

shaping | future | together

1972 – 2022

50  
Years

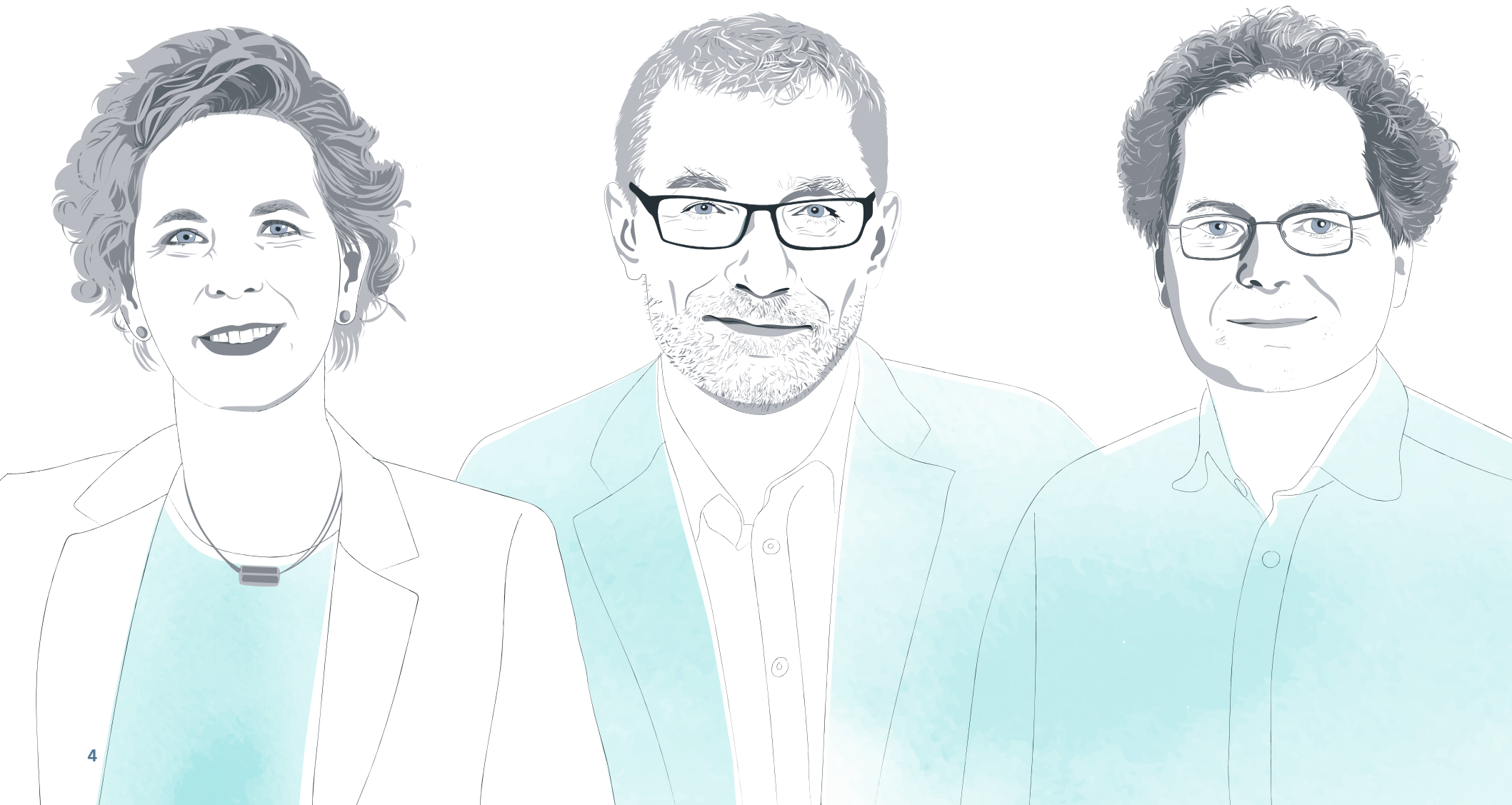
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Fraunhofer ISI  
shaping | future | together

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# Preface

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**D**ear Readers,

We have been part of the German and the international research landscape for fifty years. Fraunhofer ISI was founded in 1972 during a period of social upheaval. The motivation behind its foundation was the idea of adding a new perspective to the Fraunhofer-Gesellschaft. While the Fraunhofer-Gesellschaft as a whole develops technologies and solutions for industry, we had our own special role right from the outset. Our mission then and now is to provide expertise and research to politics, business and society, and to shed light on the origins and impacts of innovations.

To this day, we work on actively shaping the future of us all, and providing our clients with solutions that will also enable successive generations to live well in the future. Our work has never been more necessary than it is today.

With our now more than 300 employees in seven scientific Competence Centers, a Service Center and the Joint Innovation Hub, founded in 2019, we contribute to addressing the grand challenges of our times.

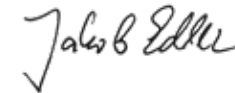
The expertise of all our colleagues enables us to take a holistic view of complex issues, such as the governance of innovation systems, electric mobility, artificial intelligence, sustainable energy supply and energy security or the relevance of emerging technologies for future value creation – to name but a few. Indeed, this was already the aim of our founding director, Helmar Krupp.

In this commemorative publication, we offer insights into half a century of Fraunhofer ISI. We present our institute's family tree, and select some of the highlights over the last five decades and points at which we charted a decisive course.

We look at the past and future of Fraunhofer ISI not only from our own perspective, but are pleased we can round off our self-portrait with valuable external perspectives kindly contributed by those closely connected to our institute.

We would like to thank our clients for their confidence in our expertise, our project partners for the rewarding and successful collaborations, and especially our employees from all five decades.

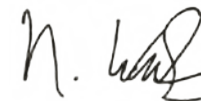
We look forward to continuing to contribute to business, politics and society in the decades to come.



Prof. Jakob Edler  
Executive Director



Prof. Marion A. Weissenberger-Eibl  
Director



Prof. Rainer Walz  
Deputy Director

1972-2022



# 50 years of Fraunhofer ISI – More than the sum of its parts

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**F**raunhofer ISI celebrates its 50th anniversary which is a cause for joy and pride. Initiated by the visionary founding director Helmar Krupp, Fraunhofer ISI has been an integral part of the innovation system in Germany and Europe for five decades now. Together with our partners from politics, business, society, and other scientific institutions, we conduct research on existential questions of our society. The focus of our institute has naturally changed over the years but the core has remained stable and has become even more important over time. As was the case 50 years ago and is still true today: Fraunhofer ISI is the place for excellent, interdisciplinary innovation and systems research, with a profound understanding of the genesis and diffusion of innovations and their role in the transformation of systems.

The complex interrelationships of transformations require a systemic approach. The need for this is not new: Even in the 1970s, the major societal and economic challenges, for example in the field of energy, sustainability or with regard to the diffusion of new technologies into all areas of life, were seldom aligned according to department, economic sector, or scientific-technological discipline.

## Founded in times of change

For that reason, our institute has supported the development of cross-system solutions for 50 years. This was already the case when Fraunhofer ISI was founded in a time that had many parallels with today, but also stark differences.

The 1970s were marked by a new awareness of the finite nature of the planet's resources and the beginnings of the environmental movement. There were also a number of avant-garde economists, natural scientists and social scientists in academia who began to use new concepts to recognize the systemic nature of problems and to search for new solutions, as well as to define an expanded role for the state.

Already in the founding document of Fraunhofer ISI, there is mention of the »innovation system«. From the very first day, the institute was oriented toward the systemic approach and therefore also deliberately set up as widely interdisciplinary. The founding director Helmar Krupp was an innovative, internationally well-connected academic, who not only thought across disciplines and departments, but also assigned science a normative

mandate to search for specific solutions. It was logical to found the new institute within the framework of the Fraunhofer-Gesellschaft, as this guaranteed a connection to a broad technological expertise. At the same time, through its contract research model, Fraunhofer ISI was *de facto* required to cooperate with decision-makers from politics and business in a solution-oriented manner. We still believe that solid integration within the Fraunhofer-Gesellschaft was and is of great benefit to the institute and society as a whole.

### More complex methods and a new mission

The early 1970s were also characterized – despite all the ideological positioning – by considerable confidence in society's capacity for discourse and the state's ability to solve problems. This is where a crucial difference to today becomes apparent. Fifty years ago, the idea prevailed that complex systems could be mapped and empirically described in a comprehensive way; and on this basis, state intervention could be designed and mobilized to steer them quite precisely. Looking back, this planning euphoria also characterized the first years of Fraunhofer ISI.

As is well known, the era of belief in our ability to control systems was replaced at the beginning of the 1980s by the idea of a more withdrawn state. In innovation policy this translated in broad terms into the focus being put on strengthening the innovation system with regard to competition between nations, with little ambition to interfere in the field of innovation. In recent years, however, this has changed again, the state has come back with force,

seeking to influence and speed up transformation, and in doing so, directing the innovation process. But when we now analyze and support systems change, in contrast to 1970s, we as analysts certainly no longer believe in almost cybernetic control. We have become much humbler and more modest.

We are aware that mapping the complexity of reality is not an exact science. If we generate evidence that is as robust as possible with increasingly complex methods, we still have to deal with uncertainties and work to simplify contexts. We also have to accept that we may go astray with our assumptions. That is why we create models and think in terms of alternative scenarios; we construct the systems, as it were, in the hope that we will gain sufficient insights to enable us to support constructive political and economic decisions.

Today, the assessment and evaluation of future developments is one of the core competencies of Fraunhofer ISI. It is to the credit of our institute that future studies have become established in Germany. With the implementation of the »Delphi 98« study and the large »BMBF Foresight Process«, the foresight of global developments was anchored in research policy.

### Innovation as a tradition

Advising policymakers on innovation policy issues has always been and will continue to be firmly anchored in science at Fraunhofer ISI. This is also reflected in the numerous scientific publications of our staff. In addition, our colleagues take on responsibility within the scientific

community, for example in expert commissions, as advisory board members or editors of internationally renowned journals.

Since its beginnings, international networking has been a distinguishing feature of Fraunhofer ISI. This is reflected in the numerous collaborations with research institutions and the opportunities for international guest scientists to conduct research at Fraunhofer ISI. Today, our institute has one of the highest shares of EU projects within the Fraunhofer-Gesellschaft.

The successful history of Fraunhofer ISI is also intrinsically linked to its location. In the »TechnologyRegion Karlsruhe« and in Baden-Wuerttemberg, Fraunhofer ISI could develop in a climate which has traditionally been open to new things. Here, the much-cited »tinkerers and inventors« can evolve in an intellectual milieu which is also influenced by »poets and thinkers«. Technology, culture and society do not exist independently of one another. They are mutually dependent, complementary and enriching. Industry and politics in this federal state wisely take this fact into account.

### Five decades of »ISI spirit«

Back in 1972, when it had seven employees, no-one could have imagined that Fraunhofer ISI would one day have around 300 employees. Despite the differentiation of the organizational structures, close collaboration between the organizational units has remained a key element of the institute's success. This is and has been essential to enable true interdisciplinarity and the

targeted application of a broad mix of methods. It is precisely the mutually influencing perspectives of technological and political understanding, sector-specific know-how and conceptual depth that lead to the holistic, systemic view of Fraunhofer ISI being more than the sum of its parts.

Another characteristic that has remained unchanged over time – sometimes referred to as the »ISI spirit« in the first decades – is also reflected in our institute's current understanding of its mission: We use independent forward and lateral thinking and critically reflect on common assumptions and premises regarding the research questions we are working on. This shared understanding also contributes to the high level of identification of staff with »their ISI«. It is precisely this that is and remains the very key to the institute's success.

We would therefore like to take this opportunity to express our sincere thanks to all former and current non-scientific and scientific staff, who have made it possible for us to celebrate this anniversary in the first place. Thanks also go to the Fraunhofer-Gesellschaft with its various associations, alliances and networks, for the support they have provided and to all our sister institutes for the close collaborative relationships, as well as to our trustees for their critical advice. We also thank all those who have supported our institute at various levels – federal, state, regional and European – whether from politics, business or civil society, and have enriched our work in a host of different ways.

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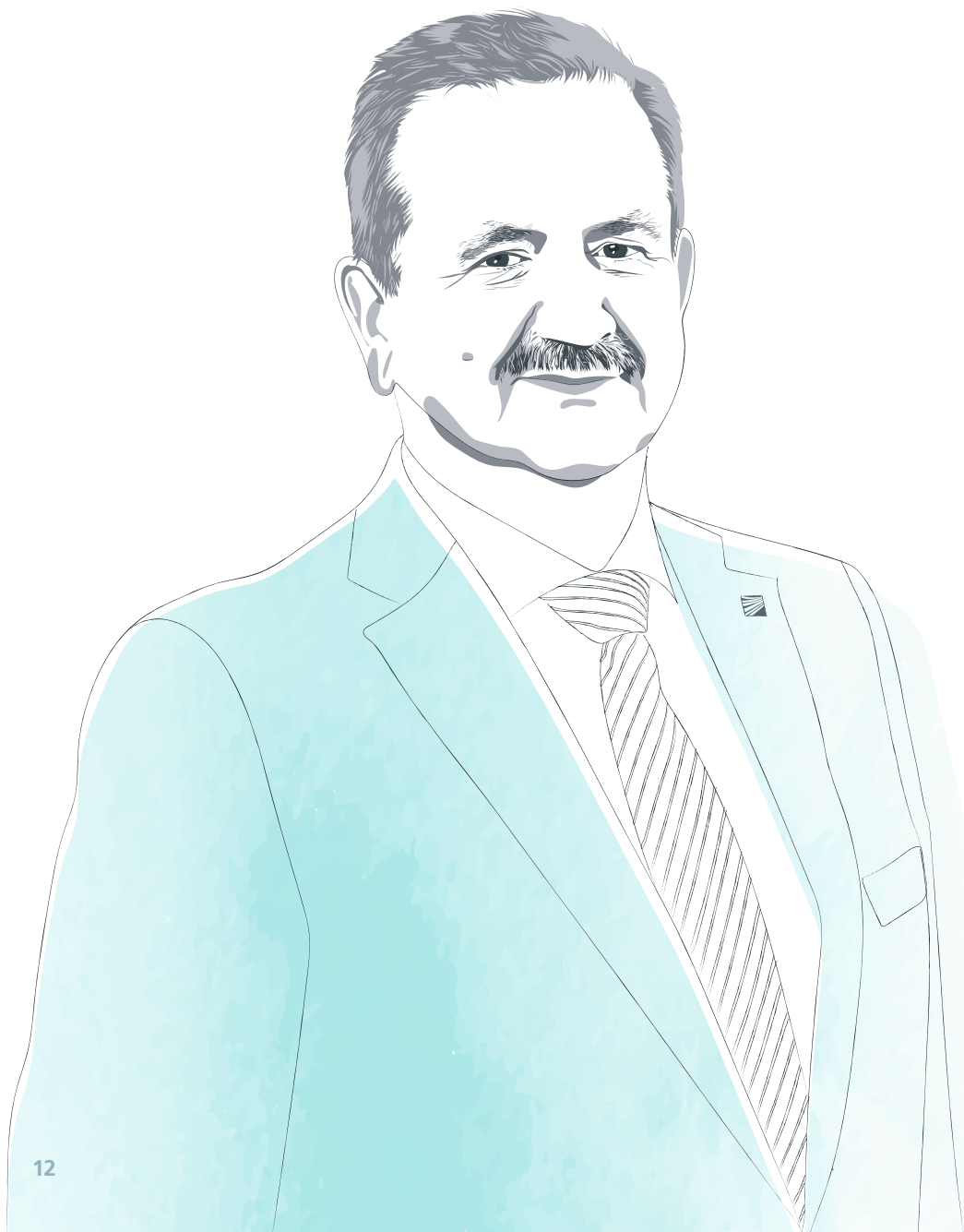






Internal meeting in the former library: In the mid-1970s, the Department of Systems Analysis discussed their future research orientation and acquisition strategy. This concerned Germany's energy supply and options for using energy more efficiently, especially in industry and residential buildings – an important topic both then and now (from left to right: Eberhard Jochem, Hartmut Bossel, Richard V. Denton, Harald Legler and Jürgen Reichert).

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Always one idea ahead

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As for the future, our  
task is not to foresee it,  
but to enable it.«

**Antoine de Saint-Exupéry**

**T**his quote by the French writer Antoine de Saint-Exupéry aptly describes the core of Fraunhofer ISI: Using their excellent scientific competence, around 250 scientists research the development of innovation processes as well as the societal effects of new technologies and thus create perspectives for sustainable decisions.

### Practiced interdisciplinarity

Since its founding 50 years ago, the particular strength of Fraunhofer ISI has been the practiced interdisciplinarity of natural sciences, engineering, economics, and social sciences. It is precisely this interconnectedness that enables the sharing and recombination of knowledge and skills, which creates the basis for new ideas and innovations. By combining systems and innovation research, the institute expands the expertise of the Fraunhofer-Gesellschaft to include the systemic analysis of complex systems for tackling future societal challenges such as decarbonization, the energy transition or digitalization.

### Highly dynamic and complex times

In this context, Fraunhofer ISI has scientifically accompanied the planning and implementation of the High-Tech Strategy 2025, the most important innovation policy strategy of the German government, in a research project lasting several years. This made it possible to develop not only recommendations for actions to increase the effectiveness of innovation policy measures, but also a practice-oriented set of instruments for measuring the impact of innovation-oriented mission policies.

The high value of systems and innovation research is always evident in highly dynamic and complex times like these. The current geopolitical events and their effects have made it clear how important resilience and technological sovereignty are for Germany. As early as 2020, ISI presented the position paper »Technology Sovereignty – From Demand to Concept«, an analytical approach to determine the criticality of technologies and the degree of technology sovereignty at national and international levels.

Over its now 50-year history, Fraunhofer ISI has earned an excellent reputation as an independent thought leader for politics, business, and society. And it also has an important advisory function within the Fraunhofer-Gesellschaft with regard to innovation research aspects such as disruptive innovations, spin-offs, or foresight.

I wish Fraunhofer ISI all the best for the next 50 years, that it will continue to support our clients and partners from business, politics, and society in staying one idea ahead in the future.



**Prof. Reimund Neugebauer**

President of the Fraunhofer-Gesellschaft

# Karlsruhe, the home of innovation

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In 2022, the Fraunhofer Institute for Systems and Innovation Research ISI can look back on 50 successful years since its foundation in 1972. On behalf of the city of Karlsruhe, its municipal council – but also on a very personal note – I would like to extend my warmest congratulations to Fraunhofer ISI on this anniversary.

## Fraunhofer ISI shapes decisions at the technology location Karlsruhe


For five decades, the institute and its 300 employees have supported strategic decisions for innovations and researching transformations on the way toward a sustainable future. Numerous profitable joint projects of Fraunhofer ISI with the city of Karlsruhe testify to its strong ties with the location, for example concerning the SmartCity initiative of the Economic Development Department or the future of the Technology Park.

Science and innovation are at home in Karlsruhe. More than 43,000 students are educated at nine universities and colleges, nearly 26,000 at the Karlsruhe Institute of Technology, which is one of the leading higher education institutions nationally and internationally, with top rankings in mathematics, computer science, natural sciences, and technology. The Karlsruhe University of Applied Sciences, with around 8,400 students, also achieves excellent results in this area. A dense network of first-class research institutions, including the Fraunhofer Institute for Systems and Innovation Research ISI, also ensures scientific excellence. Business and science cooperate closely: Strong networks support technology transfer in the fields of IT, mobility, and energy; companies and start-ups benefit from new technologies; and businesses find skilled workers.

I am pleased to be able to say that Fraunhofer ISI has made a significant contribution to the development and establishment of Karlsruhe as a technology location over

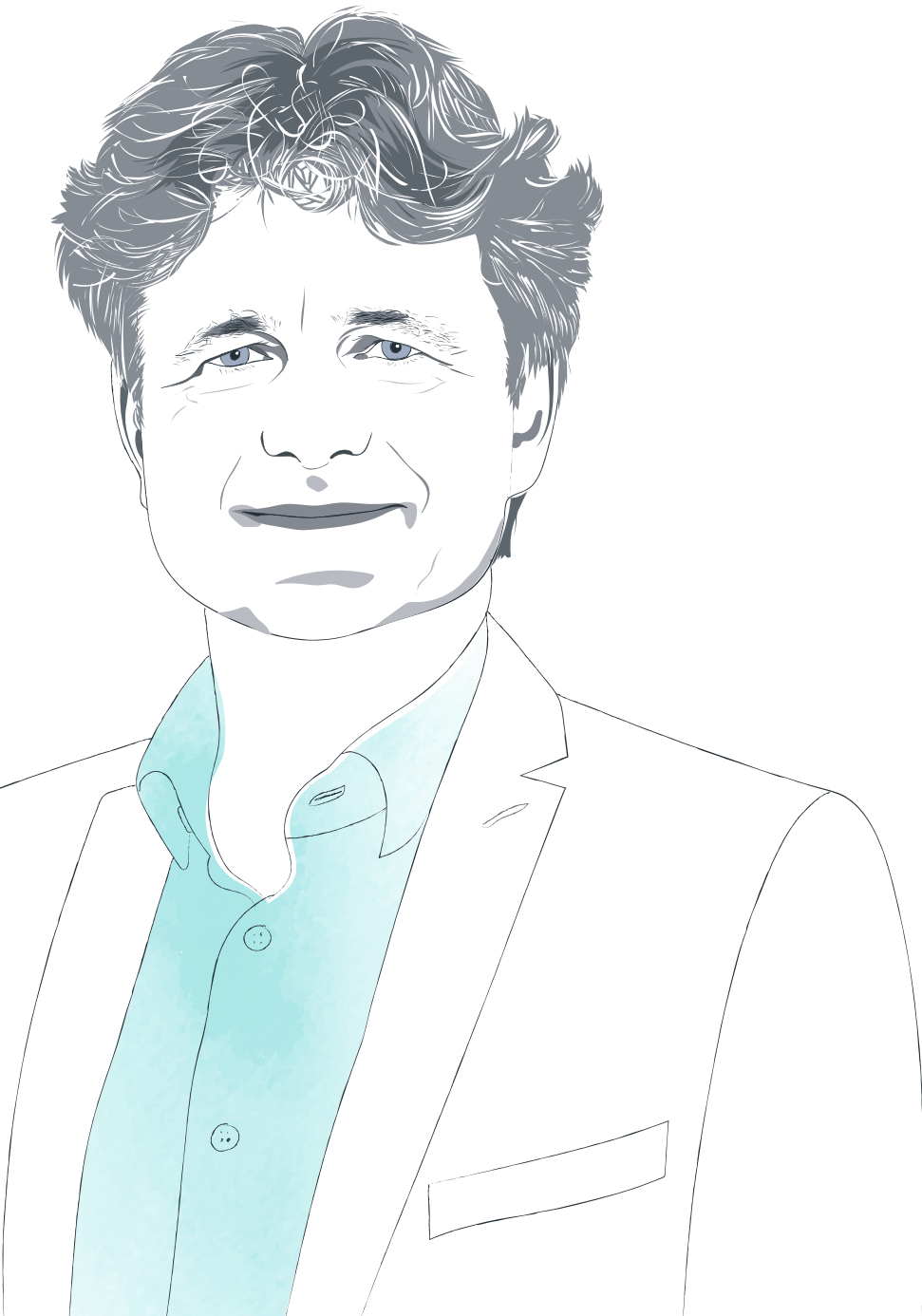
the past 50 years, so that the fan-shaped city regularly appears near the top in city rankings.

And so, it only remains for me to say thank you for the decades of good cooperation!



**Dr. Frank Mentrup**  
Lord Mayor of the City of Karlsruhe





## External perspective



The future is produced using technologies and innovations that contribute to making our world a better place. For this, we in mechanical engineering and the VDMA need the best partners. Tackling the challenges of our time in a holistic way, pursuing innovations technically, socially, and economically, thinking ahead to different »futures« with foresight – all this distinguishes Fraunhofer ISI and is the reason for our close cooperation.«

**Hartmut Rauen**

Deputy General Manager VDMA  
(Verband Deutscher Maschinen- und Anlagenbau;  
Mechanical Engineering Industry Association)

# Impact



Fraunhofer ISI remains a trustworthy partner with a clear value system of sustainability in a climate-neutral world.«

# Orientation support for politics and business

Three questions addressed to Dr. Felix Christian Matthes from the Oeko-Institut based in Berlin.

*Over the last 50 years, Fraunhofer ISI has become one of Europe's leading institutes for innovation research. Where has it made its mark? Where has Fraunhofer ISI set a decisive course?*

**Felix Christian Matthes:** ISI had and has many facets, many work areas and – in the literal sense – many faces. Over the last 30 years, I have got to know some of them, some more intensively, some sporadically and many probably not at all. ISI has had a lasting influence on the energy policy debate with its consistent work on energy efficiency, climate protection in industry and renewable energy. A few aberrations in the all-important hydrogen debate would be far more pronounced without ISI than they are today. Not to be forgotten are its contributions to systems analysis, as energy policy would lose its bearings without meta stories.

*The current geopolitical challenges lend even more weight to the research topics of Fraunhofer ISI. What are*

*other topics with similar scope from the past, present or future, where the Institute can prove its social relevance?*

**Felix Christian Matthes:** The next phases of the energy transition will be increasingly consumer-oriented. They will be much more sensitive to acceptance issues, especially with regard to the necessary construction, reconfiguration and dismantling in the infrastructure sector. International interdependencies and relationships will become more and more important, as will the mega topic of resilience with a view to energy and climate policy as well as many other policy areas. This will mean addressing wider topics, broadening horizons and require the development and implementation of new solutions. It's not just the economy, stupid!

*Looking into the future is an everyday matter at ISI. Where do you see the institute in another 50 years?*

**Felix Christian Matthes:** I think the institute will have a broader scientific base. Considering the fields it works in, I would expect greater diversity in terms of men and women, generations, cultural backgrounds and regional

origins. ISI was already on the side of value-based progress back when energy efficiency and renewable energies were by no means scientific or political mainstream, but the subject of strenuous debate. And so it will continue to be a reliable and credible partner for society, politics and business, with a clear value system of sustainability in a climate-neutral world: nationally, European, and internationally.

## Biography

**Dr. Felix Christian Matthes** is an electrical engineer with a PhD in politics and has been involved in cooperative projects with ISI literally since he started working at the Oeko-Institut in 1991. He has enjoyed collaborating with several generations of ISI employees and is currently the research coordinator for energy and climate policy at the Oeko-Institut based in Berlin.

A reunion after two years of Corona pandemic: At the Open Day in July 2022, employees and friends of Fraunhofer ISI not only celebrated the 50th anniversary of the institute – but also enjoyed meeting in person again for the first time after long phases of working from home and video conferences.

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# Ready to tackle future crises

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I am honored to contribute to the 50th anniversary celebrations of the Fraunhofer Institute for Systems and Innovation Research ISI. I would like to offer an external perspective on the work of Fraunhofer ISI with regard to mission-oriented policy, and in the context of your anniversary motto, »50 years of ISI – shaping | future | together«, describe some EU activities that attempt to directly address the challenges of today and shape the future of tomorrow.

The challenges we are facing in Europe are multifarious: accelerating crises on the geopolitical front, evolving crises in the domestic, environmental and health sectors. In order to address these challenges, our innovation systems are undergoing transformation.

## New approach to European R&I policy needed

The European Commission is committed to delivering the twofold digital and ecological transition; we want Europe to become the world's first climate-neutral continent, to be ready to tackle future crises, at the same time as remaining competitive with a high standard of living for its citizens. These objectives call for a renewed

approach to European research and innovation (R&I) policy, which cuts across silos and takes a broader view of the actors engaged in the R&I cycle. Hence, our innovation policy is transforming too, being increasingly geared toward solving specific societal challenges. This idea is embodied in the five current EU Missions.

I am privileged to be a mission manager for the EU Mission on Cancer, which has the ambitious goal to prevent three million deaths from the disease in Europe by 2030. EU Missions share the key characteristic of charting a clear course by being targeted, measurable and time bound. We have tried to capture this clarity of destination in the Missions launched. For instance, nine German cities are contributing to the EU Mission to deliver 100 climate-neutral and smart cities by 2030.

Mission-oriented policy is a promising approach to tackle the complexity of the immense challenges in today's society. However, if we are to succeed in our ambitions of a just transition, we need to develop innovation policy much further. Interdisciplinarity, reflectiveness and adaptability will be key, and here in particular your analyses, underpinned by strong technological and systems knowledge, are playing an important role.

## Fraunhofer ISI has always been in step with the times

With the recent rise in protectionism accelerated by the Russian invasion of Ukraine, the importance of global governance and open innovation has never been greater. I know that your organization has rallied to the support of Ukrainian researchers and scientists, as we have within the Commission through various initiatives. Fraunhofer ISI has always been very much in step with the times and will continue to be one of Europe's leading innovation research institutes in the future.

Herzlichen Glückwunsch zum Jubiläum, Fraunhofer ISI!



**Dr. Joanna Drake**  
Deputy Director-General,  
European Commission



Societal fragmentation was exacerbated by the COVID-19 pandemic, which required a quick and flexible response. Nevertheless, our societies were able to come together to transform our innovation systems.«

**Dr. Joanna Drake**

# An interdisciplinary Institute

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The founding of Fraunhofer ISI was initiated in the early 1970s by a department head of the then Federal Ministry of Research and Technology (Bundesministerium für Forschung und Technologie, BMFT; today's Bundesministerium für Bildung und Forschung, BMBF). He saw the need for a strategic »think tank« in the field of research, technology, and innovation. This proposal was influenced by the West German reform and planning euphoria of that time and the idea that systems technology could model society. The name of the institute was therefore logically »Institute for Systems Technology and Innovation Research«.

## The first director of the institute

The physicist Helmar Krupp took on the task of shaping the stormy founding phase as the first director of the Institute. This charismatic, go-getting, and humorous man was well equipped for the task. Thanks to his experience at the Battelle Institute in the United States, he was well acquainted with contract research. He consciously aimed for an interdisciplinary institute that

# Looking back

encompassed natural sciences, engineering, economics, and social sciences. An unusually broad disciplinary span at that time. From the beginning, he insisted on an international perspective and corresponding assignments. He set up platforms for informal and self-critical dialogue between policy managers and applied research from Europe, the USA and Japan, which have become unthinkable today in view of procurement guidelines and media pressure to report success.

## The team

Helmar Krupp was always looking for »strong people« (in his words), well aware that an interdisciplinary institute rests on many shoulders. And he found them too. As a selected example, I would like to mention Eberhard Jochem, who, together with his many team colleagues, firmly established the subjects energy efficiency, renewable energies, environment, climate, and sustainability at such a very early stage that today – 30 to 40 years later – they are a central part of Fraunhofer ISI's professional identity. Applied research also needs perseverance.

## Holistic approach

In 1990, I was lucky enough to succeed Helmar Krupp (until 2005, when I moved to the BMBF as State Secretary). The phase of establishing the institute had been completed successfully; now the focus was to increase visibility, diversify the customer base, and network with universities. The change from »systems technology« to »systems research« in the institute's name signaled the need and the goal to develop and master a variety of methods to allow a holistic approach. These included evaluation, technometrics and bibliometrics, patent analyses, sustainability assessment and system models. The science and university affiliation reinforced the scientific excellence that is essential for convincing interdisciplinarity. The increased academic visibility of the institute – spread over many strong shoulders – facilitated the recruitment of motivated young talent. Finally, improved national and European visibility also facilitated the diversification of Fraunhofer ISI's customer base to expand its market position and spread risk.

## Growth

I particularly enjoyed interacting with the people at Fraunhofer ISI. It was necessary to establish personnel development, to pay more attention to wishes and abilities, to encourage people to quickly assume responsibility for topics and functions, and to deal openly with career wishes in the institute and beyond. In short: Fraunhofer ISI was also understood as a social organism, the care of which was one of the core tasks for the management staff, workers' council, and me. In addition, ISI was a great place to work for me, especially in terms of the mix of attractive topics, decision-making environment, competent people, and open working atmosphere.

In retrospect, these are some of the highlights of the first 33 years of Fraunhofer ISI. Today, the institute is excellently positioned. To be fair, this is not only a merit of Fraunhofer ISI, but also due to the fact that interdisciplinary analyses, systemic thinking, and holistic solutions are currently indispensable for almost all important future issues.

# Looking back

## Firm anchorage

For a long time, Fraunhofer ISI was more of an »exotic outsider« in the Fraunhofer-Gesellschaft, but is now firmly established within it. This shows how consistently networking and bundling of forces is now practiced in the Fraunhofer-Gesellschaft and that ISI has found its role therein. I think Fraunhofer benefits today from having ISI – and comparable sister institutes – in its portfolio.

Let me conclude with three impulses that I was asked to give. I would like to address one message to the clients of Fraunhofer ISI, primarily the German government, the federal states and the EU Commission. During my time as State Secretary at the BMBF, I learned to what extent boundaries between responsibilities and departments hinder solutions to important questions concerning the future and how quickly the necessary perseverance evaporates in short-term political events. Closely inter-linked interaction between instruments such as financial incentives, regulatory policy, infrastructure, risk funds and qualification and training is often missing. Overcoming these frictions is one, if not the central reform task of modern policy management. If it is not possible to convincingly translate interdepartmental concepts

into holistic solutions, both technically and operationally, and to put them into practice, government will remain massively hampered by internal obstacles, especially regarding the urgent future issues of our time.

My second impulse aims at the Fraunhofer-Gesellschaft. A modest one when compared to the first impulse. Fraunhofer ISI benefits the Fraunhofer-Gesellschaft most in its role as a successful advisor to the public sector and through its national and international visibility. It thus benefits not only politics, but also the German innovation system and economy. The Fraunhofer-Gesellschaft would therefore do well to take this into account in its internal distribution mechanisms.

My third and final impulse is of course directed at Fraunhofer ISI itself. We – and I believe I may also speak on behalf of Helmar Krupp – congratulate you all and are proud of you! You have achieved much that we could only contemplate and initiate. Keep the spirit of responsibility for our community. The competence and commitment of this institute are needed more than ever. Cynicism or pessimism help neither science nor politics. You must bear in mind that the decisions and behavior of politics and society will never be guided solely by

scientific evidence. In times of increasing science skepticism, you must continue to provide politics, industry and society with your analyses, impulses, recommendations, and warnings to the best of your knowledge and conscience. Fraunhofer ISI can meet these challenges, and I wish you all the best of luck and continued success.



**Prof. Frieder Meyer-Krahmer**

Former State Secretary and  
Director of Fraunhofer ISI from 1990 to 2005

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# FRAUNHOFER

# INSTITUTE FOR SYSTEMS

# AND INNOVATION

# RESEARCH ISI



## **Chronicle**

## **1972—2022**

50 years of research. For innovation and transformation.  
shaping | future | together.

1971

1972

In a study for the Federal Ministry of Education and Science, Helmar Krupp of the Battelle Institute in Frankfurt/Main suggests establishing a Fraunhofer Institute that deals with issues of systems and innovation research.

01.04.1972: The “Fraunhofer Institute for Systems Technology and Innovation Research” is established with Helmar Krupp as its director. The first seven researchers move to Breslauer Strasse 48.

In addition, four residential homes are rented in the vicinity during the period January 1973 until mid-1977.

## CHRONICLE OF FRAUNHOFER ISI

## Publication highlights

Studies with far-reaching results are published, for example, on the expectations regarding the future demand for electricity and fuel, the emerging climate change, the international competitiveness of energy-intensive industries, the revolution in the world of work due to microelectronics and ICT as well as the great importance of SMEs for innovations in Germany.



1971 // 1972 // 1973 // 1974 // 1975 // 1976 // 1977 // 1978 // 1979 // 1980 // 1981



1972

1989

Helmar Krupp as director



1977

Fraunhofer ISI is located on the premises of Fraunhofer IITB (today Fraunhofer IOSB) on Sebastian-Kneipp-Strasse.



## 1982

On the occasion of its tenth anniversary, Fraunhofer ISI finally moves to Breslauer Strasse 48. In terms of content, it sets itself apart by differentiating its research into selected areas of technology.



## Publication highlights

Publications with great significance for innovations and innovation policies, including studies on ICT, biotechnology, manufacturing/production technology, waste and wastewater technology as well as innovation systems and regional innovations, innovation indicators and technological performance.



## 1991

Fraunhofer ISI has 100 employees.

## 1990

## 2005

Frieder Meyer-Krahmer as director



1982 // 1983 // 1987 // 1988 //



## 1988

Hariolf Grupp, Olav Hohmeyer and Ulrich Schmoch are awarded the Joseph-von-Fraunhofer special prize for their methodology to determine technology indicators.



## 1990

Fraunhofer ISI develops strategies for the reduction of energy-related greenhouse gas emissions in industry for the German Parliament's Enquete Commission "Protection of the Earth's Atmosphere".



## 1991

Olav Hohmeyer is awarded the Joseph-von-Fraunhofer prize for his method to analyze and internalize the social costs of electricity generation.

# Publication highlights

Publications with high relevance for innovations and innovation policy: For example, the first German Delphi Report “Study on the development of science and technology” is published in 1993. In 1998, a comprehensive Delphi study on the global development of science and technology systematized future issues.



## 1996

Several employees establish the “ISI Power” association. In January 1997, donations and grants are used to finance a photovoltaic plant which is expanded in the following fifteen years.



1992 // 1993 // 1994 // 1995 // 1996 // 1997 // 1998 // 1999 // 2000 // 2001

# ENERGY



## 1992

Establishment of technology foresight in cooperation with the National Institute of Science and Technology Policy in Tokyo.



## 1993

Ulrich Schmoch and Knut Koschatzky receive the Fraunhofer special prize for the development of a patent information system for medium-sized businesses.



## 1997

## 2002

From 1997 until 2002, Eberhard Jochem chairs the Panel on Climate Change. From 1999 until 2002, he is a member of the Enquete Commission Energy of the German Parliament. In 2001, he is awarded the Order of Merit of the Federal Republic of Germany.



## 2003

Fraunhofer ISI becomes an institutional partner of the Office of Technology Assessment at the German Bundestag (TAB).

## 2004

Renamed as "Fraunhofer Institute for Systems and Innovation Research".



## 2007

The Joseph-von-Fraunhofer prize is awarded to Harald Hiesl, who developed solutions for the sustainable use of water together with Fraunhofer IGB.

Fraunhofer ISI manages the BMBF Foresight Process.

Hariolf Grupp is the deputy chair of the German government's Commission of Experts for Research and Innovation (EFI).

## 2007

Marion Weissenberger-Eibl takes over as director



# DIALOGUE

2002 // 2003 // 2004 // 2005 // 2006 // 2007 // 2008 // 2009



## 2002

## 2007

From 2002 until 2007, Eberhard Jochem is a member of the first German Council for Sustainable Development.



## 2008

Between 2008 and 2010, Marion Weissenberger-Eibl is a member of the Innovation Council Baden-Württemberg.



## 2009

Fraunhofer ISI becomes a member of the European Technology Assessment Group and conducts technology impact assessments for the European Parliament.

Foundation of the Joint Research Group together with Fraunhofer ISE.

# Publication highlights

Launch of the new series "Perspectives – Policy Briefs of Fraunhofer ISI".



## 2017

Marion Weissenberger-Eibl becomes a member of the steering committee for the German government's science platform "Sustainability 2030".



## 2011

More than 200 employees work at Fraunhofer ISI.



2010 // 2011 // 2012 // 2013 // 2014 // 2015 // 2016 // 2017



## 2011

Marion Weissenberger-Eibl is an expert and head of the working group Innovation Culture for the Chancellor's Dialogue on Germany's Future.

## 2012



## 2012

The German government appoints Harald Bradke to the German Advisory Council on the Environment.

Fraunhofer ISI celebrates its 40<sup>th</sup> anniversary and hosts the Eu-SPRI Conference "Towards Transformative Governance? Responses to mission-oriented innovation policy paradigms".



## 2014

Marion Weissenberger-Eibl becomes a member of the German-Chinese Dialogue Forum.

Marion Weissenberger-Eibl is a member of the Board of Trustees of the German Federal Environmental Foundation (DBU) and a member of the Economic Committee.



## 2015

Marion Weissenberger-Eibl chairs the topic group "The future needs integrated solutions" at the 2<sup>nd</sup> International German Forum 2015 at the German Chancellor's Office.

Harald Bradke is chairperson of the VDI (Association of German Engineers) Group Energy and Environment.





## 2019

Foundation of a new Fraunhofer facility by the deputy director of Fraunhofer ISI Mario Ragwitz. Close cooperation in a joint research group of Fraunhofer ISI and the newly founded Fraunhofer Research Institution for Energy Infrastructures and Geothermal Systems IEG, Fraunhofer IEG for short.



## 2018

Jakob Edler becomes the Executive Director of the institute



## 2020

Barbara Schlomann becomes a member of the Council of Experts on Climate Change, which supports the German government in the application of the Federal Climate Change Act.



2018

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2019

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2020

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2021

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2022



## 2018

Minister-President Winfried Kretschmann initiates the “Strategy Dialog Automotive Industry Baden-Württemberg” and appoints Marion Weissenberger-Eibl to the top-level group.



## 2018

Mario Ragwitz receives the Fraunhofer-Taler.

Wolfgang Eichhammer is appointed to the Expert Group of the EU's Innovation Fund for Climate Technologies as a representative of the Fraunhofer-Gesellschaft.



## 2021

Fraunhofer ISI hosts the 12<sup>th</sup> International Sustainability Conference: “Mainstreaming sustainability transitions: From research towards impact”.

Jakob Edler is president of the European Forum for Studies of Policies for Research and Innovation (Eu-SPRI Forum) until 2021.



## 2022

Rainer Walz becomes a member of the EU Commission's expert group on the economic and societal impact of research and innovation.

## Anniversary campaign

Campaign #50Jahre50Wochen (#50years50weeks):  
Fraunhofer ISI posts a weekly insight into 50 years of  
research on social media.

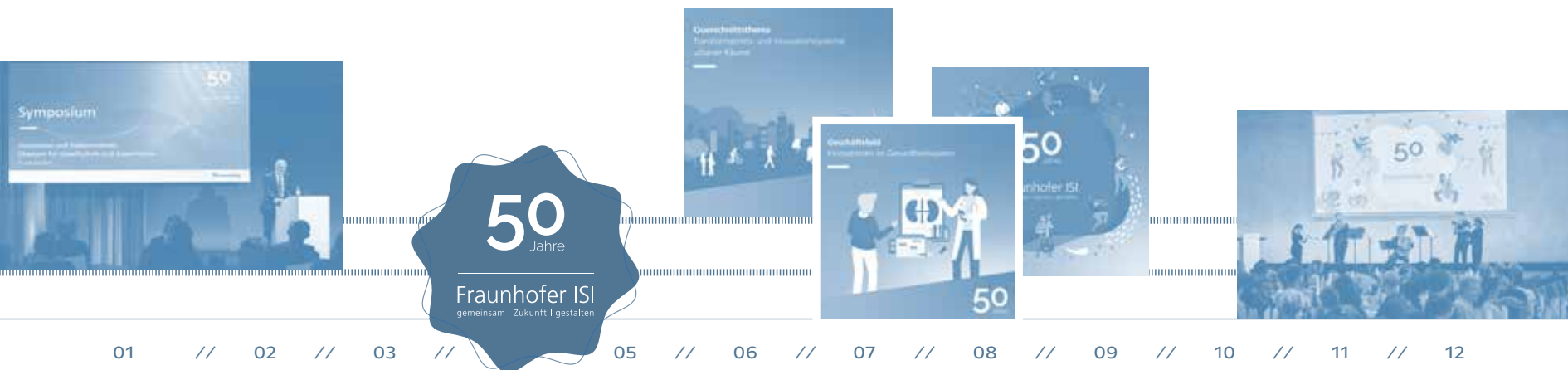
## Workshop

Workshop in Strasbourg on October 13  
and 14: Cooperation of Fraunhofer ISI  
with scientists from the Bureau d'écono-  
mie théorique et appliquée (BETA) of the  
University of Strasbourg.

## Expert Symposia

Expert Symposium in Karlsruhe on July  
19 and 20: 1.5 degrees and it's getting  
hotter ... Small and medium-sized towns:  
Acting together on climate change.

Expert Symposium in Karlsruhe on  
October 5: "Trustworthy AI in the health  
sector: challenges and solutions".



## Symposia

Symposia in Berlin on April 25 and in  
Brussels on May 2: "Innovation and sys-  
tems change: Opportunities for society  
and governance".

## Open Day

Open Day in the Gartenhalle of the Con-  
vention Centre Karlsruhe on  
July 15. Fraunhofer ISI presents itself  
and its research to the public and  
its employees.

## Anthology

Springer Publishing Company publishes an  
anniversary anthology of scientific articles  
compiled by researchers at Fraunhofer ISI  
on key topics of "Innovation and systems  
research in transition – 50 years of conti-  
nuity and change in supporting innovation  
and transformation policies".

## Ceremony

On September 15, the main anniversa-  
ry ceremony of Fraunhofer ISI takes  
place at the Center for Art and Media  
Karlsruhe.

## External perspective



Fraunhofer ISI is one of the central players in international innovation research. Strong conceptual, empirical, and policy-related expertise is paired with the highest level of commitment in working on current topics and problems. The insights gained not only enrich the international scientific literature but are also reflected in excellent research and innovation policy advice. The »icing on the cake« is its international leadership regarding topics, such as the discussion of technological sovereignty.«

**Prof. Uwe Cantner**

Friedrich Schiller University Jena, University of Southern Denmark SDU,  
Commission of Experts for Research and Innovation (EFI)

# Outlook



The world needs researchers to focus on the greater goals of stopping catastrophic environmental destruction and improving well-being.«

# Enter the policy debate

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If ever there was a need for an institute such as the Fraunhofer Institute for Systems and Innovation Research ISI, with its broad systems approach toward ways science, technology and innovation can contribute to welfare and well-being, while at the same time responding to the many challenges societies are confronted with, it would be now. Never before have policymakers been confronted with the emergence of such crises: security crises such as the war in Ukraine, health crises such as the COVID-19 pandemic, the climate and biodiversity crises, some unexpected, but most expected, or even worse, predicted. Crises which cannot be addressed by just focusing on one particular science, technology, or innovation area for policy intervention, but which bring to the fore the much broader need for fundamental, far-reaching transformations in society. Transformations which challenge received wisdom, and which require a readiness from both policymakers and the business community, on the one hand, and the research community, on the other hand, to leave their respective comfort zones. This entails policymakers and business persons listening more than ever to scientific advice;

as well as researchers leaving the disciplinary security of academic recognition and daring to enter the policy debate with scientific evidence and analytical rigor.

## Time to end the debate

The current security and health crises have undoubtedly further aggravated the climate and biodiversity crises which have been challenging policymakers in Europe and around the world for decades. In an editorial, on the occasion of the 50th anniversary of the publication of the book »Limits to Growth«, the journal Nature challenged economists to stop disagreeing on solutions: »Although there's now a consensus that human activities have irreversible environmental effects, researchers disagree on the solutions – especially if that involves curbing economic growth. That disagreement is impeding action. It is time for researchers to end their debate. The world needs them to focus on the greater goals of stopping catastrophic environmental destruction and improving well-being.«

## Addressing this challenge

With its 50-year history of systems thinking, Fraunhofer ISI can provide new insights on how to best address this challenge, or even make it its central mission for the next ten years. A mission which, in the spirit of Joseph von Fraunhofer, would provide countries, regions, and cities across the world with applied, concrete insights, sometimes even solutions to the environmental and accompanying social crises our societies will be confronted with.

### **Prof. Luc Soete**

Currently Dean of the Brussels School of Governance, VUB (Free University of Brussels)

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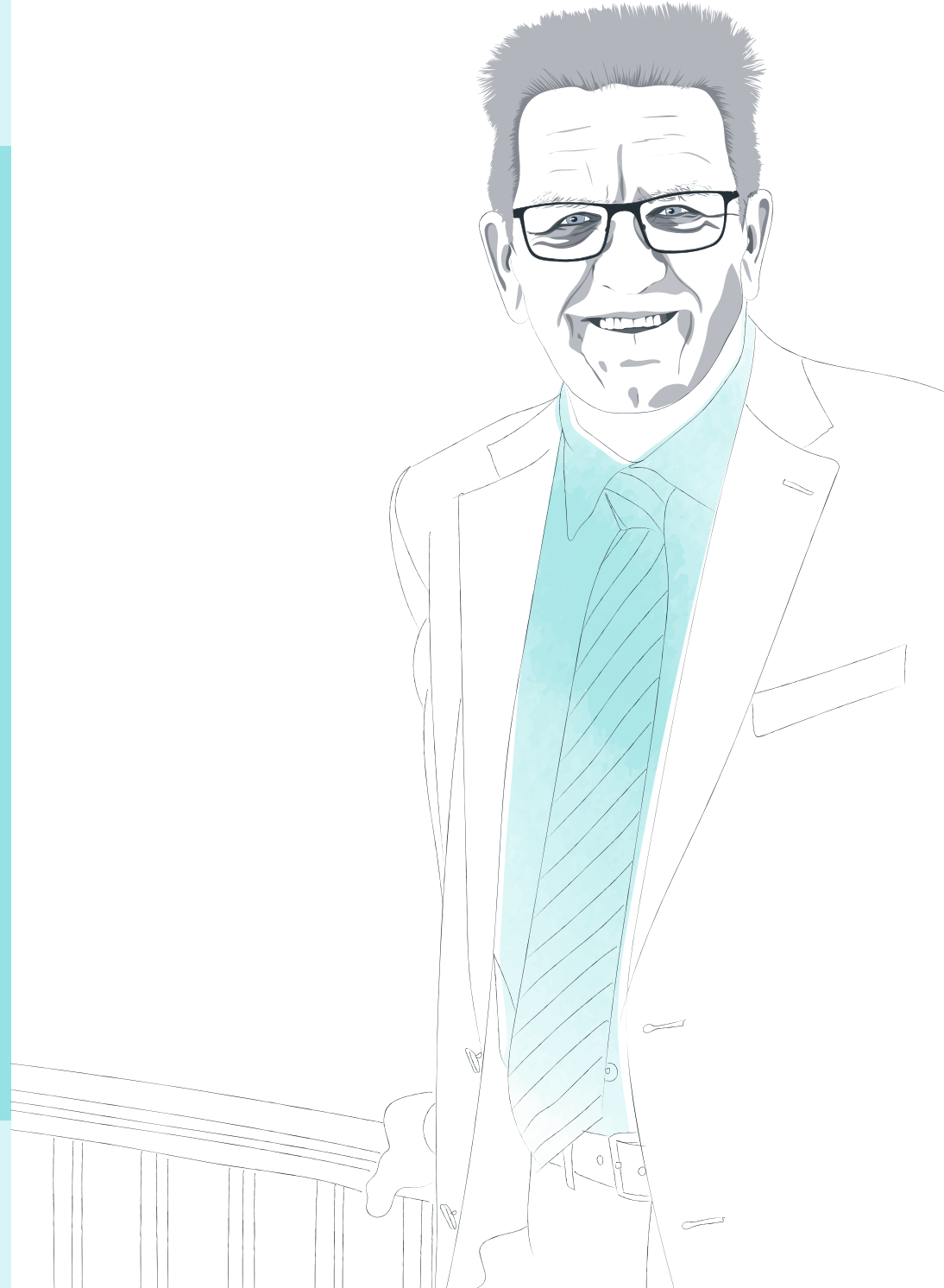
## External perspective



Together with SMEs and large companies, Fraunhofer ISI and the BDI have been collaborating for many years on optimizing all the diverse mechanisms for successful innovation in Germany. This close cooperation is a decisive building block for successful technology transfer from research to industrial application. Only via efficient technology transfer will Germany be able to maintain its internationally competitive position as a location for innovation in the future.«

**Iris Plöger**

Member of the Executive Board,  
Federation of German Industries BDI e.V.





# Innovation may be the key

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**G**lobal competition is becoming tougher, technological change more rapid and the transformation toward a climate-neutral economy more urgent. Technologies of the future such as artificial intelligence, greentech or robotics play a central role in mastering these challenges. By researching such innovations, the Fraunhofer Institute for Systems and Innovation Research ISI makes an important contribution to the competitiveness of our companies and thus also to the future viability of the federal state. On behalf of the state government, I would therefore like to sincerely congratulate Fraunhofer ISI on its 50th anniversary!

## Starting point of a success story

The year 1972 marked the starting point of a new success story within the Fraunhofer-Gesellschaft. At the instigation of the innovation researcher Helmar Krupp, a completely new type of institute was launched at the previously science and technology-oriented organization. With Fraunhofer ISI, founding director Krupp wanted

to look into the future: What is the potential of new technical solutions? Which innovations can advance the economy, politics, and society in equal measure? Today, 50 years later, Fraunhofer ISI is one of Europe's leading institutes for innovation research.

Local research institutes that are close to businesses, like Fraunhofer ISI, have an important role to play: They analyze the effects of innovative technologies and services. On this basis, they open up completely new perspectives and opportunities for business, science, and politics. After all, innovations can ultimately be our key to mastering major challenges – such as climate protection, sustainable mobility, or digital production.

## Visionary projects

Baden-Wuerttemberg must not wait for others. We ourselves must invent, co-develop, and test. So that our federal state can defend its place as European innovation champion and play at the forefront of international competition. In this spirit, I wish the Fraunhofer Institute

for Systems and Innovation Research ISI continued inventiveness and the necessary courage to research visionary projects and accompany them during their implementation!



**Winfried Kretschmann**

Minister-President of the State of Baden-Wuerttemberg

# Important basis for political decisions

For 50 years, staff at Fraunhofer ISI have been making an indispensable contribution to innovation and the future viability of Baden-Wuerttemberg's economy. Their expertise is also in great demand throughout Europe and internationally. In times of technological change through digitalization and the necessary climate-friendly orientation of our entire economy, society and politics, this knowledge will continue to gain in importance.

Innovations are drivers of progress and competitiveness for our companies across all sectors and the basis of our current prosperity. The scientific studies on the potential and limits of technical, organizational, or institutional innovations help decision-makers from business, science, and politics to set a strategic course. They support them in creating a favorable environment for innovations and the right framework conditions. Innovations are the decisive lever, especially when it comes to overcoming economic crises such as the ones we are experiencing with the Corona pandemic or the Russian war of aggression against Ukraine.

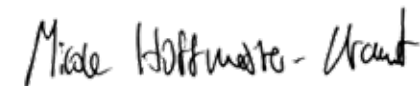
The analyses and studies provide orientational knowledge and have been an important basis for political

decisions for many years, as well as for the strategic orientation of funding programs of the federal state, so that Baden-Wuerttemberg will continue to be one of the leading innovation regions in Europe in the coming years. The topics are diverse and range from examinations of critical raw materials, information security, electric mobility and energy transition to future topics such as artificial intelligence or hydrogen and foresight processes. As the state government, we cooperate closely with Fraunhofer ISI in many areas and support its work as a Fraunhofer Institute within the framework of institutional funding as well as in research projects.

## New building in Karlsruhe will pave the way ahead

To ensure that the institute is well positioned for the future, a new building is being planned in Karlsruhe together with the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB, and the costs of up to 60 million euros will be borne jointly by the federal government and the state of Baden-Wuerttemberg. This is meant to lay the foundation for the next decades of successful work.

Since the founding of the institute in 1972, you have made an important contribution to innovation in our federal state with your interdisciplinary team and your critical, independent, and above all scientifically grounded work. The growth of the institute in the past years and its outstanding reputation prove the relevance of the topics and the persistent excellence at Fraunhofer ISI. I would therefore like to congratulate you warmly on your 50th anniversary and also wish you all the best for the future.



## **Dr. Nicole Hoffmeister-Kraut**

Minister for Economic Affairs, Labour and Tourism  
Baden-Wuerttemberg



The new building in Karlsruhe is intended to lay the foundations for successful work in the decades to come.«

**Dr. Nicole Hoffmeister-Kraut**

# Interview



## »Our research is hard to sum up in simple headlines«

Colleagues with international backgrounds, project leaders with decades of experience and PhD students with new ideas: People from all walks of life and in completely different phases of their careers work together at Fraunhofer ISI. Three of them talk about the institute and their work here.

*Ms. Fischer, you're originally from Estonia, have studied in the Netherlands, done research in the United Kingdom and Sweden, and worked in Belgium. How did you end up at Fraunhofer ISI?*

**Piret Fischer:** I worked in a laboratory while studying genetic engineering, and didn't like it. It was too boring for me, just on my own with bacteria at five in the morning. I've always said that I love science, but I don't want to work exclusively in the academic field or in a lab. Later, while writing my master's thesis in Lund, Charles Edquist, the well-known innovation researcher, told me about Fraunhofer ISI. That piqued my curiosity. Before I came to Fraunhofer ISI, however, I worked at an industry organization in Brussels, surrounded by people in smart suits and at the European Parliament every day. That was a very dynamic and exciting working environment,

but I missed the analytical perspective a little bit. Then one day a friend forwarded me a job ad from Fraunhofer ISI. That was when I knew: That is exactly what I want!

*Competence Centers, Groups, Alliances... how does a newbie get their bearings in the Fraunhofer cosmos?*

**Aline Scherrer:** At the beginning, I was a bit overwhelmed by the huge diversity in the Fraunhofer world. While at university, for example, I never thought that the Fraunhofer-Gesellschaft would have a job for me. I thought they only did technology research and had laboratories where things were developed. But I quickly grasped how different Fraunhofer ISI is from other institutes, with its systemic studies and policy consultation, especially when talking to my new colleagues. That was a good fit for me and I soon found my bearings. There were still a few confusing conversations at the introductory event in Munich, because there are not a lot of thematic overlaps with other institutes. Still, we all share the mission of applied research.

**Christian Sartorius:** ... although ISI's mission is different to that of Fraunhofer in general. I was the ISI representative in the Scientific and Technical Council for several

years. It is hard to believe how different the institutes are. Sometimes you think the only thing they have in common is the name. In most cases, they deal with all kinds of technical innovations. The unique position of Fraunhofer ISI is that we link things across the board, and look for what consequences the different innovations can have.

*How do you explain to your friends and acquaintances what it is you do exactly in »systems and innovation research«?*

**Christian Sartorius:** At first when someone asked me what my job is, I always said »it's complicated« (laughs). At some point, I began explaining that, as an economist, I have to evaluate lots of individual technologies, how they are interlinked and how they relate to real life. We cannot predict the future, but we are able to look and see what will happen if the general framework conditions develop in one direction or another. Of course, this explanation is still very abstract, and most of the time, people are none the wiser. Then I might give an example of a project.

**Aline Scherrer:** Me too. I usually pick a project example that people can relate to. For example, we asked drivers of electric cars how they use charging infrastructure.

The results can help to improve how this is designed in future. I also use words that are easy to understand. I don't talk about the »meta innovation system perspective«, but say »we want to move away from diesel and explore how we can do this«.

**Piret Fischer:** You also have to take into account who you are talking to. I have noticed that I have a very hard time explaining what we do at ISI. You talk to someone for five minutes and then they say »Oh, so you do market research!« That's not right at all.

*Perhaps innovation research is not present enough for the wider public? Do we have to up our game in presenting ourselves to the outside world?*

**Aline Scherrer:** I think we already do a lot, and that this science communication is very important. But so much of our research cannot be captured in simple headlines. Because we do systems research, which always involves different perspectives or parts of the system. It would be really complicated and would take a lot of work to try and describe the whole thing in a long text or capture it in a diagram. You cannot just pick out a single statement. However, many efforts are being made at ISI, for example, social media channels and media training. Our doctoral program also offers courses on communication and giving presentations.

*Why did you decide to do your PhD at Fraunhofer ISI?*

**Aline Scherrer:** After my degree, I really wanted to stay in research. But I felt that doing a PhD at university would be very hierarchical and thematically constricted.

A university chair is often made up of lone fighters, and I didn't want that. I wanted to do research in a team. Of course, even here, we each have our own specific focus, but there are overlaps, and we all work together on one overarching theme. I found the mix of applied projects at Fraunhofer ISI and research really great. Here, you have direct access to the topics. We don't do ex-post studies, ten years after the event. We conduct research on current issues; that was the decisive factor for me.

*Highly topical, constantly changing topics: This is familiar to many of those working at ISI. Some are even regarded as »cross-cutting employees« ...*

**Christian Sartorius:** Yes, there are many people who work across different business units and on very different projects. I always enjoyed that, because you have to be really creative when applying new methods and becoming familiar with new content. You don't know everything beforehand: Like with any job, you have to learn how to do it. And at ISI, you have to learn a bit faster (laughs). The challenge is that we have to represent a very broad perspective of knowledge in a relatively short time.

**Piret Fischer:** Sometimes, that's a bit of a shame: You do a project and learn so much in such a short time that you are almost an expert. That was the case for me in synthetic biology, for example, back when I started working at Fraunhofer ISI twelve years ago. It was a hot topic back then and I was invited to give presentations and lectures and was counted an expert in the field. But then quite soon there were no other projects coming in and this phase was over for me. I know so many different

fields, but I wouldn't consider myself an expert in any topic. We sometimes interview experts who have been working with the same bacteria for 20 or 30 years. Then I think to myself that I know so little in comparison. But, as an experienced colleague once told me: We may not know everything, but we know enough.



You are always torn, because you cannot completely avoid having your own opinion on topics in applied research.«

**Aline Scherrer:** I think, even if someone from Fraunhofer ISI says that they don't have expert knowledge, they still have a depth of knowledge that many others don't have. You may think you're covering a wide range of issues at less depth, but even compared to other research institutions, we are really good in our fields.

*In most cases, the results from Fraunhofer ISI influence decision-makers in politics and business – and therefore how we live together in society. How do you cope with this responsibility?*

**Aline Scherrer:** I often think about that. Especially in social science research, it is really important to stress that we look at what viewpoints are out there. We



synthesize these viewpoints, analyze them and examine how technology could be accepted. But this always also depends on political decision-makers wanting a certain pathway. We don't say, »This is a great idea from our perspective«; we research it. You are always torn, because you cannot completely avoid having your own opinion on topics in applied research. But we handle this by being as transparent as possible.

**Christian Sartorius:** Many project tenders already go in certain directions. If the Federal Environment Agency or state ministries have questions about sustainability, for instance, the underlying premise is usually the aim of achieving ecological sustainability. But there are always completely different questions concerning society that we do not provide answers to. For example, we don't have any answers to the question of social equity. We simply have to make the premises clear and say that this project is about this issue and, under these conditions, these alternatives seem advantageous. Maybe another person thinks something else is more important, in which case they consider other alternatives to be better. Ultimately, it's the politicians who have to determine which goals are relevant.

*What's the ratio between freedom to do research and administrative obligations in your everyday work?*

**Christian Sartorius:** Administrative tasks have increased recently. There are more and more things that simply have to be done, but actually have nothing to do with the research content itself. Nevertheless, I would still say that research makes up the bulk of our work. There is still a lot of scope for individual input. And where I

have the feeling that I can really make a difference if the results are ultimately taken up by policymakers.

**Piret Fischer:** It's changed over time. It is true that there are weeks when it's a real challenge to find time for the core work in-between meetings and admin. But I also have to say that I have two small kids and only got back to work properly one and a half years ago. If the kids are sick or I have other problems, I get a lot of support and flexibility from Fraunhofer ISI. That is really great. Otherwise, I couldn't imagine working as much as I do. It is still a challenge, but also valuable experience.



**I am very optimistic that we will become as innovative in terms of our organization as we are in terms of our content.«**

*Fraunhofer ISI researches innovations, but does it work innovatively itself?*

**Aline Scherrer:** I would say that we work innovatively by not having rigid hierarchies and networking well with everyone. Since I joined the institute in 2018, collaborative working has certainly evolved. At the beginning, I thought I might have to send a fax (laughs). There's a lot going on in terms of digital infrastructure. But there are



still legal or administrative hurdles such as data protection, confidentiality and so on.

**Christian Sartorius:** The rooms in the Technology Park Karlsruhe are one example of Fraunhofer ISI implementing something innovative. But apart from that, I honestly can't remember anything else. We still have telephones on our desks, complete anachronisms! I've never used mine because everything is done by cell phone or computer anyway. But now we've been given new telephones that are just as impractical as the old ones. We could deal with such things differently. We also always spend so much time discussing things, but it takes ages before anything really gets done.

**Aline Scherrer:** In the Technology Park, we said, let's take a small area and try something out. There are lots of working groups on the topic of new work, among others. I see a real difference there between when I started and how things are now. I am very optimistic that this will continue and we will become as innovative in terms of our organization as we are in terms of our content.

**Christian Sartorius:** The Corona pandemic was a strong driver for this, because there was simply no other way of working. This is evident beyond Fraunhofer ISI as well. It used to involve such a huge effort to set up video conferences with ministries that no-one wanted to do it. Every week, you had to travel to Berlin to discuss something with a client for an hour. To do so, you sat on a train for 13 hours and had a working day that ran from six in the morning until one the next morning.

**Piret Fischer:** Corona showed us how quickly we can change if we have to. I have to say that how innovatively we work is always a question of perspective. We might not be very innovative compared to a start-up or Google, but I think we do quite well compared to a university.

*Ideally, new ideas also come from new people joining the institute. How can doctoral students get involved at Fraunhofer ISI?*

**Aline Scherrer:** Doctoral positions are created at the institute if we have to work on a new topic or develop a new method. I wasn't aware of this before I came here. As a student, you think you will start somewhere and the people there will explain how everything functions. It's not like that at Fraunhofer ISI. From day one, you are fully involved and sometimes even show other people how something works. In my second month, for example, I went straight to a meeting of the Commercial Vehicles Working Group at KIT and gave a presentation and then discussed with logistics experts how these more sustainable trucks can work. Cycling there that morning, I thought »uh-oh«. But now I can see when the new doctoral students arrive that it is a good feeling to say »you've got this, you can do this«. You do get support, you're not left completely on your own. But you come in with a different perspective and that's precisely why new doctoral students are chosen so that they arrive with new ideas in terms of content and methodology. It is never the intention that they replicate someone or just take over something that is already there.

*After completing your PhD, you would like to stay at the institute – why?*

**Aline Scherrer:** It's a huge undertaking to juggle a PhD thesis and project work. Of course it's fun, but I am looking forward to tackling new tasks once I have completed my PhD. I want to take on more project management functions and see what other topics I could do. I like my PhD subject, but I'm interested in many things – that's why I'm at Fraunhofer ISI. I am really looking forward to digging into a few other areas.



We already have the knowledge and the technologies, but we don't always have access due to different non-technological barriers.«

*What do you want to achieve in the coming years, Ms. Fischer?*

**Piret Fischer:** My hope is that every project we do in the healthcare sector improves patient access to innovative technologies. There are such huge gaps in health care and very unequal access to innovations, even between Western European nations. There is such potential for improvement here. I think it's such a shame because we already have the knowledge and the technologies, but we don't always have access due to different non-technological barriers. If I can make a difference in this direction with my work at Fraunhofer ISI, I will be very happy.

*Mr. Sartorius, you are about to retire this year. What will you take with you from your 18 years at Fraunhofer ISI?*

**Christian Sartorius:** Much less work, first of all. But I'm a biologist by nature and want to continue working on the topic of sustainability. I was active in Greenpeace before my academic career. At that time it bothered me that ideas were spread without people really knowing what was behind them. That's why I thought I had to do the scientific work myself – which is what I have been doing for the last 18 years. Now I know a bit more about how things work and want to emphasize what's important. I plan to increase the pressure to act at grassroots level beyond academia. Politicians have finely-tuned antennae for what is more or less relevant to the public. If you make more noise, you get more attention. That's one way I could still be active – only now with the feeling that I really do understand the bigger picture. I have been able to spend the last 18 years researching things that I was also interested in privately. Now I know much more than I did before.

## The participants

**Aline Scherrer** studied Liberal Arts and Sciences (BA) and Sustainable Development (MSc) and wrote her Master thesis at Fraunhofer ISI in 2018. She is currently a researcher and a doctoral student in the Competence Center Energy Technology and Energy Systems and is working on her thesis about technology competition in zero-emission vehicles.

**Dr. Piret Fischer** studied Gene Technology (MSc) and Science and Technology Studies (MA), before completing her PhD in Innovation Management at Utrecht University. She has been a researcher in the Competence Center Emerging Technologies since 2010, and a project manager in the business units Innovations in the Health System, and Bioeconomy and Life Sciences since June 2016.

**Dr. Dr. Christian Sartorius** is a biologist and an economist and joined Fraunhofer ISI in 2004. In the Competence Center Sustainability and Infrastructure Systems, his main focus was on chemical topics, resource efficiency and water management projects. After 18 years working in different business units, he is due to retire in 2022.

# Overcoming boundaries to our thinking

**T**he degree of interconnectedness in virtually all areas of life, work and, of course, science is increasing at a breathtaking pace. This creates new opportunities for information supply, knowledge acquisition and (also industrial) interaction and cooperation. The accompanying increases in speed, complexity and mutual influence pose an enormous challenge. This is particularly true for export-oriented, highly innovative industrial nations such as Germany.

## A successful future requires foresight

In order to be able to recognize and use the existing opportunities and to develop the most intelligent strategies possible for dealing with the risks, now more than ever, we need a dynamic, holistic view of our global systems. A tunnel vision of individual regions, industries, disciplines, or areas of society will do less and less justice to our shared task of shaping a successful future – not only our own, but also and especially for future generations. Rather, the key to success lies in understanding the diverse interrelationships in a world of increasing interconnectedness, as well as in appropriate

approaches – including intellectual approaches – to deal with rising uncertainties and volatilities.

I am convinced that we will only successfully master the necessary transformation processes if we, as a society, take a holistic view of the major challenges of our time, focusing on sustainable solutions. For this, it is necessary to overcome existing boundaries to our way of thinking that continue to obstruct the critical-constructive view of decisive interactions. Fraunhofer ISI will continue to make a very valuable contribution to this, since the interdisciplinary, holistic-dynamic approach of the institute is future-orientated and is exactly what is needed. As Chairperson of the Board of Trustees, I personally have been able to experience this time and again in an impressive way over the past years and been able to help shape it to a certain extent. We can all be proud of this together.

## Fraunhofer ISI will have a broader scientific base

At the same time, however, the institute has to develop continuously. The disciplinary and international

expansion is certainly a challenging task for the coming years. In addition, the institute has the important task of providing excellent policy advice at German and European levels, with the aim of systemically strengthening and further developing our common innovation system. The broad scientific basis of Fraunhofer ISI is also valuable for organizations and large industrial companies to review and discuss their own models for the future. The expansion of critical interaction in this sense, from which joint strength can be gained, is very important to me for the future. So too is the development of suitable implementation tools that enable rapid and broad effectiveness.

I congratulate Fraunhofer ISI on its 50th anniversary and know that it is well on its way to a continued successful future.



## Dr. Manfred Wittenstein

Chairman of the Supervisory Board of Wittenstein SE  
Chairman of the Board of Trustees of Fraunhofer ISI



The key to success lies in dealing critically and constructively with the diverse interrelationships across entrenched boundaries to our way of thinking.«

**Dr. Manfred Wittenstein**





Over the years, Fraunhofer ISI has provided inspiration for the strategic orientation of research and innovation policy.«

**Mario Brandenburg**





# »Thinking what no-one has thought before«

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**F**or 50 years, Fraunhofer ISI has stood for a systemic approach to innovation research. Earlier than others, it began to bring together technical, economic and social science knowledge with the aim of »seeing what everyone else sees, but thinking what no-one else has thought before«. For me, this quote by the Hungarian scientist and Nobel laureate Albert Szent-Györgyi is symbolic of the work of Fraunhofer ISI, with its strong focus on interdisciplinarity as well as its analyses on the question of which technical and social developments are possible, feasible and desirable in the coming years.

## Fraunhofer ISI as a reliable advisor and provider of ideas

This strategic orientation has proved to be very far-sighted and its effects can be seen in different concrete actions made by the government. Today, the German government has a broad understanding of innovation that is reflected in its research funding, which focuses equally on technological and social innovations. Its research and innovation policy is aimed at solving societal challenges, placing greater emphasis on participation,

and combining more and more measures from different policy areas through a mission-oriented approach.

Over the years, Fraunhofer ISI has provided inspiration for this strategic orientation of research and innovation policy, and has established itself in recent decades as a reliable advisor and provider of fresh ideas for the work of the German government and the Federal Ministry of Education and Research (BMBF). Examples include its work on mission-oriented innovation policy, the scientific research accompanying the German government's activities, and its involvement in the BMBF's strategic foresight processes.

## Meeting the challenges of our time with innovation

We want to build on this productive collaboration. The guiding principle of the new German government is »Dare to make more progress«. We want to meet the grand challenges of our time with innovation and accelerate the application of research. We want to improve what already exists and, where this is not enough, create something new.

Science is providing us with new solutions to achieve this. Therefore, I would like to encourage you to keep on »thinking what no-one has thought before«. Today, Fraunhofer ISI looks back on decades of scientific expertise in innovation research. I would like to congratulate you on the occasion of the institute's 50th anniversary and look forward to further inspiration and ideas in the years to come.



**Mario Brandenburg**

Parliamentary State Secretary at the  
Federal Ministry of Education and Research BMBF

# What's next



The grand societal challenges of our time require holistic, cross-system approaches.«

# What's next

In our contribution at the beginning of this commemorative publication, we explained the special significance of Fraunhofer ISI in the field of innovation and systems research and how its current role resulted from its special historical mission. We are firmly convinced that Fraunhofer ISI's relevance will continue to increase in the future.

We now see a threefold set of challenges that will shape our efforts in the years and decades ahead: increasing complexity through intertwined transformations, the return of geopolitics, and the threat of social fragmentation.

## Intertwined transformations

First: Whether in politics, science, societal groups or industry, everyone seems to agree that the grand societal challenges of our time require holistic, cross-system approaches. We are convinced that science, research, and technology can make key contributions to this by laying the foundations for innovations. Technological innovations are usually generated in the industrial sector. However, their societal added value, their transformative

effect only unfolds – and this is often underestimated – in the interplay with society, individuals, and the corresponding institutional framework. At the same time, we are becoming increasingly aware that many innovations are triggered by changes in social behaviors and routines and by the emergence of new needs.

We must be very clear: The perceived urgency of the challenges, their scale and growing complexity underline the significance of holistic, cross-system approaches. The number of innovation actors is also increasing. At the same time, in recent years there have been renewed calls for the state to play a more active, guiding role. The current transformation policies enhance the degree of complexity and require greater analytical ambition. Despite all the methodological improvements, however, it is important for us to remain humble and bear in mind that we cannot control everything. We need to think about how to deal with the remaining uncertainties. It will never be possible to map these transformations exhaustively or steer them precisely. The question of what this really means, especially in relation to the state's increasingly ambitious aspirations in terms of regulations and incentives, and the stability and agility of state action, must remain a central component of our endeavors.

## Shadows of geopolitics

Second, the diverse ambitions to shape transformation must be embedded in the changing geopolitical situation along with the resulting need to act in a certain way. At the same time, we need to recognize that those ambitions for change also influence geopolitical constellations. The capacity for innovation and transformation has always been the base of competitiveness between nations. Well before the terrible Russian war of aggression in Ukraine, concerns about a country's own technological capacity to act, as defined on a national or ideally on a European level, had increased, and confidence in open markets and secure interdependence through a global division of labor had decreased. System competition and technological sovereignty are seen as possible blueprints for the future. However, their fundamental long-term significance has not yet been comprehensively understood and even though they have the capacity to be highly productive, they also harbor a highly disruptive, counterproductive potential.

## Fragmentation of society

A third bundle of challenges is created by the risk of social fragmentation; the dissolution of social cohesion, which accompanies the various transformations. This is reflected in a growing disparity in the distribution of income and wealth as well as in the unequal impact of some of the negative consequences of transformations, not only within countries, but also internationally. This

has potentially enormous implications for the success and widespread acceptance of transformations in general. This applies all the more because, at the same time, we are witnessing a growing fragmentation of discourse in society as a whole. Different echo chambers are emerging in mutual isolation, which results in people questioning the value of scientific evidence – think »fake news« or »fake science«. Taken together, there is a danger that we as societies will become increasingly unable to discuss and argue about the challenges and their solutions in a constructive and respectful manner.

This threefold set of problems; intertwined transformations, the shadow of geopolitics, and the dangers of social fragmentation, do indeed present a challenge to all of us. We cannot capitulate to complexity, nor can we assume, no matter how evidence-based we try to remain, that we can simply plan and steer transformations using intelligently designed governmental measures as was assumed in the 1970s. At the same time, however, we need to become more ambitious than in the last decades, both in terms of analysis and policy design.

Therefore, bearing in mind the uncertainties and their complexity, what we require is in-depth knowledge of systems, innovations, and governance. We need to know how systems such as energy, mobility and healthcare function, as well as the sectors embedded within them and how they interact with one another. We need to understand technological and social innovations, as well as the preferences and behavioral patterns of actors in the system. Finally, we need to link this with detailed

knowledge of the possibilities and limits of governance, and the role of the state in steering and shaping innovation and transformation.

Connecting these perspectives makes up the core mission of Fraunhofer ISI. We are determined to further develop these connections in the future so that we can continue to offer our partners from politics, industry and indeed society as a whole in Germany and Europe excellent analyses, evidence-based forward-thinking, and active participation in supporting decision-making processes.

We are firmly convinced that we will continue to succeed in the future thanks to the excellence and drive of our staff, the support of the Fraunhofer-Gesellschaft, and the partnerships we enjoy with politics and industry. The success story of the first 50 years of Fraunhofer ISI serves as our obligation, incentive, and encouragement.

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We need to become more ambitious in terms of analysis and policy design.«

# Imprint

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Fraunhofer Institute for  
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Breslauer Strasse 48  
76139 Karlsruhe

## Editors

Anne-Catherine Jung  
(responsible)  
Julia Weller  
Dr. Jacob Leidenberger  
Christoph Peters

## Graphic design

*Concept and illustrations*  
Sabine Wurst  
*Layout and typesetting*  
Sabine Wurst  
Alice Rensland  
*Chronicle*  
Jeanette Braun  
*Fraunhofer ISI's family tree*  
Renata Sas

## Translation

Mahler translations  
Gillian Bowman-Köhler  
Louise Blum  
Barbara Sinnemann

## Photo credits

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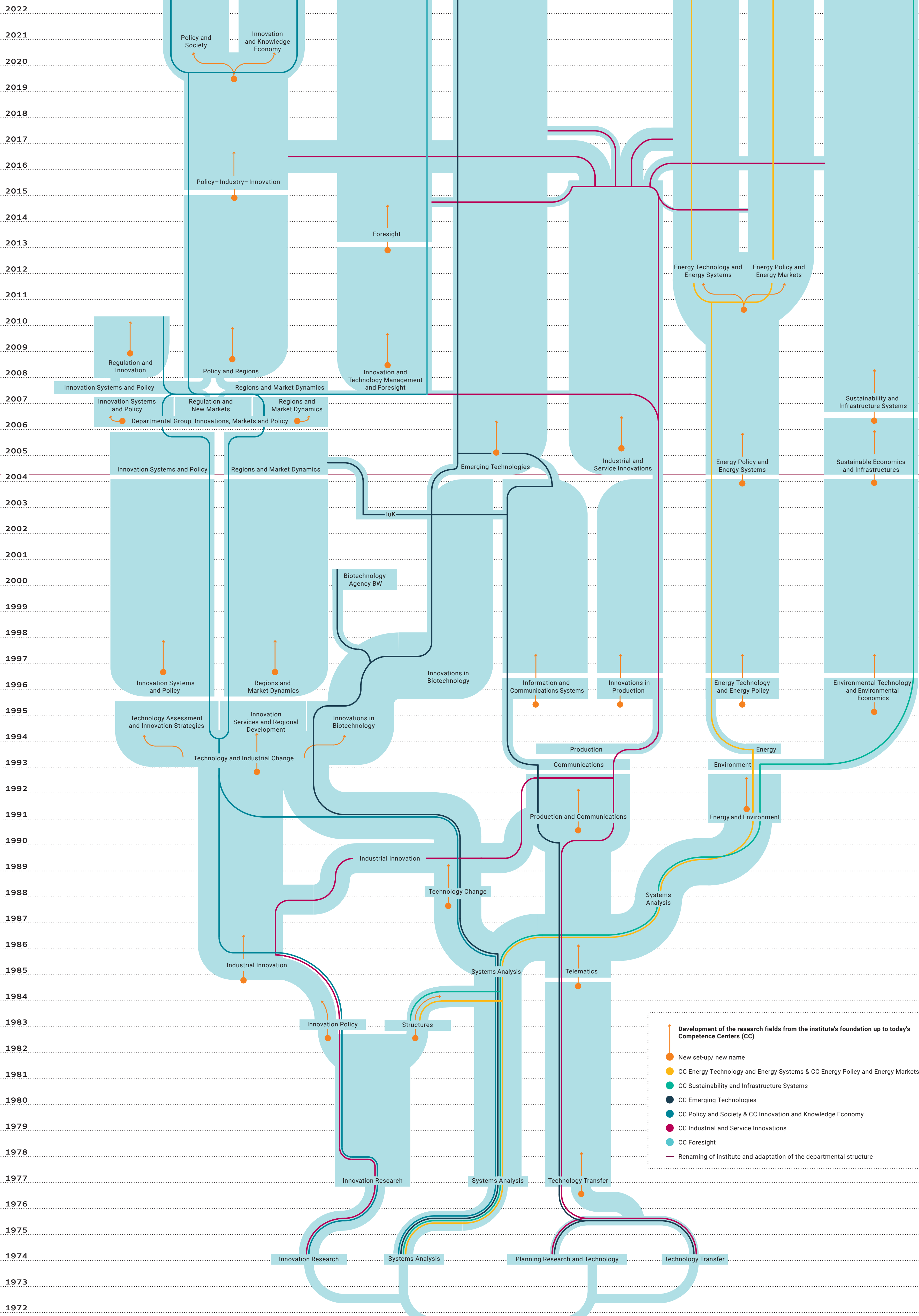


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# Fraunhofer Institute for Systems and Innovation Research

1972–2022





## The anthology

At the end of its anniversary year, Fraunhofer ISI will publish a comprehensive review of the developments over five decades of systems and innovation research. The anthology »Innovation and systems research in transition – 50 years of continuity and change in supporting innovation and transformation policies« features fascinating contributions by authors from Fraunhofer ISI on the following topics:

- Evaluation of science, technology and innovation policies
- Strategic and conceptual development of science, technology and innovation policies
- Futures research
- Innovation monitoring
- Environmental and sustainability research
- Production and humanization of the working world
- Technology impacts and technology assessment
- Renewable energies
- Energy efficiency and energy system analysis

For a first impression, go to:

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