Energiewende half-time

Annual Report of the Oeko-Institut 2015



1980 - 2015 - 2050?

From the Oeko-Institut's perspective, Germany reached the half-way stage in its energy transition in 2015. Or did it?

We first published a report back in 1980 showing what an energy supply without uranium and oil might look like. In the report, we described, for the first time, the pillars of an alternative energy future. Back then, coal still featured in the energy mix. In parallel, the Oeko-Institut's researchers – in what was, at the time, a visionary step – outlined the major role of renewables and energy efficiency in sustainable power generation and use.

The study coined the word Energiewende – and it was this energy transition which reached the 35-year milestone in 2015.



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The second half has begun

All the current climate scenarios – generally modelled to 2050 – show how society and the economy must be transformed to make them fossil-free. 2015 marked the half-time in the transformation of our energy systems.

For the Oeko-Institut, this was a cause for celebration (see our report on the event on page 6). At the same time, we critically reviewed progress to date and cast a glance at the challenges facing us in the coming decades. One of the key questions is how we can phase out coal from our energy mix over the next few years.

Our Annual Report for 2015 therefore focuses on the half-time in the energy transition. As you will see, this theme runs through the report, for many of our projects identify ways of shaping this transformation in numerous other areas: in the resource sector, the nuclear industry, consumption, mobility, etc. For an introduction, please turn to page 19.

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Our year 2015

Dear readers,

For many people, 2015 ended on an unexpectedly positive note for the climate. We are very pleased that the 195 UN member states reached a new climate deal in mid December. For the first time, all the world's countries have agreed that the rise in global temperatures must be kept well below 2°C in order to avoid the worst impacts of climate change. At the same time, many more countries than before have adopted their own, in some cases ambitious, climate targets. Power generation free from harmful greenhouse gases now also features on all countries' policy agenda for the first time.

From our perspective, the decisions adopted at the Paris Climate Conference usher in a new phase in the international climate process. The goal of a global energy transition is moving closer, and Germany's successful policy of promoting renewable energies - although still in need of improvement - may well serve as a model for others. The fact is that Germany's early and lavish investment in wind, hydro and solar power has helped to bring down the costs of renewables worldwide. Cost-effective energy system transformation on a global scale has thus become a realistic prospect. The developed countries should now press ahead and restructure their energy systems on the basis of renewables. Phasing out coal is also essential, not only for the climate's benefit but also to avoid the particulate and mercury emissions which have a harmful effect on human health in many regions of the world.

Speaking of the "Energiewende half-time"

In light of this and other energy policy milestones, our key theme for 2015 - the half-time stage in Germany's energy transition - seems more relevant than ever. In our first energy transformation scenario in 1980, we were still describing coal as a possible source of power in Germany's energy mix - but this will no longer be conceivable in decades to come. So how can we make the energy transition a success despite the absence of coal? We have provided answers to that question in numerous studies in recent years, most recently in the 2050 Climate Protection Scenario produced in late 2015. The transition from coal, a re-design of electricity markets, completion of the nuclear phase-out with all its challenges - these are just some of the topics on which we will continue to bring our analytical skills and expertise to bear in the coming years and decades.

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But if the energy transition is done properly, honouring the Paris pledges, the transition from a carbon-intensive model will result in radical changes in all sectors of our economy and society. Transport will have a key role to play in this context, especially in Germany, where it produces around 20 percent of national greenhouse gas emissions. Today, transport emissions are scarcely any lower than they were in 1990. This is another area in which we have been working intensively in recent years, proposing solutions for a GHG-neutral transport system. The Renewbility project launched in 2015 now focuses on climate strategies for the transport sector to 2050.

Resources, resources

In our last Annual Report, we announced that now and in future, we must focus more intensively on the challenges posed by sustainable resource management. From the Oeko-Institut's perspective, this will require a comprehensive strategy, which we plan to unveil at our Annual Conference this year, i.e. in 2016. However, the many small steps needed to translate good ideas into action, pool and utilise knowledge and achieve policy changes are also important. This is evident from our Lead Recycling in Africa project, which focuses on the recycling of lead-acid car batteries in Ethiopia, Cameroon, Kenya and Tanzania and is already achieving visible successes. The local environmental groups which are cooperating with our researchers have collated new country-specific information. The public authorities and civil society in the partner countries are increasingly addressing the issue, and the United Nations Environment Programme (UNEP) will focus more intensively on this topic in international cooperation in the coming years as well. For more information, please turn to page 23.

These and many other projects have inspired, motivated and preoccupied us in 2015. Some of our 300plus projects are profiled in this Annual Report. I hope you find it an interesting and enjoyable read.

With very best wishes, Yours

Michael Sailer Chief Executive Officer of the Oeko-Institut

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Oeko-Institut celebrates the "Energiewende half-time"

Today, we are closer to a coal- and nuclear power-free world than we were 35 years ago. Our aim is to complete energy system transformation by 2050. With 2015 marking the half-time stage in Germany's energy transition (Energiewende), our friends, supporters and partners joined us to review the progress made to date and to celebrate the initial successes. Around 200 guests from politics, business and civil society discussed this issue with Oeko-Institut researchers and looked at the challenges that lie ahead. The discussions focused particularly on the public's involvement in implementing the energy transformation. The Oeko-Institut has played a particularly important role in this context: when the dangers of nuclear power became all too apparent after the Chernobyl disaster in 1986, an appeal was launched by the Oeko-Institut's researchers for the establishment of energy committees to promote renewable energies. More than 400 of these initiatives were set up across Germany and began to promote the expansion of renewable energies at the local level. A glance at the progress made on renewables expansion demonstrates their success: one third of the power generated in Germany now comes from wind, hydro and solar, and around 1.4 million citizens have a stake in wind power installations.

In his keynote speech, Rainer Baake, State Secretary at the Federal Ministry for Economic Affairs and Energy, identified some of the milestones

reached in the energy transition. The next stage in the process was the subject of a panel discussion with Rainer Baake, Vera Brenzel (Head of E.ON's EU Representative Office), Professor Peter Hennicke (Senior Advisor and former President of the Wuppertal Institute for Climate, Environment and Energy) and Dr Felix Christian Matthes from the Oeko-Institut. The discussion also emphasised the role played by the Oeko-Institut and other stakeholders in this context. From the German Government's commitment to the energy transition in 1997 to the current Climate Action Plan 2050, from the first amendments to Germany's legislation on nuclear power in 1998 after the incidents at Biblis Nuclear Power Plant to the 2011 law on the phase-out of nuclear power, from the first National Allocation Plan in 2005, which regulated the distribution of emissions allowances to participating companies, to the EU Emission Trading System (EU ETS) Directive, and from the genesis of the Renewable Energy Sources Act (EEG) in 2000 to the stage now reached in the expansion of renewable energies - the Oeko-Institut has provided scientific input and practical ideas for all the major energy policy decisions taken in recent decades.

The Oeko-Institut is identifying potential solutions for energy system transformation for the future too. Whether it's re-designing the electricity markets, developing climate scenarios for all sectors of society and the economy or proposing practical action on energy efficiency - the Oeko-Institut's staff will continue to work tirelessly on the energy transition in the next 35 years.

The event also featured an impressive music and light painting performance by the duo Kopffarben, which traced the evolution of the Energiewende.

An online gallery of photos of the event is available here: tinyurl.com/flickr-halbzeit



The year in figures

Human resources

At the end of 2015, more than 165 members of staff were employed at the Oeko-Institut's offices in Freiburg, Berlin and Darmstadt, including more than 115 researchers. Some 50 staff are employed in project, financial and human resources management, communications, IT and other areas, making a key contribution to the Oeko-Institut's success.

Projects and turnover

In 2015, Oeko-Institut researchers were engaged in more than 360 projects across all its divisions, thus continuing the successful work undertaken in previous years. The Oeko-Institut, a non-profit organisation, achieved a total turnover in excess of 14 million euros (target figure). _____

146

147

156

135

Human resources 2000 - 2015

2000

2002 2004

2006

2008

2010

2011

2012

2013

2014

2015 166

Turnover 2000 - 2015 (in million euros)*



76

99

106

120 126

*2015 target; final figure for 2015 not yet available (as of beginning of March 2016)

Sustainability at the Oeko-Institut

The Oeko-Institut is currently finalising its in-house sustainability report, with full data on its energy and resource consumption, mobility, staff catering and other environmentally relevant issues, including procurement. It also highlights the social benefits provided by the Oeko-Institut for its staff, such as free canteen services.

The sustainability report will soon be available for download from the Oeko-Institut website: www.oeko.de/nachhaltigkeitsbericht

Professor Rainer Griesshammer, a member of the Institute's Executive Board, answers three questions on sustainability at the Oeko-Institut:

Why is the Oeko-Institut producing an in-house sustainability report?

We have had a detailed environmental report in place for some time. As our organisation grows larger, however, it is important to think about the social dimension of sustainability – after all, that's what we demand from businesses, universities and other organisations.

Which aspects of the Oeko-Institut's work have the greatest environmental impacts?

That's very easy to answer: it's business travel. With several hundred projects a year, the number of train journeys really mounts up, and on top of that, there are the flights for the international projects.

How is the Oeko-Institut thinking of reducing its environmental footprint?

We put the key measures in place some years ago: we have our PlusEnergy office building in Freiburg, energy-efficient equipment, mandatory justification of car journeys and flights on travel expenses claims, almost 1400 telephone and desktop sharing conferences every year, and the staff canteens, which only serve organic vegetarian food. We also offset unavoidable greenhouse gas emissions from air travel through Atmosfair. Measures adopted more recently will have less reduction potential but should not be overlooked. One example is our retrofitted heat exchanger control system, which is automatically aligned to our working hours.

We are on track Selected projects from 2015

For the Oeko-Institut, the key theme in 2015 was the energy transition. At this half-way stage in the restructuring of our energy supply, how far have we progressed towards large-scale decarbonisation? But the energy supply was not the only issue on the Oeko-Institut's agenda in 2015. Our researchers worked on many other projects and explored numerous other issues of relevance to the transformation of our society towards sustainability: a low-carbon transport system, more efficient buildings, sustainable biomass production, and more environmentally friendly sporting events.

In the following pages, we profile 10 projects which epitomise the Oeko-Institut's work on this transformation. In relation to the energy transition, the Institute's Energy & Climate Division, for example, studied the pros and cons of a centralised versus decentralised approach and looked at ways of meeting Germany's greenhouse gas emissions reduction targets to 2050. The Infrastructure & Enterprises Division focused, among other things, on the environmental and economic benefits of a collaborative economy, with reference to car sharing and communal housing. Researchers in this Division also investigated strategies for improving recycling infrastructures in Africa.

The opportunities to replace perfluorinated and polyfluorinated chemicals in industrial processes were explored by the Sustainable Products & Material Flows Division, which also looked at the issue of sustainable public procurement. The Environmental Law & Governance Division identified legal barriers to climate investment in Germany and assessed the effectiveness of the Second Aircraft Noise Protection Ordinance. The Nuclear Engineering & Facility Safety Division assessed the suitability of the Buchen-Sansenhecken landfill facility for post-clearance disposal of waste produced in the decommissioning of Obrigheim nuclear power plant. And in the Models of Change project, strategies for social transformation were developed.

We are on track towards a more sustainable society – and not only in the context of the energy transition. The way ahead, with its stumbling blocks and potential solutions, was the key issue for all the Oeko-Institut's researchers in 2015.



Correct substitution PFOS in galvanics

It is beyond question that they have many useful properties. Perfluorinated and polyfluorinated chemicals (PFC) are dirt- and fat-repellent, and resistant to weathering and ultraviolet radiation. They are therefore used in many industrial products such as coatings for non-stick pans, rain-proofing for garments, in fire extinguisher foams, in galvanic processes, for paper refinement and in ski wax. But they also have harmful properties which are markedly more serious: chemical compounds with fluorine can pass into blood and breast milk; they are not easily biologically degradable and can have harmful effects on reproductive health. The scientists at the Oeko-Institut therefore urge a systematic cessation of the use of PFC. Taking the example of perfluorooctane sulphonate (PFOS), which belongs to the PFC group of compounds, they carried out a study for the German Environment Agency (UBA) on whether and how PFOS can be substituted in galvanics, where it remains in use for non-decorative hard chrome plating in closed-loop systems.

In collaboration with the environmental consultancies IUW-Integrierte Umweltberatung and POPs Environmental Consulting, the Oeko-Institut collected as-yet unavailable data on the use of PFOS in galvanics. Using a sample of five galvanic plants, the analysis shows which characteristic features and measures a closed-loop system has to exhibit.

Furthermore, the experts compiled an overview of substances with which PFOS can be replaced in galvanics. They show that substitution is possible in almost all fields of application, but also emphasise that the risks of the replacement substances as regards persistence, ecotoxicity and degradability cannot yet be assessed conclusively. Further studies are necessary for this purpose. More transparency in the discussion about PFC can be achieved, say the scientists, if people are made more aware of the alternatives that exist. Additionally, a proposal was developed as part of the study on how the EU Regulation concerning Persistent Organic Pollutants (POPs Regulation) can be brought up to date.

Project profile

Project title: Report to the European Commission according to Article 12 of the EU POPs Regulation Contact: Markus Blepp, m.blepp@oeko.de Institute Division: Sustainable Products & Material Flows Client: German Environment Agency (UBA) Project partners: IUW-Integrierte Umweltberatung, POPs Environmental Consulting

Timescale: May 2015 – September 2015 Further information: www.oeko.de/chemikalien

Markus Blepp

The assessment of technologies, products and processes is the focus of Markus Blepp's work. Since 2010 he has been working for the Oeko-Institut, where he has engaged with such themes as substitution assessment and sustainable chemistry.



"Regarding the use of perfluorinated and polyfluorinated chemicals, PFC for short, it is high time for a rethink. Substances like PFOS must urgently be replaced – but not by similar chemicals which give rise to comparable risks and problems. It is essential to find innovative approaches for sustainable chemicals, and companies that are willing to try them out."

A suitable landfill site Storage of decommissioning waste

Dismantling a nuclear power plant is considerably more challenging than demolishing an average residential home. Whereas a wrecking ball can often bring down the walls of a house in one fell swoop, considerably more caution is required with a nuclear facility so as to rule out hazards to the population as far as possible. This applies equally to the very slightly contaminated waste from the dismantled facility, which must meet stringent requirements to be cleared for disposal as conventional waste. Under commission from AWN, the municipal waste management company of the Neckar-Odenwald district, the Oeko-Institut analysed the suitability of the Buchen-Sansenhecken landfill site for the storage of safety-cleared demolition waste from the Obrigheim nuclear power plant.

The decommissioning process is likely to generate around 3,000 tonnes of waste – especially building rubble – which is contaminated with such a low level of radioactivity that it can be cleared for disposal as landfill. According to the opinion supplied by the Oeko-Institut, the Buchen-Sansenhecken landfill site meets the requirements of the Radiation Protection Ordinance for sites to which cleared waste may be sent for landfill. A further reduction of the possible radioactive contamination will additionally be ensured, in the experts' view, by the stipulations of the Baden-Württemberg Ministry of the Envi-

ronment and the code of practice issued by the Baden-Württemberg Assembly of Rural Districts.

> Because of the State of Baden-Württemberg's additional measures, the scientists expect radioactivity in the environs of the Buchen-Sansenhecken landfill site to be significantly

below the de minimis dose of 10 microsieverts a year. The risk to the population at this dose is so low as to require no further protective measures, according to internationally applied principles.

The Baden-Württemberg measures also provide for additional controls of the readings taken at the nuclear power facility prior to disposal. As soon as the technical prerequisites for this have been created, the Oeko-Institut experts will carry out such controls at the Obrigheim nuclear power facility under commission from the AWN.

Project profile

Project title: Opinion on conceptual issues of clearance for disposal at a landfill in the decommissioning and dismantling of the Obrigheim nuclear power plant (KWO)

Contact: Christian Küppers, c.kueppers@oeko.de Institute Division: Nuclear Engineering & Facility Safety

Client: Abfallwirtschaftsgesellschaft des Neckar-Odenwald-Kreises mbH (AWN)

Timescale: November 2014 – August 2015

Further information: www.oeko.de/obrigheim (in German)

Christian Küppers

The physicist Christian Küppers has been working for the Oeko-Institut since 1986. The Deputy Head of Division for Nuclear Engineering & Facility Safety engages with such matters as questions of safety in the handling of radioactive materials.



"The phasing out of nuclear energy is associated with many technical and societal challenges such as disposal of the waste from the dismantling of nuclear power plants. The population often looks upon this with anxiety. But demolition waste is not brought to a landfill site unchecked. Beforehand it must pass elaborate clearance procedures, as the Radiation Protection Ordinance demands."

Between ventilators and soundproofing The 2nd Aircraft Noise Ordinance

Anyone who lives close to an airport should be protected from the associated noise pollution. Exactly how, is governed by regulations including the German Act for Protection against Aircraft Noise (FluLärmG) and legal ordinances on its implementation. The 2nd Ordinance on Implementation (2. FlugLSV) provides for the establishment of regulated noise protection zones, in which new buildings must comply with diverse structural noise protection standards and property owners are entitled to reimbursement for passive sound insulation measures. But how effective is 2. FlugLSV? What insights can be drawn from practice? Is the population sufficiently protected from aircraft noise? These questions were investigated by the Oeko-Institut in collaboration with the law partnership Fridrich Bannasch & Partner and the noise consultants Büro GeräuscheRechner under commission from the German Environment Agency (UBA).

To review the efficacy and impact of 2. FlugLSV the experts first analysed the legal framework and the progress made with defining noise protection zones, and studied the handling of reimbursement claims in selected locations. They also compared the ordinance with regulations on road and rail noise. Furthermore, the project team interviewed stakeholders, developed proposals for improvement and made recommendations for the legal framework and enforcement.

Among other points, the analysis calls for more precise definition of the zones to be protected pursuant to 2. FlugLSV as well as improvement of the requirements for structural noise protection, since these are not in line with the current state-of-the-art in noise insulation technology. It also criticises the inclusion of allowance clauses in the ordinance, lowering the protection standard for pre-existing building stocks, and calls for these allowances to be abolished. With regard to concrete implementation in situ, the project team identified major differences between the individual sites. For residents close to several airports, there are additional support programmes which improve the situation – for instance, Hamburg has instituted measures to eliminate bureaucratic delays. In the recommendations for action, the experts also propose the introduction of a quality assurance scheme for noise protection measures. The lack of such a scheme was likewise criticised by interviewees.

Project profile

Project title: Evaluation of the 2nd Ordinance on Implementation of the Aircraft Noise Protection Act Contact: Silvia Schütte, s.schuette@oeko.de Institute Division: Environmental Law & Governance Client: German Environment Agency (UBA) Project partners: Fridrich Bannasch & Partner Rechtsanwälte mbB, Büro GeräuscheRechner Timescale: February 2015 – November 2015 Further information: www.oeko.de/laermschutz (in German)

Silvia Schütte

Environmental and planning law as well as participation procedures in environmental law are the key topics of Silvia Schütte's work. A qualified lawyer, she has been working for the Oeko-Institut since 2010; her research focus is on national and European environmental law.

"The 2nd Ordinance on Implementation of the Aircraft Noise Protection Act has shortcomings which are detrimental to its purpose: to protect the population from aircraft noise. Possible improvements come to light when we look at examples from practice where additional measures have helped to facilitate a good solution. We recommend the creation of clearer enforcement regulations and the abolition of unjustified allowances for pre-existing buildings."

Best of two Worlds Sustainable recycling in Africa

The current recycling of electronic waste and lead-acid batteries in many African countries leaves a great deal to be desired in terms of sustainability: the practices pose major threats to the environment and health, and many valuable metals - such as cobalt - are lost in the process. The Best of Two Worlds (Bo2W) project was intended to remedy this problem. In collaboration with several partners, under the leadership of the Oeko-Institut, environmentally sound and socially equitable processes were developed to ensure that vital resources are recovered effectively and sustainably without threatening human health. Two local corporations were also involved: City Waste Recycling in Ghana and CEDARE in Egypt. They carried out pilot projects to trial the new recycling structures.

The project focused on the recycling of end-of-life vehicles and electronic waste – but only waste generated locally. For example, over the past few years the number of mobile telephones in Egypt has climbed steeply, and is expected to reach 115 million devices by 2025. Estimates forecast that after 2018 the number of disused mobile phones in that country alone will amount to around ten million. According to projections by the Oeko-Institut, by 2025 the quantities of precious metals contained in discarded mobile phones, computers and notebooks are likely to reach 6.8 kilograms of gold, 53 tonnes of silver and 3.2

tonnes of palladium.

To recycle these metals more effectively, the Bo2W project was set up so as to combine the strengths of the developing and industrialised countries. In order to improve local recycling methods, initially training sessions were carried out on the appropriate dismantling of electronic waste and to promote the responsible recycling of lead-acid batteries. Under the Bo2W approach, all resulting components for which efficient and environmentally sound recycling is not possible locally should be transported to European refineries providing high-tech recycling processes. In the course of the project supported by the German Federal Ministry of Education and Research, the first consignments of lead-acid batteries and dismantled circuit boards were dispatched. Beyond this, proposals for optimising the processes and local framework conditions were developed, along with information material on sustainable recycling, among other project outputs.

Project profile

Project title: Global recycling of strategic and essential metals: Best of Two Worlds approach (Bo2W) Contact: Dr Matthias Buchert, m.buchert@oeko.de Institute Division: Infrastructure & Enterprises Client: German Federal Ministry of Education and Research (BMBF) Project partners: Umicore, Vacuumschmelze (VAC),

Johnson Controls, City Waste Recycling (Ghana), CE-DARE (Egypt)

Timescale: June 2012 – October 2015 Further information: www.resourcefever.org

Dr Matthias Buchert

Dr Matthias Buchert has been working at the Oeko-Institut since 1992, where he has headed its Infrastructure & Enterprises Division since 1998. A chemist by training, the focus of his research is on sustainable resources management, working on such themes as closed-loop management and technology metals.



"Even after the project's conclusion, many challenges remain. The core problem is that, for cost reasons alone, sustainable recycling cannot compete with the previous informal practices. The outdoor flame-cleaning of cables, for instance, barely costs money or effort. But this leaves the consequential costs arising from the immense harm to health and the environment out of the equation."

Centralised or decentralised? Designing the energy transition

Germany's energy transition is well under way, that is obvious. But when it comes to its design, the situation is less clear-cut. For example, should it be based on a centralised or decentralised system? Most of our electricity should come from renewable sources - but what is the better option: a massive solar power plant in the desert, or numerous smallscale roof-mounted systems? Centralised or local? There are supporters of both options - and heated debates. The Oeko-Institut is engaged in several projects which aim to answer this question by modelling scenarios, analysing viable options and discussing the issue with a range of stakeholders. In a discussion paper produced within the framework of the Environmentally and Socially Compatible Transformation of the Energy System programme funded by the Federal Ministry of Education and Research, the Oeko-Institut's researchers put various options under the microscope.

Their analysis considers a range of dimensions – such as power generation technology and essential flexibility options – and identifies the advantages and disadvantages of a centralised/decentralised design for the energy transition. The assessment was based on the following criteria: environmental compatibility, economic efficiency and security of supply. Socio-political aspects were also considered, including the democratisation of the energy system.

The discussion paper shows that the energy transition does not just mean replacing a centralised with a decentralised system. Decentralised power generation may offer some advantages, such as more security of supply, as the system is based on a large number of small installations instead of a small number of larger ones. However, the environmental impact assessment produced a more nuanced picture: decentralised models make some infrastructural measures, such as new transmission networks, redundant to some extent, but also depend on other systems – such as storage capacities – which have their own environmental impacts. Both options require investment, but the overall costs are beset with uncertainties, which the Oeko-Institut is investigating in other projects. As regards the socio-economic dimension, the analysis shows, among other things, that decentralised renewable energies offer many opportunities for the public's direct involvement – but there is scope to improve participation in a centralised system as well.

Project profile

Project title: Discussion paper within the framework of the project: Research coordination of the BMBF funding initiative "Environmentally and socially compatible transformation of the German energy system" Contact: Dr Dierk Bauknecht, d.bauknecht@oeko.de Institute Division: Energy & Climate (Freiburg) Client: Federal Ministry of Education and Research (BMBF)

Project partners: Institute for Social-Ecological Research (ISOE)

Timescale: March 2013 – August 2017 Further information: www.oeko.de/de_zentral

Dr Dierk Bauknecht

How can renewable energies be integrated to an optimal extent into the energy system? Political scientist Dr Dierk Bauknecht has explored this question in numerous projects. He has worked at the Oeko-Institut since 2001, focusing on issues such as infrastructural transformation and flexibility options.

"This discussion paper identifies possible economic and socio-political impacts of a centralised or decentralised energy transition. Within the framework of the BMBF programme on energy system transformation, the study focuses in detail on energy governance issues and also considers economic aspects."

2050 Climate Protection Scenario Successfully reducing greenhouse gases

Germany has set itself one key climate target: an 80-95 percent reduction in GHG emissions by 2050. For an industrialised country like Germany, meeting this goal is essential for successful climate change mitigation. However, it will take considerable effort and a firm commitment from all sectors to overcome the numerous obstacles along the way. A joint analysis conducted by the Oeko-Institut in cooperation with Fraunhofer Institute for Systems and Innovation Research (ISI) on behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) shows how Germany's ambitious reduction targets can be met.

The researchers conclude that without very substantial emissions reductions in all economic sectors, the climate targets cannot be reached. Numerous sectors – such as the energy industry and households – offer a reduction potential of more than 95 percent. The potential contribution from agriculture, however, is limited: due to unavoidable biological processes in agricultural production, the reduction potential for nitrous oxide and methane emissions is around 60 percent at most. According to the analysis, a further expansion of renewable energies is needed, particularly as demand for RES electricity is growing. In their ambitious Climate Protection Scenar-

io, the project partners calculate that demand for renewable energies will be five times higher by 2050 than it is today. Wind and solar will play a key role in meeting this demand.

The experts conclude that in order to reach its climate targets, Germany must halve its primary energy consumption. To achieve the necessary increase in energy efficiency, energy upgrading of buildings must be greatly accelerated and the energy efficiency of domestic appliances must be improved. In addition to the front-runner principle, where the most efficient appliance serves as a model, one option is to introduce new energy efficiency categories. A further measure is to switch to e-mobility, powered by renewables. Further energy efficiency gains can be achieved in future through increased recovery of waste heat from industrial processes.

Project profile

Project title: 2050 Climate Protection Scenario Contact: Julia Repenning, j.repenning@oeko.de Institute Division: Energy & Climate (Berlin office) Client: German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)

Project partners: Fraunhofer Institute for Systems and Innovation Research (ISI)

Timescale: December 2011 – May 2016 Further information:

www.oeko.de/klimaschutz2050

Julia Repenning

Julia Repenning's research focuses on the electricity market. A graduate in Environmental Engineering, she has worked for the Oeko-Institut since 2003. Her main topics of interest include emissions trading, emissions inventories and the development of scenarios for future power generation.



"As Germany moves closer to achieving its climate targets, the interaction between the individual sectors will increase. If emissions are to fall by more than 90 percent, both the transport and the buildings sector will have to expand their use of renewable energies considerably compared with today's level."

Constrained capital A framework for climate investment

The transition to a sustainable society cannot be achieved at no cost. It requires investment across a range of sectors: in better transport infrastructure, renewable energy generation and storage, and more efficient buildings. Although green investment opportunities often promise to deliver a healthy profit, they are not being exploited to an adequate extent worldwide. Even Germany is failing to invest adequately in green projects. On behalf of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the Oeko-Institut's researchers have identified legal barriers to climate investment and looked at ways of dismantling them.

The researchers focused on various investment sectors, including energy efficiency for businesses, and infrastructural measures in buildings and transport. Together with four project partners – BCC Business Communications Consulting, the Ecologic Institute, Professor Domenik Henning Wendt from Frankfurt University of Applied Sciences, and Professor Janine Wendt from TU Darmstadt - they looked at various barriers to investment, as well as opportunities to create incentives that are being ignored at present. The project team focused on capital and investment law, commercial and company law, and accounting and tax law. The study found that climate investment barriers vary across branches of the law. A major obstacle existing in accounting law, for example, is the lack of uniform climate protection reporting. In the researchers' view, if clear rules existed here, investors would have a much better basis for decision-making and the costs for investors seeking suitable projects would fall, boosting investment.

Reporting on corporate social responsibility (CSR) was the focus of a short study on Germany's implementation of the European CSR Directive (2014/95/



EU), conducted within the project framework. In future, certain large undertakings will be required to prepare a non-financial statement containing information relating to environmental, social and employee-related matters and respect for human rights, among other things. The report evaluates various options for the elaboration of the Directive as regards its scope of application, sanctions, etc.

Project profile

Project title: Frameworks for climate investment – Barriers and actions

Contact: Ass. iur. Friedhelm Keimeyer,

f.keimeyer@oeko.de

Andreas Hermann, LL.M. (Project Manager), a.hermann@oeko.de

Institute Division: Environmental Law & Governance **Client:** German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)

Project partners: BCC Business Communications Consulting GmbH, Ecologic Institute, Professor Domenik Henning Wendt (Frankfurt University of Applied Sciences) and Professor Janine Wendt (TU Darmstadt)

Timescale: January 2014 – March 2016 Further information: www.oeko.de/investitionen

Friedhelm Keimeyer

Friedhelm Keimeyer worked in a law firm before joining the Oeko-Institut in 2012. His research focuses mainly on legal aspects of climate change and resource conservation. He undertakes legal analyses, primarily in the field of national and European energy and environmental law, and provides policy advice.

"The time has come for the major companies to include non-financial information in their status reports, with a focus on environment and social issues, for example. After the Paris Climate Conference, this also means establishing mandatory criteria for reporting on greenhouse gas emissions. Other European countries have successfully demonstrated that this is possible."

Using, not owning Advantages of a collaborative economy

Living in shared accommodation means less living space but more of a sense of community. Using a car available to all members of a car-club to drive to the station saves having to own a car privately. The "collaborative economy" encompasses many approaches aimed at shifting the focus from individual ownership to collective use. We share washing machines and cars, exchange clothes, and work together to grow fruit and vegetables. But what impacts does that actually have on the environment, and what are the possible economic implications? With reference to integrated mobility with flexible car-sharing schemes and forms of shared housing, the Oeko-Institut investigated this under commission from the German Environment Agency.

Together with the independent research and consultancy group INFRAS, the experts first compiled an overview of different collaborative economy approaches: from food-sharing schemes to repair cafés. Next, the environmental and economic implications of flexible car-sharing were analysed. Up to 109,000 new jobs, mainly in the services sector, can potentially be created and more than six million tonnes of greenhouse gas emissions abated annually, according to the analysis. This clearly shows the advantages of practising shared use.

> Harmful greenhouse gas emissions from the German transport sector could be reduced by four

percent in this way. Alongside flexible car sharing, this depends upon systematic upgrading of public transport and pedestrian and cycling facilities. Multimodal and integrated transport provision is a key prerequisite for a sustainable impact, as the study was able to demonstrate.

In addition, the researchers in the study analysed the benefit of shared housing. Here, too, clear climate benefits are evident. If more people share accommodation, there is potential for the annual abatement of around one million tonnes of greenhouse gases, which is equivalent to the annual emissions of a small coal-fired power plant. Positive effects on employment were another finding from this example: shared forms of accomodation may give rise to 18,000 additional jobs.

Project profile

Project title: Using rather than owning: New approaches for a collaborative economy Contact: Martin Gsell, m.gsell@oeko.de Institute Division: Infrastructure & Enterprises Client: German Environment Agency (UBA) Project partners: INFRAS Forschung und Beratung Zürich

Timescale: August 2013 – June 2015 Further information:

tinyurl.com/uba-nutzen-besitzen (in German)

Martin Gsell

Even during his time as an economics undergraduate, Martin Gsell focused his attention on the social and environmental consequences of economic processes. Since 2011 he has been working for the Oeko-Institut, where he is principally concerned with waste prevention, resource conservation and sustainable modes of production and consumption.



"If schemes for collaborative consumption are to have positive environmental and economic consequences, the framework conditions must be right. Positive impacts of flexible car-sharing occur particularly when there are also attractive networks of cycling and pedestrian routes and a user-friendly public transport system. These include such facilities as car sharing parking spaces at stations and frequent, well-coordinated bus and rail services."

Models of change Strategies for societal transformation

The transformation of energy systems, car-free mobility, meat-free canteens, shared accommodation - the adjustments that are necessary for a more sustainable lifestyle can be very sizeable. But how can our society be motivated to move, not just individually and piecemeal but culturally and comprehensively, in the direction of sustainability? This was the subject of research commissioned by the Federal Environment Ministry (BMUB) and the German Environment Agency (UBA) and carried out by scientists from the Oeko-Institut in conjunction with the Zeppelin University and the KWI Institute for Advanced Study in the Humanities, Essen. Beyond this they developed recommendations on how political actors can promote societal transformation.

The analysis shows that cross-sectoral concepts and coordinated strategies, which involve different instruments and activities and a variety of stakeholders, are vital. Because societal transformation calls for working together: cooperation is needed between politics and civil society, business and industry and academic research. The experts also attach great significance to vision statements and guiding principles, which can act as drivers of change if concrete goals with lasting impact can be derived from them. In addition, they emphasise the importance of new ideas and experimental approaches as well as incentives for socio-technical developments.

With regard to political actors the scientists stress the necessity of early identification of transformation movements and niche trends, which need strategic monitoring. They urge sound advance preparation of measures promoting transformation, and point out that fundamental societal changes also call for new financing models. In the event of conflicts – such as those that can arise over the construction of high-voltage power lines – the analysis advises a proactive approach. For example, this involves attracting alliance partners or communicating positive aspects of change but does not exclude negotiation over compensation arrangements or, in individual cases, the revision of decisions.

Project profile

Project title: Transformation strategies and models of change for sustainable societal change

Contact: Dr Bettina Brohmann, b.brohmann@oeko.de Institute Division: Nuclear Engineering & Facility Safety

Client: German Environment Agency (UBA), German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)

Project partners: Zeppelin Universität, Kulturwissenschaftliches Institut Essen

Timescale: October 2012 – November 2015 Further information:

tinyurl.com/uba-mehrebenenansatz (in German)

Dr Bettina Brohmann

As Research Coordinator for Transdisciplinary Sustainability Research, Dr Bettina Brohmann engages with numerous projects across divisions of the Oeko-Institut, where she has worked for over 20 years. She is a social scientist with a particular interest in consumer research.



"If our society is to change in a more sustainable direction, what it needs is the constant willingness to look for new pathways in that direction. We must seek and experiment, accept mistakes and learn from them. New ways of thinking are vital for societal transformation, but so is constructive handling of the conflicts that arise."

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Large consumption, large impact Sustainable public procurement

Light. Paper. Detergent. Public offices and administrations are large-scale consumers in many areas. For Berlin alone, the public sector's stock of computers is estimated at 80,000, and as many as 240,000 desk lamps. Annual paper consumption is put at around 620 million sheets; the use of cleaning agents amounts to 12,000 cubic metres. This also means that sustainable public procurement can have a substantial influence on every local authority's environmental balance sheet. For example, the State of Berlin's greenhouse gas emissions could be reduced by around 47 percent by means of green procurement, as a study commissioned by the Berlin Senate Administration for Urban Development and the Environment shows.

Sustainable procurement not only has positive impacts on the environment but also entails cost benefits: it could save the State of Berlin 38 million euros every year. For 15 product groups and services in total, including computers and printers, textiles, electrical power and building renovations, Oeko-Institut scientists determined how far environmental impacts and costs might be relieved.

The analysis reveals that commercial waste management has a very high potential for greenhouse gas emissions reduction. Per tonne of waste, environmentally sound recycling could result in an annual saving of 584 kilograms carbon dioxide (CO₂) equivalent. Overall, with reference to the product groups and services studied, the State of Berlin's greenhouse gas emissions inventory can potentially be improved from around 757,000 tonnes to 355,000 tonnes CO₂ equivalent. Sustainable procurement would result in cost savings in ten of the 15 areas analysed, according to the study. The potential is especially high for street lighting, for example, where the costs per light can be reduced by 533 euros or 33 percent annually. But even for the five products and services that have no cost-saving potential, the experts recommend environmentally sound alternatives, since these generate either very minor additional costs or an especially high potential to relieve environmental impacts.

Project profile

Project title: Environmental impact and cost relief through green procurement

Contact: Jens Gröger, j.groeger@oeko.de

Institute Division: Sustainable Products & Material Flows

Client: Berlin Senate Administration for Urban Development and the Environment

Timescale: July 2014 – June 2015

Further information: www.oeko.de/beschaffung (in German)

Jens Gröger

Since 2009, Jens Gröger has been working at the Oeko-Institut on sustainable consumption, in relation to such areas as building services engineering or information & communication technology. A graduate energy technology and process engineer, he carries out product sustainability analyses and develops criteria for environmental labels and procurement guidelines.



"Our analysis shows how great the potential of green procurement is, for the State of Berlin alone. Apart from the environmental benefits, it can bring about clear cost savings. Even products which are more expensive to procure usually pay off as a result of lower consumption costs over their useful lifetime."

Clients of the Oeko-Institut

Politics & Government

- Abfallwirtschaftsgesellschaft des Neckar-Odenwald-Kreises mbH (AWN)
- Arbeitsgemeinschaft (ARGE) Hamburg 2024
- Baden-Württemberg Ministry of the Environment, Climate Protection and the Energy Sector
- Baden-Württemberg State Agency for Environment, Measurements and Nature Conservation (LUBW)
- Berlin Senate Department for Urban Development and Environment
- Bischweier Municipality
- City of Freiburg Environmental Protection Office
- City of Munich, capital of the Free State of Bavaria
- Deutsche Gesellschaft f
 ür Internationale Zusammenarbeit (GIZ) GmbH
- Federal Agency for Nature Conservation (BfN)
- Federal Ministry for Economic Affairs and Energy
- Federal Ministry of Education and Research
- Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
- Federal Ministry of Transport and Digital Infrastructure
- German Federal Environment Agency (UBA)
- German Federal Environmental Foundation (DBU)
- European Commission: Directorates-General for Energy, Research and Innovation, Climate
- Action, Environment, Industry and Entrepreneurship; EACI, EASME, Eurostat, Joint Research Center, Research Executive Agency; Secretariat of the European Parliament (DG IPOL)
- Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH
- Hessen Agentur GmbH
- Hessian Ministry of the Environment, Climate Protection, Agriculture and Consumer Protection
- International Energy Agency (IEA)
- Lower Saxony Ministry of the Environment, Energy and Climate Protection
- Ministry of Finance, Ghana
- North Rhine-Westphalian Ministry for Climate Protection, Environment, Agriculture, Conservation and Consumer Protection
- North Rhine-Westphalian State Office for Nature, the Environment and Consumer Protection
- Sogin S.p.A., Italy
- State Secretariat for Economic Affairs (SECO), Switzerland

Industry

- BSH Bosch und Siemens Hausgeräte GmbH
- Caparol GmbH
- Daimler AG
- Duales System Holding GmbH & Co.KG
- Eunomia Research & Consulting Ltd.
- KeTAG Baden-Württemberg
- Saturn
- Stadtwerke München GmbH und Stadtwerke Ulm/Neu-Ulm GmbH
- Stakeholder Reporting GmbH
- Telekom AG
- TÜV Nord
- TÜV SÜD und TÜV SÜD Energietechnik GmbH
- Tchibo GmbH
- TRIAZ GmbH

Civil society

- Agora Energiewende
- Carbon Market Watch
- Collaborating Centre on Sustainable Consumption and Production (CSCP) gGmbH
- EnergieVision e.V.
- European Environmental Bureau (EEB)
- Forests and the European Union Resource Network (FERN)
- Fraunhofer Institute for Systems and Innovation Research (ISI)
- German Association for Plastics Packaging and Films
- German Football Association
- German Society for the Promotion of Research on Standardization
- ifeu GmbH
- Landschaftsverband Rheinland
- Legacy for the Future Foundation
- Leibniz Institute of Ecological Urban and Regional Development
- Mercator Foundation/Stiftung Mercator
- RAL-Gütegemeinschaft Rückproduktion von Kühlgeräten e.V.
- Rhine-Main Aircraft Noise Control Association
- RWTH Aachen University (RWTH)
- Velux Foundation
- WWF Germany

A full list of references is available (in German) at www.oeko.de/referenzen2015

No half measures Staff and structures at the Oeko-Institut

Stability and change – these are the two pillars on which the Oeko-Institut's management is based. Ever since the Oeko-Institut was established as a non-profit organisation in 1977, the membership of the Committee and Advisory Board has tended to remain unchanged for long periods. The same applies to the Executive Board and the management of the Institute's divisions and organisational units, where there is a high level of continuity among specialist staff. There was a change in the composition of the Executive Board in March 2015, when Susanne Fröschl joined the team and took over responsibility for the Institute's management and coordination.

Executive Board



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Susanne Fröschl s.froeschl@oeko.de

Advisory Board

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Committee

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Internal members of the Committee

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Susanne Rossbach

Head of the Finance & Accounting Department s.rossbach@oeko.de



Mandy Schossig

"Energiewende half-time" in Oeko-Institut's communications

The half-way stage in Germany's energy transition was a dominant theme in the Oeko-Institut's communications activities in 2015. In addition to the celebration in Berlin, attended by 200 guests, it featured in a package of other promotional measures:

Logo: Energiewende half-time



The impact of our public relations activities relating to the half-way stage in Germany's energy transition was reinforced with a logo – a visual depiction of the concept of halves, which shows an old form of energy being replaced by renewables. The logo appeared in a variety of formats to publicise the Oeko-Institut's celebratory event in March 2015.

Animated video: Half-time Energiewende

An information video released by the Oeko-Institut in March underlines the importance of the energy transition for the global climate and identifies the efforts that continue to be required to expand renewables, grids and storage systems. Based on the work of the Oeko-Institut's researchers, the video is intended to mobilise support for energy system transformation.

Relaunch of energiewende.de

Along with the video, we have updated the content and appearance of the www.energiewende.de website. Readers will appreciate the fresh new layout and access to information about the key topics in the Oeko-Institut's research on energy system transformation and climate since 1980: the nuclear phase-out, transport, electricity market design, infrastructure, bioenergy, and climate change mitigation in the buildings sector. The website also traces the origins of the energy transition and highlights milestones from 1980 to the present.

Other PR formats

Traditional and newer communication channels are used to provide comprehensive and objective information, based on sound science, about the Oeko-Institut's work. Information is provided in the form of press releases, thematic dossiers on the website, a members' newsletter and the e-paper eco@work, etc. The Oeko-Institut also uses social media (Twitter for short messages, Youtube for videos, Flickr for infographics and Slideshare for presentations) as highspeed, high-impact communication channels.



Video: Energiewende half-time



www.energiewende.de



eco@work, Issue 3/2015

Information about the Oeko-Institut is available online:

www.oeko.de www.twitter.com/oekoinstitut www.oeko.de/presse www.slideshare.net/oeko-institut www.oeko.de/epaper www.flickr.com/oekoinstitut www.youtube.com/oekoinstitut

Our members The basis of our ideas and independence

More than 2300 members and numerous other sponsors regularly support our work with donations and subscriptions. These contributions enable us to undertake research on topics that we regard as important but are not addressed in projects commissioned by our clients. This guarantees our independence and helps to consolidate our unique position in the German research landscape. One example of an independent Oeko-Institut initiative is our 2014 donation-funded project, which will come to an end in the next few weeks.







Stakeholder workshop in the Bo2W Project Unproted

Unprotected workers at a lead furnace

Loading filter dust in a lead processing workshop in Ghana

2014 donation-funded project: Lead Recycling in Africa

In late 2014, the Oeko-Institut launched a project, together with African partners, to highlight the problem of inappropriate lead-acid battery recycling in their countries. The project raises policy-makers' awareness of the issue and, in the medium term, aims to establish higher standards in battery recycling. All four African environmental groups in Ethiopia, Cameroon, Kenya and Tanzania are doing outstanding work, networking with each other and conducting research into local conditions for lead-acid battery recycling, and have already produced some very significant and in some cases alarming findings:

- In Cameroon and Tanzania, some leadworks have sufficient capacity for large-scale car battery recycling. Very few safeguards are in place to prevent the release of lead emission from these facilities. In addition, a large number of car batteries are recycled in small backyard workshops. One particular problem is that some of the lead is used to manufacture cooking pots, which is very likely to cause lead poisoning in the general public on a wide scale. It has also become apparent that there is virtually no local market for lead in Africa, so the unprocessed lead removed from the batteries is usually exported – including to Europe.
- In Ethiopia, defective car batteries are usually recycled in small backyard workshops, where attempts are often made to repair them. Here too, most workers are unaware of the serious risks that lead poses to health. As a result, they take no precautions to protect themselves from lead dust, fumes and waste. Due to Ethiopia's strong eco-

nomic growth, the vehicle fleet – and, in parallel, the number of waste batteries – is rising sharply, so the problem is likely to worsen considerably in the near future.

In Kenya, research on lead pollution conducted by our partner organisation before the launch of the project resulted in the withdrawal of one lead workshop's operating licence. The project is now supporting the environmental group's efforts to collect information about other recycling operations in Kenya and to draw up protocols for the correct disposal of waste batteries. Unfortunately, none of the facilities in operation in the four countries complies with international standards. In the short term, therefore, the only recommended solution is to export waste batteries to other countries for safe recycling.

The Oeko-Institut's researchers are providing support and advice to the local experts and undertaking preliminary studies as a basis for more extensive background research. In order to move the issue higher up the political agenda, all the project partners engage in dialogue with local environmental agencies and with lead workshops' employees and local residents. The issue was discussed at a side-event during the International Conference on Chemicals Management (ICCM4) in Geneva in October 2015. The project website www.econet.international is a source of information and lessons learned, and offers access to downloadable resources, including a poster on appropriate packing of lead-acid batteries.



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