



# Fraunhofer

## ISI

FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH ISI



ANNUAL REPORT  
**2011**

TITLE DIAGRAM:  
ENERGY FLOW DIAGRAM FOR GERMANY 2010

- Domestic production
- Import
- Export and bunker
- Non-energetic consumption
- Conversion losses
- Consumption in the energy sectors
- Removal from stock
- Statistical differences

Source: Arbeitsgemeinschaft Energiebilanzen 7/2011



FRAUNHOFER INSTITUTE FOR SYSTEMS AND INNOVATION RESEARCH ISI



## FRAUNHOFER ISI

The Fraunhofer Institute for Systems and Innovation Research ISI analyzes the origins and impacts of innovations. We research the short- and long-term developments of innovation processes and the impacts of new technologies and services on society. On this basis, we are able to provide our clients from industry, politics and science with recommendations for action and perspectives for key decisions. Our expertise lies in a broad scientific competence as well as an interdisciplinary and systemic research approach.

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## RESPONSIBILITY FOR INNOVATION

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We are looking back on an eventful year, which was also a successful one for the Fraunhofer Institute for Systems and Innovation Research ISI. Once again, we remained true to our mission to be a visionary for society, science and politics. This annual report documents the most important milestones of 2011.

As an international innovation research actor, the Fraunhofer ISI uses its systemic perspective to contribute to society by participating in think tanks and expert committees. One example of this is the appointment of our Institute's director, Professor Marion A. Weissenberger-Eibl, by Angela Merkel, the German Chancellor, to head the working group Innovation Culture in the Chancellor's Dialogue on Germany's Future.

Fraunhofer ISI analyzes the innovation capacity of Germany and in this way contributes to the further development of the German innovation system. An outstanding example of this is the "Innovation Indicator 2011", which was compiled in cooperation with the Centre for European Economic Research (ZEW) in Mannheim on behalf of the Deutsche Telekom Stiftung and the Federation of German Industry (BDI).

We consider cooperations and networks to be a key component of our work. In 2011, Fraunhofer ISI took over the coordination of the large-scale innovation cluster project "Regional eco mobility 2030" (REM 2030), in order to make a decisive contribution to developing and shaping system concepts for future urban and regional mobility. We continued to bolster our national and international partnerships in 2011, especially those with China, as well as intensifying our links to the Fraunhofer-Gesellschaft: alongside the Fraunhofer Alliances in Energy, Transport, Water Systems and Nanotechnology, Fraunhofer ISI is a member of the Fraunhofer Material and Components Group and this year also a guest member in the Group for Defence and Security.

Due to our methodological strengths, systemic approach and awareness of societal issues, we were able to compile important findings in 2011 concerning key issues of the future and support our clients in making strategic decisions – fruitful work – as demonstrated by more than





350 projects and the satisfaction of our clients. The annual budget of Fraunhofer ISI climbed to almost 21 million euros as the result of our numerous contracts. This could only be managed due to a substantial increase in the number of staff to more than 200. This also means that the capacity limits of the Institute's current building have been reached. Temporary solutions to the overcrowding will be necessary to bridge the period until the move to the urgently desired new building.

That the number of staff will continue to increase in the future was already apparent in 2011 with the preparations to set up a new Competence Center (CC). Because it was no longer possible to manage the demand for Fraunhofer ISI's expertise in very diverse areas of the energy domain, we decided to establish another main focus: The CC Energy Policy and Energy Markets began work at the turn of the year 2011/2012. The previous CC Energy Policy and Energy Systems was renamed Energy Technology and Energy Systems and reorganized into Business Units. This new organization structure became effective at the beginning of 2012.

There were also organizational changes in the CC Industrial and Service Innovations, where the Business Units *Industrial Innovation Strategies and Systems* as well as *Innovative Production Systems and Value Chains* were realigned, in order to bundle topics more clearly for industry.

Planning a network for innovations also began in 2011. From spring 2013, representatives from industry, academia and politics will meet to discuss issues which extend beyond the short-term horizon of day-to-day business, in order to provide important impulses for the medium- to long-term orientation of technology and innovation policy.

We are looking forward to all the tasks and challenges ahead in 2012. This will certainly be a very special year for us as Fraunhofer ISI celebrates its 40<sup>th</sup> anniversary.

**Prof. Marion A. Weissenberger-Eibl**  
Director of the Institute

**Dr. Harald Hiessl**  
Deputy Director of the Institute

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## A LIVELY INNOVATION CULTURE IS VITAL TO SAFEGUARD GERMANY AS AN INDUSTRIAL PRODUCER

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**Fraunhofer ISI regards the innovative capacity of Germany with a systemic research approach and, as a result, is an independent mentor for policymakers, industry and society. Fraunhofer ISI's Director and its Chairman of the Board of Trustees regularly discuss current developments.**

Discussion between the Chairman of the Board of Trustees, Dr. Manfred Wittenstein, and the Director of the Institute, Professor Marion A. Weissenberger-Eibl

*Frau Weissenberger-Eibl, the German Chancellor Angela Merkel has appointed you an expert in the "Dialogue on Germany's Future". You head the working group on innovation culture. What issues does this group tackle and how are these influenced by Fraunhofer ISI's topics?*

**Weissenberger-Eibl:** These are precisely the questions we deal with at Fraunhofer ISI. In the working group Innovation Culture we are addressing questions such as "How will we innovate tomorrow and the day after tomorrow? How can we handle scarce resources more creatively? And how can we responsibly shape the future together?" The Chancellor's Experts Dialogue aims to get people thinking and stimulate a nation-wide debate. The working group wants to make a contribution here by developing concrete recommendations of action for policymakers.

**"OUR APPROACH IS TO EXAMINE QUESTIONS FROM DIFFERENT PERSPECTIVES."**

*The Experts Dialogue is only one part of the "Dialogue on Germany's Future". Since February 2012, the general public has also had the opportunity to discuss recommendations via an internet portal which will be integrated into the Experts Dialogue. What do you think about this way of participating?*

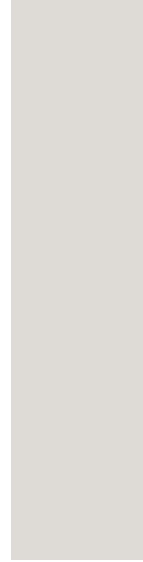
**Weissenberger-Eibl:** I welcome the way the Chancellor has used this new format of communicating with our country's citizens. That is why I was delighted to be appointed. The Chancellor's Dialogue offers the opportunity to explore questions from different perspectives. This matches the approach we take at Fraunhofer ISI.

*Herr Wittenstein, at the end of 2011 you were named one of Germany's entrepreneurs of the year. Which role does innovation play for you from an entrepreneur's viewpoint?*

**Wittenstein:** I believe it is important to welcome new ideas and blaze new trails. Innovation is indisputably a major factor in advancing Germany as an industrial producer. Long-term investments pay off as much as the courage to innovate. We need to break new ground again and again. Being open and willing to innovate are decisive characteristics here.

*Is it also the responsibility of companies to be innovative?*

**Wittenstein:** What do you mean here by "also"? It is primarily the task of businesses to pursue innovations. It is therefore absolutely vital to make sustainable investments in innovation – and here I am talking about not cutting budgets even in times of crisis. WITTENSTEIN AG, for example, continued to invest in research and development (R&D) even during the crisis; about ten percent of our turnover flows into research. I believe companies bear a huge responsibility here.



**Weissenberger-Eibl:** I can only agree with Herr Wittenstein here. In order to strengthen the innovation system in Germany, incentives for private investments in research and development should be bolstered. We have to actively tackle the new technology challenges which have arisen, for example, due to the change in national energy policy and which are necessary for us to be able to comply with climate targets. Experiences in countries like France and Austria have already shown us the effectiveness of tax incentives for funding R&D.

*Frau Weissenberger-Eibl, the Deutsche Telekom Stiftung and the Federation of German Industry (BDI) commissioned the Fraunhofer ISI to make an international comparison of Germany's innovative capacity. What were the main results?*

**Weissenberger-Eibl:** In an international ranking, Germany has moved from the ninth position it held two years ago to fourth place. This is a clear improvement. Despite this, it is still quite obvious that Germany is not up with the leaders consisting of Switzerland, Singapore and Sweden. We only lead the midfield.

*Where did we not perform so well?*

**Weissenberger-Eibl:** There is a clear need for improvement in the education system. The German education system shows considerable deficiencies, which are reflected in the country's ranking only 17<sup>th</sup>. This result is alarming, especially against the backdrop of demographic change. The population's level of education and qualification is a key prerequisite to being able to catch up with the leaders in the future.

*And how could Germany improve?*

**Weissenberger-Eibl:** The German innovation system could certainly be strengthened by an orientation towards high technologies. Germany's openness in a globalized world also plays an important role. The individual actors of the German innovation system are well connected in networks. This is a huge

advantage compared to countries like Japan or South Korea, which do not have such good links because of their rather closed innovation systems.

**“SMALL AND MEDIUM-SIZED ENTERPRISES HARBOR CONSIDERABLE INNOVATION POTENTIAL.”**

*Herr Wittenstein, where do you see Germany's innovative strength, in small and medium-sized enterprises (SMEs) or large concerns?*

**Wittenstein:** Of course concerns play an important role, especially with regard to international competitiveness. These also include suppliers, service providers and public research cooperations. But SMEs are equally as important, because of their large potential. In many cases, small and medium-sized enterprises are even more innovative. You should not be taken in by the pertinent statistics. Much of what large enterprises explicitly account for as expenditure on research, development and innovation also takes place in SMEs, but is not explicitly documented as such.

*Can you provide more details?*

**Weissenberger-Eibl:** SMEs, which account for almost 60 percent of the employees in the private sector and produce more than one third of the economic output are obviously just as relevant. These firms, in particular, harbor potentials. Up to now we have talked a lot about research and development. But I want to stress that innovation is more than just research and development. Even if innovative capacity is frequently equated with R&D intensity in political debates and often also in empirical innovation research – a holistic understanding of innovation goes well beyond this.

*What do you think, Herr Wittenstein?*

**Wittenstein:** I have a similar view to Frau Weissenberger-Eibl. Without wanting to question that R&D is an important source of innovation, we have to see that, in fact, a large share of innovations is not based on R&D, but on other search strategies. I mean, for example, improving existing technologies or combining them in new ways, in other words, non-technical forms of innovation as well.

*Does that mean we need to re-think the commonly held belief that, as an industrial nation, Germany's future growth, employment and competition potentials are exclusively found in research-intensive industry sectors?*

**Weissenberger-Eibl:** Absolutely. That is a really important point. Non-research-intensive companies are extremely relevant for industrial value added and employment in Germany. These are the results of recent studies by Fraunhofer ISI. In economic terms, if demand increases, the strong domestic orientation of these industrial sectors offers the chance to create a higher domestic value added and more jobs than research-intensive sectors. At present, these companies generate a value-added share of around 41 percent and employ about half of all the workers in German industries.

**Wittenstein:** Of course non-research-intensive sectors make a major contribution to safeguarding economic growth and creating jobs as well as to stabilizing the social security systems in Germany and are therefore part of Germany's success as an industrial base.

*Which companies do you mean here?*

**Weissenberger-Eibl:** I am thinking, for example, about the suppliers to the biggest export sectors of German industry. These companies also make a major contribution to international competitiveness. The very tight vertical integration with domestic upstream sectors is also the main reason why non-

research-intensive industries induce significantly higher domestic productivity and employment effects than R&D-intensive industries.

*Herr Wittenstein, what conclusions should policymakers draw from this?*

**Wittenstein:** It would be a mistake to simply reverse things and repeat the same mistakes made in the past but the other way round. Both domains have to be sponsored: R&D as well as non-research-intensive sectors. And there is a great need to catch up here.

*What could such options actually look like?*

**Weissenberger-Eibl:** One way of supporting non-research-intensive companies could be to make their identified strengths the starting point of innovation policy measures. This requires a broader view of innovations. It should be the aim of policymakers, associations and companies to safeguard and expand the strengths of non-research-intensive companies.

**Wittenstein:** The task is not solely to stimulate corporate R&D activities and scientific innovations, but also to set more holistic incentives for innovation. These would also take into account the diffusion and adoption of innovations and the associated necessary integration and interaction of non-research-intensive and R&D-intensive companies and sectors.

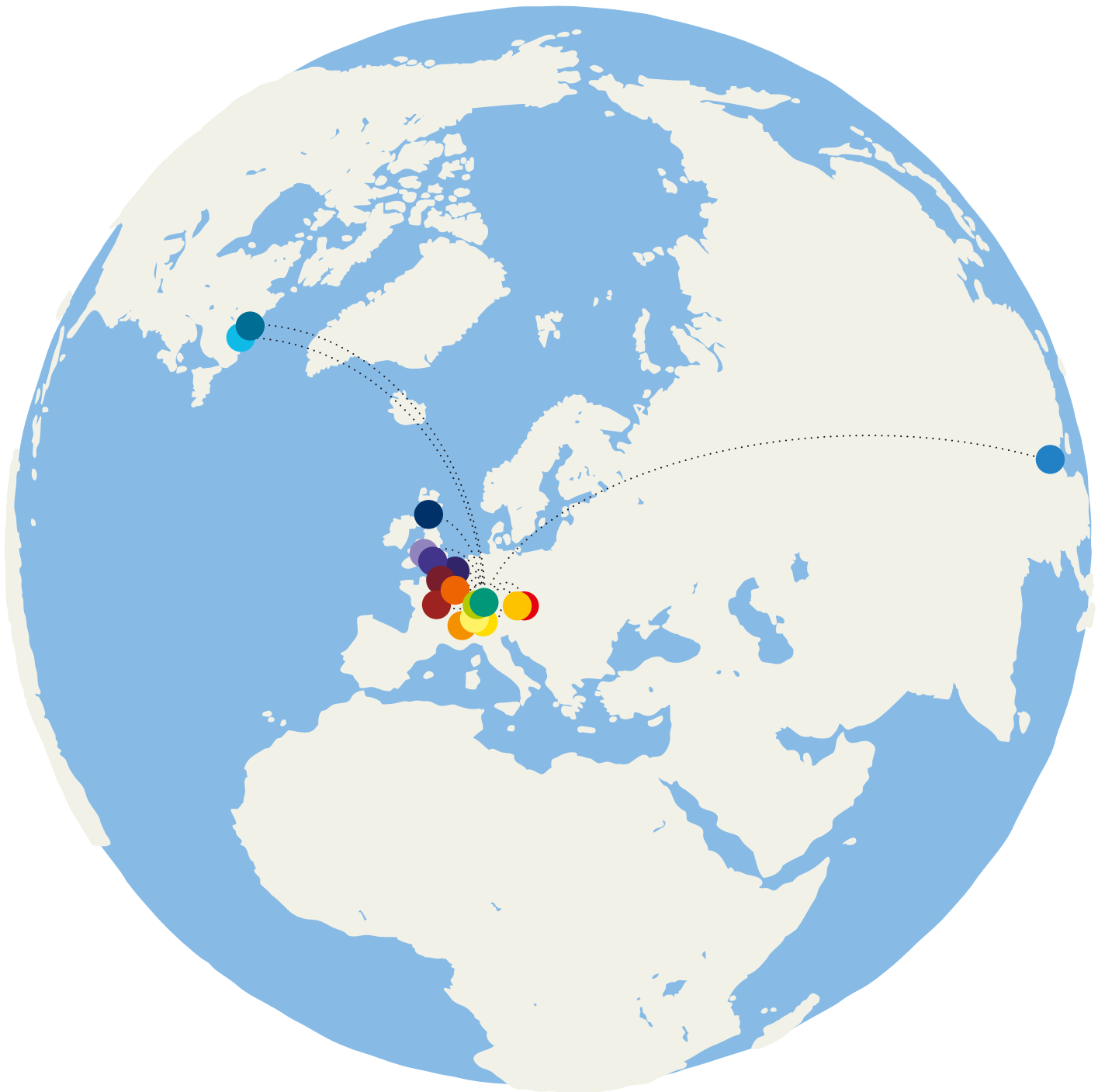
*Thank you for your time!*

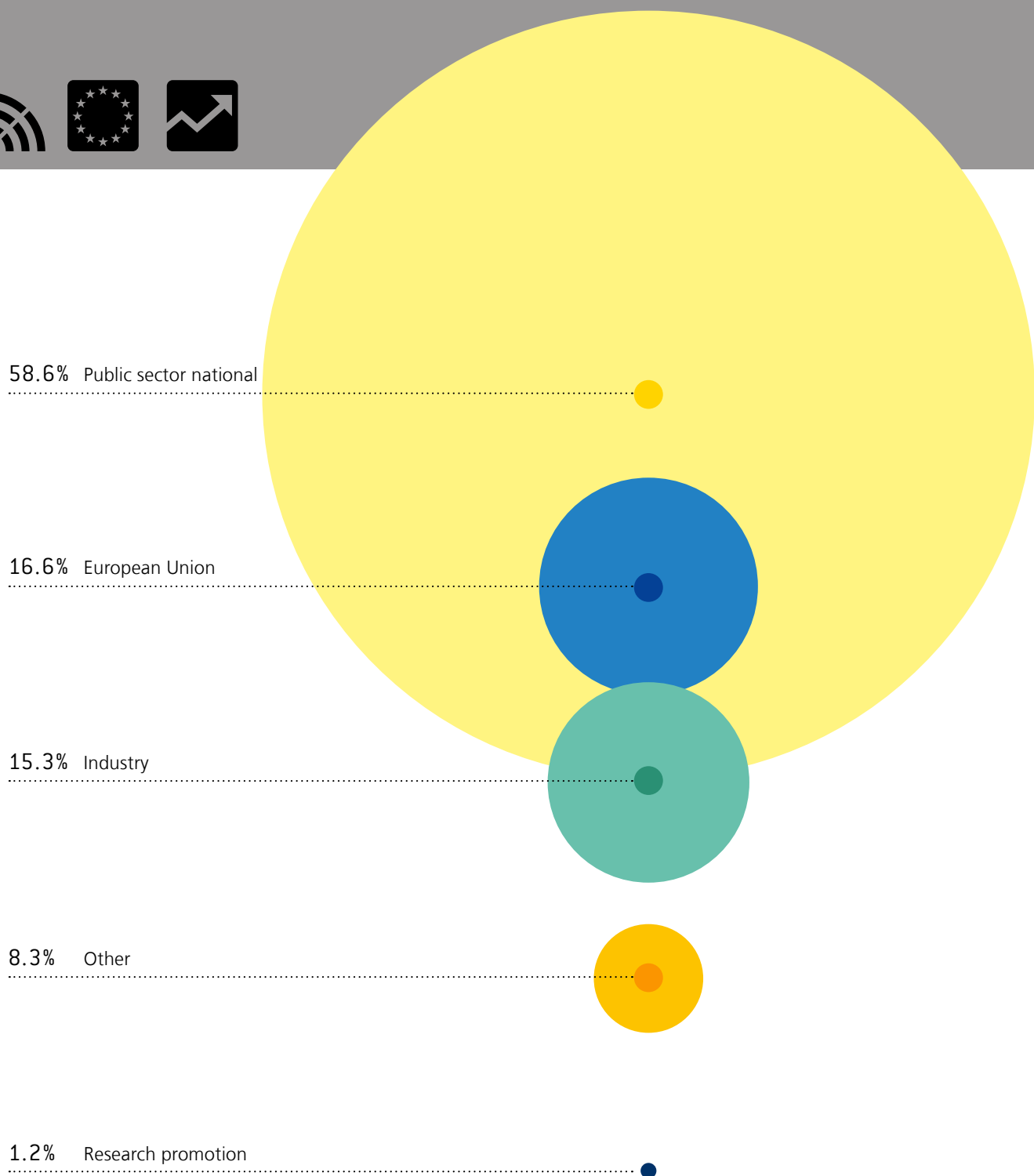
*The interview was conducted by Anne-Catherine Jung.*

## LOCATIONS OF OUR CLIENTS



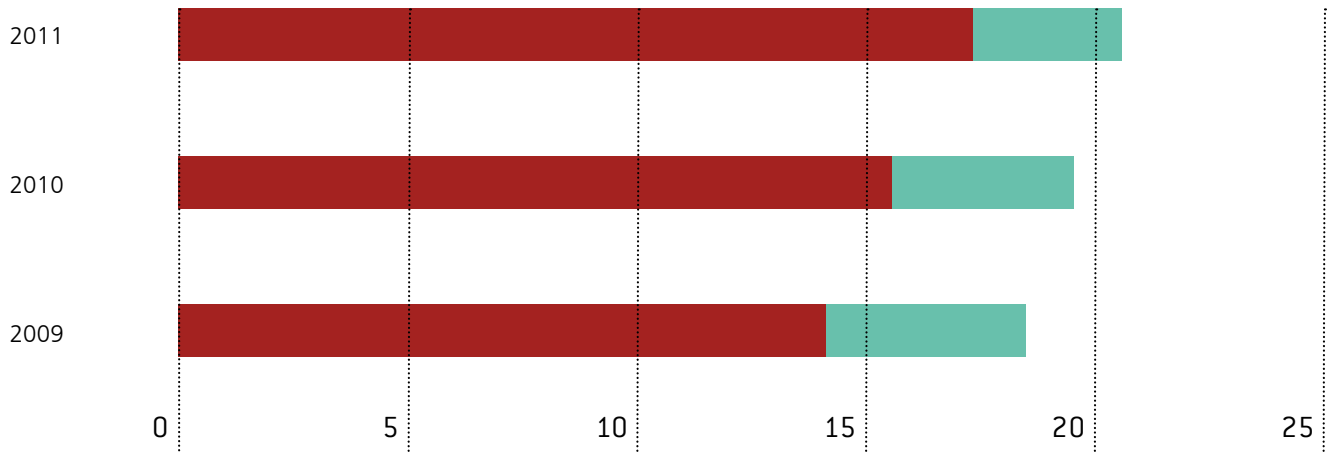
● Basle ● Bratislava ● Brighton ● Brussels ● Geneva ● Harwell ● Luxembourg ● New York  
● Paris ● Beijing ● Stirling ● Strasbourg ● Utrecht ● Washington, D. C. ● Vienna ● Zurich







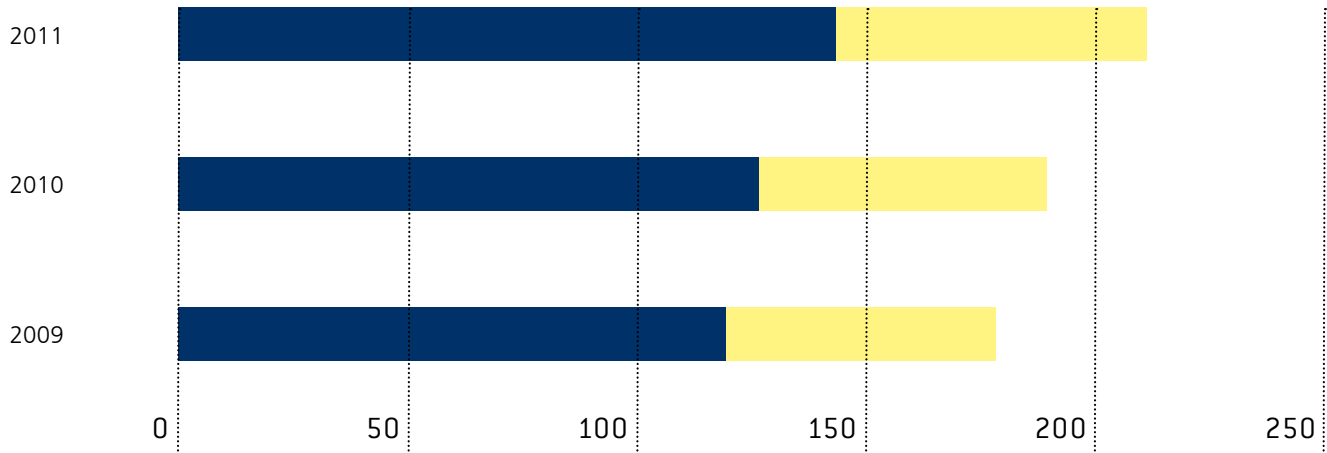
● Basic funding ● Earnings



#### DEVELOPMENT OF TURNOVER 2009–2011 (IN MILLION EUROS)

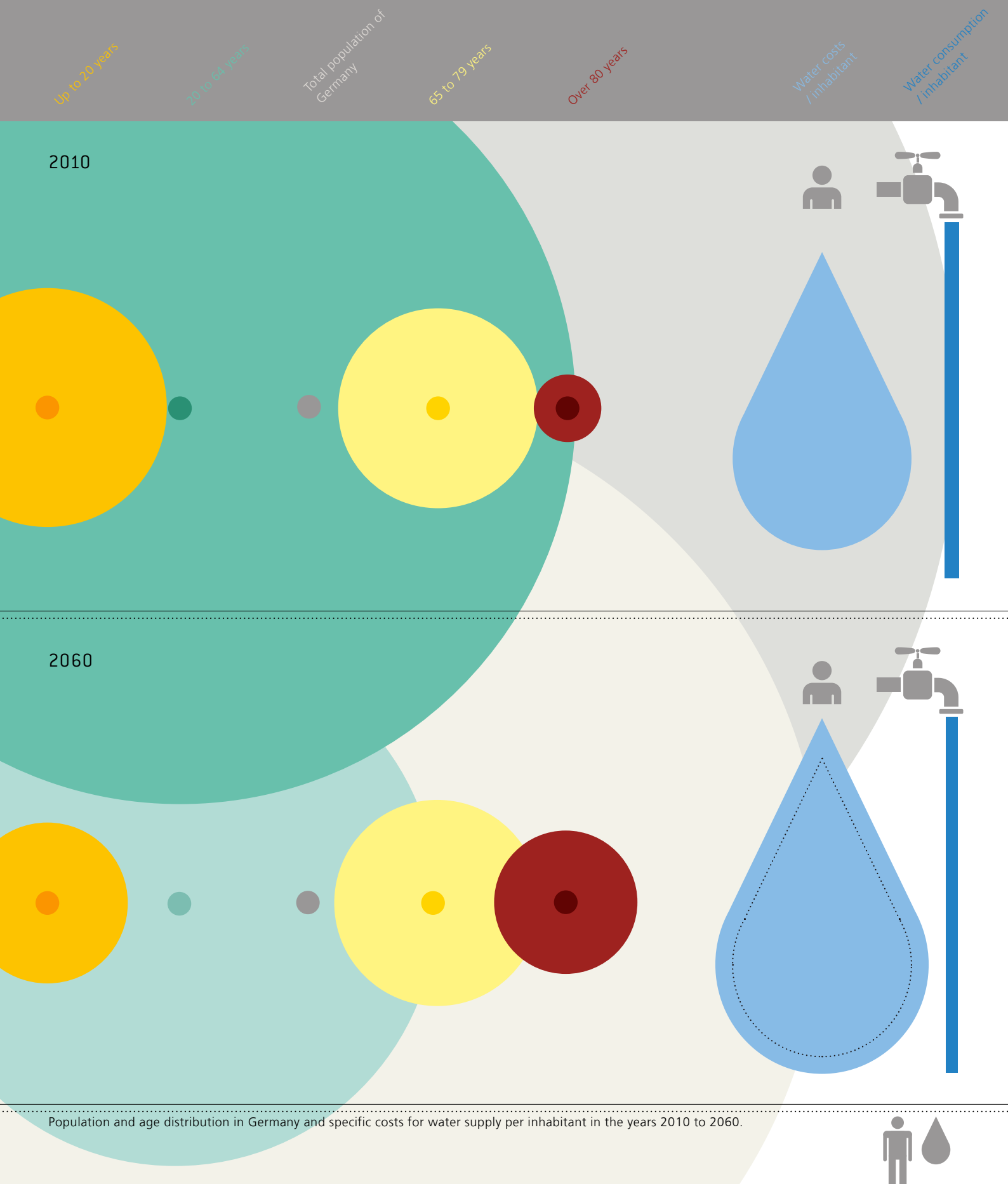


● Scientists ● Non-scientists



#### NUMBER OF STAFF 2009–2011

IMPACTS OF DEMOGRAPHIC CHANGE





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# DEMOGRAPHIC DEVELOPMENT CALLS FOR CREATIVE APPROACHES

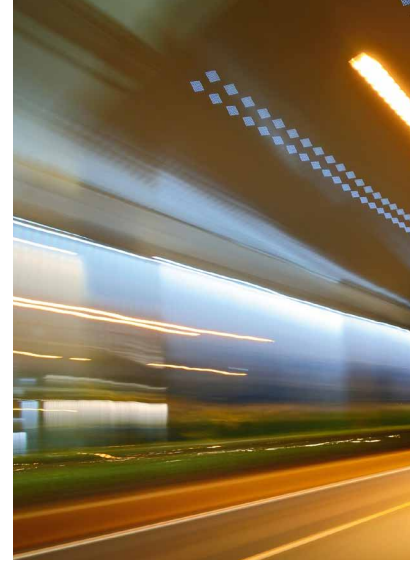
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**Innovations are formed in interactive and interdependent processes involving actors from different subsystems of the innovation system. Both the processes and the actors involved are shaped by higher-level developments. One such influence – currently the subject of intensive discussions – is the global megatrend of demography. The impacts demographic development has on the German innovation system, some of which are already visible and others which can be predicted, raise numerous seminal questions about the future.**

*Demographic change represents a challenge for the actors of the innovation system in every area of life.*

According to the German Federal Statistical Office, the population of Germany will drop significantly from the almost 82 million living in the country today to 70 or even 65 million by 2060, depending on immigration figures and the expected fertility rate. The population's age structure will also change substantially as a result of the continued rise in life expectancy. These predictions result in a huge variety of tasks for actors in the innovation system. Highlights from different research projects of the Fraunhofer ISI underline the heterogeneity of the challenges involved here: The subsystem of mobility, for instance, will be increasingly defined by scenarios of barrier-free public transport systems which are geared to the needs of the elderly and others improving the safety of older car drivers with the help of adaptive assistant systems such as active emergency braking and lane departure warning systems. In the health sector, the changing age structure of the population together with the demand for more efficient care is raising interest in the solutions offered by information and communication technologies (ICT). There are already numerous approaches such as the telemonitoring of health data or specialized systems for the elderly (Ambient Assisted Living). At the moment, however, it is not clear which of these solutions will become part and parcel of our daily lives.

Looking at water infrastructure systems, for example, shows that modifications are necessary in both the supply and disposal systems in order to adapt these to the demands of a shrinking population. The demographic development also means that the demand for water is altering, as are the volumes and composition of the wastewater produced. In addition, infrastructure networks will have to be adapted to the changing urban development structures and the residents they serve, structurally and in terms of capacity, in order for them to be able to continue to function reliably in the future and, at the same time, still be affordable.



### **Concrete impacts on the innovativeness of companies**

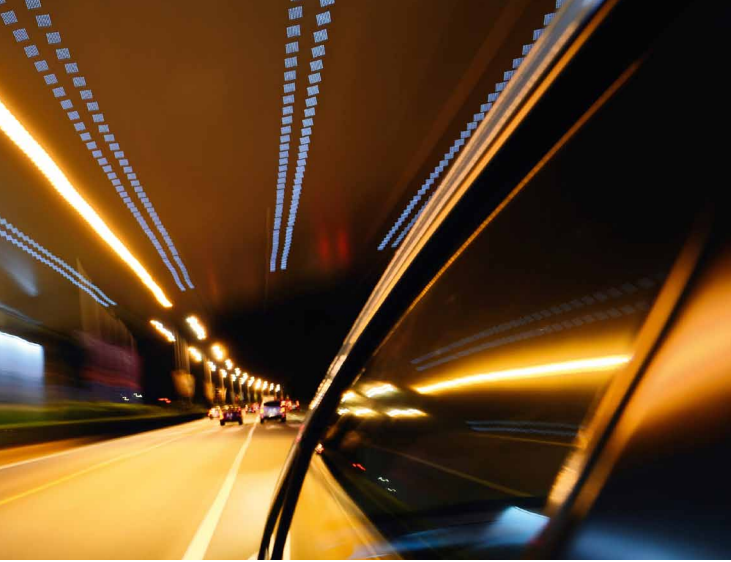
The complexity of the different subsystems of the innovation system on the one hand and of the demographic development on the other place high demands on the required problem-solving ability. Companies are also being challenged by the consequences of population trends at different levels. This applies, for instance, to changes in demand: Which technologies, products and services will be more in demand for an ageing population and which not? Population development is already playing a role today and will continue to be of relevance in the future regarding the availability and age structure of the working population. In Germany and many other West European countries, it is expected that the resulting shortage of highly qualified, well-educated workers will intensify. Since workers have a decisive influence on the success of innovations, this is a major challenge for particularly innovative companies. However, this change does not automatically imply negative consequences for corporate innovativeness if companies counteract the trend, for instance, by mobilizing and integrating new workers with demographic-oriented personnel measures.

*Demographic development influences companies – not only regarding the changing demand for products, but also in their working processes due to the lack of qualified skilled workers.*

### **Demographic-oriented personnel management as a proactive strategy**

The analyses of Fraunhofer ISI show that the implementation of demographically oriented personnel management measures in companies is a heterogeneous field. Incentives to encourage junior staff to remain with a company and training and education measures specifically for them are offered more frequently than personnel measures targeting older employees. Concrete examples for the latter include specific training courses, special health and work schedule programs for older employees and knowledge transfer using instruments like mixed-age teams. The use of such demographically oriented personnel measures is co-determined by the company's market and competitive environment. Research intensity, for instance, has a positive influence on the use of personnel measures specifically for older employees, for example, being able to pass on their knowledge to young engineers and also to better integrate the up-to-date technology know-how of young university graduates into the existing knowledge base of the company.

Using demographic-oriented personnel measures can be a distinguishing feature of non-research-intensive companies as well. In fact, it is often these companies in particular, which not only manage to take suitable steps, but also link these to the successful development and marketing of new products – in other words, which manage to generate innovations. Because non-research companies do not have a research and development department, the knowledge required for innovations is often broader in scope and distributed throughout the company, spanning departmental borders. In addition, closer links to customers and extensive knowledge about clients' needs frequently play a key role in the innovativeness of non-research-intensive companies. For this mode of innovation, supporting older workers is at least as important as promoting junior staff because the seniors have many years of experience in dealing with customers and designing customized solutions.



Given the backdrop of demographic change, gender-differentiated personnel policy is also becoming increasingly important. It is the objective of many companies to have more women in top management positions. In this context, the Fraunhofer ISI is currently involved in an analysis of the careers of male and female top managers in order to identify possible reasons for career breaks. Discussions are being initiated at several partner companies in order to attract especially women with high potentials to further their careers, existing instruments promoting the career opportunities of women are being further developed, new measures are being designed and, in particular, adapting the framework conditions is being considered. The focus here is on corporate culture as the primary context for women participating in management.

*Personnel policy has to change in the wake of demographic changes in order to make full use of the creative potential and innovativeness of all employees. Particular attention should be paid to promoting the careers of women.*

In this context, the important finding is that the ability to find innovative solutions is not a question of either age or sex. A supportive and integrative corporate working environment, favorable team and organizational units, the creation of heterogeneous workforce structures and a personnel management which takes demographic development into account, are decisive approaches to harnessing the creative potential and innovativeness of every employee.

### **Systemic approach as a reaction to demographic development**

Both the ageing and the decline of the population cannot be directly influenced, at least in the short term. Despite this, the consequences of these trends do not have to be interpreted as burdens. Whether technical solutions in the subsystems of mobility and health are concerned, or the adaptation of infrastructures or the use of demographically oriented personnel management – there is no “one-size-fits-all” solution to cope with demographic change. What has to be done instead is to take the many pieces of the jigsaw from the individual parts of the innovation system and put them together to form a suitable picture.

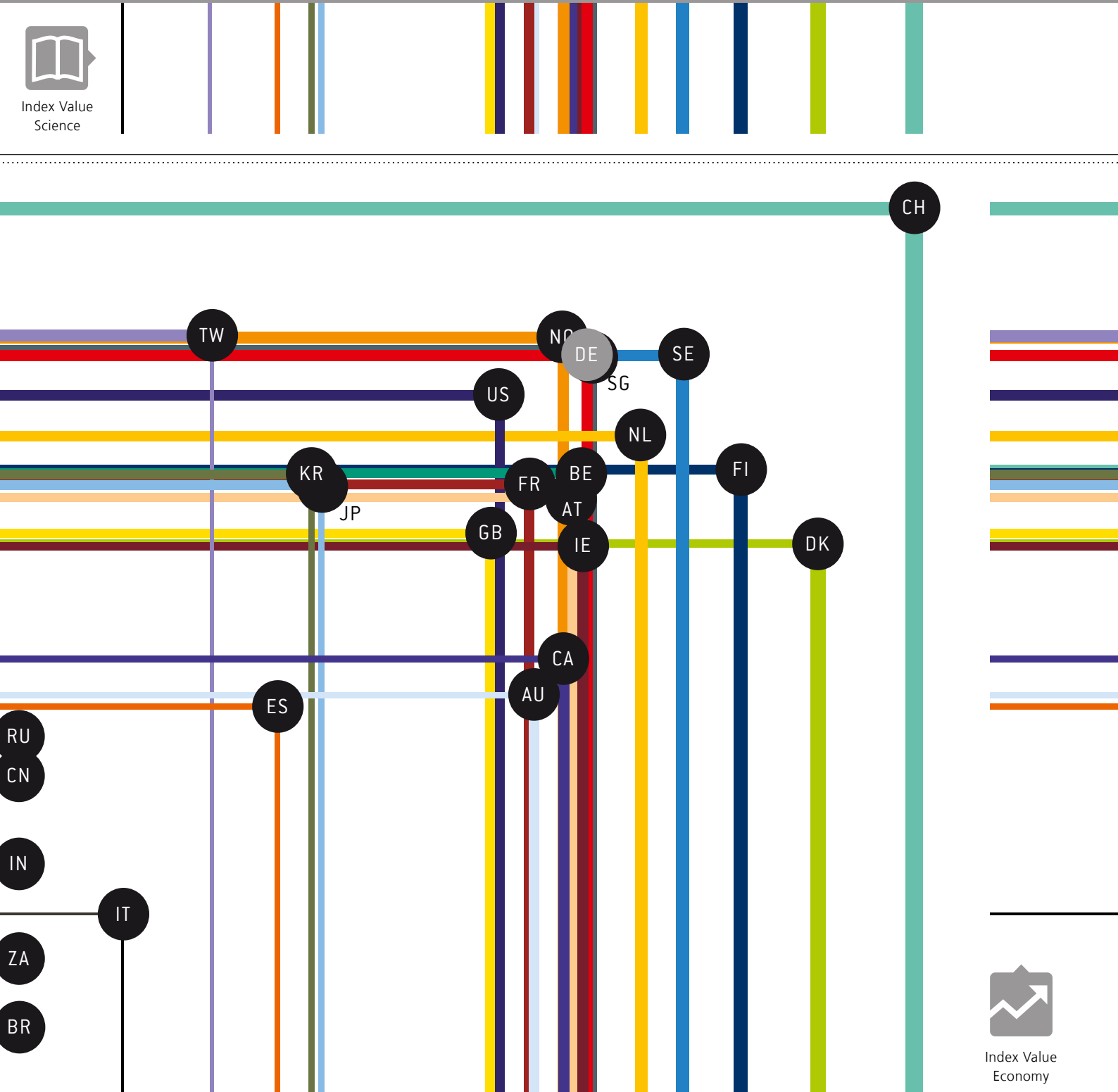
COLLABORATION BETWEEN SCIENCE AND ECONOMY FOR INNOVATIONS



AT: Austria, AU: Australia, BE: Belgium, BR: Brazil, CA: Canada, CH: Switzerland, CN: China, DE: Germany, DK: Denmark, ES: Spain, FI: Finland, FR: France, GB: United Kingdom, IE: Ireland, IN: India, IT: Italy, JP: Japan, KR: South Korea, NL: Netherlands, NO: Norway, RU: Russia, SE: Sweden, SG: Singapore, TW: Taiwan, US: USA, ZA: South Africa.



Index Value  
Science



Index Value  
Economy

Source: "Innovations Indicator 2011", Deutsche Telekom Stiftung and Federation of German Industry (BDI).

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# BEING INNOVATIVE TOGETHER – HOW INDUSTRY AND SCIENCE CAN BENEFIT FROM EACH OTHER

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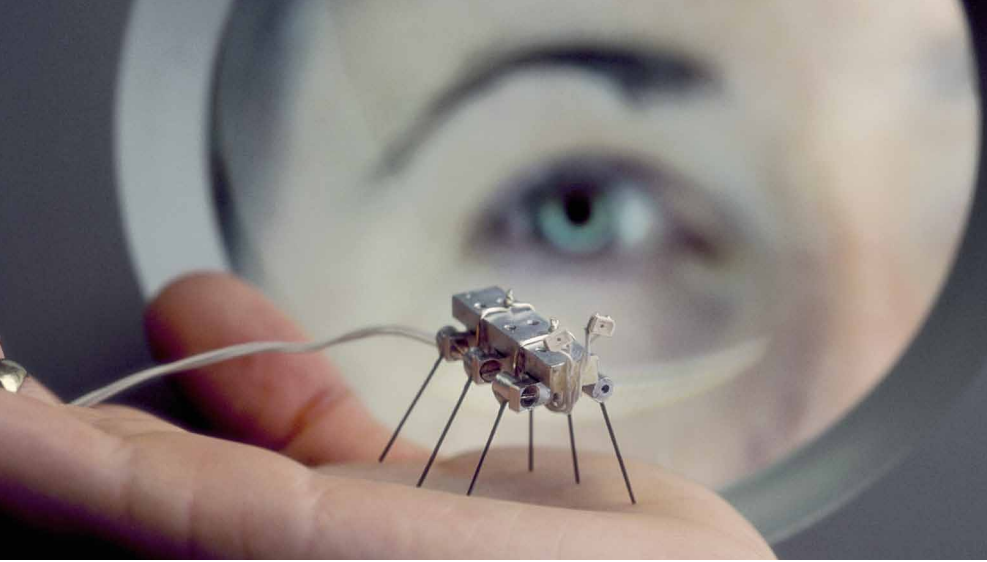
**Innovations are the basis for the competitiveness of the German economy and for maintaining our quality of life. Against the background of globalization, the increasing complexity of technical and social innovations, and material and immaterial restrictions as the framework conditions of innovation processes, preserving and expanding innovation capability is a crucial task for companies. Cooperations between academia and industry contribute decisively to this.**

The “Innovation Indicator 2011” has made clear that support for cooperations between science and industry in Germany functions relatively well, in an international comparison. This does not apply, however, to the economy in its entirety. In particular, innovators without their own research and development (R&D) facilities, who make up a considerable proportion of German companies, have been very cautious in their willingness to cooperate up to now. Analyses by Fraunhofer ISI have clearly demonstrated that innovation cooperations between enterprises and research institutions lead to greater innovation success. The report of the Expert Commission for Research and Innovation 2011 therefore recommends that universities and non-university research institutions should set the hurdles for making contact as low as possible. Other measures cited include, for instance, opening up existing programs to firms without their own R&D facilities and integrating them in project-related cooperations, as well as a more intensive collaboration with universities and application-oriented research institutes for the purposes of technology observation.

*The “Innovation Indicator 2011” points to a significant need for improvements in cooperations between firms and research institutions.*

## **Together on site: Regional cooperation**

Lack of information about current technology developments and relevant actors in one’s own region can lead to a sub-optimal utilization of innovation resources. The Innovation Alliance of the Technology Region Karlsruhe, which was launched in 2011 with Fraunhofer ISI participating, has set itself the goal of providing companies with appropriate partners with scientific know-how in the research institutions of the region. The joint initiative of the Chamber of Industry and Commerce Karlsruhe, the Karlsruhe Fraunhofer Institutes, the Karlsruhe Institute of Technology KIT, the Karlsruhe University of Applied Sciences and the Forschungszentrum Informatik FZI is aimed at companies with an idea for a new product or production process that are seeking a short-term solution to a technical problem, or require assistance in strategic questions. Experts in the relevant research institutions address the concerns of the firms in an un-bureaucratic and targeted manner and within a short time provide them with an appropriate scientific contact.



Increasing significance is also given to cross-border cooperations. One example is the initiative “nanoValley.eu”, which, in the triangle formed by the borders of Germany, France and Switzerland, promotes technology transfer between science and industry in the areas of nano-materials, materials and surfaces. The initiative particularly addresses small and medium-sized enterprises for which instruments must be developed to push ahead innovation activity efficiently i.e. cost-effectively and promptly, on the basis of technology-based research and development. Instead of in unspecific networks, relevant actors meet in so-called transfer forums to address concrete issues. These forums serve to solve corporate challenges and can be dissolved after the target is reached.

#### **Innovative models of collaboration: Heterogeneous cooperations**

Regional networking activities have belonged for some years now to the universities' range of activities. Numerous examples such as the mergers between universities and research institutions (as in the case of the Karlsruhe Institute of Technology, KIT), the founding of university-associated spin-offs or cooperations with large enterprises emphasize the increasing variety of cooperation forms. In addition, government promotional measures focus increasingly on networking between universities, companies and other research institutions.

*Different forms of cooperation promote successful collaboration between science and industry.*

The wide variety of cooperation forms between science and industry ranges from bilateral research contracts up to complex, institutionalized forms of collaboration. As research performed by Fraunhofer ISI shows, in the recent past a trend towards more heterogeneous cooperations can be observed. This is the case in collaboration between at least two different partners from at least two of the three sub-systems science, industry as well as politics and administration. Differences exist, for example, with regard to the research orientation, the educational mission or the financing model. Goals of heterogeneous cooperations can be scientific and technological exchange via research and development, education, qualification and application as well as the transfer of research results to industrial, economic or societal practice.

#### **Knowledge transfer and cooperation**

The range of services offered by Fraunhofer ISI also includes developing new instruments of knowledge transfer. The success of state research promotion depends in particular on the extent to which it succeeds in realizing a systematic exploitation of the obtained results above and beyond the institution which directly received funding. In the project “Transfer Mechatronics”, on the one hand, concrete transfer measures were carried out in order to widely disseminate the research results obtained in the individual joint projects of the project cluster “Reliable mechatronic systems”. On the other hand, because of the experience gained and findings, successful procedures were identified, evaluation metrics were developed for transfer mechanisms and, finally, general recommendations were formulated for transfer processes in future project clusters. The crux of the project “Efficiency factory” is to communicate the latest research results of the





BMBF funding priority “Resource efficiency in production”. The innovation platform enables firms that are seeking specific solutions to improve their resource efficiency in production to find the problem-solving approaches in the joint projects quickly and with little effort by using the so-called efficiency navigator.

The results obtained in the joint projects are additionally diffused in branch- and topic-specific transfer events, together with the project partners. Potential users can thus more rapidly find the projects that will help them with their problems.

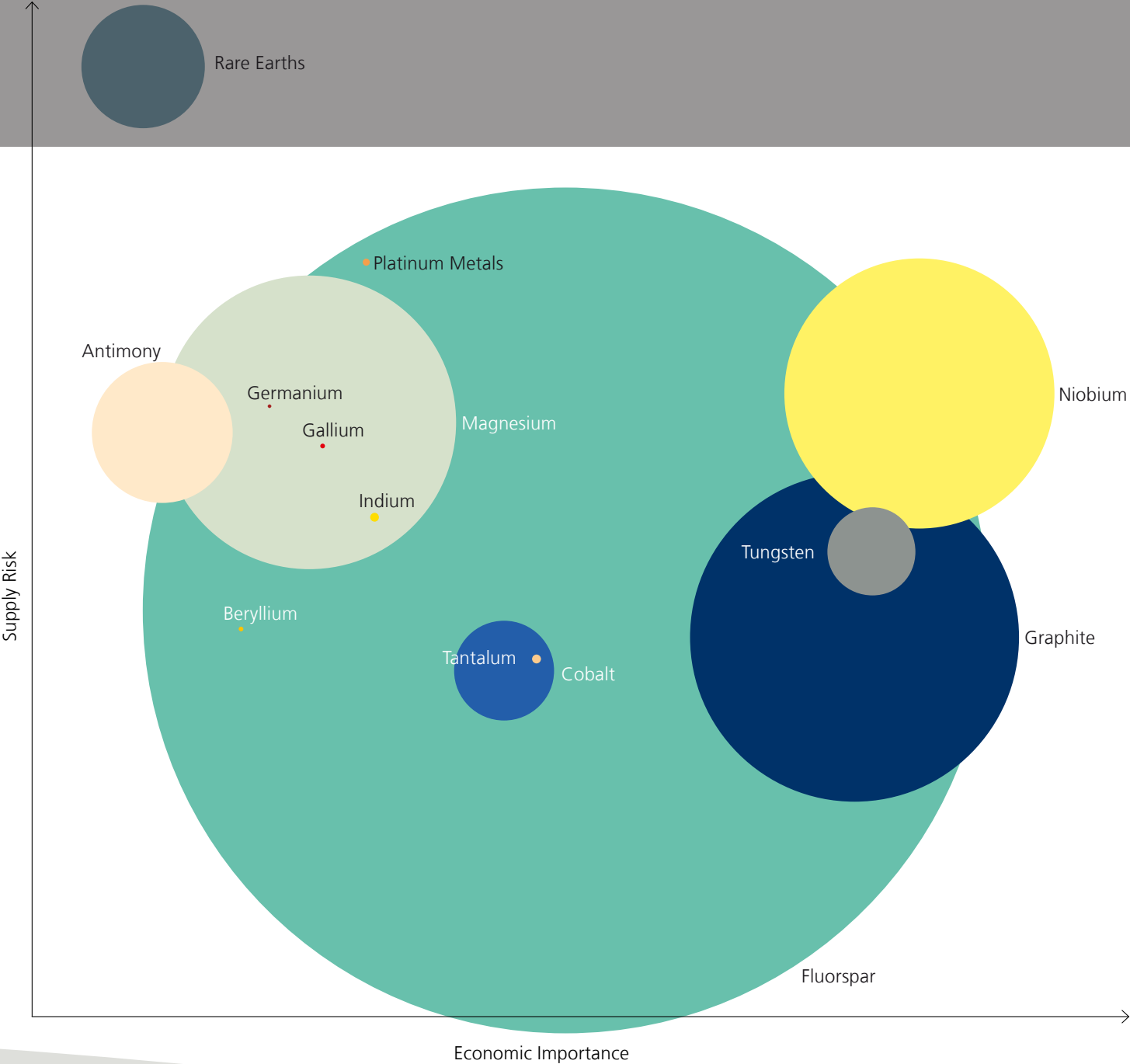
In addition to developing new transfer mechanisms, Fraunhofer ISI also assists directly with concrete issues. The need for information, not only about current developments but also future ones, often triggers collaborations. Foresight methods open up perspectives for decisions in the corporate context. In view of the increasing complexity of markets, technologies and innovation processes, the systematic observation of chances and risks is necessary for survival. In foresight processes about possible developments in companies, therefore, a structured analysis of complex “futures” is utilized to develop alternative action plans. Through a stringent process in which the company’s specific needs are coordinated with corporate culture, enterprises can systematically and holistically come to grips with developing their current and future business.

#### **Win-win: Learning from each other**

Increasingly, the efficient access to knowledge and innovation resources is crucial for firms’ capability to innovate. The transfer between science and industry itself also depends on innovative mechanisms and networking instruments. This transfer is in no way unilateral. To the same degree that companies profit from findings and developments from research, can universities and non-university research organizations learn from close cooperation with partners from industry.

*New possibilities to transfer knowledge and insights enable new problem-solving approaches and policy recommendations to reach the user faster and help with specific questions/problems.*

# CRITICAL RAW MATERIALS AND THEIR MARKET SIZE



Iron

Copper

The area of the circles indicates the annual output. Iron and copper are shown as a benchmark (section).  
 Data from "Critical materials for the EU", 2010; "World Mining Data", 2011.





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# SCARCE RESOURCES – POTENTIALS RATHER THAN DEFICITS

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**The German economy cannot function without a reliable supply of raw materials. Above all, future technologies frequently need raw materials which are in short supply. The imbalance of supply and demand and the production in politically instable countries cause turbulent raw material markets. On top of this is the concern that, at some point, the supply of raw materials will dry up. However, it is important to see not only the risks involved, but also to recognize and seize the opportunities offered in time. Instead of just consuming more and more rare earths, recycling, substitution and efficiency represent good alternatives. Innovations in these fields should not only concentrate on one level, but have to be addressed systemically.**

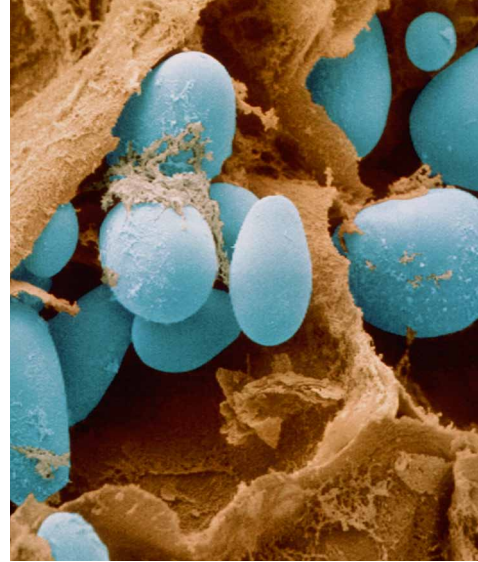
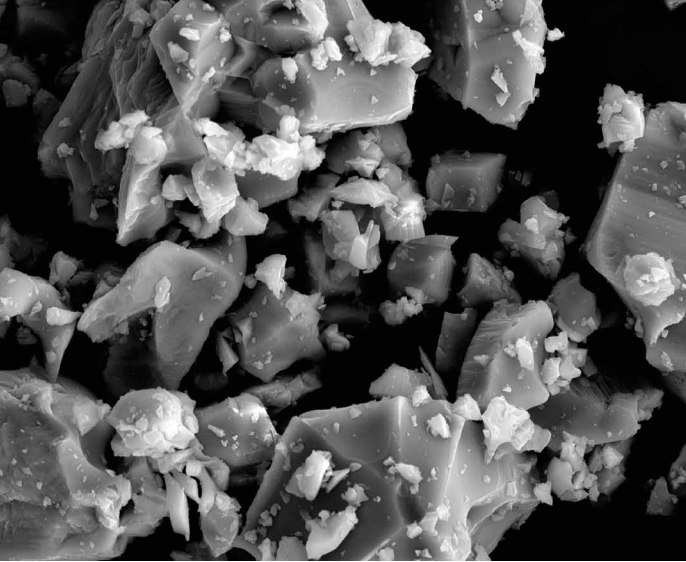
*Sustainable handling of critical raw materials, recycling and substitution are vital measures to safeguard their long-term availability.*

As an industrial nation with few domestic natural resources, Germany is dependent on a guaranteed supply of imports. The German government therefore put forward its Raw Material Strategy in October 2010. Fraunhofer ISI is currently addressing the main questions resulting from this strategy and investigating the relevance of raw materials for the high-tech sector on behalf of the Office of Technology Assessment at the German Bundestag (TAB) among other things. The objective is to estimate the risks, potentials and practical approaches to a sustainable use of critical raw materials for the German economy. These include not only safeguarding the resource supply, but also associated higher objectives like combating poverty, developing “good governance” in the supplying countries and shaping social and environmental standards.

Apart from this strategic level, the availability of new technical solutions is decisive for the question of resources. Effective recycling is needed where substitutions with more readily available raw materials are not possible. Take the example of phosphorous: Fraunhofer ISI is evaluating projects to develop and test processes for phosphorous recycling which are being funded as part of the initiative “Recycling management of plant nutrients, especially phosphorus”. The scientists are assessing the technical and economic feasibility of the processes for the BMBF under the framework conditions expected in the future. Ultimately, the objective is to develop a concept for phosphorous recovery and for marketing the corresponding technologies in Germany.

## **Efficient processes using biotechnology**

Using resources efficiently so that fewer raw materials are consumed is just as important as recycling. The topic of resource efficiency is increasingly becoming a top priority in industry and



politics. Real and suspected shortages of certain raw materials, increasing material costs and Germany's import dependency for many materials due to its lack of domestic resources are all contributing to this.

A sensible and economical use is industrial or white biotechnology: Its potential was not sufficiently exploited in the 1990s; it was only after the debate about climate protection intensified and it became increasingly obvious that fossil raw materials were running out that attention shifted to focus on the innovation potentials of industrial biotechnology in addition to its substitution potentials.

Biotechnical processes can help to use resources in industrial production processes more efficiently and to reduce negative environmental effects, because they take place under mild conditions, in aqueous process media and with high selectivity and specificity compared to classical chemical approaches. They are especially useful in the conversion of natural substances, such as renewable raw materials. In this way, biotechnical processes can make a major contribution in industrial production to successively supplementing and substituting fossil raw materials with biomass-based resources like wood and starch and to manufacturing products with new types of functional features.

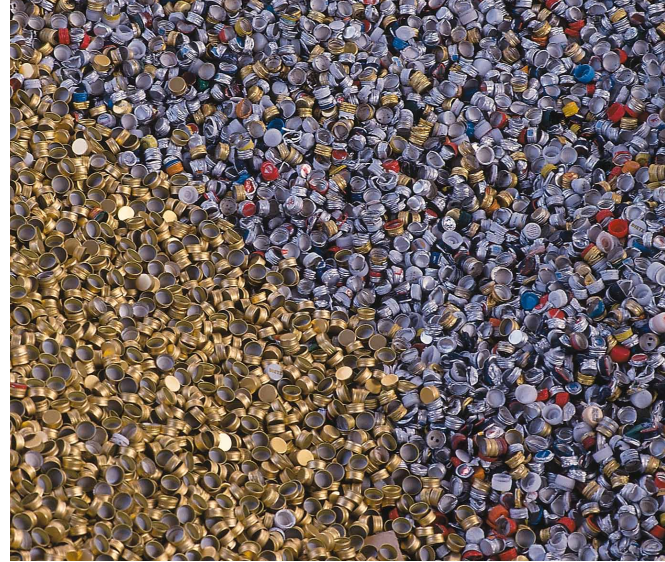
*Due to the shortage of fossil raw materials, resource-efficient measures like industrial biotechnology are needed in production.*

Fraunhofer ISI supports this technological change with innovation analyses. It identifies obstacles, evaluates funding measures and gives recommendations for support measures which can help to exploit the innovation potentials of industrial biotechnology to a greater extent.

Industrial biotechnology is used primarily in the chemical industry, but the efficient utilization of raw materials is a fundamental way of safeguarding Germany as an industrial producer in other fields as well, because a high degree of resource efficiency strengthens German industry's position in global competition, especially in economically difficult times.

### **Targeted information exchange for intensive networking**

In view of the growing shortages of primary resources and increasingly fluctuating prices on the markets for raw materials, the German government has set itself the target of doubling the resource productivity of industry between 1994 and 2020 in its national Sustainability Strategy. Technological innovations are required to meet this target. In order to accelerate such innovations, the German Ministry of Education and Research BMBF has launched the funding program "Innovative Technologies for Resource Efficiency – Resource-intensive Production Processes (r<sup>2</sup>)". This program focuses on resource-dependent industries with high material consumption including the chemical industry, and those producing metal, steel and building materials.



Besides the projects on technology development, an integration and transfer project was also launched, led by Fraunhofer ISI. It augments the innovative power of the funded cooperative projects by targeted networking of the research cooperations with each other and their environments. Research cooperations can exchange experiences and information at events and receive expert support, for example concerning the socio-economic and ecological assessment of their projects or transferring research results into practice.

#### **Saving potential in manufacturing amounts to 48 billion euros**

The manufacturing sectors have to handle their resources efficiently. A current analysis of the survey "Modernization of Production" concentrates specifically on material efficiency in this sector: As the study shows, manufacturing companies estimate their potential material savings to be seven percent on average. In these sectors, lowering material costs could amount to savings of about 48 billion euros per year, 15 billion euros in automobile manufacturing alone.

To harness this saving potential, however, it is necessary for the companies to invest in material-efficient production methods. Information and assessment systems can make a major contribution here, for example, environmental performance indicator systems and lifecycle cost analyses. It is not only important that companies use these kinds of instruments, but also that they use different sources of information to find out about material saving options and that they are involved in cooperations to improve the process of producing their products and services. The study shows that companies which follow these approaches are comparatively more likely to apply material efficiency concepts, such as using recycled materials to manufacture new products.

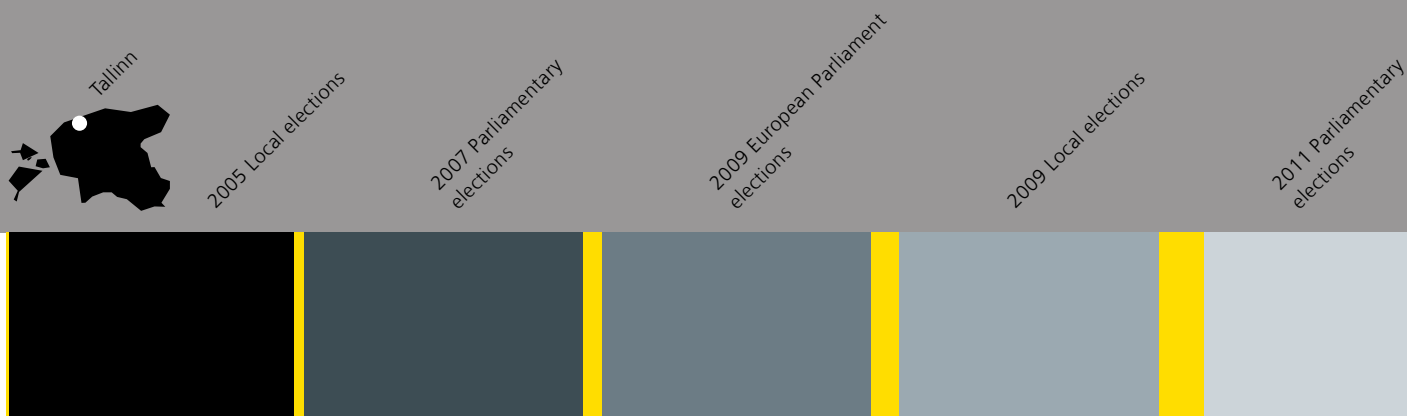
#### **Support for companies**

Before companies actually implement measures to improve efficiency, recycling or substitution, it is essential that they are first well informed about their own situation. Political raw material strategies cannot replace careful risk assessment or risk minimization strategies at company-level; instead it is necessary for each company to consider their own individual case. Fraunhofer ISI provides sound data for positioning companies in the raw materials market as well as arguments to help with strategic decisions and helps companies to handle critical raw materials in a future-oriented way – so that the industrial strength of resource-poor Germany remains secure.

*In the manufacturing sector, seven percent of material costs could be saved on average. Individual strategies are needed to identify the risks in companies and to use critical raw materials sustainably.*



# E-VOTING IN ESTONIA



## E-VOTERS AMONG ELIGIBLE VOTERS



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# A LOOK INTO THE FUTURE – INNOVATIONS TODAY AND TOMORROW

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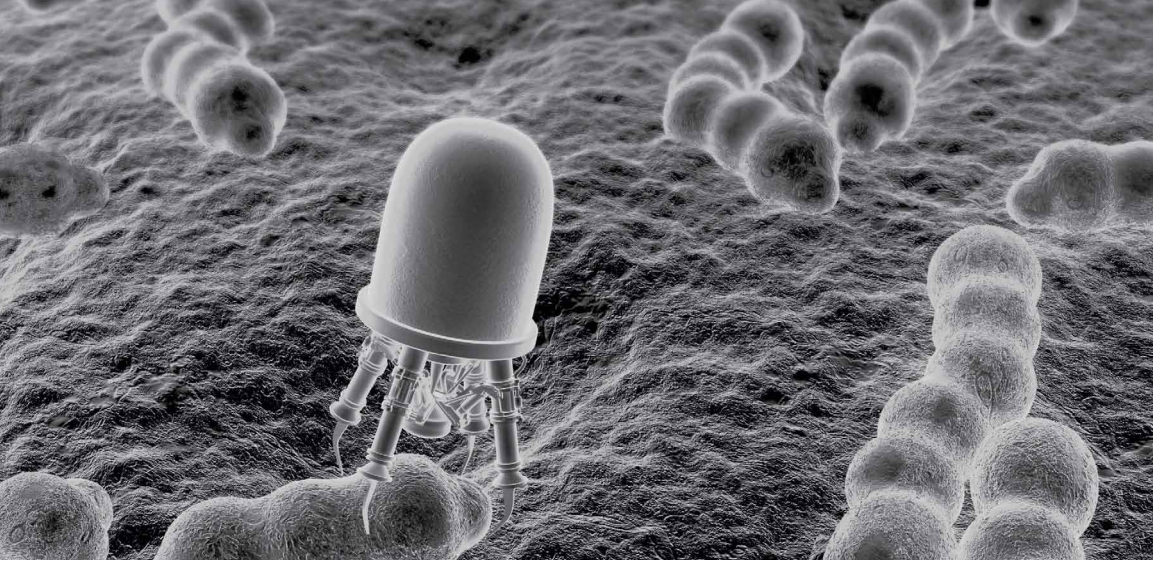
**Our world is changing rapidly. Innovations must react to these changes, but also actively influence the developments. A consistent view to the future is required in this context. The name Fraunhofer ISI stands for this view into the future and poses the following questions, among others: How will we innovate tomorrow? What will tomorrow's questions be and what will innovations look like? Answers to these questions are provided by studies on the innovation potentials of new systems promoting science or of economic sectors previously ignored in terms of innovation capability. Fraunhofer ISI's critical view is also directed at the impacts of innovation, for instance, in investigating new dimensions of privacy, the possibilities of political participation via e-voting or citizens' perception of security.**

*The pros and cons of e-voting: Advocates see the chance for greater turnout at elections, opponents the danger of invalid elections due to cyber attacks and hackers.*

Fraunhofer ISI addresses the potentials but also the dangers of e-voting in terms of data protection, cyber attacks and fraud, on behalf of the European Parliament in the project "E-Democracy: Technical possibilities of the use of electronic voting and other Internet tools in European elections". The project results reflect the wide range of pros and cons with regard to e-voting. Supporters see e-voting as a logical step in the age of Web 2.0. In their opinion, e-voting could be an alternative to the postal vote because of its spatial and temporal flexibility. Opponents of e-voting, however, do not accept this argument: Cyber attacks on on-line elections have far-reaching consequences – in cases of doubt, entire elections are invalid. In addition, no technical solution exists at present which excludes intentional fraud and unintentional mistakes. As long as there are no digital signatures available, e-voting is much more complicated than a paper vote, as multiple identification processes are required.

## **Safety in the public sphere**

Assessing or guaranteeing technical security does not only play a role in the Internet, innovative security technologies must also be assessed in public places. New methodological procedures are required for this, which already provide a reliable picture of the future acceptance for technical solutions at an early development stage of the innovation. Fraunhofer ISI plans and tests such processes, taking modern security technologies applied in aviation security as an example. Using this method, it is also intended to detect different security needs and interests as early as possible, in order to arrive at a security solution acceptable to all involved. It is planned to transfer these procedures to other areas of application.



### **Safety and the perception thereof**

Criminal cases, terrorist attacks, natural and technical disasters are events that shake the general feeling of security to its very foundations. But what about the actual perception of safety in Germany, and what determines how safe citizens in Germany feel? Researchers from different disciplines investigate these issues on behalf of the Federal Ministry of Education and Research (BMBF) in the joint project "Barometer of Safety in Germany", in which Fraunhofer ISI is taking part.

Various methods are utilized to examine perceptions, expectations and feelings of personal and general safety and compared in a "security barometer" with the officially recorded data on civil security. In this framework, Fraunhofer ISI specifically deals with the impact of technology use on the perception of security. Using the example of new security techniques such as intelligent video surveillance and civil, unmanned aircraft ("drones"), the scientists study when technical solutions raise the perception of safety and when they undermine it. In this context, participative processes of technology design are developed and applied which can contribute towards increasing the transparency and quality of technological innovations in the area of civil security.

### **Successfully implementing high-tech innovations together**

On behalf of the BMBF, Fraunhofer ISI focuses on a successful model when developing high-tech in Germany: namely the cooperation between non-research-intensive and research-intensive companies in innovation processes.

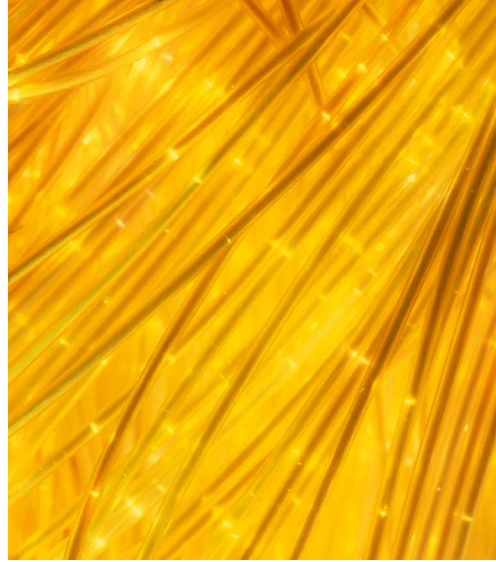
Many non-research-intensive enterprises are characterized by high process excellence. Their vast user knowledge and experience contribute significantly to the development of tailor-made components and manufacturing processes to successfully implement innovative high-tech developments from research-intensive industrial sectors. At the same time, non-research-intensive firms are themselves clients and users of high-tech products and thus support the implementation of new technologies within the economy.

In both roles non-research-intensive firms are important partners for innovation and initiators in the industrial value chain for research-intensive companies, particularly in so-called high technology sectors.

### **Open questions as a source of innovation**

Particularly in rapidly developing areas of technology such as ICT, bio- or nano-technology, answers to technology-driven and interdisciplinary research questions lead to surprising results and have a high innovation potential. However, the tightly defined topics of research programs can also restrict scientists' work. Therefore, Fraunhofer ISI conducts thematically open basic

*United we stand: A continuous exchange of experiences as well as providing significant components from non-research-intensive companies are the basis for innovative high-tech developments.*



research – so-called Blue-Sky research – on behalf of the European Commission to show what the future of science could look like if research topics and methods could be chosen freely.

The project “Boosting the exploratory power of open research in Future and Emerging Technologies” (FET Open) assesses current programs which promote open, bottom-up research and gives an overview of the different bodies and regions conducting this kind of research. Scenarios for further developing open research are constructed, and best practices are identified and analyzed which are used as guidelines for the European Commission.

Looking into the future raises a number of questions and requires new ways of looking at safety, data protection and privacy. Fraunhofer ISI deals with these questions using a systemic and interdisciplinary approach and supports decision-makers from politics, science and industry in their future orientation.

*Open questions lead to creative and surprising results. This applies in particular to science.*

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# MODELING – DEVELOPING FAR-SIGHTED FUTURE SCENARIOS

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## A VARIETY OF METHODS FOR NEW PERSPECTIVES

**Models at the Fraunhofer ISI are used, for example, to analyze the impacts of policy measures or strategic decisions in enterprises. In addition, models are used to create scenarios of possible developments of technology and society with time horizons which stretch far into the future.**

### **Which modeling methods are applied?**

Fraunhofer ISI uses modeling methods to answer complex questions from different fields of application:

- Simulation models can be used to analyze the macroeconomic impacts of emerging technologies or policy instruments. The German and European ASTRA models quantify the growth and employment effects of climate policy, especially of sets of measures in the transport sector. Simulation models are also used in the dynamic analysis of material flows, for example to identify supply bottlenecks or recycling potentials as well as to analyze power grids and their expansion requirements.
- Computable general equilibrium (CGE) models are used to estimate the macroeconomic effects of global climate protection innovations and policies.
- Agent models make it possible to describe the behavior of actors – individuals or institutions – under certain framework conditions. The Power-ACE model, for instance, simulates the German and European power markets and the integration of renewable energies.
- Multi-criteria methods can help with decision-making by taking different weightings into account when evaluating several alternatives based on different criteria with conflicting objectives.
- Life cycle analyses (LCA) are used to compare the emissions of different processes or products. Where costs are concerned, life cycle costing (LCC) is used to examine products from the initial idea right up to their final disposal.
- Optimization models are used to develop solutions, for instance concerning technology choices, taking requirements and costs into account.

*Different modeling methods are used to answer complex questions in different fields of application.*

### **What are models used for?**

Fraunhofer ISI attaches particular importance to linking quantitative methods with empirically-qualitative insights, for instance by considering the results of surveys on the acceptance of emerging technologies. Fraunhofer ISI takes a leading role here in developing application-oriented models.



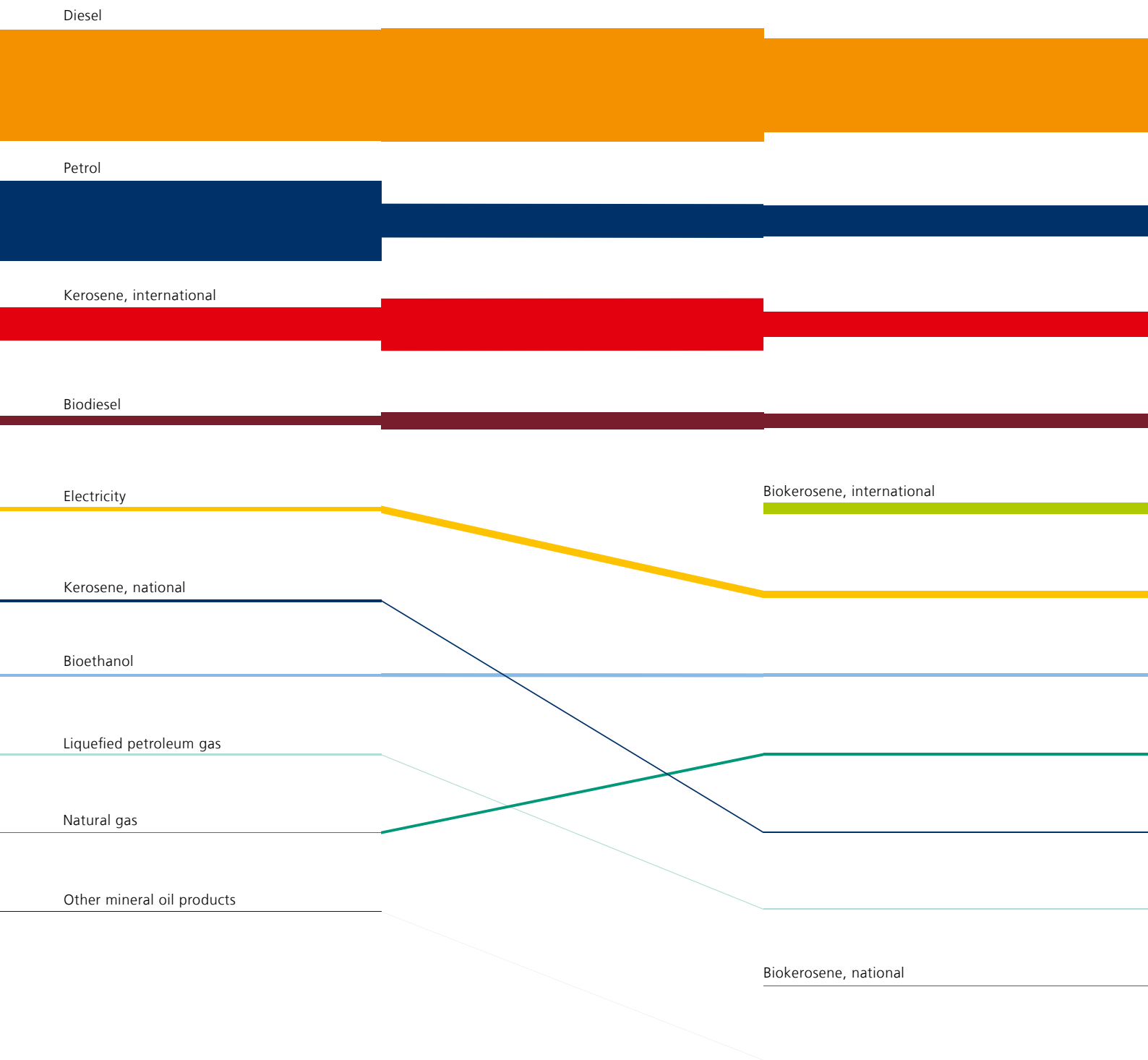
ENERGY SOURCES FOR TRANSPORT IN GERMANY 2009 AND 2030.  
DATA ACCORDING TO AG ENERGY BALANCE AND ASTRA MODEL



2009

Policy trend 2011  
2030

Climate protection policy  
2030



## STAFF

OUR STAFF OF 220 FROM SCIENCE, TECHNOLOGY AND INFRASTRUCTURE FORM A HIGHLY SKILLED, MOTIVATED TEAM, WHICH IS ABLE TO MEET THE DIVERSE REQUIREMENTS OF OUR CLIENTS USING SCIENTIFIC EXPERTISE AND A SYSTEMIC RESEARCH APPROACH.

AS ONE OF THE INTERNATIONALLY LEADING INSTITUTES FOR INNOVATION RESEARCH WE COOPERATE WITH INSTITUTIONS AND ACTORS AROUND THE GLOBE AND IN THIS WAY ENSURE DIFFERENT RESEARCH PERSPECTIVES. WE CULTIVATE AN INTENSIVE DIALOG WITH BRAZIL, INDIA AND ESPECIALLY CHINA, FOR EXAMPLE THROUGH THE EXCHANGE OF VISITING SCIENTISTS.

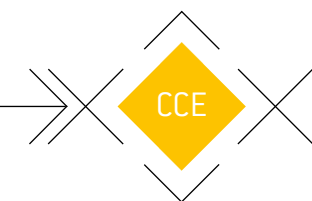






Eberhard Jochem, Wolfgang Eichhammer, Mario Ragwitz, Kristin Reichardt, Barbara Schломann, Brigitte Kallfaß, Uta Schneider, Elisabeth Dütschke, Tobias Boßmann, Nicolai Parlog, Simone Steinilber, Jenny Winkler, Lena Kappler, Rainer Elsland, Tobias Fleiter, Fabio Genoese, Ursula Mielicke, Bärbel Katz, Marian Klobasa, David Dallinger, Clemens Rohde, Vicki Duscha, Jan Steinbach, Marlene Arens, Julia Michaelis, Fabian Kley, Hans Marth, Inga Boie, Renate Schmitz, **Harald Bradke**, Martin Wietschel, Till Gnann, Gerda Schubert, Patrick Plötz, Sebastian Frehmel, Frank Sensfuß, Barbara Breitschopf, Joachim Schleich, Simon Hirzel, Irmgard Sieb, Benjamin Pfluger, Karoline Rogge // not in the photo: Michaela Gigli, Volker Ott

Competence Center Energy Policy and Energy Systems



THOUGHT LEADER FOR SOCIETY, POLITICS AND THE ECONOMY

A BROAD RANGE OF ADVANCED SCIENTIFIC THEORIES, MODELS AND METHODS

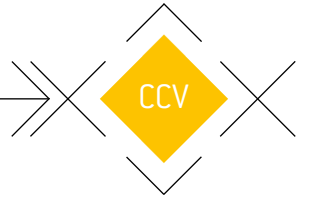


Philine Warnke, Ralph Seitz, Ralf Isermann, Bruno Gransche, Konstantin Chernykh, Daniel Jeffrey Koch, Ewa Dönitz, Stephan Grandt, Petra Sandker, Jacqueline Steiner, Ina Jacoby, **Anette Kübler**, Elna Schirrmeister, Kerstin Cuhls, Benjamin Teufel, Antje Bierwisch, Linda Spoden, Björn Moller, Simon Berner // not in the photo: Lorenz Erdmann, Rolf Gausepohl, Meike de Vries

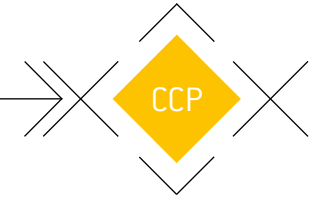


Torben Schubert, Emmanuel Muller, Gabriele Küchlin, **Knut Koschatzky**, Stephanie Daimer, Oliver Rothengatter, Peter Neuhäusler, Ulrich Schmoch, Nadine Bethke, Esther Schricke, Carolin Michels, Miriam Hufnagl, Tasso Brandt, Marianne Kulicke, Susanne Bühler, Kerstin Kripp, Andrea Zenker, Friedrich Dornbusch, Joachim Hemer, Christina Schmedes, Thomas Stehnen, Nicole Schulze, Rainer Frietsch, Meike Urresta Carrillo, Elisabeth Baier, Thomas Stahlecker, Henning Kroll, Christine Schädle, Michael Schleinkofer // not in the photo: Natalja Bubenberger

Competence Center Innovation and Technology Management and Foresight



INTERDISCIPLINARY TEAM OF SCIENTISTS



Competence Center Policy and Regions

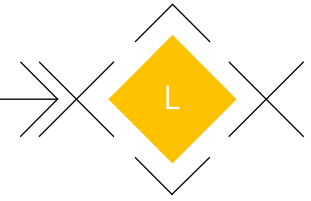


Sebastian Ziegas, Melanie Sorhage, Marianne Werder, Nicole Lasogga, **Marion A. Weissenberger-Eibl**, Harald Hiessl, Kathrin Schwabe, Dennis Stockinger, Anne-Catherine Jung, Peter Zoche not in the photo: Arlette Jappe-Heinze

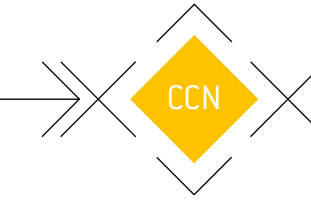


**Rainer Walz**, Arne Lüllmann, Thomas Hillenbrand, Jutta Niederste-Hollenberg, Christian Sartorius, Luis Tercero Espinoza, André Kühn, Anja Peters, Jonathan Köhler, Eve Menger-Krug, Frank Marscheider-Weidemann, Stefan Klug, Monika Silbereis, Katrin Ostertag, Wolfgang Schade, Imke Gries, Florian Senger, Simon Glöser, Michael Krail, Dominik Toussaint, Isabell Hörth, Felix Tettenborn, Matilde Alpino, Johannes Hartwig, Luisa Sievers, Claus Doll // not in the photo: Carsten Gandenberger, Jana von Horn

Team of the Director



A SYNERGY OF TECHNICAL, ECONOMIC AND SOCIAL-SCIENCE KNOWLEDGE



Competence Center Sustainability and Infrastructure Systems

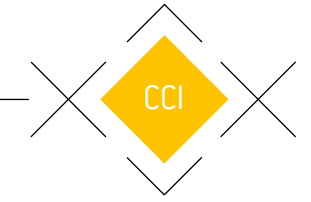
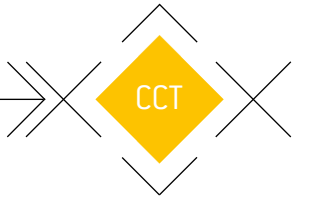


Heike Aichinger, Karin Herrmann, Tanja Bratan, Sven Wydra, Ralf Lindner, Etienne Vignola-Gagné, Nils Heyen, Andreas Sauer, Philip Schütz, **Thomas Reib**, Bärbel Hüsing, Axel Thielmann, Michael Friedewald, Renate Heger, Bernd Beckert, Davy van Doren, Piret Kukk, Cleide Victor Kolewe, Susanne Ruhm, Simone Kimpeler, Dara Hallinan, Jana Schuhmacher // not in the photo: Silke Just, Timo Leimbach, Michael Möckel



Petra Jung Erceg, Esther Bollhöfer, Christoph Zanker, Oliver Som, Gunter Lay, Kerstin Kopf, Brigitte Mastel, Albena Kyuchukova, Tanja Künast, Tim Hettesheimer, Ute Weißfloch, Christian Lerch, Daniela Buschak, Sabine Biege, Janis Diekmann, Oliver Kleine, Katharina Mattes, **Steffen Kinkel**, Spomenka Maloca, Angela Jäger, Thomas Christian Schmall, Hans-Dieter Schat, Marcus Schröter

Competence Center Emerging Technologies

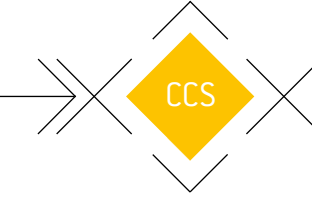


Competence Center Industrial and Service Innovations



**Sabine Hobich**, Annelie Selinger, Roland Schönthaler, Gudrun Krenický, Julia Roth, Tatjana Griffith, Petra Schmid, Martina Fuchs-Blum, Silvia Rheinemann, Gillian Bowman-Köhler, Katja Rische, Sabrina Bulk, Sabine Wurst, Jeanette Braun, Ulrike Aschoff, Ralph Helbig, Heinz Schirmer, Uwe Pretzsch, Georg Mangels, Pia-Dorothea Fisher, Anna Fedotova, Klaus Wenzel, Zoia-Ecaterina Tasch, Maria Linden, Jutta Schönthaler, Gernot Eich, Vera Wendler, Ursula Gärtner, Ute Toniogold, Neziye Getmez, Ulrike Glutsch, Sonja Mohr, Dominic Schimmel, Viola Schielenski, Sylvia Bader, Günter Heger, Silvia Firnkes // not in the photo: Maria Kotalla, Christine Mahler-Johnstone, Monika Mühlberg, Rebecca Rangnow, Michael Ritt, Renata Sas

Competence Center Service and Internal Management

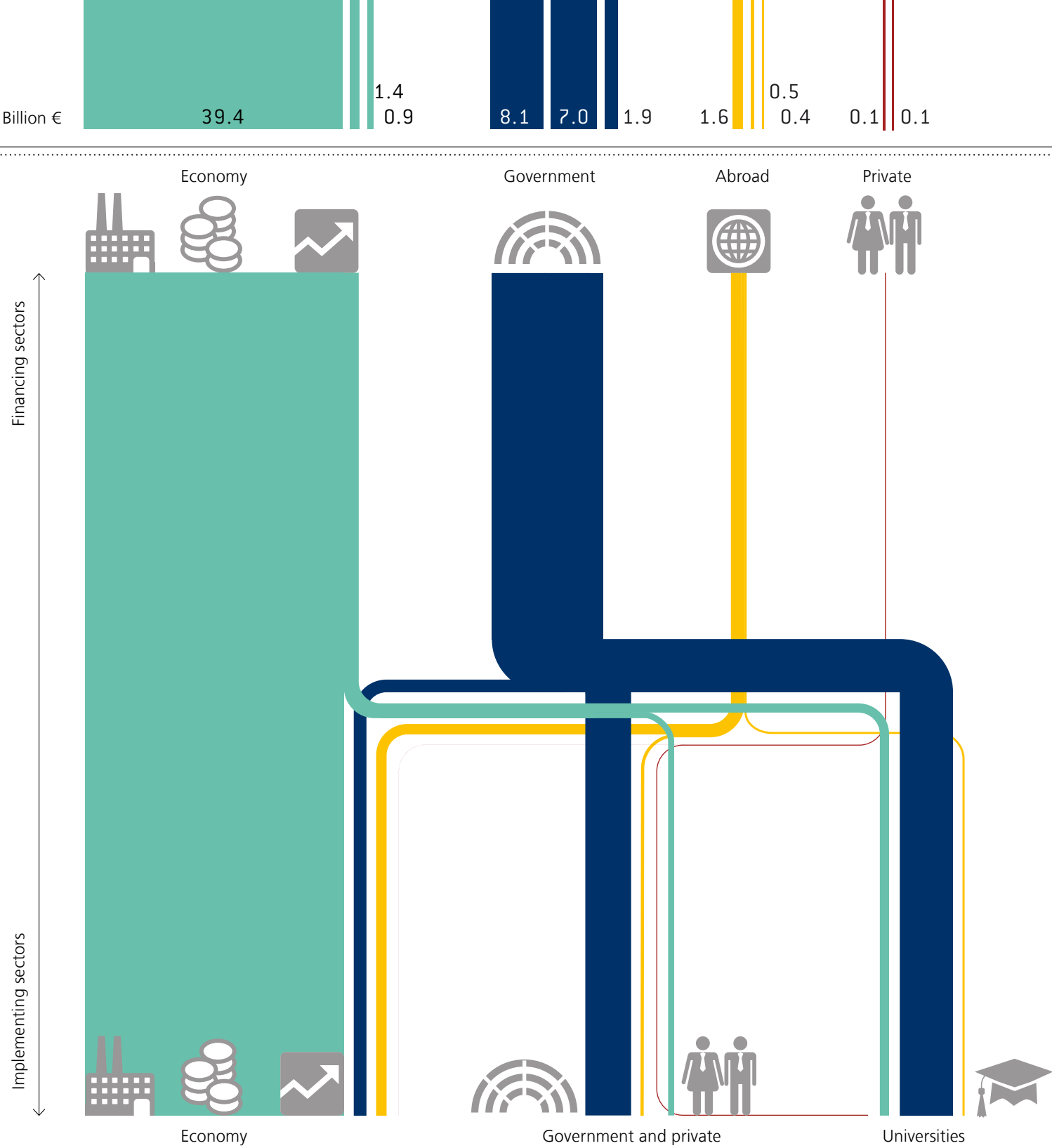






# GROSS DOMESTIC R&D EXPENDITURE AFTER FUNDING AND IMPLEMENTATION

Economy: Companies and joint research institutions, government and private: non-university institutions, data from 2007.  
 Source: "Federal Government Report on Research and Innovation", 2010.



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# THE COMPETENCE CENTERS

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We conduct research for policymakers, industry and science. We apply a broad spectrum of methods which are being continuously further developed. Due to our comprehensive and interdisciplinary approach, we are able to offer our clients a wide range of services, which are bundled in six competence Centers (CC), which are in turn split into different Business Units:

The CC Energy Policy and Energy Systems (CC E) researches solutions for a sustainable energy system. In 2012, the existing CC will be reorganized into two Competence Centers.

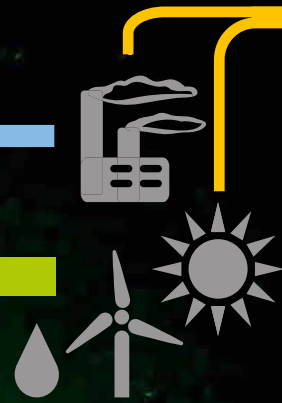
The CC Industrial and Service Innovations (CC I) conducts research on how to ensure technical and organizational innovations in Germany as a production location.

The CC Innovation and Technology Management and Foresight (CC V) develops methods to identify and analyze long-term developments in society, industry and technology.

The CC Sustainability and Infrastructure Systems (CC N) analyzes the prerequisites and possibilities to reduce emissions, and improve resource efficiency and the sustainability of infrastructure systems.

The CC Emerging Technologies (CC T) analyzes the potentials, effects and design conditions of new technologies and develops courses of action.

The CC Policy and Regions (CC P) explores the functionalities and the changes in research and innovation systems.



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## MAJOR TOPICS FOR THE RESEARCH AND DEVELOPMENT OF ENERGY TECHNOLOGIES

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### CC ENERGY POLICY AND ENERGY SYSTEMS

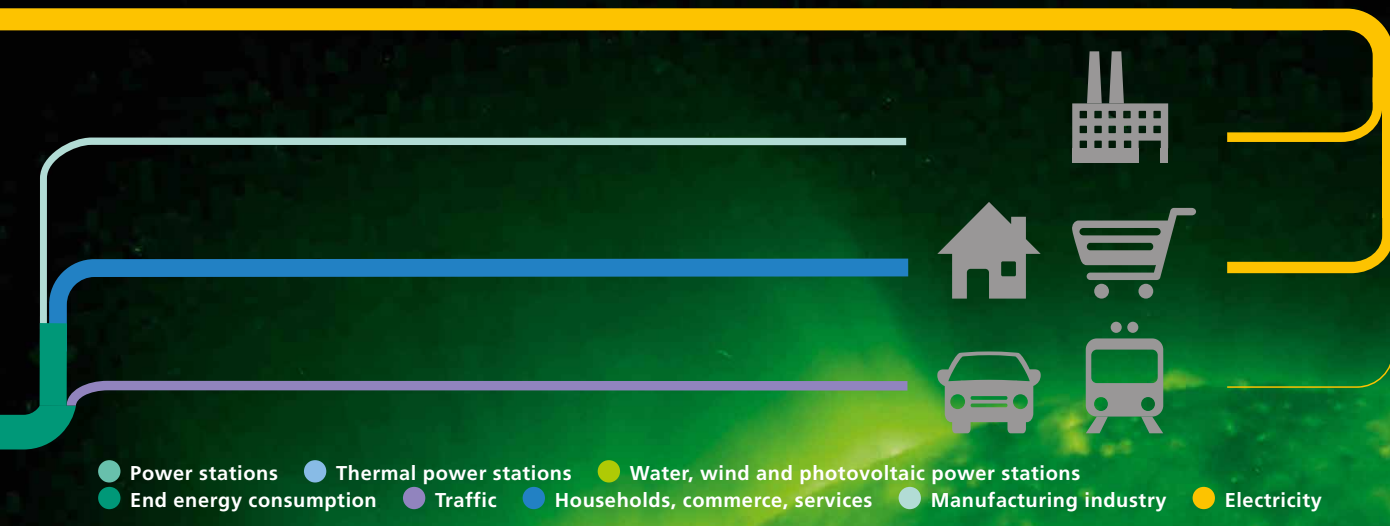
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The challenges facing the energy system are increasing: Meeting the objectives of a secure energy supply, economic efficiency and environmental compatibility has to be done under increasingly rigorous frame conditions such as the phase-out of nuclear energy, rising prices for fossil energy sources and ambitious climate targets. The Competence Center Energy Policy and Energy Systems conducts research into solutions for a sustainable energy system. The researchers examine how energy technologies will develop in the future by making demand and emission forecasts, identifying the potentials of CO<sub>2</sub> reduction measures and analyzing the markets for energy carriers, energy technologies and energy services. They also develop instruments for the dissemination of sustainable technologies as well as evaluating and investigating how these measures impact employment, income, economic structure and the environment. The Competence Center uses this work to advise policymakers and companies on research and development questions and in this way supports the implementation of measures contributing to the diffusion of energy-efficiency technologies and renewable energy sources.

The researchers in the Business Unit *Energy and Climate Policy* develop and evaluate instruments limiting the greenhouse effect. In projects for the Volkswagen Stiftung and the German federal state of Baden-Württemberg they examined the innovation effects of the EU emissions trading scheme in the power generation, paper and cement production sectors. The results show that, so far, the impacts on innovation have been rather limited because of the low CO<sub>2</sub> prices. However, it is assumed that these will increase in the future due to altered allocation mechanisms and the expected rising price for emission allowances. Long-term climate targets and international agreements like those at the Durban Climate Conference in December 2011 provide important pointers for innovation activities and new market opportunities in this field.

*Climate targets and international agreements play an important role in achieving success in the long term with innovations in power generation and on the market.*





Renewable energies are essential for climate protection, the security of supply and competitiveness. The team in the Business Unit *Renewable Energies* identifies the costs, benefits and potentials of these energy sources, develops and evaluates policy instruments to promote them effectively and efficiently and constructs scenarios of future energy systems with high shares of renewable energies. As part of the continued development of the German Renewable Energies Act, the researchers examined the proposed reforms for promoting renewable energies in the electricity sector for the German government and worked on how to design elements to improve their integration into the existing market and system. They also accompanied the implementation of the Directive on Renewable Energy on behalf of the European Commission and put forward suggestions for innovative promotion and financing instruments such as, for example, coordination options among member states when setting tariffs for renewable power generation.

## #1

*Energy flow diagram renewable energies Germany 2008*

Researchers in the Business Unit *Energy Efficiency* are concerned with techniques and measures which can help to improve energy efficiency. They assess the costs and benefits of efficiency technologies and determine indicators of efficient energy use. They derive strategies for companies and political decision-makers from their analyses. In an international setting, the Business Unit accompanies the preparation and implementation of important EU directives promoting energy efficiency; at national level, research focuses on the developments resulting from the shift in German energy policy: the aim here is to realize the most profitable energy efficiency potentials first. As many companies are only partly implementing these because of the high transaction costs involved, networks of firms supported by experts are being set up to learn from each other. Compared to the German industrial average, these networks can double the rate of energy-efficiency improvements as was empirically determined in the 30 Pilot Networks Project sponsored by the German Federal Ministry for the Environment (BMU).

*Energy-efficiency measures and the relevant technologies are important drivers for reducing CO<sub>2</sub> emissions at both national and international levels.*

The discussion about the need for storage and storage technologies in the future is highly relevant for policymakers and industry given the planned accelerated reorganization of the German energy system in the direction of more renewable energy. The assessment of storage technologies and their market potentials is an important field of research of the Business Unit *Energy Economy*. One study which analyzed the most promising technologies and the market volume of storage systems in Germany up to the year 2020 served as the basis for deciding about a possible market entry and the allocation of R&D funds. Other research topics include the construction of energy demand scenarios and the energy-economic evaluation of alternative drives and technologies, especially of electric mobility including fuel cell-powered vehicles.

Head: Professor Harald Bradke, phone +49 721 6809-153, harald.bradke@isi.fraunhofer.de



15,698

7,188

5,481

4,601

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## MEASUREMENT AND MODERNIZATION OF PRODUCTION PROCESSES

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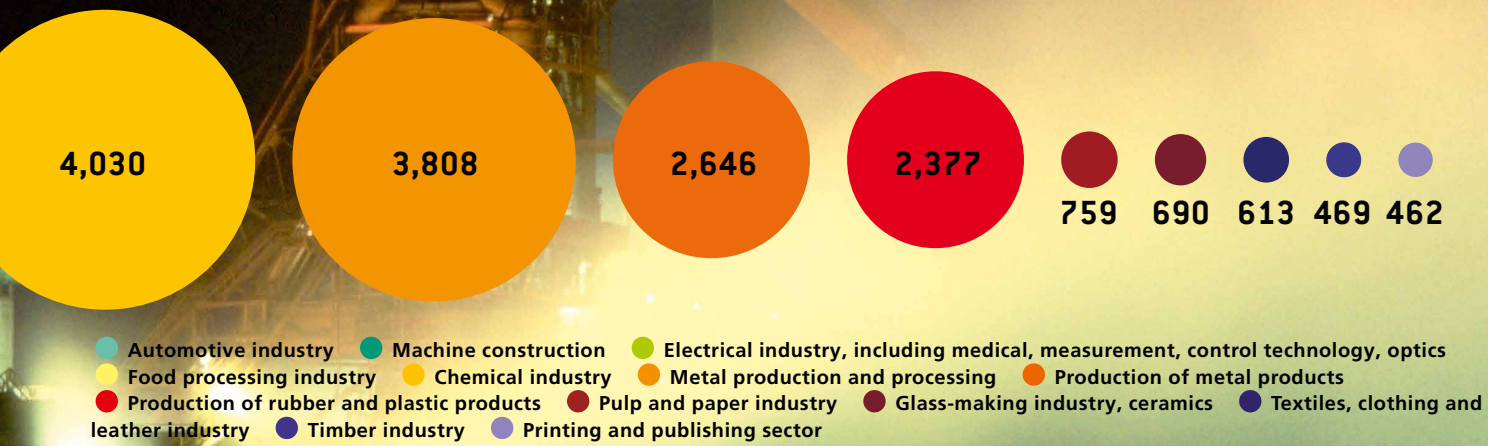
### CC INDUSTRIAL AND SERVICE INNOVATIONS

The Competence Center Industrial and Service Innovations identifies and evaluates the potentials of technical and organizational innovations in production, as well as product and service innovations in manufacturing industry. One core element is the survey “Modernization of Production”, which has been analyzing the innovation trends in manufacturing industry for the past 15 years. This database together with comprehensive knowledge about key future trends in manufacturing industry forms an ideal basis for scientifically based and practice-oriented decision-making in questions of industrial innovations. The scientists develop future-oriented strategies for firms, associations and politics, which contribute towards securing value added creation in Germany and other European high-wage locations.

Knowledge-intensive services like consulting and development are performed not only by firms in the service sector, but also in manufacturing industry. Efficiency criteria like productivity play an increasingly significant role in this context. Until now, however, appropriate methods were lacking to measure the productivity of knowledge-intensive services reliably and control their cost effectiveness. In the project INPROWID, the Business Unit *Industrial Services* develops a concept which measures productivity with particular emphasis on the degree of innovation of the services. This calculation method will be made available to all interested enterprises after the project is completed. In addition, companies can use an internet-based benchmarking tool to measure and assess how productive their services are. With these results, firms can find a better balance between raising productivity and the required innovativeness of their knowledge-intensive services.

*By using benchmarking, enterprises can compare their current position regarding knowledge-intensive services with other firms and thus obtain concrete information about their own productivity and degree of innovation.*

Innovative service robots exploit new application fields in production, logistics, agriculture and health care. In the EFFIROB study, the Business Unit *Future-oriented Production Systems and Location Management*, together with Fraunhofer IPA, designed innovative service robotic ap-



plications and evaluated their life cycle costs in detail. The study showed, among others, that the purchase costs for a service robot as a rule amount to less than 25 percent of the total costs. Reducing the production costs in order to improve cost effectiveness is often less important from the client's perspective than, for example, reducing the complexity of handling. Market potential analyses also show that, in some cases, the financing options for users can be a bottleneck preventing rapid diffusion. New business models offered by the robot manufacturers can be of help here – in particular ones that focus on the product performance.

The increasing dynamism of the markets and complexity of the value-added processes have changed the competitive environment for industrial firms: Customers demand more, and more individualized, product variants, while the product life cycles are becoming ever shorter. Small and medium-sized enterprises (SMEs) in particular often do not possess the concrete instruments to dynamically plan process innovations. In the SIMPRO-KMU project, the Business Unit *Technical and Organizational Process Innovations* developed scenario-based planning instruments to support modernization decisions, which enable not only a cost-effective evaluation of alternative investment strategies, but also to estimate the future technology and personnel requirements. The concepts were successfully tested in mechanical engineering firms.

The growing importance of alternative mobility and power train concepts poses challenges for automobile parts suppliers. In a study, Fraunhofer ISI discovered that many suppliers in Baden-Württemberg are not adequately prepared for this eventuality: While large suppliers are already comparatively well equipped to replace components for conventional drives by components for electric mobility, SMEs have so far been barely active in this field. Only one third of the small and half of the medium-sized suppliers have begun to develop products which can be utilized for new power train technologies. In addition, the expenditures for research and development amount on average to a mere 2.6 percent of turnover. Baden-Württemberg thus lags behind the other German automobile supplier regions and action is urgently required. In the medium to long term, it is a question of maintaining technological adaptation capabilities and the still existing technology lead – without political support. SMEs, in particular, will find it difficult to meet these challenges.

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## #2

*Saving potential of material costs in the manufacturing industry in million euro, 2008*

*Scenarios provide information about the planning of modernization measures, taking into account cost effectiveness, future technologies and personnel requirements.*



**1 National and European research**

**1A Larger programmatic intersection**

**1B Increased separation**

**2 Society's expectations of research**

**2A Efficiency and effectiveness**

**2B No analysis of research results**

**3 Overall development of EU**

**3A Europe of regions**

**3B Withdrawing to nation and region**

**4 European research communities**

**4A International competitive networks**

**4B Fragmented research**

#3

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## FORESIGHTED ADVICE FOR DECISION-MAKERS FROM INDUSTRY AND POLITICS

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### CC INNOVATION AND TECHNOLOGY MANAGEMENT AND FORESIGHT

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Society, the economy and technologies change rapidly which continuously poses new challenges. The Competence Center Innovation and Technology Management and Foresight develops methods which allow its clients to understand these changes and their interplay and unlock their associated opportunities and potentials. The scientists' sophisticated set of methods includes scenario analysis, dialog processes, Delphi surveys, technology roadmapping as well as the analysis of publication and patent data.

Together with its clients, the team of the Business Unit *Futures Research and Foresight* developed guiding models of futures. Such "visions" are based on the values of one group and help them to move into an unknown future. For example, the Fraunhofer Gesellschaft used this approach to understand the demands future forms of employment make on young employees. Another methodological focus are dialog procedures for participative technology engineering, which were processed in great detail for the project "Barometer of Safety in Germany" funded by the Federal Ministry of Education and Research (BMBF). A public open space workshop and a focus group investigated how the use of new security technology, for example intelligent video surveillance, could affect the public's perception of security. Analyzing the influence of socio-cultural factors for the acceptance or rejection of security measures in the public sphere is at the center of the project "Safety in the Public Sphere". The particular challenge here is to consider the different stakeholders and their points of view.

*Future visions provide insights into new developments but also require analysis of the acceptance and rejection of new technologies. A direct dialog with citizens is crucial for this.*

The tried and tested scenario methodology was also developed further: Several European research projects with innovative scenario concepts were launched in order to address different issues such as "Future of Research", "Future of the European Research Area", "Danger Scenarios for Europe" and "Application Paths for New Security Technologies". For example, a two-step



1A	1B	2A	2B	3A	3B
1	0				
0	0				
2	-1	1	0		
-2	1	-1	0		
1	0	2	0	1	-1
0	0	0	1	0	1

concept of explorative and transformative scenarios was developed and applied, and scenario analysis was combined with semantic technologies.

The Business Unit *Innovation and Technology Management* develops methods for companies to make innovation development efficient and successful in the early phases. For innovations to succeed, foresighted thinking, technological competence and the appropriate contact with experts and their expertise are crucial. To this end, projects have been conducted with companies from the automotive industry and automotive component suppliers. From the OEMs' (original equipment manufacturers) point-of-view, the cheapest suppliers are not necessarily the most attractive choice for the product life cycle. The central result of the project "Total Cost of Ownership (TCO)" was the development of guidelines which allow a schematic approach when choosing suppliers with a view to TCO. These guidelines were developed together with well-known suppliers and OEMs on behalf of the German Association of the Automotive Industry. In addition, the Industrial Working Group Competence Management's exchange of experiences with approximately 30 well-known companies took place in 2011. This working group represents participants from Human Resources and Competence Management from different sectors. The aim of this exchange of experiences was to demonstrate the understanding and added value of the use of foresight methods such as road-mapping and Delphi in competence management.

Many innovations are inconceivable without the appropriate materials. The scientists of the Business Unit *Strategies for Material Technology* investigate new applications for well-known materials and the possibilities for innovative materials. Strategies for material technologies were developed for clients from the automotive industry and automotive component suppliers. In the project "Molecular Sorting", scenarios were developed to describe future production and consumption as part of the Fraunhofer internal research program "Tomorrow's Markets – Subjects for the Future". Within this context, several demonstrators for recycling at the molecular level and their savings potential for the respective project partners are discussed and assessed.

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### #3

*Consistency matrix – excerpt from a scenario process*

*Cheap is not always the best choice. Guidelines for the automotive industry show what needs to be considered when choosing suppliers in order to work cost-effectively throughout the entire product cycle.*



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## INNOVATIONS FOR A SUSTAINABLE FUTURE

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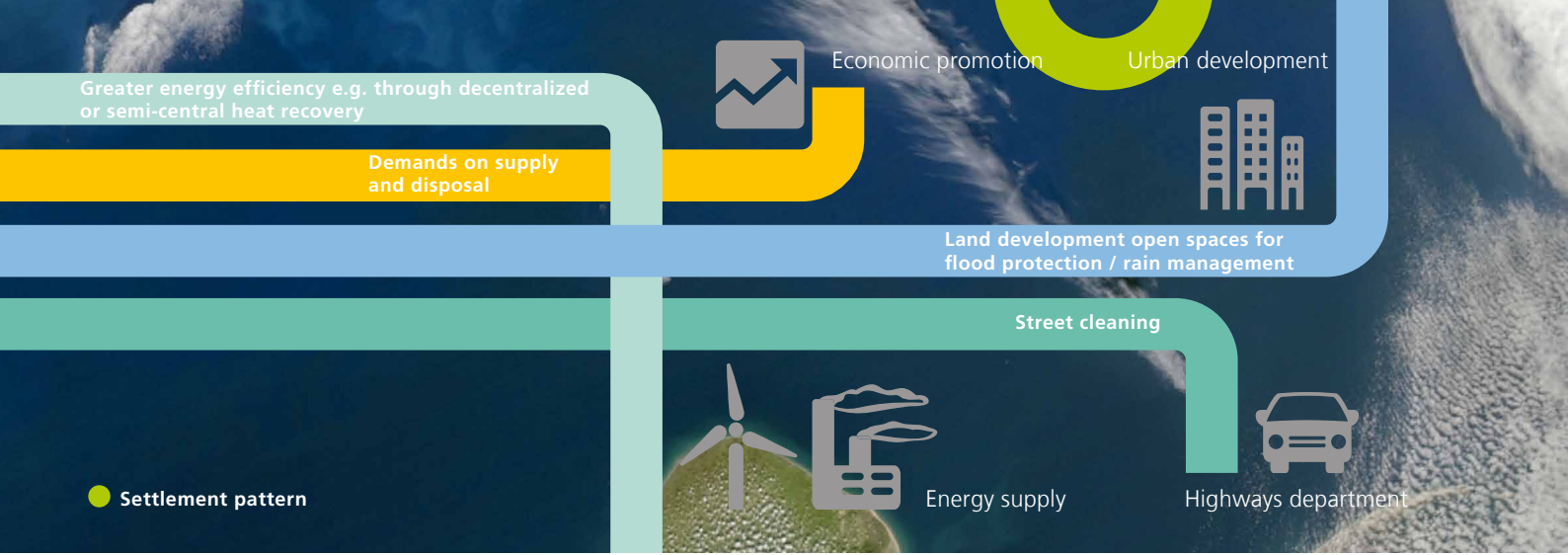
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### CC SUSTAINABILITY AND INFRASTRUCTURE SYSTEMS

Resource scarcity, the increase in global temperature and the resulting climate change are only some of the keywords which underline the necessity of handling finite natural resources sustainably as well as avoiding environmental pollution. In the “Green Economy” concept, which is also the focus of the fourth United Nations Conference on Sustainable Development (Rio+20) in June 2012, the economic opportunities of environmentally-friendly future markets are emphasized for industrialized, emerging and developing countries. The research conducted by the Competence Center Sustainability and Infrastructure Systems adds to the knowledge about the required innovation processes, so that policymakers and companies can make decisions along the lines of sustainability.

Water infrastructure systems are facing more and more new challenges due to climate change, but also due to demographic changes and ecological requirements. Technical, organizational, legal and political measures are required in order to design systems to be highly flexible and environmentally compatible. The Business Unit *Water Resources Management* develops and monitors new approaches to urban water infrastructure and examines measures for water protection with regard to reducing pollutants. In the NAUWA project, which deals with the sustainable further development of urban water infrastructure, all the factors of influence from the changing environment were regarded in four regional case studies in North Rhine-Westphalia. The most important topics identified and addressed were land-intensive urban housing developments for a declining population, flooding due to heavy rain, the use of innovative approaches as well as the need to adjust water supply and sewage tariffs. The results and experiences as well as strategies and recommendations for action were summarized in a guideline to support local authorities and infrastructure operators.

*Water supply and wastewater disposal have to be adjusted to the changes resulting from demographic developments. Findings from case studies are made available to local authorities and decision-makers as recommendations for action.*



Environmental protection is sustainable if it is integrated into processes, products and systems. The scientists in the Business Unit *Sustainability Innovation and Policy* conduct research on how sustainable emerging technologies diffuse and what effects they have. They investigate how to increase competitiveness in green markets. This is done for concrete technologies and needs, but also for cross-cutting approaches like resource efficiency. For instance, for the third time, the Competence Center was responsible for the scientific assessment of the entries to the German Innovation Prize for Climate and the Environment (IKU). The projects entering this competition represent sustainable innovations which help to protect climate and the environment, can be applied industrially and thus induce growth and employment.

Modern societies have to be highly mobile; a demand which results in large volumes of traffic and harbors risks for climate and the environment. The Business Unit *Transportation Systems* develops concepts and instruments in this field which ensure the efficient performance of the transport infrastructure and simultaneously limit the risks. The studies conducted help companies with decision-making; at the same time, analyzing the impacts on the economy and society also helps to guide policymakers.

Fraunhofer ISI worked on an expert report as part of the parliamentary discussion of the new 2011 White Paper for the Transport Committee of the EU Parliament, which describes the ten most important measures needed to achieve a sustainable transport system from an economic viewpoint. The three most important measures according to this are: setting CO<sub>2</sub> emission limits for road vehicles, pushing alternative transport fuels and taking external costs into account. Besides this, another important component is shifting urban passenger transport to multi-modal, integrated transport systems which include pedestrians and cyclists.

The Business Unit *Systemic Risks* works on identifying such risks in modern society: Increasingly networked economic, technical and ecological systems mean higher risks for infrastructure systems and the supply of raw materials. Research is conducted on how to design these systems so that they are less susceptible to natural catastrophes, crises or supply bottlenecks. The WEATHER project documents the costs of extreme weather events and the benefits of adaptation strategies; this is necessary for designing policy strategies and measures. The project's overriding objective is to document and economically assess the impacts of extreme weather events on infrastructure, transport companies, passengers and the economy for all transport modes in Europe. In addition, an assessment is also made of suitable emergency measures and adaptation strategies with regard to climate and weather trends for Europe up to 2050.

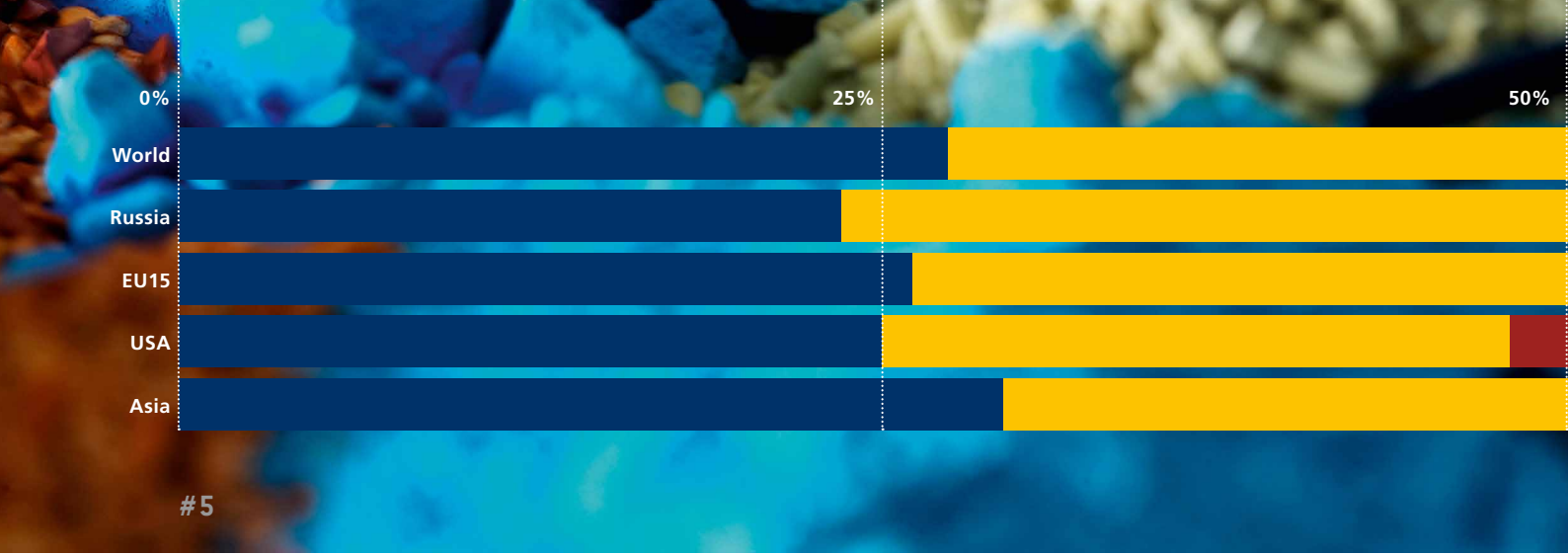
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#### #4

*Important interactions between the water infrastructure and other municipal areas*

*Ten steps to a sustainable transport system: Expert report of Fraunhofer ISI looks at measures from an economic viewpoint.*





#5

## FOCUS ON TECHNOLOGIES WITH POTENTIAL

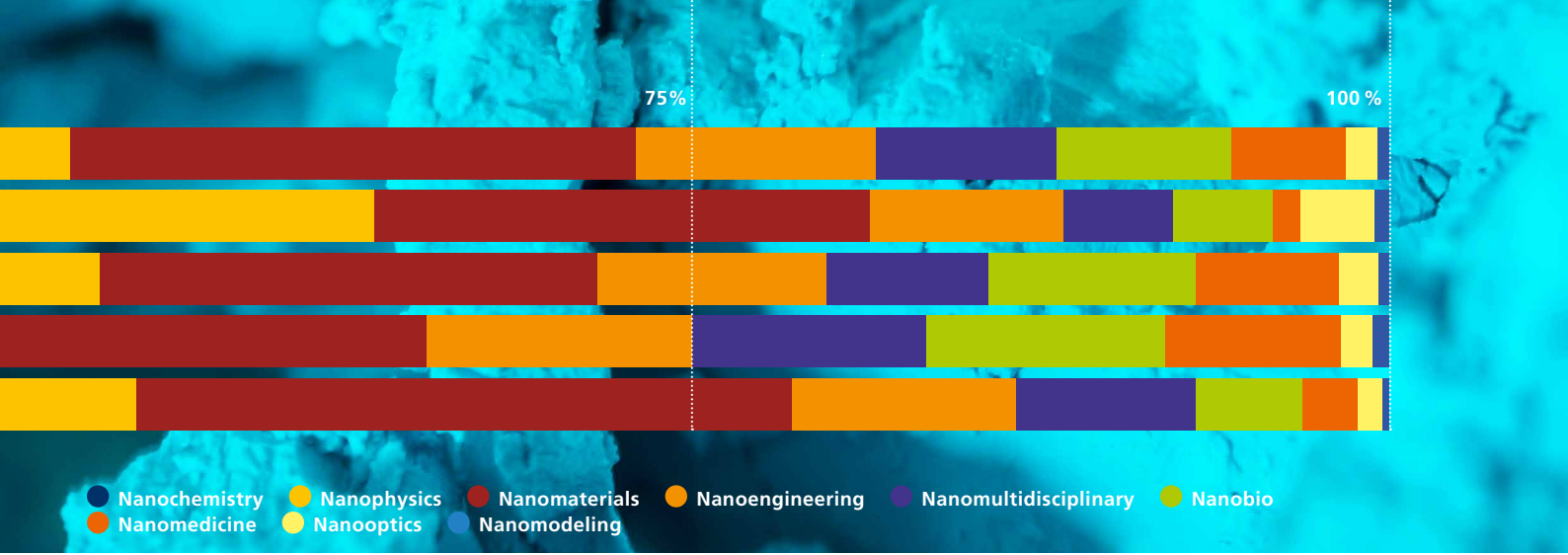
### CC EMERGING TECHNOLOGIES

New technologies are expected to provide essential solutions for a sustainable energy supply, preservation of the environment, mobility, health and nutrition in view of the demographic change, as well as secure communications. The Competence Center Emerging Technologies analyzes the scientific and economic potentials of technologies and evaluates their possible applications. It investigates the societal and political framework conditions as well as the economic, ecological and social impacts resulting from the utilization of new technologies. The research focuses on biotechnology, nanotechnology, health technologies, information and communication technologies as well as new, interdisciplinary approaches which result from the interaction of these fields.

*Human-technology cooperations are a significant field of the future, not only at the national level; internationally they are also increasingly a focus in the area of life sciences.*

The increasing use of biotechnology in medicine, agriculture, food production, industrial production, energy conversion and environmental protection leads to new societal issues and the need for political action. The Business Unit *Biotechnology and Life Sciences* points out possibilities for politicians to exert influence. In the BMBF Foresight Process, the topic "Human-Technology Cooperations" was identified as a significant cross-cutting issue for the future. According to the slogan "Biology becomes technological, technology biological", this subject was studied, with special attention to the life sciences, by an international consortium on behalf of the Office for Technology Assessment of the European Parliament.

Within the BMBF strategy process "The Next Generation of Biotechnological Procedures – Biotechnology 2020plus", the Fraunhofer Gesellschaft is conducting a large-scale systems research project. The aim is to establish an industrially applicable production process with new, yet to be developed cell-free production technology, which can manufacture large quantities of high-quality proteins. Fraunhofer ISI is conducting measures supporting innovations for the project consortium.



The Business Unit *Information and Communication Technologies* studies IT-based innovations and new media and formulates recommendations for changing political, economic and legal framework conditions. In the consulting project "Information Society" for the German Parliament (Bundestag), the unit investigates how various countries are promoting broadband Internet. In addition, they analyze the extent to which the Internet can already be regarded as the main medium and what relevance the press and television still have in forming public opinion in the digital age. The Business Unit supports the European Commission in the project "FET Open" in developing strategies for the new research framework program "Horizon 2020" in the area of "New and future IT technologies".

The health system is facing major challenges in view of demographic change, new diagnosis and therapy methods and increasing cost pressure. In the Business Unit *Innovations in the Health System* the scientists point out opportunities for policymakers to better adapt the health care system to cope with these changes. On behalf of the Hans Böckler Foundation, the Unit examines how a more efficacious and efficient health system can be designed whose primary focus is to preserve health. In an innovation report for the Bundestag the question is addressed whether technical advances in the health care system must generally be accompanied by cost increases. It transpires that technical progress plays a smaller role than previously assumed in spending on health.

The CC-overarching thematic field of nanotechnology, which is coordinated in the Competence Center Emerging Technologies, deals with innovations and chances resulting from nanotechnology, as well as the challenges and design possibilities inherent in the diffusion of new or improved nanotechnology-based products. Thus, for instance, the nano-structured components of batteries and material innovations can lead to significant improvements in the performance of lithium-ion batteries, which are regarded as key technologies for future electric vehicles. In the project "LIB2015 Roadmapping", roadmaps are developed up to the year 2030, which, besides material and cell development, take into account mobile and stationary applications for lithium-ion batteries. They thus provide an orientation for science, industry and politics for future developments, trends and challenges. The nanotechnology innovation system in Russia was analyzed for the European Commission. A comprehensive database of Russian research institutions and enterprises was established in this project. Topics for future cooperations between Russia and the EU were identified, for example, nano metals for extreme conditions or supra-conducting nano-electronic components.

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## #5

*Share of publications  
2000 to 2009*

*Nano-technology holds many opportunities and challenges. Material innovations with nano-elements can significantly improve the performance of lithium-ion batteries – a key point for the implementation of electric mobility.*



#6

## STRATEGIC KNOWLEDGE FOR INNOVATIVE RESEARCH POLICY

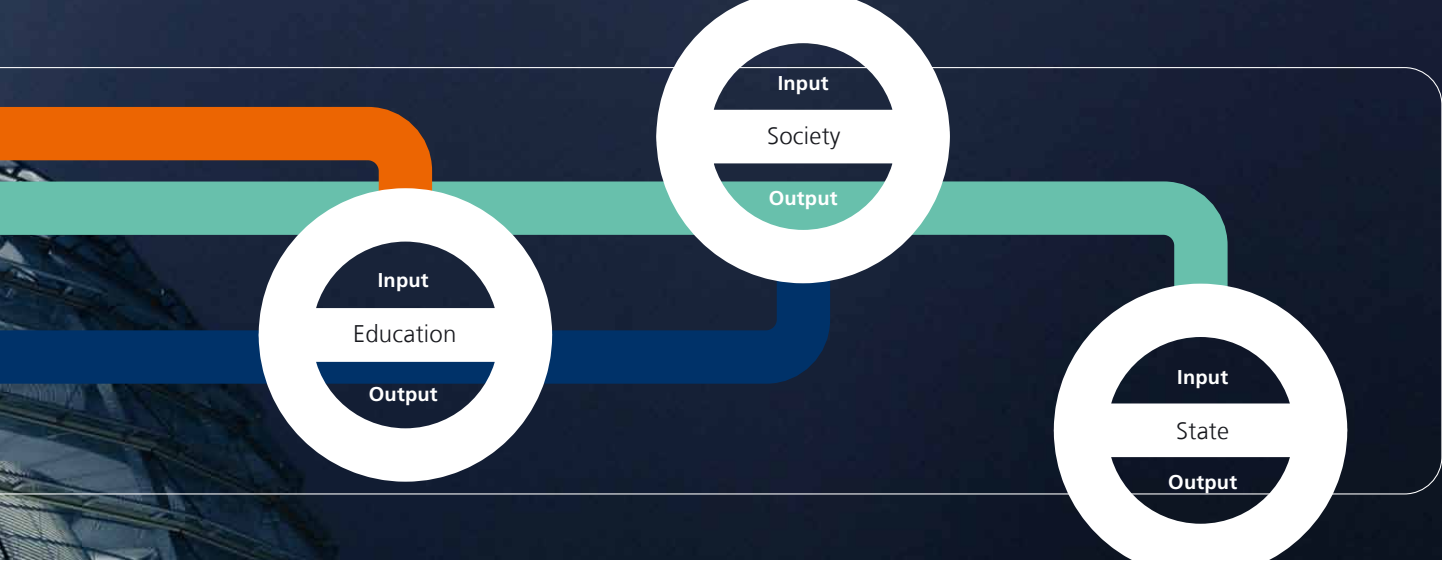
### CC POLICY AND REGIONS

Policy advice has to design political decision-making processes more systematically and justify decisions more rationally. The Competence Center Policy and Regions investigates the way research and innovation systems work and change on a supranational, national and regional level. To this end, it analyzes the actors, instruments and strategies in industry, science and government which produce knowledge and technological innovations. The qualitative and quantitative methods comprise surveys, benchmarks, cluster analyses, evaluations, multiple view approaches, discursive procedures as well as analyses of documents, patents and publications.

The Business Unit *Policy and Evaluation* investigates innovation policy measures and programs and conducts policy analyses in the fields of research, technology and innovation policy (RTI). Based on the concept of (inter)national research and innovation systems, the contexts and conditions for successful innovations and the policy design initiatives taken by political institutions and actors are analyzed. In 2011, a large database on the regional activities of German universities was created in the project "Regional network participation and its impacts on the internal governance structures of universities", which is conducted within the framework of the BMBF funding program "New governance in science". The project "Change company cultures – prevent career breaks" developed new approaches to improve the career opportunities for women in major companies. In addition, the Business Unit conducted workshops on the challenges of innovation systems and developed a training course for the systemic understanding of innovation and governance of RTI activities.

*More women in leading positions: A noble objective which requires new approaches in corporate culture to improve women's career opportunities.*

The Business Unit *Regions and Clusters* offers analyses to measure, document and assess regional technology and innovation. In 2011, several analyses of regional potential were presented, which focused on an indicator-based documentation of technological potentials and cluster structures. These analyses were commissioned by the Chamber of Industry and Commerce Karlsruhe, the



Association of Chambers of Industry and Commerce in Baden-Württemberg and the City of Regensburg. A pilot scheme of concepts to measure the effects of regional economic and innovation policies was conducted within the ERAWATCH project “Development of a methodology for the profiling of regional economies”. The Business Unit also assessed regional and regionalized innovation policies. For instance, the operational program for the European Fund for Regional Development in Berlin was evaluated. At the workshop “New approaches of regional innovation policy and regionally adapted strategies” in Brussels, new perspectives, topics and approaches for a successful regional innovation policy were discussed. Here the development of political opportunities in the framework of “intelligent specialization” (Growth strategy Europe 2020) was the focus of the discussion.

In the Business Unit *Innovation Indicators*, quantitative scientific and social-scientific methods are used to describe and analyze innovation systems and to assess their competitiveness. In this context, the BMBF has commissioned the Fraunhofer ISI to conduct economic evaluation for the federal government’s High-Tech Strategy. It is the aim of this ongoing project to quantify Germany’s present scientific and technological productivity and future scientific and economic potentials. On behalf of the Expert Commission on Research and Innovation (EFI) of the federal government, the framework conditions for excellent research in German universities, universities of applied science and non-university research institutions were investigated together with the Social Science Research Center Berlin, the Centre for European Economic Research and Joanneum Research. The project “Research Perspectives” revealed that researchers’ increasing dependency on third party funding is frequently at the expense of internationalization. It was also shown that large university chairs do not increase efficiency; it is far more effective to focus funding on selected universities.

2011 saw the beginning of the ongoing evaluation for the support measure “Validating the innovation potential of scientific research”(VIP) on behalf of the BMBF. Its main objective is to identify the innovative role of VIP in the spectrum of funding policies and to assess its effects on the innovation activities of publicly funded basic research. In accordance with the nature of the VIP as a learning program, the potential recipients’ needs take center stage. Design, choice of instruments and program management are to be made even more compatible in a continuous learning process. The methodology is distinguished by a multiple view approach, which identifies the assessment of different groups and actors in surveys and interviews.

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## #6

*Interactions in the innovation system*

*Researchers’ increasing dependency on third party funding is at the expense of internationalization.*

INTERDISCIPLINARY RELEVANCE OF RECYCLING



Electrical engineering

Metallurgy

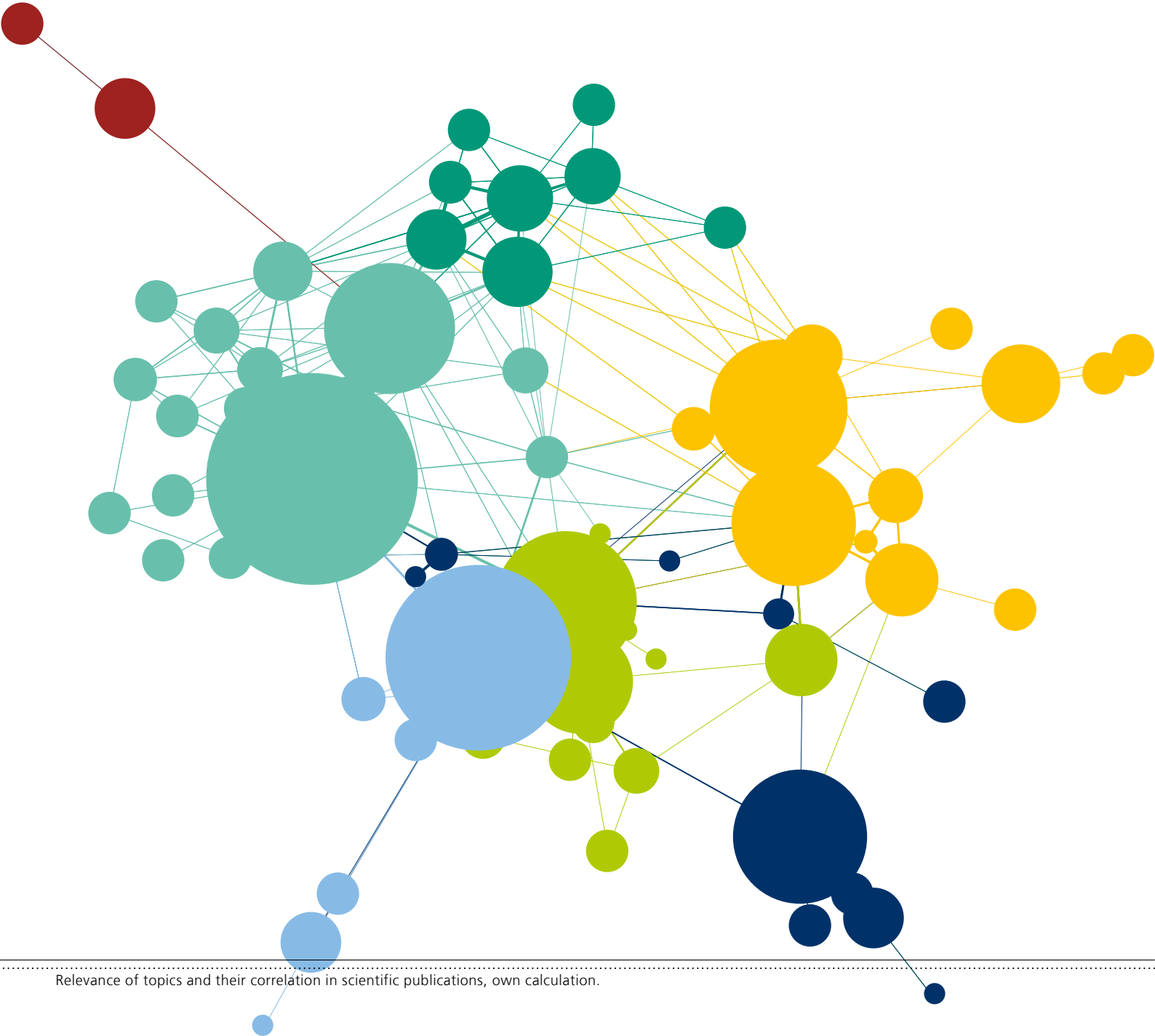
Environment

Chemistry

Management

Energy

Education



Relevance of topics and their correlation in scientific publications, own calculation.

# ACADEMIC TEACHING

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## ACADEMIC TEACHING

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### Harald Bradke

LECTURE  
*Energiewirtschaftliche Aspekte der Energietechnik I*  
University of Kassel

SEMINAR  
*Energiewirtschaftliche Aspekte der Energietechnik II*  
University of Kassel

### Tanja Bratan

LECTURE  
*E-Health*  
Hochschule Furtwangen University

### Barbara Breitschopf

LECTURE  
*Socio-economic aspects of development planning*  
Karlsruhe Institute of Technology

### Kerstin Cuhls

SEMINAR  
*Demographischer Wandel*  
Universität Heidelberg

SEMINAR  
*Innovationen in Japan*  
Universität Heidelberg

LECTURE  
*Geschichte Ostasiens in der Welt*  
Universität Heidelberg

KOLLOQUIUM  
*Kolloquium für BA, Master, Magisterkandidaten*  
Universität Heidelberg

COURSE  
*Spezifische Fachlektüre*  
Universität Heidelberg

COURSE  
*Zukunftsforschung*  
Freie Universität Berlin

### David Dallinger

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*Grid-connected electric vehicles and management of intermittent renewable generation*  
ICAI School of Engineering  
University Pontificia Comillas  
Madrid, Spain

### Ewa Dönitz

LECTURE  
*Methoden der Zukunftsforschung*  
University of Kassel

### Rainer Frietsch

LECTURE  
*Soziale Strukturen der Wissenschaften: Paradigmen der Innovationsforschung: Veränderte Rollen der Akteure*  
Karlsruhe Institute of Technology

### Ralf Isenmann

LECTURE  
*Industrial Ecology*  
University of Kassel

### LECTURE

*Nachhaltige Unternehmensführung I*  
University of Kassel

### LECTURE

*Nachhaltige Unternehmensführung II*  
University of Kassel

### LECTURE

*Strategisches Nachhaltigkeitsmanagement*  
University of Kassel

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*Sustainable Development and Industrial Ecology*  
Universidad Quintana Roo,  
Cozumel, Mexico

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LECTURE CONTRIBUTION  
*Environmental impacts of energy conversion and use*  
ETH Zurich, Switzerland

LECTURE CONTRIBUTION  
*Technological solutions against climate change*  
ETH Zurich, Switzerland

### Simone Kimpeler

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*Wirtschaftsinformatik Open Innovation*  
University of Potsdam

### Steffen Kinkel

LECTURE AND SEMINAR  
*International Offshoring and Outsourcing*  
University of Hohenheim

### Daniel Koch

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*Roadmapping*  
University of Kassel

### LECTURE

*Wissensmanagement*  
University of Kassel

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*Angewandte Wirtschaftsgeographie Grundlagen, Instrumente und Wirkungen der regionalen Innovationspolitik*  
Universität Hannover

### SEMINAR

*Angewandte Wirtschaftsgeographie Innovationssysteme und deren politische Gestaltung im inter-regionalen und internationalen Vergleich*  
Universität Hannover

### SEMINAR

*Angewandte Wirtschaftsgeographie Globalisierungsprozesse aus Sicht der New Economic Geography*  
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*Regionale Effekte von Hochschulen*  
University Giessen

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*Grundlagen und Prinzipien der Europäischen Union*  
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### LECTURE

*Grundlagen und Prinzipien der Gesetzgebung*  
Quadriga Hochschule Berlin

### SEMINAR

*Akteure und Rechtssetzungsverfahren auf europäischer Ebene*  
Quadriga Hochschule Berlin

### SEMINAR

*Verfassungsorgane und Gesetzgebungsverfahren*  
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*Übungen zu Wissensmanagement*  
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### SEMINAR

*All for Decision Making and Game Playing Computers*  
Karlsruhe Institute of Technology

### SEMINAR

*Erschließung von Denkräumen Computerunterstützte Kreativität*  
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### SEMINAR

*Graphbasierte Wissensrepräsentation*  
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Université de Strasbourg, France

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*Management neuer Technologien – Technikbewertung mit Patentanalysen*  
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### Katrin Ostertag

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### Mario Ragwitz

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*Erneuerbare Energien in Europa*  
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### Thomas Reiß

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*Management neuer Technologien*  
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### Clemens Rohde

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OPEN UNIVERSITY COURSE  
*Planspiel Emissionshandel*  
University of Koblenz-Landau

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LECTURE  
*Energy Marketing and Strategy*  
Grenoble Ecole de Management,  
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Africa

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*Soziale Strukturen der Wissen-  
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Wissenschaften: New Public  
Management*  
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Karlsruhe Institute of Technology

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*Soziale Strukturen der Wissen-  
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Karlsruhe Institute of Technology

LECTURE  
*Umweltökonomik und Nachhal-  
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*Innovation und Wissen*  
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**Martin Wietschel**  
LECTURE  
*Energiepolitik*  
Karlsruhe Institute of Technology

SEMINAR  
*Themenfelder Energie und  
Umwelt*  
Karlsruhe Institute of Technology

LECTURE  
*Technologischer Wandel in der  
Energiewirtschaft*  
Karlsruhe Institute of Technology

LECTURE  
*Quantitative Modelle zum  
Abbilden des technologischen  
Wandels am Beispiel Energie-  
anwendungen*  
ETH Zurich, Switzerland

**Sven Wydra**  
LECTURE  
*Volkswirtschaftslehre*  
Hochschule Karlsruhe – Technik  
und Wirtschaft

LECTURE  
*Arbeitsmarkt und Soziale  
Sicherung*  
International University of Coope-  
rative Education Darmstadt

## DISSERTATIONS

### Elisabeth Baier

*Les entreprises multinationales  
dans les systèmes régionaux  
d'innovation: facteurs d'attraction  
et mécanismes d'intégration*  
*// Multinational enterprises in  
regional innovation systems:  
attraction factors and integration  
mechanisms*  
Prof. Dr. Jean-Alain Héraud  
Université de Strasbourg,  
France  
Prof. Dr. Caroline Kramer  
Karlsruhe Institute of Technology

### Sabine Biege

*Servicegerechtes Design. Rückwir-  
kungen der Ausgestaltung dienst-  
leistungsbasierter Geschäfts-  
modelle auf die Auslegung von  
Investitionsgütern*  
Univ.-Prof. Dr. Marion A.  
Weissenberger-Eibl  
University of Kassel

### Rainer Frietsch

*Qualifikation und Innovation*  
Prof. Dr. Werner Rothengatter  
Karlsruhe Institute of Technology

### Juliane Hartig

*Learning and Innovations  
@ a Distance*  
Prof. Dr. Dieter Wagner  
Universität Potsdam

### Nicki Helfrich

*Economic growth effects of  
innovations induced by climate  
protection policies*  
Prof. Dr. Werner Rothengatter  
Karlsruhe Institute of Technology

### Fabian Kley

*Ladeinfrastrukturen für Elektro-  
fahrzeuge – Entwicklung und  
Bewertung einer Ausbaustrategie  
auf Basis des Fahrverhaltens*  
Prof. Martin Wietschel  
Karlsruhe Institute of Technology

### Arne Lüllmann

*Einfluss dezentraler Erzeugung  
und Erneuerbarer Energien  
auf die Vulnerabilität des Strom-  
übertragungsnetzes*  
Prof. Wolfgang Kröger  
ETH Zurich, Switzerland

## Oliver Som

*Innovation patterns of non-R&D-  
performing firms in the German  
manufacturing industry*  
Prof. Dr. Carsten Dreher  
Universität Flensburg

## PRESENTATIONS

### EXAMPLES

### Elisabeth Baier

*Einführung: Erfahrungen aus dem  
deutschsprachigen Raum: Drei  
Kooperationsmodelle zur Ver-  
besserung des Innovations- und  
Forschungspotenzials*

▶ Workshop Heterogene Koope-  
rationen – Ein Ansatz zur Flexi-  
bilisierung des Forschungs- und  
Innovationssystems?, Berlin

*Integration of Multinational Firms  
in Innovation Systems: The role of  
knowledge flows and creativity*

▶ evoREG Workshop: Knowledge,  
creativity and regions, Strasbourg,  
France

### Bernd Beckert

*From complex data to consistent  
narratives*

▶ Summer Conference of ICSTI  
(International Council for Scien-  
tific and Technical Information),  
Beijing, China

*Network neutrality from an  
innovation research perspective*

▶ 50<sup>th</sup> FITCE International Con-  
gress, Palermo, Italy

### Sabine Biege

*Challenges of Measuring Service  
Productivity in Innovative,  
Knowledge-intensive Business  
Services*

▶ RESER, Hamburg

*EPISIS Service Seminar*

▶ RESER, Hamburg

*Product Adaptation for Industrial  
Product-Service Systems –  
Characteristics, Motives and  
Challenges*

▶ IPS2, Brunswick



**Inga Boie**

*Development of the CSP technology in the MENA region: Chances for technology transfer & economic benefits*  
 ▶ WWEC – World Wind Energy Conference 2011, Cairo, Egypt

**Harald Bradke**

*30 Pilot-Netzwerke für den Klimaschutz – Ein Gewinn für Klima und Unternehmen*  
 ▶ Berliner Energietage 2011

*Energieeffizienzpotenziale realisieren – meist mehr möglich als gedacht*

▶ KRdL-Expertenforum: Energieeffizienz für den Klimaschutz, Bonn

*Energiewende in Unternehmen*

▶ KfW-Bankengruppe Auftakt-symposium Energiewende in Deutschland, Berlin

**Susanne Bühner**

*Evaluation als Lernmedium: von den Chancen und Grenzen der Partizipation*  
 ▶ Jahrestagung der Deutschen Gesellschaft für Evaluation e.V. (DeGEval), Linz, Austria

*Erfolgreiche Frauen in Forschung und Entwicklung*

▶ Workshop: Anwerben – Andocken – Anwenden, WZB, Berlin

*INNO-APPRAISAL – Qualität und Wirkungen von Evaluationen im europäischen Vergleich*

▶ Frühjahrstagung des AK FTI-Politik, Berlin

**Kerstin Cuhls**

*Demographie und Innovation*  
 ▶ Berliner Expertengespräche

*Planning Research for the Future – Statement*

▶ Conference Planning for the Future, Berlin

**Stephanie Daimer**

*Evaluation als Lernmedium: Von den Chancen und Grenzen der Partizipation*  
 ▶ Jahrestagung der Deutschen Gesellschaft für Evaluation e.V. (DeGEval), Linz, Austria

*Relevanz regionaler Aktivitäten für Hochschulen und das Wissenschaftssystem*

▶ Workshop: Anwerben – Andocken – Anwenden, WZB, Berlin

**Ewa Dönitz**

*Scenarios for the European Research Area 2025*

▶ 8<sup>th</sup> European Congress of Chemical Engineering, Berlin

*Szenario-Methode: Varianten der workshopbasierten Annahmen-Entwicklung*

▶ 7. Symposium für Vorausschau und Technologieplanung, Berlin

**Friedrich Dornbusch**

*Relations between academic inventors and firms in space*

▶ International Workshop S+T and Innovation Development, Moscow, Russia

*Relations between academic inventors and firms in space*

▶ IIDEOS – Innovation, Industrial Dynamics, Entrepreneurship, Organisation and Space, Marburg

**Elisabeth Dütschke und Anja Peters**

*Rebound effects from a psychological perspective – a theoretical framework*

▶ 9<sup>th</sup> Environmental Psychology Conference, Eindhoven, Netherlands

**Wolfgang Eichhammer**

*Why renewables and energy efficiency are complementary and how to measure energy efficiency?*

▶ Global Renewable Energy Development GRED – The Future is Green, Brussels, Belgium

*Evaluation of CET performance with patent information – Foreign Trade Analysis for Wind and PV*

▶ Conference Clean energy technologies and patent management, Oslo, Norway

*Will the European Emission Trading Scheme ETS promote green innovation in the European industry?*

▶ Innovation for Green Growth. 4<sup>th</sup> German-Chinese Conference on Technical Innovation and Management; Institute of Policy and Management / Chinese Academy of Sciences, Beijing, China

**Tobias Fleiter**

*Where are the promising energy-efficient technologies?*

*A comprehensive analysis of the German energy-intensive industries*

▶ ECEEE summer study 2011, Presqu'île de Giens, France

*The contribution of energy efficiency to CO<sub>2</sub> mitigation – an assessment of costs and potentials for the German paper industry*  
 ▶ 22<sup>nd</sup> International Climate Policy PhD Workshop, Cologne

**Michael Friedewald**

*Privacy Impact Assessments: Concepts and Experiences*

▶ 4<sup>th</sup> International Conference Computers, Privacy and Data Protection, Brussels, Belgium

*Supporting Fundamental Rights, Privacy and Ethics in Surveillance Technologies*

▶ Policy Meeting More Surveillance, More Security? The landscape of surveillance in Europe and challenges to data protection and privacy, Brussels, Belgium

*The Ubiquitous Information Society: Privacy Challenges from New Technology*

▶ Arbeitstagung Biokybernetische Adaptation und HCI, Karlsruhe

**Fabio Genoese**

*Ökonomische Bewertung mittelfristiger Kraftwerks- und Stromspeicheroptionen zur verbesserten Integration Erneuerbarer Energien*  
 ▶ VDI-Fachtagung Optimierung in der Energiewirtschaft, Nürtingen

**Joachim Hemer**

*Crowdfunding – Can it contribute to Social Wellbeing?*

▶ Workshop Happiness, Innovation and Creativity, Fraunhofer ISI, Karlsruhe

*Crowdfunding innovativer Vorhaben – Ein brauchbares Instrument zur Schließung der Frühphasen-Finanzierungslücke?*

▶ Crowdfunding-Workshop, Fraunhofer ISI, Karlsruhe

*Das Verhältnis institutioneller Akteure des formellen Kapitalmarktes und des Staates zu Crowdfunding*

▶ Ikosom-Workshop, Berlin

**Tim Hettesheimer**

*The German Automotive Industry on the Road to E-Mobility*  
 ▶ International Workshop S&T and Innovation Development, Moscow, Russia

**Thomas Hillenbrand**

*Neue technische Lösungen im städtischen Bereich – Optionen, Randbedingungen und Hemmnisse*

▶ Hofgeismarer Gespräche zur Gemeingüterwirtschaft: Der öffentliche Wassersektor in Deutschland – ineffizient und reformbedürftig?, Hofgeismar

*Urbane Wasserinfrastrukturen im Spannungsfeld zwischen demographischem Wandel, Klimaveränderungen und Energiewende*

▶ Forum Green Cities, Regensburg

*Zukunft unserer urbanen Wasserinfrastrukturen – Dynamische Prozesse versus inflexible Systeme*

▶ Regionaler Diskurs auf dem Weg in die Zukunft der Metropolregion Ruhr – Regionalforum Herausforderungen, Oberhausen

**Miriam Hufnagl**

*Bringing the region back in? German Higher Education Institutions (HEIs) between regional engagement and isolated business*  
 ▶ 6<sup>th</sup> ECPR General Conference, Reykjavík, Iceland

*Relevanz regionaler Aktivitäten für Hochschulen und das Wissenschaftssystem*

▶ Workshop: Anwerben – Andocken – Anwenden, WZB, Berlin

**Bärbel Hüsing**

*Eröffnungsvortrag: Individualisierte Medizin – das allgemeine Verständnis*

▶ 12. Jahrestagung Deutsches Netzwerk Evidenzbasierte Medizin e.V.: EbM & Individualisierte Medizin, Berlin

*Zufallsbefunde: Künftige Herausforderungen und gesellschaftliche Auswirkungen*

▶ Tagung des Zentrums für Gesundheitsethik: Zufallsbefunde als Problem medizinischer Diagnostik und Forschung, Evangelische Akademie Loccum

# PRESENTATIONS

*Privacy, data protection and policy implications in whole genome sequencing*

- ▶ STOA workshop at the 3<sup>rd</sup> European Innovation Summit: Making Perfect Life – European governance challenges in 21<sup>st</sup> century bio-engineering, Europäisches Parlament, Brussels, Belgium

## **Ralf Isenmann**

*Technologie-Roadmapping Energiespeichertechnologien*

- ▶ Fraunhofer-Netzwerk Energiespeichersysteme und Netze, Kloster St. Trudpert, Münsertal

*Produkt-Roadmapping Lithium-Ionen-Batterien*

- ▶ BMBF Innovationsallianz Lithium Ionen Batterie (LIB2015), Frankfurt a. M.

*Technologie-Roadmapping Energiespeichertechnologien*

- ▶ BMBF Innovationsallianz Lithium Ionen Batterie (LIB2015), Frankfurt a. M.

## **Eberhard Jochem**

*An analysis of the medium to long term policies needed to achieve the sustainability targets in industry*

- ▶ Efonet Workshop – Increasing energy efficiency in industrial processes, Berlin

*Kosten und Chancen industrieller Abwärmennutzung*

- ▶ 10. Tagung Fernwärme für Klimaschutz, Biel, Switzerland

*Energieeffizienz-Netzwerke für die mittelständische Wirtschaft – Schneller unterwegs zum Energiedienstleister*

- ▶ 15. Euroforum-Jahrestagung Stadtwerke 2011, Berlin

## **Steffen Kinkel**

*Flexibilität in der Prozessindustrie – Verbreitung und Nutzen geeigneter Organisationskonzepte zur Flexibilitätssteigerung im Vergleich mit anderen Branchen*

- ▶ Process Manufacturing Gipfel, Heiligendamm

*Erfolgsfaktoren und Fehlerquellen bei internationalen Standortentscheidungen*

- ▶ Konferenz Internationalisierung als Erfolgsfaktor, Wolfsburg

*Flexibilitäts- und Stabilitätsstrategien in der deutschen Industrie – Muster, Erfolgsfaktoren, Gestaltungskonzepte*

- ▶ Sitzung des Industrieausschusses der IHK Karlsruhe, Ubstadt-Weiher

## **Marian Klobasa**

*Potential of fossil and renewable CHP technology to reduce CO<sub>2</sub> emissions in the German industry sector*

- ▶ World Renewable Energy Congress 2011, Linköping, Sweden

*Load Participation from Energy-intensive Industry in Ancillary Services*

- ▶ 2<sup>nd</sup> Annual European Electricity Ancillary Services & Grid Integration Forum, Berlin

*Implementation strategies for infrastructure development – Major recommendation from the SUSPLAN project*

- ▶ 2<sup>nd</sup> International SUSPLAN Conference – Towards a European energy infrastructure – from strategies to implementation, Brussels, Belgium

## **Stefan Klug**

*Eine Vision für einen nachhaltigen Verkehr in 2050 und die Chancen für das Taxi*

- ▶ 5. Taxizentralenkongress, Bad Wildungen

*A Vision for Sustainable Transport and the Role of the Taxi in 2050 (keynote)*

- ▶ Taxi Research Network European Meeting, Amsterdam, Netherlands

## **Knut Koschatzky**

*Cluster quo vadis? The future of the cluster concept*

- ▶ Humboldt-Kolleg Istanbul 2011: Regional and Sectoral Clustering under the Investment Support, Aydin University, Istanbul, Turkey

*Distributed innovation processes – A multi-territorial approach to corporate innovation in MNE*

- ▶ Forum for Networked Innovation, Grenoble Ecole de Management, LINC Lab, France

*Contribution of universities to regional innovation: The case of Baden-Württemberg*

- ▶ Symposium Universities, innovation and territory, Institut d'Economia de Barcelona, Spain

## **Henning Kroll**

*The Regional Role of Universities*

- ▶ Regional Innovation Monitor – 2<sup>nd</sup> Policy Workshop, Brussels, Belgium

*European Innovation Policy – The Challenge of Regional Adaptation*

- ▶ Regional Policy Dialogues with China – GIZ / NDRC – Information Sessions in Regional Policy, Berlin

*Internationale Beispiele Heterogener Kooperationsmodelle*

- ▶ Heterogene Kooperationen – Ein Ansatz zur Flexibilisierung des Forschungs- und Innovations-systems?, Berlin

## **Anette Kübler**

*Foresight as an effective method to initiate innovation*

- ▶ Sisecam, 26<sup>th</sup> internal symposium innovation and technology, Istanbul, Turkey

*German Russian Summer School 2011 – Presentation of the Fraunhofer ISI*

- ▶ German Russian Summer School 2011 organized between Higher School of Economics and Fraunhofer ISI, Moscow, Russia

*Innovationen – Erfolgsfaktoren für Unternehmen*

- ▶ UnternehmerForum der WGZ-Bank, Düsseldorf

## **Marianne Kulicke**

*Rahmen einer nachhaltigen Förderkulisse*

- ▶ 10. Sitzung der Enquete-Kommission Strategien für eine zukunftsorientierte Technologie- und Innovationspolitik im Freistaat Sachsen, Dresden

*Forschung an Fachhochschulen*

- ▶ 42. Mitgliederversammlung und Arbeitstagung der Mitglieder-gruppe der Fachhochschulen in der Hochschulrektorenkonferenz, Fulda

*Ausgründungen als Instrument des Wissens- und Technologietransfers – Erfahrungen aus den EXIST-Teilprogrammen Gründerstipendium und Forschungstransfer*

- ▶ Tagung: Zukunft des Technologietransfers. Vom University Industry Research Center bis Open Source Innovation, Speyer

## **Timo Leimbach**

*Developing policy strategies for emerging industries*

- ▶ 3<sup>rd</sup> European Conference on Corporate R&D (CONCORD-2011): The dynamics of Europe's industrial structure and the growth of innovative firms, Sevilla, Spain

## **Christian Lerch**

*Industrial Services as a Source of Product and Service Innovations – An Approach with Strategic Implications*

- ▶ Konferenz DRUID-Society, Copenhagen, Denmark

*Interaction of Product and Service Innovations – An Analysis of the Dynamics in Industrial Companies*

- ▶ Konferenz System Dynamics Society, Washington, D.C., USA

## **Ralf Lindner**

*Medizintechnische Innovationen – Herausforderungen für Forschungs-, Gesundheits- und Wirtschaftspolitik*

- ▶ Zukunftskonferenz Medizintechnik, Berlin

*Neue Partizipation, neue Herausforderungen?*

- ▶ Politikongress 2011, Berlin

## **Katharina Mattes**

*Effizienzfabrik – Innovationsplattform Ressourceneffizienz in der Produktion*

- ▶ TSB (Technologiestiftung Berlin) – Veranstaltung Trends und Entwicklungen für eine energie- und ressourceneffiziente Produktion, Berlin

*Adoption of resource efficient production technologies in companies of the manufacturing sector*

- ▶ Science and Technology and Innovation Development, Moscow, Russia

*Bewertung der wirtschaftlichen Potenziale von Ressourceneffizienten Anlagen und Maschinen*

► Effizienzfabrik-Treff bei der Daimler AG – Ökonomische Notwendigkeit oder Ökologischer Mainstream? Bewerten Sie Ihre Energieeffizienzmaßnahmen, Mannheim

#### **Carolyn Michels**

*Creating a journal classification schema via citation analysis*

► NBW 2011, Aalborg, Denmark

*Identification of emerging fields in science*

► 13<sup>th</sup> Conference of the International Society for Scientometrics and Informetrics (ISSI), Doctoral Forum, Durban, South Africa

#### **Björn Moller**

*Investigation and optimization of multi-walled carbon nanotube (MWCNT) dispersions in different solvents for high performance polymers*

► 8<sup>th</sup> European Congress of Chemical Engineering, Berlin

#### **Emmanuel Muller**

*Clusters et politiques de clusters: regards croisés d'Allemagne et du Canada*

► Observatoire des Pôles de Compétitivité, Ecole des Mines, Paris, France

*The Impact of Research Infrastructures on Regional Creativity*

► EVARIO workshop, Université de Strasbourg, France

#### **Peter Neuhäusler**

*Patent indicators for macroeconomic growth – The Value of Patents Estimated by Export Volume*

► Atlanta Conference on Science and Innovation Policy 2011, Atlanta, USA

*Patent Information and Corporate Credit Ratings: An Empirical Study of Patent Valuation by Credit Rating Agencies*

► Patent Statistics for Decision Makers Conference 2011, Alexandria, USA

*Patent indicators for macroeconomic growth – The Value of Patents Estimated by Export Volume*

► International Workshop S+T and Innovation Development, Moscow, Russia

#### **Katrin Ostertag**

*Flächenausweisungszertifikate im Praxistest – Erfahrungen aus dem Projekt SpielRaum*

► Grün statt Grau: Die Steuerung des Flächenverbrauchs mit Abgaben und Zertifikaten. Fachgespräch der Bundestagsfraktion Bündnis 90/Die Grünen, Berlin

*Innovation dynamics in resource efficiency*

► DIME Final Conference Maastricht, Netherlands

#### **Anja Peters (mit R. Agosti, M. Popp und B. Ryf)**

*Nutzerakzeptanz von Elektromobilität*

► Clean Tech Insights, Berlin

*Electric mobility – a survey of different consumer groups in Germany with regard to adoption*

► ECEEE Summer Study 2011 Presqu'île de Giens, France

#### **Patrick Plötz**

*Electric vehicles – an Example for Innovative markets*

► HSE Summer School, Moscow, Russia

*Wie viel Ladeinfrastruktur für Elektromobilität braucht Deutschland?*

► Workshop Ladeinfrastruktur, Forum Elektromobilität, Berlin

*B Branchenreport Elektromobilität in Deutschland*

► Branchentag Handelskammer Österreich, Vienna, Austria

#### **Mario Ragwitz**

*Promotion of Renewable Energies – costly or innovative?*

► IEA Renewable Energy Working Party, Workshop Renewables – from Cinderella options to mainstream energy solution, Paris, France

*Developments of EU RES-Policy – Best Practices and Lessons Learnt*

► Renewables – Competitiveness and Innovation Workshop on the Occasion of the Official IITC Inauguration, Bonn

*Ideas for RES support scheme reform*

► Member State meeting in support schemes for renewable energy, Brussels, Belgium

#### **Thomas Reiß**

*Synthetische Biologie: Status-quo und Perspektiven*

► PTJ Fachgespräch Synthetische Biologie, Berlin

*Policy Issues raised by Convergence*

► OECD CSTP Thematic discussion on Technology Convergence – Challenges and Opportunities and the Policy Response, Paris, France

*Emerging Industries – Opportunities for European Competitiveness and Innovation*

► Boosting Innovation in Central Europe, Stuttgart

#### **Christian Sartorius**

*Phosphorus recovery from wastewater – state of the art and future potential*

► Konferenz Nutrient Recovery and Management – Inside and Outside the Fence, Miami, USA

*Technologievorausschau und Zukunftschancen durch die Entwicklung von Phosphorrecycling-technologien in Deutschland*

► Schlusspräsentation der Förderinitiative Kreislaufwirtschaft für Pflanzennährstoffe, insbesondere Phosphor, Berlin

*Lead market potential of phosphorus recycling technologies in Germany*

► Deutsch-Chinesische Konferenz zu Technischen Innovationen und Management Innovation for Green Growth, Beijing, China

#### **Wolfgang Schade**

*Welchen Beitrag kann das Verkehrssystem zum Klimaschutz leisten?*

► Zukunftsforschung für eine nutzerorientierte Verkehrsplanung, veranstaltet vom Netzwerk Zukunftsforschung und der Deutschen Verkehrswissenschaftlichen Gesellschaft (DVWG), Berlin

*Verkehr und Mobilität – Gibt es einen Systemwechsel in der Mobilität?*

► Urbanität Stad(t) Öl, veranstaltet durch die Petra-Kelly-Stiftung, Nuremberg

*Megatrends and customer challenges in Asia Pacific – Key Note Speech*

► Schaeffler Asia Pacific Innovation Days 2011, Shanghai, China

#### **Hans-Dieter Schat**

*Demographieorientierte Personalmaßnahmen und Innovation in produzierenden Betrieben*

► Frühjahrskonferenz der Gesellschaft für Arbeitswissenschaft, Chemnitz

*Exzellentes Demographie-Management*

► 1. Wirtschaftswissenschaftliches Forum, Essen

*Ältere Fachkräfte beschäftigen*

► Stuttgarter Gespräche

#### **Elna Schirrmeister**

*Szenario-Methode: Varianten der workshopbasierten Annahmen-Entwicklung*

► 7. Symposium für Vorausschau und Technologieplanung, Berlin

#### **Joachim Schleich**

*Smart metering in Germany – Results of providing feedback information in a field experiment*

► International Association for Energy Economists (IAEE), 34<sup>th</sup> International Conference, Stockholm, Sweden

*Energy Efficient Appliance Choice under the EU Labelling Scheme*

► European Association of Environmental and Resource Economists (EAERE), 18<sup>th</sup> Annual Conference, Rome, Italy

*Why do retailers comply with the EU energy labelling program*

► European Council for Energy-Efficient Economy Presqu'île de Giens, France

#### **Barbara Schlomann**

*Energie- und Klimaziele 2020 – sind wir auf dem richtigen Weg?*

► Berliner Energietage 2011

# PRESENTATIONS | PROJECTS

*The labelling of domestic appliances: what lessons can be applied to tires*

- ▶ Challenge Bibendum, Berlin

*Energy Saving Potentials and their Contribution to Energy efficiency targets in the European Union up to 2050*

- ▶ Building Technology Lecture Series am MIT Cambridge, USA

## **Ulrich Schmoch**

*The Growth of Science and Database Coverage*

- ▶ 13<sup>th</sup> Conference of the International Society for Scientometrics and Informetrics (ISSI) Durban, South Africa

*Experiences on use of innovation survey findings in policy discourse with reference to the German experience*

- ▶ The review of innovation measurement in South Africa, Pretoria, South Africa

## **Esther Schricke**

*Developing new roles for higher education institutions in structurally-fragmented regional innovation systems*

- ▶ 6<sup>th</sup> International Seminar on Regional Innovation Policy, Lund, Sweden

*Spatial dimension of innovation cooperation in clusters of optical technologies*

- ▶ Humboldt-Kolleg, Istanbul, Turkey

*Regional patterns of Knowledge-intensive Services: A European perspective*

- ▶ evoREG Workshop Rethinking regional innovation policies and tools, Strasbourg, France

## **Marcus Schröter**

*Energy Efficiency in the German Manufacturing Industries – Dream or Reality*

- ▶ Baden-Württemberg – The German Southwest: Driving Force & Trendsetter for Energy Efficiency in Research & Production Technologies in Germany, Taichung, Taiwan

*Servicemärkte im Ausland systematisch erschließen*

- ▶ Bund-Länder Ausschuss Dienstleistungswirtschaft, Berlin

*Relevanz der Produktionsphase für eine ressourceneffiziente Produktgestaltung*

- ▶ Praxisdialog Ressourcen- und materialeffiziente Produktgestaltung im BMWi, Berlin

## **Torben Schubert**

*The Impact of Cooperation with Public Science on Entrepreneurial Success with Innovations – A Comparison of France and Germany*

- ▶ 2<sup>nd</sup> ZEW Conference on Patenting and Innovation, Mannheim

*Testing Restrictions in Production Analysis: An Empirical Application*

- ▶ Statistics and Econometrics Seminar, University of Leuven, Belgium

*Skalen- und Agglomerations-effekte in der Wissenschaft*

- ▶ Hochschulpolitischer Gesprächskreis, Dortmund

## **Jana Schuhmacher**

*Wissenschaftskultur im Wandel? Die Rolle von Open Access im digitalen Zeitalter*

- ▶ III. Tagung Technik und Kultur – Digitalisierung und Bewahrung des digitalen kulturellen Erbes, Karlsruhe

## **Nicole Schulze**

*Bringing the region back in? German Higher Education Institutions (HEIs) between regional engagement and isolated business*

- ▶ 6<sup>th</sup> ECPR General Conference, Reykjavik, Iceland

## **Ralph Seitz**

*Akteursanalyse von innovativen Technologien für Ressourceneffizienz*

- ▶ IHK, Nuremberg

## **Frank Sensfuß**

*Markt- und Flexibilitätsprämie: Der Einstieg in die bedarfsgerechte Erzeugung*

- ▶ Tag der nachwachsenden Rohstoffe (Bayrischer Bauernverband), Herrsching

*Direktvermarktung: Gleitende Marktprämie*

- ▶ Eineinhalb Jahre EEG-Strom an der Börse (Bundesnetzagentur, EPEXSPOT), Berlin

*Price effects of renewable electricity generation and its consequences for renewable support schemes*

- ▶ Florence School of Regulation Florence, Italy

## **Oliver Som**

*The Impact of the Crisis on the German SME Sector – Survey Results*

- ▶ Partnership Workshop on SMEs after the Crisis. Challenges and Consequences for the Recovery Period. In collaboration with COST Action IS0902: Systemic Risks, Financial Crises and Credit, Brussels, Belgium

## **Thomas Stahlecker**

*Clusterbildung auf dem Birkelareal*

- ▶ Workshop Funktionale und bauliche Lösungsmöglichkeiten für die zukünftige Entwicklung des Gewerbegebiets Birkelareal, Weinstadt

*Automobilzulieferer in der Sackgasse? Innovationsbezogene Perspektiven und Strategien für zukünftige Entwicklungen in Baden-Württemberg*

- ▶ Geographisches Kolloquium der RWTH Aachen, Aachen

*Branchen und Technologiepotenziale in der TechnologieRegion Karlsruhe*

- ▶ Sitzung der Regionalkonferenz der TRK Karlsruhe, Karlsruhe

## **Luis Tercero Espinoza**

*Critical raw materials for the EU*

- ▶ 5<sup>th</sup> International Conference Sustainable development in the minerals industry, Aachen

*Rohstoffe für Zukunftstechnologien*

- ▶ Berliner Recycling- und Rohstoffkonferenz, Berlin

## **Axel Thielmann**

*LIB2015 – Roadmapping*

- ▶ Innovationsallianz LIB2015, Ulm

*Technologie-Roadmap Lithium-Ionen-Batterien 2030*

- ▶ VDMA, Batterieproduktion im Forum E-Motive, Frankfurt a. M.

*Lithium-Ion Battery Roadmap for Electric Mobility – Trends, Markets, Policies*

- ▶ Productronica 2011, Innovation Forum, Munich

## **Ute Weißfloch**

*Dealing with conflicting targets by using group decision making within promethee*

- ▶ OR 2011, Zurich, Switzerland

## **Marion Weissenberger Eibl**

*Chancen und Risiken strategischer Rohstoffe*

- ▶ Elektrizitätswerke des Kantons Zürich, Zurich, Switzerland

*Innovationsmanagement muss nachhaltig sein*

- ▶ Unternehmertreff des Zentrums Europäischer Netzwerke für Innovation und Technologie ZENIT e.V., Mülheim a. d. Ruhr

*Innovative KMU und kreatives Handwerk – tragende Säule der deutschen Wirtschaft*

- ▶ Verleihung des Innovationspreises der Stiftung zur Förderung innovativer Leistungen im Handwerk, Reutlingen

## **Martin Wietschel**

*Haben wir ein Speicherproblem?*

- ▶ Die Speicherfrage – Stolperstein für die Energiewende? Fachgespräch der Bundestagsfraktion Bündnis 90/Grünen, Berlin

*Übersicht Elektromobilität – aktueller Stand und Technologieentwicklung*

- ▶ E-Mobility, Managerakademie, Frankfurt a. M.

*Ganzheitliche Bewertung der Elektromobilität*

- ▶ Kongress Forum E-Mobilität, Berlin

## **Sven Wydra**

*Policy measures for bio-based-products in Germany*

- ▶ 7<sup>th</sup> International Conference on Renewable Resources and Biorefineries, Bruges, Belgium

*Assistive technologies in nursing and health care: Cost factor and/or economic driver?*

- ▶ 71<sup>st</sup> International Atlantic Economic Conference, Athens, Greece

*Innovation and industrial policy for key enabling technologies in Europe*

▶ 3<sup>rd</sup> European Conference on Corporate R&D and Innovation Concord-2011, Seville, Spain

#### **Andrea Zenker**

*Investigating KIBS: Towards a new research agenda?*

▶ Conference Exploring Knowledge Intensive Business Services. Entrepreneurship, business models and knowledge management strategies, University of Padua, Padua, Italy

*Creativity and innovation in the Upper Rhine region. Concepts, activities and projects*

▶ PAMINA Developers Club, 27<sup>th</sup> Plenary Meeting, Baden-Baden

*Regional patterns of Knowledge-intensive Services: A European perspective*

▶ evoREG Workshop Rethinking regional innovation policies and tools, Strasbourg, France

## **ENERGY POLICY AND ENERGY SYSTEMS**

### **PROJECTS AND CONTACT PERSONS**

• Egypt Energy Master Plan: Consultancy Services for a Combined Renewable Energy Master Plan for Egypt  
**Inga Boie**

• Energieeffiziente Schule: Sozialwissenschaftliche Begleitforschung zum Projekt Energieeffiziente Schule der EnBW  
**Harald Bradke**

• 30 Pilot-Netzwerke: Lernende Energieeffizienz- und Klimaschutz-Netzwerke  
30 Pilot-Netzwerke und Entwicklung von Investitionsberechnungshilfen  
**Harald Bradke**

• EMPLOY\_RES D: Kurz- und langfristige Auswirkungen des Ausbaus der Erneuerbaren Energien auf den deutschen Arbeitsmarkt  
**Barbara Breitschopf**

• MAP 135: Einzel- und gesamtwirtschaftliche Analyse von Kosten- und Nutzenwirkungen des Ausbaus der Erneuerbaren Energien im Strom- und Wärmemarkt  
**Barbara Breitschopf**

• EEWärmeG: Vorbereitung und Begleitung bei der Erstellung eines Erfahrungsberichtes gemäß § 18 Erneuerbare-Energien-Wärmegesetz  
**Barbara Breitschopf**

• EID-EMPLOY: Economic and Industrial Development  
**Barbara Breitschopf**

• Klimaregime 2012 – IV: Ausgestaltung des neuen Klimaschutzabkommens: Analyse der und Vorschläge für Verpflichtungen der Industriestaaten  
**Vicki Duscha**

• Klimaregime 2012 – VI: Emissionsminderung in Industriestaaten und Entwicklungsländern – Kosten, Potenziale und ökologische Wirksamkeit  
**Vicki Duscha**

• NEARCO<sub>2</sub>: New participation and communication strategies for neighbours of CO<sub>2</sub> Capture and Storage Operations  
**Elisabeth Dütschke**

• Modellregionen: Sozialwissenschaftliche Begleitung der Modellregionen  
**Elisabeth Dütschke**

• Modellregionen II: Plattform Sozialwissenschaften  
**Elisabeth Dütschke**

• EuPlastVoltage: Plastics Converting Industry Long-term Agreement on Energy Efficiency  
**Wolfgang Eichhammer**

• ODYSSEE MURE 2010: Monitoring of EU and national energy efficiency targets  
**Wolfgang Eichhammer**

• Projektionsbericht 2011: Verbesserung der methodischen Grundlagen und Erstellung eines Treibhausgasemissionsszenarios als Grundlage für den Projektionsbericht 2011 im Rahmen des EU-Treibhausgasmonitorings  
**Wolfgang Eichhammer**

• EC ECCP ESD: Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community-wide measures Reference  
**Wolfgang Eichhammer**

• BMU EU Energy Roadmap: Wissenschaftliche Unterstützung bei der Erarbeitung von Vorschlägen für eine EU-Energy-Roadmap  
**Wolfgang Eichhammer**

• BMU Energiekonzept: Wissenschaftliche Unterstützungsleistungen bei der weiteren Ausgestaltung und Umsetzung des Energiekonzepts der Bundesregierung  
**Wolfgang Eichhammer**

• IIP Steel: Best Practices in Energy Efficient Industrial Technologies  
**Wolfgang Eichhammer**

• NEEAP 2 Luxemburg: Erstellung des 2. Nationalen Energieeffizienzplans für Luxemburg im Rahmen der Umsetzung der Richtlinie 2006/32/EG über Endenergieeffizienz und Energiedienstleistungen  
**Wolfgang Eichhammer**

• ETS BM Guidance II: Service contract to support the Commission and Member States in applying the benchmarks to production data in the Member States in the context of the Emissions Trading Scheme  
**Wolfgang Eichhammer**

• Klimaszenario 2050: Klimaschutzenszenario 2050  
**Wolfgang Eichhammer**

• Energiepolitik & -effizienz: Energiepolitik und Energieeffizienz (EPEE)  
**Wolfgang Eichhammer**

• SEF BW Speicher: Verbesserte EE-Integration durch Speicher/ Vergleichende Analyse mittelfristiger Kraftwerks- und Stromspeicheroptionen zur verbesserten Integration Erneuerbarer Energien mit agentenbasierter Strommarkt-simulation  
**Fabio Genoese**

• NOW-Wind-Wasserstoff-Studie  
**Fabio Genoese**

• SUSPLAN: Integration of Renewables into Infrastructures  
**Marian Klobasa**

• Intellekon: Nachhaltiger Energiekonsum von Tarifkunden durch intelligente Zähler-, Kommunikations- und Tarifsysteme  
**Marian Klobasa**

• KWK-NRW: Studie zur Potenzialhebung von Kraft-Wärme-Kopplung in Nordrhein-Westfalen  
**Marian Klobasa**

• EnArgus: Zentrales Informationssystem Energieforschungsförderung  
**Patrick Plötz**

• Branchenreport Elektromobilität in Deutschland für ausländische/österreichische Unternehmen  
**Patrick Plötz**

• RES-H Policy: Policy development for improving RES-H/RES-C penetration in European Member States  
**Mario Ragwitz**

• REPAP2020: Renewable Energy Policy Action Paving the Way towards 2020  
**Mario Ragwitz**

• RE-SHAPING: Shaping an effective and efficient European renewable energy market  
**Mario Ragwitz**

# PROJECTS

- Flex-Mech-BMU: Wissenschaftliche Begleitung und Unterstützung der Umsetzung der flexiblen Mechanismen der Zielerreichung im Rahmen der EU-Richtlinie für Erneuerbare Energien

**Mario Ragwitz**

- Wärme- und Kältestrategie: Erarbeitung einer integrierten Wärme- und Kältestrategie für das BMU

**Mario Ragwitz**

- CSP-Manufact: Mena Region Assessment of the local manufacturing potential for Concentrated Solar Power (CSP) Projects

**Mario Ragwitz**

- Beyond 2020: Design & impact of a harmonised policy for RES(E) in Europe

**Mario Ragwitz**

- RES Pathways: Definition of Pathways, Potentials and Policy Support Schemes of Renewable Energy Technologies in the EU

**Mario Ragwitz**

- PROGRESS-II: Support activities for assessment of progress in renewable energy and sustainability of biofuels

**Mario Ragwitz**

- LUX EEG: Wissenschaftliche Beratung Luxemburgs zur Ausgestaltung der Förderinstrumente für Erneuerbare Energien im Strom- und Wärmesektor

**Mario Ragwitz**

- Dii-DESERTEC EUMENA: Model based analysis of the impact of desert power on the EUMENA electricity markets

**Mario Ragwitz**

- Feed-in Coop III: Wissenschaftliche Begleitung und Unterstützung der International Feed-in Cooperation (IFIC)

**Mario Ragwitz**

- SuperGrid: Komponenten und Systeme zur Gleichspannungskopplung von Erzeugern, Speichern und Verbrauchern im europäisch-afrikanischen Netzverbund

**Mario Ragwitz**

- RESPONSES: European responses to climate change: deep emissions reductions and mainstreaming of mitigation and adaptation

**Kristin Reichardt**

- DG CLIMA: Climate change mitigation by changing behaviour and consumption patterns

**Clemens Rohde**

- BMF Steuerbegünstigungen: Untersuchung des Energieeinsparungspotenzials für das Nachfolgemodell ab dem Jahr 2013 zu den Steuerbegünstigungen für Unternehmen des produzierenden Gewerbes sowie der Land- und Forstwirtschaft bei der Energie- und Stromsteuer

**Clemens Rohde**

- Anwendungsbilanzen 2009–2012: Erstellung von Anwendungsenergiebilanzen für das Verarbeitende Gewerbe

**Clemens Rohde**

- IIP Glass: Best Practices in Energy Efficient Industrial Technologies (Glass Industry)

**Clemens Rohde**

- IIP Paper: Best Practices in Energy Efficient Industrial Technologies (Pulp and Paper Industry)

**Clemens Rohde**

- NAP IV: Weiterentwicklung des EU-Emissionshandels nach 2012

**Joachim Schleich**

- ETSupstream: Ausweitung des Emissionshandels auf neue Sektoren und Kleinemittenten (z. B. Gebäudebereich) – Potenziale, Ausgestaltung, Verbindung mit dem internationalen Klimaregime

**Joachim Schleich**

- Smart Metering: Technik und Potenziale von intelligenten Zähl-, Mess- und Kommunikationssystemen zur Energieeinsparung und Effizienzsteigerung

**Barbara Schlomann**

- NKI Begleitforschung: Wissenschaftliche Begleitforschung zu übergreifenden technischen, ökologischen, ökonomischen und strategischen Aspekten des nationalen Teils der Klimaschutzinitiative

**Barbara Schlomann**

- GHD-Erhebung 2007–2010: Energieverbrauch des Sektors Gewerbe, Handel, Dienstleistungen (GHD) in Deutschland für die Jahre 2007–2010

**Barbara Schlomann**

- NEEAP 2 Deutschland: Berechnung von Endenergieeinsparungen in Deutschland zur Vorbereitung des zweiten nationalen Energieeffizienz-Aktionsplans

**Barbara Schlomann**

- Kosten-/Nutzen-Analyse der Einführung einer Energieeinsparquote bzw. ähnlicher Instrumente zur Realisierung von Endenergieeinsparungen in Deutschland

**Barbara Schlomann**

- Endenergieverbrauch 2008: Entwicklung einer detaillierten Datenbasis für den Endenergieverbrauch 2008 zur Bewertung von Energieeinsparung

**Barbara Schlomann**

- KfW Weisse-Zertifikate: Zertifikatebasierte Klimaschutzinstrumente in Deutschland

**Barbara Schlomann**

- EU-ETS 5: Evaluierung und Weiterentwicklung des EU-Emissionshandels

**Barbara Schlomann**

- BMU Langfristszenarien: EU-Energieszenario 2050 im Lichte der deutschen Ziele für Erneuerbare Energien

**Frank Sensfuß**

- EEG Erfahrungsbericht IV: Instrumentelle und rechtliche Weiterentwicklung im EEG (Vorhaben IV)

**Frank Sensfuß**

- PowerACE-KWK: Kombinierte Modellierung der Strom- und Wärmeversorgung

**Frank Sensfuß**

- EE-Wärme-Quote: Fachliche und juristische Unterstützungsleistungen zur Prüfung eines neuen Instruments für erneuerbare Wärme in Umsetzung des Energiekonzepts vom 28.09.2010

**Jan Steinbach**

- Elektromobilität: Integration Erneuerbarer Energien durch Elektromobilität

**Martin Wietschel**

- FSEM-SP4: Technische Systemintegration, gesellschaftliche Fragestellungen und Projektmanagement

**Martin Wietschel**

- FSEM-SP2: Energieerzeugung, -verteilung und umsetzung

**Martin Wietschel**

- MeRegioMobil: Teilvorhaben Geschäftsmodelle und Evaluation von Steuerungsoptionen

**Martin Wietschel**

- TREMOD: Überleitung der Ergebnisse aus GermanHy in das Emissionsrechenmodell TREMOD

**Martin Wietschel**

- REM2030: Regional eco mobility 2030

**Martin Wietschel**

- Energienachfrageprognose: Weiterentwicklung der Energienachfrageprognose für die EU27 + Norwegen, Schweiz, Türkei und Balkan

**Martin Wietschel**

- Alpiq Stromnachfrage: Modellgestützte Stromnachfrage-Perspektiven in Europa

**Martin Wietschel**

- EnBW Elektromobilität: Wir machen Baden-Württemberg E-mobil

**Martin Wietschel**

- KIC InnoEnergy: Knowledge & Innovation Community

**Martin Wietschel**

- FSEM-SP3-TPC: Grundlegende Untersuchungen zur Test- und Prüfmethodik von Batterien für Fahrzeuganwendungen

**Martin Wietschel**

- Biowasserstoff: Evaluierung der Verfahren und Technologien für die Bereitstellung von Wasserstoff auf Basis von Biomasse

**Martin Wietschel**

- EnBW Stromnachfrage: Analyse der Entwicklung der Stromnachfrage im Haushaltssektor  
**Martin Wietschel**

- Helmholtz Energieszenarien  
**Martin Wietschel**

- Kaufpotenzial für Elektrofahrzeuge bei sogenannten early adopters  
**Martin Wietschel**

- Rittal Speicher: Speichertechnologien und Schaltschranksysteme im SmartGrid  
**Martin Wietschel**

- Alpiq Wärmemarkt Schweiz: Energienachfrage Wärmemarkt und dezentrale Erzeugung mittels Wärmekraftkopplung (WKK) in der Schweiz  
**Martin Wietschel**

- Energiespeicher: Speicherstadt/ Der hybride Stadtspeicher – Integration Erneuerbarer Energien, verlustarme Energieverteilung und effiziente Energienutzung durch hybride Ortsnetzspeichersysteme  
**Martin Wietschel**

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## INDUSTRIAL AND SERVICE INNOVATIONS

### PROJECTS AND CONTACT PERSONS

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- CS-EDA-WP1: CS-EDA-WP1 ALTREQ (CLEANSKY – Joint Technology Initiative for Aeronautics & Air Transport)  
**Esther Bollhöfer**

- DyWaMed: Entwicklung eines simulationsgestützten Werkzeugs zur dynamischen Steuerung der Wandlungsfähigkeit integrierter Wertschöpfungsketten in der Medizintechnik (DyWaMed)  
**Steffen Kinkel**

- VITNESS: Veränderungsbereitschaft und interne sowie externe Flexibilität mit nachhaltigen EFQMplus-Konzepten stabilisieren und strategisch in den Geschäftsprozessen implementieren  
**Steffen Kinkel**

- EPISIS Transfer DL-Forschung: Durchführung einer Erhebung zum Transfer aus der Dienstleistungsforschung in 13 europäischen Ländern  
**Oliver Kleine**

- Transferprojekt Mechatronik: Entwicklung von Transfermechanismen für die effiziente und nachhaltige Verbreitung von Forschungsergebnissen in die industrielle Praxis am Beispiel Mechatronik (TPM)  
**Gunter Lay**

- DEMAT: Dematerialised Manufacturing Systems: A new way to design, build, use and sell European Machine Tools  
**Marcus Schröter**

- Effizienzfabrik Verbundprojekt: Innovationsplattform Ressourceneffizienz in der Produktion, Teilprojekt Fraunhofer ISI: Zielgruppenspezifische Aufbereitung und Bündelung der Projektergebnisse sowie Umfeldbeobachtung  
**Marcus Schröter**

- EnEffAH: Energieeffizienz in der Produktion im Bereich Antriebs- und Handhabungstechnik (EnEffAH), Teilprojekt Erarbeitung von Methoden und Strategien  
**Marcus Schröter**

- CR2011: Convergence of knowledge intensive sectors and the EU's external competitiveness  
**Marcus Schröter**

- Matff: Materialeffizienz in der Produktion  
**Marcus Schröter**

- INNO-GRIPS-Lot 2: Economic and market intelligence on innovation  
**Oliver Som**

- Low2High Verbundvorhaben: Innovationsmanagement für Lowtech-Hightech-Kooperationen (Low2High), Teilvorhaben Wissenschaftliche Begleitung  
**Oliver Som**

- INPROWID: Entwicklung und Erprobung eines innovationsorientierten Produktivitätsmesskonzepts für wissensintensive Dienstleister  
**Christoph Zanker**

- Balanced-GPS Verbundvorhaben: Balanced GPS – Fraunhofer ISI Teilprojekt wissenschaftliche Konzeptentwicklung, Begleitung und Transfer  
**Christoph Zanker**

- Zukunft-AI: Innovationsreport Zukunft der Automobilindustrie  
**Christoph Zanker**

- SIMPRO-KMU: Entwicklung eines simulationsbasierten Konzepts zur systematischen und vorausschauenden Prozessmodernisierung in KMU  
**Christoph Zanker**

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## INNOVATION AND TECHNOLOGY MANAGEMENT AND FORESIGHT

### PROJECTS AND CONTACT PERSONS

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- SIRA: Sicherheit im öffentlichen Raum  
**Antje Bierwisch**

- ETCETERA: Evaluation of critical and emerging technologies for the elaboration of a security research agenda  
**Antje Bierwisch**

- For-MOSTAF: Services of international expert group for developing a methodology, delivering training and consultancy aimed at prognostic evaluation (Foresight) of Lithuanian research and higher education system  
**Kerstin Cuhls**

- ESF Medical Research: Foresight Training for the European Science Foundation  
**Kerstin Cuhls**

- ESF Science in Society  
**Kerstin Cuhls**

- Foresight-Verlaufssystem: Konzeptionelle Entwicklung und Implementierung eines Verlaufsystems zum Foresight-Prozess des BMBF  
**Kerstin Cuhls**

- ESF TECHBREAK: Forward Look on technological breakthroughs for scientific progress  
**Kerstin Cuhls**

- ESF Personalized Medicine  
**Kerstin Cuhls**

- NachhaltigkeitsLivingLab: Nachhaltigkeitsinnovationen in LivingLabs – Potenzialanalyse einer deutschen Forschungsinfrastruktur zur interaktiven Entwicklung ressourceneffizienter, umweltschonender und sozial verträglicher Produkte und Dienstleistungen  
**Lorenz Erdmann**

- RIF Gesamt: Research and innovation futures for Europe 2030: Emerging Constellations and Scenarios of doing and organising Research, Technology Development and Innovation  
**Lorenz Erdmann**

- Potenziale der Nanoelektronik in Deutschland  
**Rolf Gausepohl**

- BTR: Betriebliche Anwendung des Technology Roadmapping, Projekte für diverse Unternehmen mit Aktivität in Zukunftsbranchen  
**Ralf Isenmann**

- WM@Bosch II: Wissensmanagement  
**Daniel Jeffrey Koch**

- WM@Bosch III: Wissenschaftliche Unterstützung der systemischen Planung, Ausarbeitung und Umsetzung von Enterprise 2.0 für die wissensbasierte Produktentwicklung bei der Robert Bosch GmbH  
**Daniel Jeffrey Koch**



# PROJECTS

- InnoTALK: Innovación y Tecnología en América Latina y el Caribe

**Daniel Jeffrey Koch**

- VDA: Gesamtkostenrechnung TCO

**Daniel Jeffrey Koch**

- CVC Innovation: Workshopreihe Innovations- und Technologiemanagement

**Daniel Jeffrey Koch**

- Fraunhofer 2025: Szenario Fraunhofer 2025

**Elna Schirrmeister**

- Risk2Return: Entwicklung und Erprobung einer Methodik zur Generierung und Identifizierung von High-Risk-High-Return-Forschungsprojekten im Material-Kontext

**Elna Schirrmeister**

- Visioning Workshop: Visioning Workshop für Nachwuchswissenschaftler

**Elna Schirrmeister**

- Surface Technology Roadmap: Generation of a technology roadmap for Surfaces & Skins

**Ralph Seitz**

- Surface Technology Integration Roadmap: Roadmap Integration (product and technology) for Surfaces & Skins

**Ralph Seitz**

- Roadmap Bio-Materials: Technology Roadmapping for Bio-Materials

**Ralph Seitz**

- Strategy for Bio-Materials: Strategy Development for Bio-Materials

**Ralph Seitz**

- Allianz Vision Modul 1: Strategieentwicklung für die Allianz Vision Modul 1

**Ralph Seitz**

- Molecular Sorting: Scenarios and validation of technologies for molecular sorting

**Ralph Seitz**

- Rumänien foresight support: Quality and Leadership in Higher Education

**Philine Warnke**

- INFU Gesamt: INFU – Innovation Futures in Europe: A Foresight Exercise on emerging Patterns of Innovation. Visions, Scenarios and Implications for Policy and Practice

**Philine Warnke**

- BaSiD Verbundprojekt: Barometer Sicherheit in Deutschland – Ein Monitoring zum Thema Sicherheit in Deutschland (BaSiD), Teilvorhaben Interaktive Technikgestaltung – Sicherheit

**Philine Warnke**

- SIFO-Dialog: Fachdialog Sicherheitsforschung, unterstützende Stelle

**Peter Zoche**

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## SUSTAINABILITY AND INFRASTRUCTURE SYSTEMS

### PROJECTS AND CONTACT PERSONS

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- WEATHER: Weather Extremes: Assessment of impacts on Transport Systems and Hazards for European Regions

**Claus Doll**

- Wirtschaftliche Aspekte nichttechnischer Maßnahmen zur Emissionsminderung im Verkehr

**Claus Doll**

- Schätzung externer Umweltkosten und Vorschläge zur Kosteninternalisierung in ausgewählten Politikfeldern

**Claus Doll**

- Study on the effects of the introduction of LHVs on combined road-rail transport and single wagon load rail freight traffic

**Claus Doll**

- Reducing railway noise pollution

**Claus Doll**

- Innovationsreport: Die Versorgung der deutschen Wirtschaft mit Roh- und Werkstoffen für Hochtechnologien – Präzisierung und Weiterentwicklung der deutschen Rohstoffstrategie

**Carsten Gandenberger**

- NRW-NAUWA: Nachhaltige Weiterentwicklung urbaner Wasserinfrastrukturen unter sich stark ändernden Randbedingungen

**Thomas Hillenbrand**

- Prio IV: Leitlinie für die Bestandsaufnahme gefährlicher Stoffe

**Thomas Hillenbrand**

- z\*dez: Zentraler Betrieb dezentraler Anlagen – Umsetzung eines innovativen Organisationskonzepts zur Abwasserentsorgung mittels Kläranlagen in Baden-Württemberg

**Thomas Hillenbrand**

- Konzeptstudie Bochum: Innovatives Wasserinfrastrukturkonzept für das geplante Neubaugebiet Havkenscheider Feld / Feldmark

**Thomas Hillenbrand**

- Wasserbedarf: Charakteristika des Wasserbedarfs von Nichthaushaltskunden

**Thomas Hillenbrand**

- inWasif: Zukunftsfähiges integriertes Wasserinfrastruktur- und Nutzungskonzept für Stadtquartiere

**Thomas Hillenbrand**

- HAPPI: Small Hydropower Plants: Assessment of Climate Protection Potential and Improvement by Smart Technologies

**Stefan Klug**

- Smart Cities Stakeholder Platform

**Stefan Klug**

- PACT: Pathways for Carbon Transitions

**Jonathan Köhler**

- GLOBIS: Globalisation Informed by Sustainable Development

**Jonathan Köhler**

- Market-up: Market uptake of transport research and role of actors and regions

**Jonathan Köhler**

- Fallstudie bezüglich der Ausgestaltung und Anwendung eines marktbasierenden Instrumentes zur Reduktion von Treibhausgas-Emissionen in der internationalen Seeschifffahrt

**Jonathan Köhler**

- Vermeidung von nachteiligen Effekten einer regionalen marktbasierenden Maßnahme in der Seeschifffahrt

**Jonathan Köhler**

- ASSIST: Assessing the social and economic impacts of past and future sustainable transport policy

**Michael Krail**

- Prioritäre Stoffe III: Prioritäre Stoffe der Wasserrahmenrichtlinie – europäische Regelung und nationales Maßnahmenprogramm

**Frank Marscheider-Weidemann**

- COHIBA: Control of hazardous substances in the Baltic Sea Region

**Frank Marscheider-Weidemann**

- STROM-MORE: Recycling von Komponenten und strategischen Metallen aus elektrischen Fahr- antrieben

**Frank Marscheider-Weidemann**

- IKU: Innovationspreis für Klima und Umwelt

**Frank Marscheider-Weidemann**

- Produktverantwortung: Weiterentwicklung der abfallwirtschaftlichen Produktverantwortung unter Ressourcenschutzaspekten am Beispiel von Elektro- und Elektronikgeräten

**Frank Marscheider-Weidemann**

- ProLignocel – Neue nachhaltige Prozesse zur ganzheitlichen Verwertung und Materialentwicklung aus Lignocellulose

**Frank Marscheider-Weidemann**

- CapChemRU 2: Dialogue among stakeholders

**Eve Menger-Krug**

- Modernisierungsstrategie für die Deutsche Wasserwirtschaft – Maßnahmen zur Stärkung der Präsenz der deutschen Wasserwirtschaft auf internationalen Märkten für Wasserdienstleistungen

**Jutta Niederste-Hollenberg**

- PRYM-Park II: PRYM-Park Düren – Lebensphasen Wohnen

**Jutta Niederste-Hollenberg**

- Cleantech CH: Optimierung der Wertschöpfungskette Forschung-Innovation-Markt im Cleantech-Bereich

**Katrin Ostertag**

- r<sup>2</sup>: Innovative Technologien für Ressourceneffizienz – Integrations- und Transferprojekt

**Katrin Ostertag**

- Modellversuch Flächenhandel: Vorbereitung eines Modellversuchs zum Handel mit Flächenausweisungszertifikaten

**Katrin Ostertag**

- Wirtschaftsfaktor Umweltschutz: Analyse der wirtschaftlichen Bedeutung des Umweltschutzes durch Aktualisierung und Auswertung wichtiger Kenngrößen

**Katrin Ostertag**

- REBOUND: Die soziale Dimension des Rebound-Effekts

**Anja Peters**

- Konzepte der Elektromobilität und deren Bedeutung für Wirtschaft, Gesellschaft und Umwelt

**Anja Peters**

- Phosphorrecycling – Ökologische und wirtschaftliche Bewertung verschiedener Verfahren und Entwicklung eines strategischen Verwertungskonzeptes für Deutschland

**Christian Sartorius**

- NRW-Umwelttechnologiecluster: Bereitstellung eines Clustermanagements für die Entwicklung des Clusters Umwelttechnologien.NRW

**Christian Sartorius**

- Kosten und Nutzen von Anpassungsmaßnahmen an den Klimawandel

**Christian Sartorius**

- Ökologische Modernisierung der Wirtschaft durch eine moderne Umweltpolitik

**Christian Sartorius**

- APRAISE: Assessment of Policy Interrelationships and Impacts on Sustainability in Europe

**Christian Sartorius**

- Economic aspects of sustainable mobility

**Wolfgang Schade**

- EFFINALP: The analysis of economic effects of establishing the traffic management instruments in alpine corridors

**Wolfgang Schade**

- Zukunft der Automobilindustrie

**Wolfgang Schade**

- GHG-TransPoRD: Techno-economic analysis per mode and combined to meet GHG emission reduction targets at time horizon 2020 and beyond

**Wolfgang Schade**

- RENEWABILITY-II: Stoffstromanalyse nachhaltiger Mobilität im Kontext Erneuerbarer Energien

**Wolfgang Schade**

- Szenarien der zukünftigen Magnesium-Nachfrage

**Luis Tercero Espinoza**

- POLINARES: Policy for natural resources

**Luis Tercero Espinoza**

- Development of a global copper flow model

**Luis Tercero Espinoza**

- r<sup>3</sup> – InTra: Innovative Technologien für Ressourceneffizienz – Strategische Metalle und Mineralien

**Luis Tercero Espinoza**

- T-IWARM: Taicang-Integrated Water and Resource Management

**Felix Tettenborn**

- Schutz-TW: Schutz der Trinkwasserversorgung vor Anschlägen mit CBRN-Stoffen – Technik und Strategieentwicklung / Teilvorhaben 5: Sozioökonomische Ansätze zur Bewertung und Kommunikation von Maßnahmen zur Verbesserung der Sicherheit der Wasserversorgung

**Felix Tettenborn**

- Lead-Market-Strategien: First Mover, Early Follower und Late Follower, Teilvorhaben Lead-Market-Strategien und Systemdynamik

**Rainer Walz**

- Systemische Risiken: Analyse der Vulnerabilität von Elektrizitätsversorgungssystemen mit unterschiedlich ausgeprägter Integration Erneuerbarer Energien

**Rainer Walz**

- Arbeitsplatzeffekte CH: Volkswirtschaftliche Bedeutung Erneuerbarer Energien in der Schweiz

**Rainer Walz**

- Strategie Nachhaltigkeit: Strategie zur Umsetzung des Leitbilds Nachhaltige Entwicklung in der Fraunhofer-Gesellschaft

**Rainer Walz**

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## EMERGING TECHNOLOGIES

### PROJECTS AND CONTACT PERSONS

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- TAB Infogesellschaft: Gesetzliche Regelungen für den Zugang zur Informationsgesellschaft

**Bernd Beckert**

- KIT-Kulturelles Erbe digital: Beteiligung an der Gründung eines Karlsruher Kompetenzzentrums (KIT-Projekt)

**Bernd Beckert**

- ESF Forward Look: Begleitung von Forward look gene environment interaction in chronic diseases

**Bernd Beckert**

- STOA E-Democracy: E-public, E-participation and E-voting in Europe. Consulting project for the European Parliament

**Bernd Beckert**

- IPTS IPHS: Integrated personal health systems – country study Germany

**Tanja Bratan**

- TAB Gesundheitswesen: Technischer Fortschritt im Gesundheitswesen

**Tanja Bratan, Thomas Reiß**

- EVITA: E-safety vehicle intrusion protected application

**Michael Friedewald**

- PRESCIENT: Privacy and Emerging Sciences and Technologies

**Michael Friedewald**

- LiSS: Living in a Surveillance Society

**Michael Friedewald**

- Open Research: Boosting the exploratory power of open research in future and emerging technologies

**Michael Friedewald, Bernd Beckert**

- SAPIENT: Supporting fundamental rights, privacy and ethics in surveillance technologies

**Michael Friedewald**

- IT2Green: Evaluation, wissenschaftliche Begleitung und Ergebnistransfer der Maßnahme IT2Green – Energieeffiziente IKT für den Mittelstand, Verwaltung und Wohnen

**Michael Friedewald, Bernd Beckert**

- TRi-Gen: Translational research in genomic medicine, Institutional and social aspects

**Bärbel Hüsing**

- Ersatzmethoden zum Tierversuch: Evaluation des Förderschwerpunkts Ersatzmethoden zum Tierversuch

**Bärbel Hüsing**

# PROJECTS

- Zellfreie Bioproduktion, BMBF: Zellfreie Bioproduktion – Etablierung einer Bioproduktionsanlage für die zellfreie Proteinsynthese mit integrierter Energieversorgung – Biomoleküle vom Band  
**Bärbel Hüsing**
  - TAB – Weiße BT: Innovationsreport Weiße Biotechnologie – Stand und Perspektiven der Industriellen Biotechnologie für nachhaltiges Wirtschaften  
**Bärbel Hüsing**
  - Zellfreie Bioproduktion, FhG: Fraunhofer-Systemforschung: Basismodul für die zellfreie Bioproduktion „Die Industriezelle“  
**Bärbel Hüsing**
  - Making Perfect Life, Phase 3: Making Perfect Life – Bioengineering in the 21<sup>st</sup> century  
**Bärbel Hüsing**
  - Personalised Medicine: ESF Forward Look, Personalised medicine for the European citizen  
**Bärbel Hüsing**
  - KKW Wertschöpfung: Die Kultur- und Kreativwirtschaft in der gesamtwirtschaftlichen Wertschöpfung (für BMWi, zusammen mit Prognos AG)  
**Simone Kimpeler**
  - Evaluierung RSA Austria: Evaluierung des BMWF-Programms Research innovation – rapid prototyping studios  
**Simone Kimpeler**
  - ESF-Media: ESF Forward Look Media Studies  
**Simone Kimpeler**
  - IT-Trends BW: IT-Trends und neue Technologien  
**Timo Leimbach**
  - Softwarestudie AT: Die Software- und IT-Dienstleistungsbranche in Österreich  
**Timo Leimbach**
  - Software-Atlas: Atlas der deutschen Software- und IT-Dienstleistungsbranche 2012  
**Timo Leimbach**
  - Software-Studie 2011: Weiterentwicklung des Wettbewerbsindex für die europäische Software- und IT-Dienstleistungsbranche  
**Timo Leimbach**
  - E-Infra: Development of impact measures for e-infrastructures  
**Timo Leimbach**
  - BMWi-Hemmnisse: Analyse von Wachstumshemmnissen kleiner und mittlerer Unternehmen am Beispiel der IT-Branche  
**Timo Leimbach**
  - TAB ePetitionen 2009: Elektronische Petitionen und Modernisierung des Petitionswesens in Europa  
**Ralf Lindner**
  - SF-Policy-Instrumente: Strategiefondsprojekt Forschungsklausur Policy-Analyse am Fraunhofer ISI  
**Ralf Lindner**
  - HuWY: E-participation preparatory action: Hub websites for youth participation  
**Ralf Lindner**
  - MetaForum 2011: MetaForum Innovation im Gesundheitswesen  
**Thomas Reiß**
  - ERACEP: Emerging Research Areas and their Coverage by ERC-supported Projects  
**Thomas Reiß**
  - NANORUCER: Mapping the nanotechnology innovation system of Russia for preparing future cooperations between the EU and Russia  
**Thomas Reiß**
  - ETEPS: European techno-economic policy support network  
**Thomas Reiß**
  - ManETEI: Management of emergent technologies for economic impact  
**Thomas Reiß**
  - EU-RU-NET: Linking R&D strategies, foresights and stimulation of EU-Russia cooperation in nano-electronics technology  
**Thomas Reiß**
  - SynBio-Fallstudien: Synthetische Biologie Fallstudien  
**Thomas Reiß**
  - SynBio-Patentrecherche: Synthetische Biologie Patent-recherche  
**Thomas Reiß**
  - Hightech Los 2: Begleitforschung der Hightech-Strategie – Analyse zu ausgewählten Aspekten. Los 2: Rahmenbedingungen  
**Thomas Reiß**
  - EMOTOR: Energiespeicher-MONITORING für die Elektromobilität  
**Thomas Reiß**
  - NMP-Foresight: Economic foresight study on industrial trends and the research needed to support the competitiveness of European industry around 2025  
**Thomas Reiß**
  - HBS Gesundheitssystem: Analyse des Gesundheitswesens aus Innovationssystemperspektive  
**Thomas Reiß**
  - BioBias: Thematische Schwerpunkt-bildung in den Life Sciences durch systemimmanente Prozesse  
**Thomas Reiß**
  - LIB2015: LIB2015-Roadmapping (Innovationsallianz Lithium Ionen Batterie, BMBF)  
**Axel Thielmann**
  - SF-Nanotechnologie: Strategiefondsprojekt Nanotechnologie  
**Axel Thielmann**
  - LMI-Bio: Analyse des Handlungsbedarfs für das BMWi aus der Leitmarktinitiative (LMI) der EU-Kommission für biobasierte Produkte außerhalb des Energiesektors  
**Sven Wydra**
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- ## POLICY AND REGIONS
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- ## PROJECTS AND CONTACT PERSONS
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- Strat. PATSTAT User-Interface: Strategiefondsprojekt Bereitstellung von PATSTAT für das gesamte Fraunhofer ISI im Jahr 2011 und Konzeptentwicklung eines User-Interface  
**Nadine Bethke**
  - SIS Eval: Interim Evaluation and Assessment of Future Options for Science in Society Actions  
**Susanne Bühner**
  - Karrierebrüche: changing cultures – Unternehmenskulturen verändern. Karrierewege öffnen (vormals: Karrierebrüche: Entwicklung und Verbreitung geeigneter Maßnahmen, um erfolgreiche Frauen in Organisationen zu halten)  
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**Susanne Bühner**
  - Intertrans: Strategiefondsprojekt Internationalisierung von Forschung und Innovation  
**Stephanie Daimer**
  - EFI-Indi2011: Indikatorensystem zur Technologischen Leistungsfähigkeit Deutschlands – Publikationen und Patente  
**Rainer Frietsch**
  - HTS Los 1: Begleitforschung der Hightech-Strategie – Analyse zu ausgewählten Aspekten – Los 1: Ökonomische Analyse der Bedarf-felder der Hightech-Strategie  
**Rainer Frietsch**
  - Kreditrisiko: Strategiefondsprojekt Kreditrisiko und finanzielle Performance von Unternehmen in Abhängigkeit von Innovations-indikatoren: Verknüpfung von Finanzdaten, Patent- und EMS-Daten  
**Rainer Frietsch**

- Innovationsindikator: Innovationsindikator Deutschland  
**Rainer Frietsch, Marion Weissenberger-Eibl**
- EFI-Liste: Erarbeitung einer aktuellen Liste wissens- und technologieintensiver Güter und Wirtschaftszweige  
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- CRIMASS: On the Critical Mass of Public R&D Programmes – A Potential Driver of Joint Programming  
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- Nano: Strategiefondsprojekt Strategie zur Positionierung des Fraunhofer ISI im Bereich der Nanotechnologie  
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- Kreativität und Innovation: Strategiefondsprojekt Kreativität und Innovation  
**Rainer Frietsch**
- Micro-Val: Strategiefondsprojekt Ermittlung des Wertes von Patenten durch Mikrodatenanalysen  
**Rainer Frietsch**
- Strat. Crowdfunding: Strategiefondsprojekt Crowdfunding und andere Formen informeller Mikrofinanzierung in der Projekt- und Innovationsfinanzierung  
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- Strat. Crowdfunding Verwertung: Strategiefondsprojekt Verwertung der Ergebnisse der Crowdfunding-Vorstudie  
**Joachim Hemer**
- LSA III: Wissenschaftliche Begleitung des Sonderprogramms zum Aufbau der Informationsgesellschaft im Land Sachsen-Anhalt  
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- EFI-EuroInno: Analyse der Auswirkungen Europäischer Innovationspolitik auf die Konzeption der deutschen FuE-Politik  
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- Policy-Instrumente: Strategiefondsprojekt Systematisierung von Policy-Instrumenten in der Innovationspolitik  
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- Innovationssystem Agrar: Sektorstudie zur Untersuchung des Innovationssystems der deutschen Landwirtschaft  
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- Strat. Workshop Wissenschaftssystem: Strategiefondsprojekt Vorbereitung und Durchführung eines Workshops zum Thema Bestandsaufnahme des deutschen Forschungs- und Innovationssystems  
**Knut Koschatzky**
- Governance Regional: Regionale Netzwerketeiligungen und ihre Auswirkungen auf die internen Governancestrukturen von Hochschulen – Neue Governance der Wissenschaft – Forschung zum Verhältnis von Wissenschaft, Politik und Gesellschaft, Teil II  
**Knut Koschatzky**
- Heterogene Koop.: Strategiefondsprojekt Heterogene Kooperationen – Strategische Ansatzpunkte zur „Entsäulung“ des deutschen Forschungssystems?  
**Knut Koschatzky**
- Eval-VIP: Begleitende Evaluierung der Fördermaßnahme Validierung des Innovationspotenzials wissenschaftlicher Forschung – VIP  
**Knut Koschatzky, Stephanie Daimer**
- Regional Key Figures: Regional Key Figures of the European Research Area  
**Knut Koschatzky, Thomas Stahlecker**
- Regional Profiling: Development of a methodology for the profiling of regional economies  
**Henning Kroll**
- BJASt TT: Comparative Analysis of Technology Transfer Systems in Germany and the U.S.  
**Henning Kroll**
- EXIST IV: Wissenschaftliche Begleitung und Evaluation des BMWi-Programms Existenzgründungen aus der Wissenschaft (EXIST) – Anschlussauftrag  
**Marianne Kulicke**
- PFI-Monitor: Dienstleistungsauftrag zur Erfassung bibliometrischer Indikatoren für die PFI-Monitoringberichte 2011–2015  
**Ulrich Schmoch**
- Bibliometrie: Aufbau eines bibliometrischen Kompetenzzentrums für die deutsche Wissenschaft – Teilvorhaben Erwartete Zitate und Klassifikationen sowie vollständige Erfassung von Patentanmeldungen aus Universitäten (mit Promotionsförderung)  
**Ulrich Schmoch**
- Geschäftsstelle: Geschäftsstelle der Expertenkommission Forschung und Innovation  
**Ulrich Schmoch**
- InterStrat: Internationalisierungsstrategie  
**Ulrich Schmoch**
- EFI-Entwicklungsperspektiven: Status und Entwicklungsperspektiven der Forschung an Hochschulen  
**Torben Schubert**
- MIP2: Erhebung des Innovationsverhaltens der Unternehmen in der Produzierenden Industrie und in ausgewählten Dienstleistungssektoren in Deutschland in den Erhebungsjahren 2009, 2010, 2011 und 2012  
**Torben Schubert**
- PROXSCI: Strategiefondsprojekt Nähe zur Wissenschaft und ihr Einfluss auf den Innovationserfolg von Unternehmen – Ein deutsch-französischer Vergleich  
**Torben Schubert**
- Strat. Hochschulforschung: Strategiefondsprojekt Potenzialerschließung Hochschulforschung  
**Nicole Schulze**
- TechnologieRegion: Studie zu Branchen- und Technologieprofilen in der TechnologieRegion Karlsruhe  
**Thomas Stahlecker**
- IHK Technologieprofile: Quantitative Analyse regionaler Branchen- und Technologiestrukturen in Baden-Württemberg  
**Thomas Stahlecker**
- EFRE-Berlin: Halbzeitbewertung des operationellen Programms für den Europäischen Fonds für regionale Entwicklung (EFRE) Berlin  
**Thomas Stahlecker**
- Strat. Regional-Navigator: Strategiefondsprojekt Entwicklung eines Standards für Regionalprofile (Regional-Navigator)  
**Thomas Stahlecker**
- Regensburg: Gutachten zum Ausbaupotenzial der Regensburger Hochschulen in den MINT-Fächern  
**Thomas Stahlecker**
- RIM: Regional Innovation Monitor  
**Thomas Stahlecker**
- Clusterkonferenz: Strategiefondsprojekt Vorbereitung und Durchführung einer Konferenz im Themenfeld Clusteranalyse  
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- Global Challenges: The challenges of globalization: Technology driven Foreign Direct Investment (TFDI) and its implications for the Negotiation of International (bi- and multilateral) Investment Agreements  
**Thomas Stehnen**
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**Thomas Stehnen, Elisabeth Baier**
- GIZ Tunesien: Externe Evaluierung der Pilot-Innovationsmanagement-Programme Innov 30 und Innov 60  
**Andrea Zenker**
- German-French-Publ.: Publikationsvorhaben Strategies for bilateral research co-operations: German-French experience in applied research  
**Andrea Zenker**

# VISITING RESEARCHERS

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## VISITING RESEARCHERS

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**Xu Jinhua**

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**Prof. Dr. Tomasz Mroczkowski**

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## **Imprint**

### **Publisher**

Fraunhofer Institute for Systems  
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### **Printers**

E&B engelhardt und bauer  
Druck und Verlag GmbH, Karlsruhe

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This annual report was printed  
on a climate-neutral basis on  
Condat matt Périgord.

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