



**eco@work**

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Sustainable reading  
from the Oeko-Institut

# Digitalisation

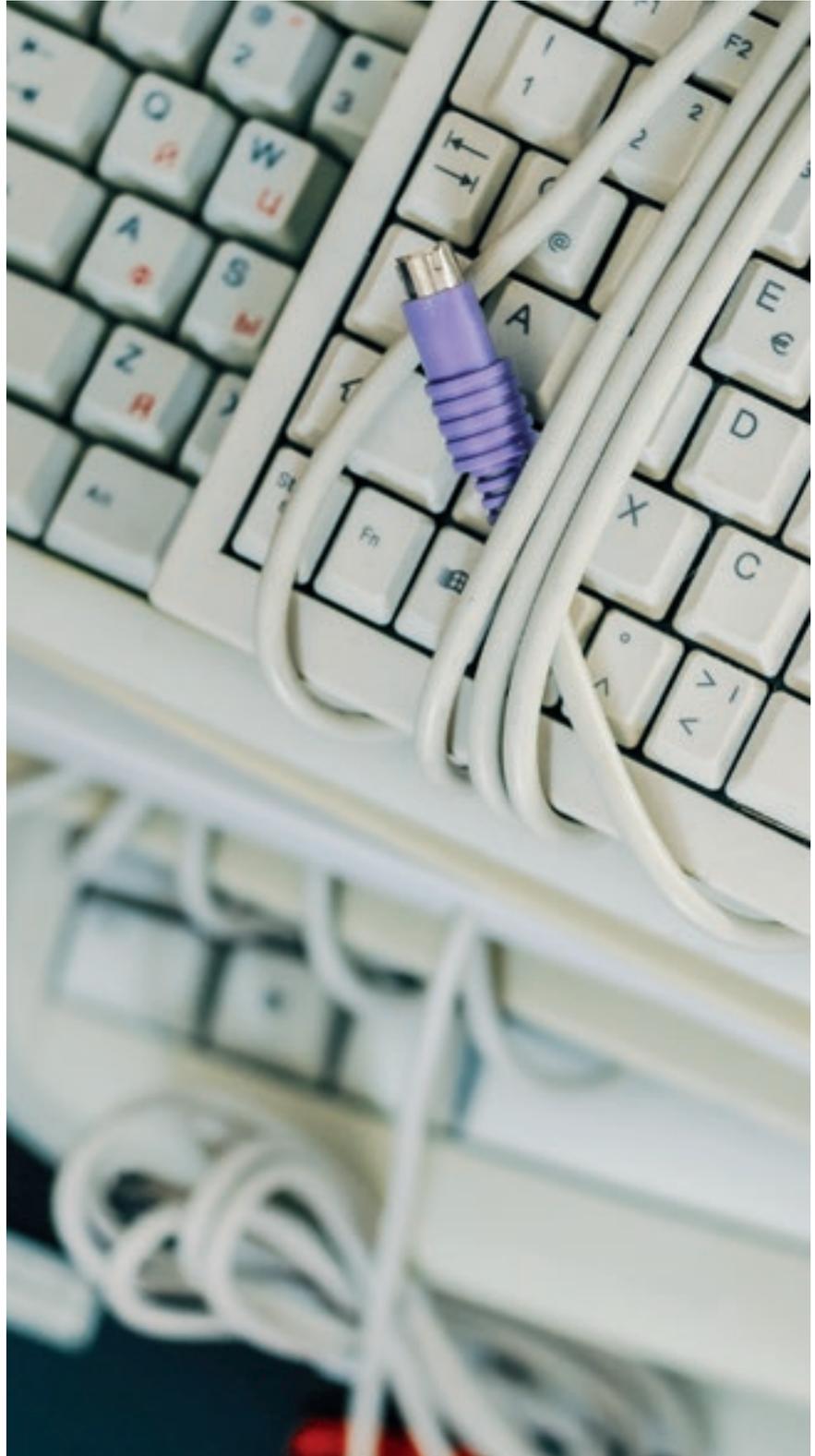
Strategies for more sustainability

Scientists for Future Interview with Professor Maja Göpel

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# “The focus is on increasing consumption, profits and productivity.”

The German Advisory Council on Global Change (WBGU) was set up in 1992 as an independent scientific advisory body on global environmental and development issues. WBGU's remit is to make recommendations for action and research and to draw attention to new problem areas. One of the issues that it has addressed is digitalisation, where it has developed the concept of a digitalised sustainability society. We talked to Professor Maja Göpel, a political economist and WBGU's Secretary-General, about the tensions between digitalisation and sustainability and, more generally, about the WBGU concept itself.

## Professor Göpel, is digitalisation a fire-starter for environmental destruction and climate change or is it a driver of sustainability?

At the moment, it is mostly a fire-starter. Energy consumption is soaring, along with demand for server infrastructure and mobile devices. What's more, digital devices often have a shorter lifespan than other consumer goods. Then there are the downstream effects, such as round-the-clock shopping with free returns, which mean that the last barriers to buying are falling. On the other hand, a renewable energy supply is impossible without digital planning, control systems and monitoring.

## Can digitalisation be meaningfully combined with sustainability goals?

Not by itself. Our economy is geared towards growth: more consumption, more profits and more productivity and the vast majority of digital solutions are developed and marketed with that in mind. So until development, investment and innovation targets are focused on sustainability, we cannot expect digitalisation to be the antidote to the deep-rooted drivers of unsustainable development.

## What are the hallmarks of a digitalised sustainability society, in your view?

The goal of a digitalised sustainability society is to utilise the new technologies' potential for systemic innovation. Which of the ideas, processes and parameters of our current development model are no longer fit for purpose in our radically changing 21st-century world? And which future-oriented so-

lutions can we initiate with the aid of our new knowledge, new networking options, automation and virtual realities? It is about restructuring our core economic, political and social processes around the principle of sustainability.

## What kind of conditions need to be in place for this to happen?

First, we must adapt our education systems and educational content to 21st-century challenges as a matter of urgency: it is essential to build people's capacities to make proactive and constructive contributions. And we need clear rules – also as a matter of urgency – so that digitalisation is not controlled by a handful of corporations or a surveillance state. The EU is taking the initiative here with the GDPR and the discussion about a digital tax, for example, but we now need a courageous and comprehensive digitalisation strategy as soon as possible. The United Nations is another key institution as it has global reach. What is important here is to cluster the programmes and actions being initiated by the various institutions and member states.

## Through the Scientists for Future initiative, you are supporting the Fridays for Future movement. How did this come about?

We set up the coalition because it was becoming apparent, within the national conversation, that young people's credibility was being called into question – and so was the legitimacy of their demands, which are quite extreme, of course, compared to what we normally hear in our wishy-wishy politi-

cal discourse. In fact, the young people themselves refer to our studies. Granted, scientists have not yet been able to generate the same kind of public pressure, but they found it intolerable that the demands being voiced by people who take these studies seriously were being called into question.

## What are the Scientists for Future doing now?

At the moment, we are mainly attempting to deal with the many enquiries reaching us for services such as project assessments and talks. We hope that we will soon secure some funding so that we can publish all the various studies on our website, along with proposed actions; at present, everything is scattered across various institutional and university servers.

## Thank you for talking to eco@work.

The interviewer was Christiane Weihe.



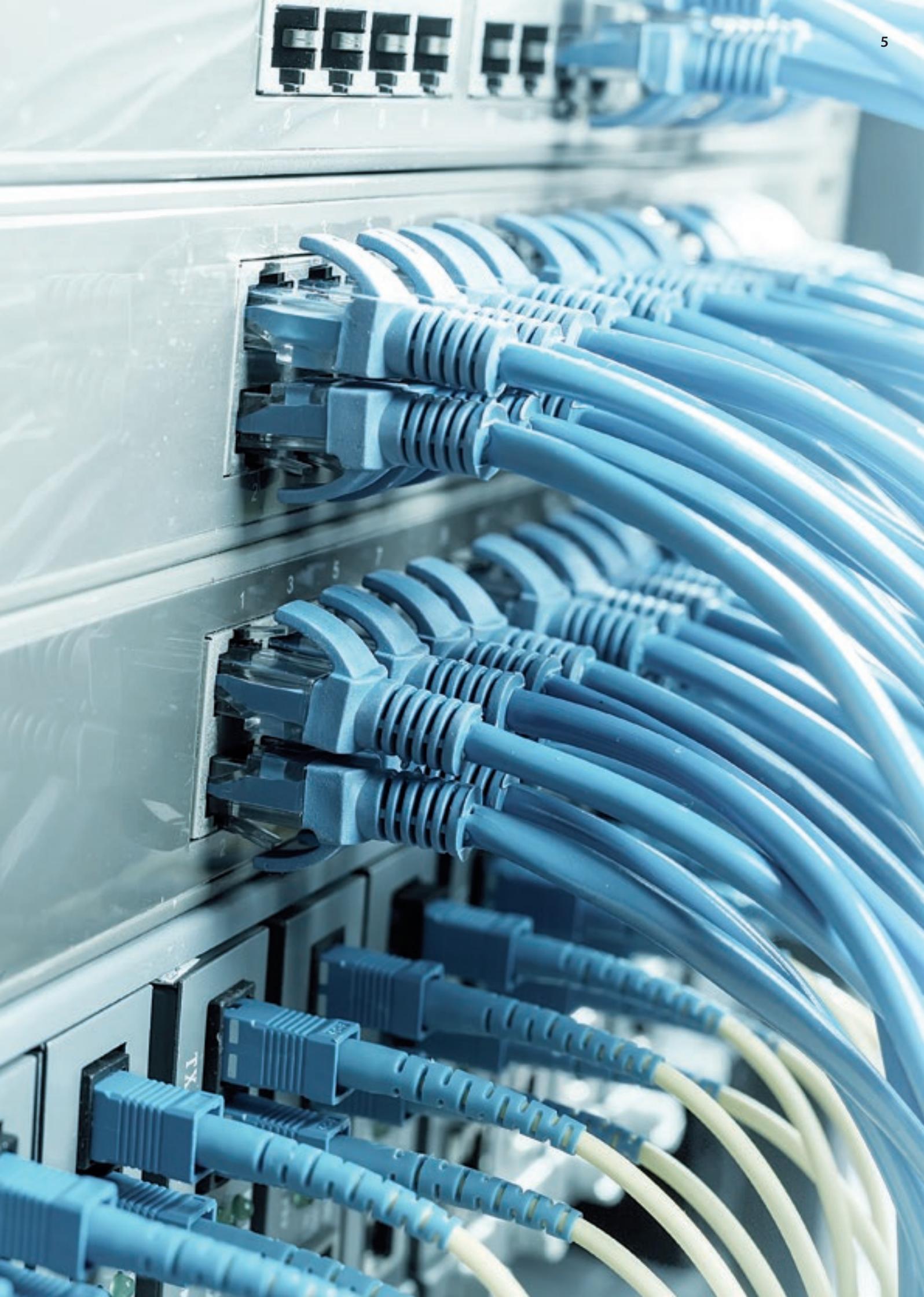
Talking to eco@work: Professor Maja Göpel, Secretary-General of the German Advisory Council on Global Change (WBGU)  
mgoepel@wbgu.de



# Data: a precious resource

## Regulation and sustainability

Some say it's the new oil; for others, it's the new water. Others describe it as quite simply the most important resource for the 21st century. In our digitalised society, data has immense value. The European Commission estimated the value of the data economy for the EU alone at €272 billion in 2015. But to a very large extent, data also means power – so the question of how data may be lawfully collected and utilised is of crucial importance. Data governance is advancing – the EU's General Data Protection Regulation (GDPR), in force since 2018, is evidence of that. But in the wide-ranging discussion about the appropriate regulation of data use, one topic – environmental protection – has been largely overlooked. It is a gap that the Oeko-Institut is keen to fill – for the question of how data should be regulated and who should have access to it can have a significant impact on the environment and policies to protect it.



Initial case studies show that the seemingly identical use of data by different institutions can positively or negatively affect sustainability. Take the example of a parking app from Munich: "A great many organisations are interested in parking space data here; they would like to use it for commercial purposes," says Dr Peter Gailhofer, a researcher in the Oeko-Institut's Environmental Law and Governance Division. "So the city decided to launch a municipal parking app." The scheme offers environmental benefits: as well as providing customers with a digital application that helps them find a parking space, the city aims to enhance the appeal of local transport and thus ease congestion in the centre. "A lot of the big companies, especially in the car industry, are not at all pleased," says Dr Gailhofer. "They want access to this data to launch a similar app of their own. But their aim is to make driving in the city as convenient as possible." A commercial parking app could also be used to sell other products and services unrelated to transport. Instead of encouraging people to switch to green mobility, this type of app – if it were combined with personalised offers – would actually increase consumption. Of course, genuinely sustainable use of

data would look very different. What's more, in many fields of application, it is possible that only one supplier will ultimately be left in the running, as has already happened with search engines and social networks – and the question of which provider stays the course has major environmental implications.

### ECO-FRIENDLY DATA REGULATION

The question of who uses data and how it is used has major implications for sustainability, not only in this specific case from Munich. In instances such as this, then, who should have data access? Who should make that decision, and on which basis? Clearly, some rules are needed here. "At present, an exclusive right to data does not exist in law. Nevertheless, data use is restricted to some extent through legislation on data privacy and the protection of commercial confidentiality," Dr Gailhofer explains. Some initial regulatory concepts and initiatives have already been mooted; at EU level, for example, the possibility of regulating public authorities' access to company records is already being

considered. "However, the question of what comprehensive regulation of the data economy might look like has yet to be answered."

Data regulation is a highly complex issue, not least due to the numerous and highly diverse objectives that it must fulfil. "It is about promoting economic growth, innovative products, equitable distribution and the protection of privacy, but it is also about preventing market concentrations that restrict freedoms, and it is about giving citizens more and better opportunities to have a say," Peter Gailhofer explains. When looking at the regulation of data use, it is essential, in his view, to consider environmental goals as well. "Thus far, no one has thought about how the various options for regulating data use and data processing will impact on the environment." However, he has already taken the first step: in an Oeko-Institut Working Paper entitled Regulation of the Data Economy – Towards an Eco-Friendly Position, he and his colleague Cara-Sophie Scherf, a researcher in the Environmental Law and Governance Division, examined three options for improving the regulatory situation and assessed their legal and environmental policy merits.

The first option that they analysed is establishing a right to data ownership: here, anyone who generates data, whether individual or corporate, retains the right to this data. "In this variant, everyone would be able to decide whether to share their data or not, and with whom," Dr Gailhofer explains. "The main aim is to ensure equitable distribution of the economic benefits associated with data." From the Oeko-Institut's perspective, however, this is not a suitable approach to avoid market concentration; nor does it support green innovation. "After all, green innovation relies on access to data," says Dr Gailhofer. "And it is also safe to assume that most people will transfer their data to wherever they are likely to get the most value. So this variant is not expected to lead to eco-efficient and innovative data use."



## COMPETITION LAW AND REPRESENTATION

A further regulatory option that the researchers considered is based on competition law. This variant would provide as much free data access as possible to all potential users. "It would mean that data-gathering giants like Google and Amazon would be obliged to share some of their data," Dr Gailhofer explains. "It would avoid further market concentration and make data more widely available, which in turn would promote innovation." Broadly speaking, this type of approach could well be suitable for ensuring better data flows, boosting competition and facilitating innovation. However, from an environmental perspective, it is not a good idea to rely solely on competition and free markets: "For example, "data access for all" would not prevent the development of new applications promoting consumer behaviour that damages the environment," Dr Gailhofer says. The right of "data access for all" is often portrayed as an element of a "consumers' utopia": providing universal access to data, it is argued, would enable personalised options to be offered that best suit individual preferences and habits. However, in many areas where there is potential for these applications to be used, we are reliant on policy decisions being future-focused and oriented towards the common good – if, that is, the aim is to bring about environmental transformation. "Regulating who should use which data and how it is used will ultimately determine whether digitalisation helps us to meet ecological targets or whether behavioural patterns that are harmful to the environment become even more prevalent in future."

As the third option, the study considers a proposal in which the collection and use of data would be subject to policy control by a regulatory body. The regulator would be tasked with tackling the abuse of data power, preventing market concentration and investing wealth accrued from data in socially meaningful ways, for example. "It is doubtful,

however, whether this type of central authority would genuinely be able to reflect the great diversity of interests within society – especially given that our society is becoming increasingly fragmented," says Dr Gailhofer. "What's more, this option has weaknesses from an environmental perspective." One issue, he says, is which rules would apply to a regulatory body such as this – especially given that environmental interests have a relatively weak status in German law compared to other constitutional rights. "This would result, yet again, in environmental welfare as a matter of public interest being neglected."

## DATA REGULATION – WHAT HAPPENS NOW?

Three proposals, then – and all three are unsatisfactory from an environmental perspective. So viewed from this angle, where should the data regulation pathway lead? New data-based applications could well have great potential to address environmental challenges. But their risks should not be overlooked – not only for individual rights or political processes, but also for the environment, the climate, and energy and resource consumption (*for a more detailed discussion, see "Behind the screens" on p. 8*).

"Given its major ecological implications, this topic should be treated as a priority in environmental policy," says Dr Peter Gailhofer. "Our analysis shows that there are no simple solutions. However, it also allows conclusions to be drawn on what the outlines of an appropriate regulatory regime might look like." For example, as he explains, universal rights of access are better suited to leverage environmental potential and minimise risks than solutions based on exclusive data ownership. "But here too, further regulation is needed to prioritise particularly sustainable applications, for example. With a purely competition-based solution, there is no guarantee that the public interest and sustainability will be considered to an adequate extent. We should not leave it to the market to find a solution." With regard to

control by a regulatory body, too, other alternatives should be considered from a sustainability perspective. According to the Oeko-Institut's analysis, a more decentralised organisational structure for data management at the local level could offer advantages here.

In other words, there is still plenty of work to do to achieve a system of data regulation that offers all-round benefits, according to legal expert Dr Gailhofer: "It would be helpful to have data legislation in place that defines the objectives and principles governing data use," he says. Environmental policy goals should play a key role in this context. "Further research is also needed to identify which form of data regulation would protect individual rights and meet economic and policy needs while also promoting a sustainable society instead of further accelerating environmental degradation."

*Christiane Weihe*



*Dr Peter Gailhofer studied law and social sciences in Berlin and Madrid and obtained his doctorate at the University of Zurich. After completing his postgraduate legal traineeship, he was initially employed as an attorney. He took up his current post as a researcher in the Oeko-Institut's Environmental Law and Governance Division in 2017. His work focuses mainly on law and sustainable development and on legal aspects of Corporate Social Responsibility (CSR).  
p.gailhofer@oeko.de*

# Behind the screens

## Energy and resource demand for digitalisation

It could be the saviour of sustainability – a great opportunity to conserve energy and resources: in the power sector, through the balancing of production and consumption; in transport, through a networked infrastructure and vehicle-sharing; and in industry, through smart and efficient manufacturing processes. Where sustainability is concerned, however, digitalisation has its downsides – by increasing energy and resource use, for example. Not only do digital technologies themselves rely on these resources; they also encourage people to consume more by offering ease and convenience. With such a wide range of applications and opportunities available to users, a comprehensive overview of the energy and resource demand associated with digitalisation does not yet exist. The Oeko-Institut is working on various projects that aim to close the current knowledge gaps.

“Digitalisation has tremendous potential to save energy and resources,” says Jens Gröger, a Senior Researcher in the Oeko-Institut’s Sustainable Products and Material Flows Division. “Buildings are just one example: here, digitalisation enables us to control heating and lighting in line with demand. Or take vehicles, consumer goods and machinery: they no longer need to be owned by their users; instead, they can be shared via digital platforms. Dematerialisation through simulation and virtual realities is another example.” However, digitalisation can substantially increase energy and resource consumption at the same time, as Jens Gröger explains. “The manufacturing of smartphones and laptops, for example, requires large amounts of energy and resource inputs. These devices contain minerals such as gold, cobalt and rare earth metals, often extracted under problematical conditions. Only a fraction of these valuable resources can be recovered through recycling.”

## INCREASE IN DATA VOLUME

Using IT devices also consumes energy, both to power the devices themselves and for data transmission and processing in computer centres. Usage has soared in recent years. According to the Federal Network Agency's annual report for 2018, annual data volume usage in mobile communications increased from 0.4 to 2 billion gigabytes from 2014 to 2018. In fixed networks, data volume usage surged from 12 to 45 billion gigabytes over the same period. "Data volume usage is doubling every two years, so there is likely to be a correspondingly sharp increase in demand for infrastructure such as data networks and computer centres," says Jens Gröger. "And that, in turn, is associated with increased demand for resources, land and energy. Digital technology already accounts for around 8% of German power consumption."

As part of a brief expert report prepared for the German Advisory Council on Global Change (WBGU), which was set up by the Federal Government, the Oeko-Institut conducted a literature review which looked at the global energy and resource consumption resulting from digitalisation. "There are currently no studies that would permit any firm conclusions to be drawn about all the various areas of digitalisation," Jens Gröger explains. "Nevertheless, we were able to shed light on certain aspects." For example, the study highlights the very short lifespan of devices such as smartphones, laptops and consumer electronics and the associated problems of resource demand and resource losses. "We need more transparency on these issues, including environmental life-cycle assessments."

## DATA CENTRES, CLOUD COMPUTING SERVICES, SOFTWARE

As the short report for WBGU makes clear, we know far too little about energy and resource consumption resulting from digitalisation. The Oeko-

Institut recommends progressively closing these knowledge gaps – and is contributing to this process with various projects of its own. For example, a study conducted for the German Environment Agency (UBA) focuses specifically on the resource efficiency of data centres and develops methods for conducting environmental impact assessments of these centres. Together with practitioner partners, the researchers developed a system of Key Performance Indicators for Data Centre Efficiency (KPI4DCE). "The system uses various indicators to assess the efficiency of data centres by looking at the ratio between output and resource inputs, such as processing power in relation to energy consumption," Jens Gröger explains. Using the methodology developed by the Oeko-Institut, operators can now take targeted action to optimise their data centres and reduce their environmental footprint as well as their costs. "So if I extend the useful life of my devices or use them more efficiently, I can monitor the environmental impacts directly using this methodology." The study can also be used to support the introduction of minimum environmental standards for data centres. "The EU's Ecodesign Regulation for servers and data storage products is due to enter into force in 2020. It is likely that in future, minimum ecodesign standards will apply to data centres as a whole, comparable to the Energy Performance of Buildings Directive," he explains.

On behalf of the UBA, the Oeko-Institut is also analysing the environmental impact of cloud computing services such as online storage and the use of software via the Internet. Together with the Fraunhofer Institute for Reliability and Microintegration (IZM), the Oeko-Institut is investigating these services' energy and resource efficiency. Working with service providers, the project team is calculating how much of a carbon footprint is left by an hour of video-streaming, for example. "Based on the project findings, it will be possible to compare online services and develop minimum criteria for a Blue Angel ecolabel for cloud computing services," says Jens Gröger.

A Blue Angel ecolabel could also be introduced for software products in

future. The Oeko-Institut has laid the foundations for this in a joint project with the University of Zurich and the Environmental Campus Birkenfeld of Trier University of Applied Sciences. "It is, to a large extent, the software that determines how much energy a device uses. But all too often computers or smartphones run more slowly or stop working altogether after the software is updated. Consumers then have no option but to buy new hardware," he says. A research project funded by the UBA took a closer look at software-related energy and resource consumption. It included developing a set of 25 criteria and 76 indicators for sustainable software, focusing on aspects such as energy efficiency, backward compatibility and platform independence. "The project showed that similar types of software behave in very different ways – for example, a less efficient word processing programme uses around four times more power than an efficient programme to produce the same document," Jens Gröger says. The case studies also reveal quantifiable differences between browsers, Internet service provision and database systems.

The methodology to assess the environmental impacts of data centres and of hardware and software, and eco-labels for particularly efficient IT products are further steps towards sustainable digitalisation. This opens the way for digitalisation to have genuinely positive impacts instead of accelerating energy and resource consumption.

*Christiane Weihe*



*Jens Gröger specialises in sustainable consumption and product sustainability. A Senior Researcher at the Öko-Institut, his main areas of work include green procurement, eco-labels, and information and communication technologies.*  
[j.groeger@oeko.de](mailto:j.groeger@oeko.de)