation of the mobile data network and of our technological systems to yield a 44 per cent reduction in average electricity consumption at our transmitter stations.

What are the greatest challenges in reducing electricity consumption and emissions?

ICT is fundamental to our globalised world. Data volumes are constantly increasing, so network expansion is essential, and that drives up electricity consumption. That's why we need these efficiency measures in order to reduce CO_2 emissions as planned. Implementing new technologies and steadily increasing the efficiency of existing technologies also pose major challenges.

On the subject of ICT products, we know that extending service lives is key to improving the carbon and energy footprint. But customers are offered regular upgrades, especially the latest smartphones. How can we reconcile their lifestyle choices with environmental performance?

Intensive dialogue with ICT manufacturers is important to us in ensuring that the handsets become ever more sophisticated and sustainability is built into the entire product life cycle as a priority. Together with the manufacturers, we are safeguarding sustainability along the supply chain and in life cycle management.

Which approaches is Deutsche Telekom pursuing in this area with a view to increasing sustainability?

We focus on achieving a sustainable supply chain, for example. Via the E-TASC project – which stands for "Electronics – Tool for Accountable Supply Chains", we exchange supplier-related information with other businesses and thus attempt to minimise sustainability risks. Deutsche Telekom is also a provider of low-energy, low-radiation DECT telephones, which have been awarded Blue Angel certification. And with the Universal Power Adapter project, we aim to ensure that in future, one universal adapter can be used for a variety of electronic devices. This extends the products' lifespan and reduces waste. And of course, conflict minerals are a key issue. Deutsche Telekom is actively engaged here within the GeSI framework and supports the Conflict-Free Smelter Program, which aims to increase transparency.

Thank you for talking to eco@work.

The interviewer was Christiane Weihe.

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eco@work talks to Luis Neves, Group Representative for Climate Change and Sustainability Officer at Deutsche Telekom AG.

Long live my lifestyle product!

Strategies for more sustainable electronic devices

Question: What produces almost the same quantity of carbon emissions as aviation? Answer: information and communication technologies (ICT). It's clear, then, that we need more environmental and social sustainability in ICT – and that applies all along the value chain from production to disposal and recycling. As for the devices themselves, a longer product lifespan and service life can help to improve their environmental performance and carbon footprint and mitigate negative social impacts. So how can our TVs, notebooks etc. become more sustainable? Studies by the Oeko-Institut show how.

The energy efficiency of ICT products has steadily improved. In the last eight years, the average power consumption of a flatscreen TV, for example, has fallen by around 60 per cent. But the positive effects of these efficiency gains are quickly cancelled out: falling prices, rising sales figures, greater product diversity, short innovation cycles and consumer demand for ever more attractive lifestyle products are increasingly impacting on the environment. ICT-related electricity consumption – which means ICT products, data centres and telecommunication networks – in the EU-27 amounted to 214 TWh, or 7.7 per cent of total electricity consumption, in 2011 (see "Unregulated growth" on p. 8). As well as the energy consumed and greenhouse gases emitted during the use phase, there is the manufacturing side to consider: "ICT products are mainly produced in Asia and involve a high energy consumption and high environmental impacts," says Siddharth Prakash, a senior researcher at the Oeko-Institut. In addition, many of the resources needed as inputs in ICT products are mined under dangerous conditions with no regard for social and environmental standards. "What's more, extreme environmental burdens and adverse impacts on human health are caused in the disposal and incorrect recycling of these products, above all in developing and newly industrialising countries where recycling technologies and infrastructure are still in their infancy," Siddharth Prakash explains. This causes significant and permanent loss of raw materials. But even a modern technology-based economy such as Germany's is not immune to resource losses. "Even in this country, there is often a lack of adequate collection systems and pre-treatment facilities for product recycling," he says. The problem is exacerbated by obsolescence – in other words, a shortened product lifespan.

Countering obsolescence

Many lifestyle products such as smartphones, notebooks and digital cameras are being replaced at ever shorter intervals. Many devices are disposed of even if they are still in good working order, simply because the consumer can't resist the temptation to buy the latest model. "The resulting waste has risen sharply in recent years," says Siddharth Prakash. "In addition, the primary production of resources, including rare metals, is increasing to enable the new equipment to be manufactured." Oeko-Institut experts are currently investigating obsolescence in a study commissioned by the German Federal Environment Agency. In cooperation with the University of Bonn, they are studying the influence of obsolescence on the environment and resource consumption and are analysing the policy and technical options for extending the lifespan of these products. "We're working with examples from specific product groups – TVs, notebooks and washing machines – and are mapping the average lifespan and service life of these appliances over a period of several years. Based on this information, we then pinpoint the causes of obsolescence," explains Siddharth Prakash. The experts are identifying characteristics which cause technical deterioration or reduce the product's lifespan or service life, and are devising ways of overcoming them. They are also documenting the obstacles that stand in the way of potential solutions. On this basis, the researchers aim to develop criteria for manufacturers and products in order to extend the product lifespan and are making appropriate recommendations to policy-makers and consumers.

Prakash explains one of the study's interim findings: "For flatscreen TVs, the study reveals a fluctuating trend as regards first-use duration," he says. "In 2005 – the first year of the survey – it averaged 3.2 years. In 2007, it increased to 5.7 years but fell back to 4.4 years in 2010, before rising to 5.6 years by 2012." For new flatscreens, the average duration of first use was therefore substantially lower than for cathode ray tube TVs replaced during the same period. Many flatscreen TVs are replaced simply because consumers want to upgrade to a better product: more than 60 per cent of functioning flatscreens were replaced for this reason in 2012, and only 25 per cent of purchases were made to replace a faulty product.

It's a similar scenario with notebooks. "Here, more than 25 per cent of replacements were purchased because the consumer's existing product was faulty," says Siddharth, "and we've seen a substantial increase in this figure over recent years." The main reasons, he says, are thermal problems, mechanical deterioration, and user carelessness. "Here, conversely, the desire to upgrade to a better product is on the decline," Siddharth explains. Between 2004 and 2007, the average duration of first use for notebooks initially increased slightly from 5.4 years (2004) to 6 years (2005/2006) before falling marginally to 5.7 years in 2007. In 2012, it stood at 5.1 years.

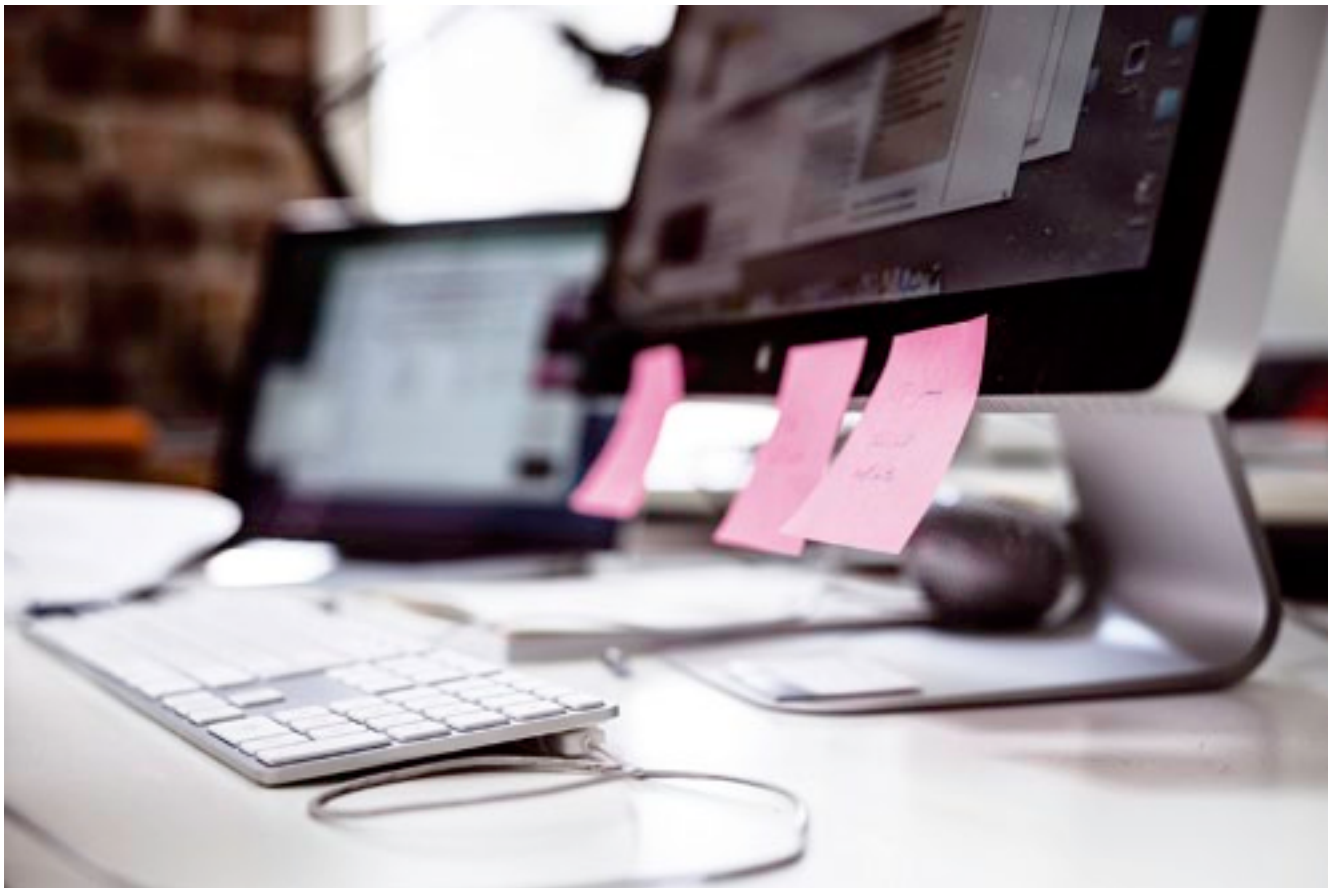
Extending lifespans

In their study of obsolescence, the experts are already making one key recommendation: the lifespan and service lifetime of products must be extended. The benefits of this approach are revealed in a joint study produced by the Oeko-Institut and the Fraunhofer Institute for Reliability and Microintegration (Fraunhofer IZM) on behalf of the German Federal Environment Agency. The researchers investigated when is the optimum time to replace an old notebook which still functions with a new, more energy-efficient model. "The study clearly shows that the environmental impacts of notebook production are so high that they cannot be compensated in realistic time periods by energy efficiency gains in the use phase," says Siddharth Prakash. Even assuming an unrealistic energy efficiency increase between two generations of notebooks of 70 per cent, the replacement of an old model with a new and more energy-efficient one is only justified from an environmental perspective after 13 years. And if the new device is around 10 per cent more energy-efficient than the old one, the energy savings outweigh the environmental impacts of production only after several decades.

In the researchers' view, it is vital to reduce the environmental impacts of notebook production and for product design to focus to a greater extent on product longevity and on ensuring that the products can be repaired and recycled. This is because notebooks also contain a number of scarce raw materials which are rarely recycled. "It should be possible to upgrade and retrofit notebooks, repair them at reasonable cost, and make standardised spare parts more readily available over a period of several years," says Siddharth Prakash. "And in terms of recyclability, it is important to ensure that individual components, such as batteries containing cobalt, can be removed easily without using tools."

Software is another challenge, as this can reduce a product's use phase. "Often, devices are replaced because they don't support a particular operating system or application, not because they are faulty," explains Siddharth Prakash. "This applies not only to products such as notebooks and printers, but also, and increasingly, to TVs." The Oeko-Institut's researchers are currently looking at how software solutions can help to extend products' service life.

Until very recently, European ecodesign policy focused primarily on energy efficiency. However, initial steps towards more transparency, minimum environmental standards and longer product lifespans have now been taken in the Ecodesign Directive. "From 1 July 2014,



manufacturers of notebook computers must provide information, in the technical documentation, about the minimum number of loading cycles that the batteries can withstand and make this information publicly available on free-access websites," says Siddharth Prakash. Manufacturers must also provide information about battery replacement on their websites, on the external packaging, and in the technical documentation. "This was the first small step. Now, others must follow for other product groups as well, and must include additional obligations for manufacturers and the development of standardised processes to measure product lifespan."

Assessing sustainability

But it is not only the manufacturers' information which guides consumers towards environmentally friendly products: so do consumer platforms such as EcoTopTen and Blue Angel. The EU Ecolabel also helps consumers identify recommended products and services that have a reduced environmental and climate impact, including computers, notebooks and TVs. The Oeko-Institut researchers have been assisting the European Commission to refine the existing criteria for the EU Ecolabel. "We have already put forward a list of criteria for computers and TVs. For the first time, they include social standards, such as working conditions in production and mining of conflict-free raw materials," says Siddharth Prakash. The researchers have also proposed measures aimed at product longevity.

In a further study, commissioned by Deutsche Telekom AG, the Oeko-Institut has identified ways of making ICT products more sustainable. It created a comprehensive sustainability matrix, whose criteria include product factors such as climate-friendly design and life-cycle costs and company-specific criteria such as the vehicle fleet. "The matrix enables products and services to be assessed and conclusions to be drawn for product development and procurement, for example," says Siddharth Prakash. "In this way, a great deal can be achieved along the entire value chain."

More environmental and social sustainability in information and communication technologies is essential. Policy-makers have a role to play here – for example, by broadening the scope of the Ecodesign Directive to include additional criteria such as longevity and material efficiency. There's a role, too, for the industry itself, which should be supplying long-lived products, for example. And not least, consumers must play their part, by using their notebooks and smartphones, etc. for as long as possible before replacing them. "Action by all groups within society is crucial," Siddharth Prakash emphasises, "especially in view of the continued growth that we expect for the ICT industry over the next few years." And that's something else that ICT has in common with aviation.

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Unregulated growth

Data centres and telecommunication networks: more climate action needed

Larger, faster, better: we're demanding more and more from our information technology. We want higher resolution, faster transmission and added convenience. But this doesn't just increase the demands on the information and communication technologies themselves: it also means that more and more is expected of data centres and telecommunication networks, which play a key role in ensuring that we can operate our devices. According to projections by the Oeko-Institut, these centres and networks will account for a significantly increased share of ICT-related electricity consumption – and therefore ICT-related greenhouse gas emissions – in future. However, there is still a lack of publicly available data, effective industry initiatives and environmental policy measures to address this issue.

Further strong growth in the share of ICT-related electricity consumption is expected over the coming years. ICT-related electricity consumption (excluding manufacturing) in the EU-27 amounted to 214 TWh in 2011, and is expected to increase to 259 TWh in 2020. The usage of ICT products (home and office) still accounts for the major share, with approximately 66 per cent of total ICT-related electricity consumption, according to a recent study prepared for the European Commission by the Oeko-Institut and TU Berlin. In absolute terms, the electricity consumption of ICT products in 2011 in the EU-27 was 142 TWh, with TVs accounting for the largest share of all products. "However, we are not expecting any growth in this sector: indeed, we believe that a slight decrease to 139 TWh in 2020 can be expected," says Siddharth Prakash, a senior researcher in the Oeko-Institut's Sustainable Products and Material Flows Research Division. "This decrease is partly due to the broader use of mobile products and to energy efficiency improvements."

However, Siddharth Prakash is predicting substantial increases in electricity consumption and greenhouse gas emissions in two other sectors: data centres and telecommunication networks. "In 2011, the collective share of data centres and telecommunication networks in the total ICT-related electricity consumption in the EU-27 amounted to 33 per cent, and we are expecting this to increase to about 46 per cent in 2020," says Siddharth. "This means that data centres and telecommunication networks would account for around 3.8 per cent of total electricity consumption in the EU in 2020." The researchers forecast that the electricity consumption of data centres will increase from 52 TWh in 2011 to 70 TWh in 2020 – a rise of almost 35 per cent, due to increased Internet and cloud services usage. "Without the expected efficiency measures, energy demand here would undoubtedly be higher still," says the Oeko-Institut's expert. The telecommunication networks' electricity consumption is rising even more dramatically. "Here, we are forecasting growth from 20 TWh in 2011 to 50 TWh in 2020," says Siddharth Prakash. "That's an increase of 150 per cent." The largest growth is expected for mobile data traffic, enabled by more capable mobile networks and an increasing number of mobile devices with significant computing power.

More efficiency

An important step in mitigating these rising greenhouse gas emissions was taken in 2011 with the introduction of the Blue Angel ecolabel for Green Data Centres. "The first task was to raise operators' awareness of their data centres' energy consumption," says Jens Gröger from the Oeko-Institut. "At present, there is very little awareness of how much energy and resources are being consumed here – both in total and by individual services." The Oeko-Institut therefore identified, as one of the award criteria, the data which need to be collected by the data centres for the purpose of energy monitoring. Recommendations for energy efficiency increases have also been developed. They include avoiding mixing of air streams in the server rooms and more efficient handling of existing hardware resources. "Any company aiming to qualify for Blue Angel certification must continuously monitor its energy consumption, establish an energy management system, prioritise energy efficiency when purchasing new products, and use renewable energy sources wherever possible," says Jens Gröger.

As the next step, the Blue Angel criteria are now being revised to enable even more energy efficiency increases to be achieved. "The new Blue Angel will then set minimum standards for specific parameters, such as the efficiency of cooling technology and power supply, and server benchmarks," says Jens Gröger. He is confident that the German Government's pledge, in its Digital Agenda, to give greater consideration to sustainability when purchasing ICT products will give a major boost to the Blue Angel and therefore also to energy efficiency in data centres. "I anticipate that all public procurers will be guided by the Blue Angel when purchasing data centre services or setting up their own data centres in future," says Jens Gröger.

Many other measures to enhance network and data centre efficiency are needed. In its study for the European Commission, the Oeko-Institut therefore makes a number of recommendations on environmental policy measures. "It is astonishing that there is currently a lack of policy measures to regulate data centres and telecommunication networks, even though their energy consumption is expected to increase significantly," says Siddharth Prakash. In their study, the experts initially recommend improving the data basis, for there is a lack of publicly available data on the share of different data centre types and their energy consumption and key performance indicators for the telecommunication networks, for example. "Once we have these data, we will have a much clear picture of how these two sectors impact on the environment and the climate. The information will also help us develop an overall methodology to measure the carbon and energy footprint on a regular basis," he says. One option is to establish a regular monitoring and reporting requirement for data centre and telecommunication network operators. According to the experts, the ensuing costs for major companies would be relatively low, as these companies presumably have a monitoring system in place already. Smaller companies, on the other hand, would have to set up this type of system. "The costs may be higher for these companies," says Siddharth Prakash, "but in the long term, we believe that the potential savings and benefits will offset the costs."

Larger, faster, better: the digital industry has already shown that this is feasible. More verifiable, more efficient and more sparing in its use of resources – that needs to be its next step.

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