KIT
Karlsruher Institut für Technologie

dfiu
Deutsch-Französisches Institut
für Umweltforschung
*Institut Franco-Allemand
de Recherche sur l'Environnement*
French-German Institute for
Environmental Research

Jahresbericht
Rapport d'activités
Annual report
2024

Vorwort

Der vorliegende Bericht beschreibt die wesentlichen Arbeiten und Aktivitäten des DFIU aus den verschiedenen Forschungsbereichen im Jahr 2024. Eine Reihe von bestehenden Projekten wie Annex89, TFTEI, und CO2Inno hat neue Forschungsergebnisse aufgezeigt. Neue Aktivitäten bereicherten die deutsch-französische Zusammenarbeit in der Oberrheinregion mit dem Projektstart von AsimutE, der neue Forschungsperspektiven im Bereich intelligenter Energiesysteme eröffnete. Über die Grenzregion hinaus ist die zweite Runde des deutsch-französischen Panels zur Energiewende zusammen mit der Grenoble Ecole de Management angelaufen und hat neue Erkenntnisse zu Wahrnehmung, Akzeptanz und politischen Aspekten der Energiewende in Deutschland und Frankreich aufgezeigt. Ausgewählte Ergebnisse aus der ersten Runde des Surveys mit Daten aus Dezember 2023 wurden im Rahmen eines Webinars vor der Europawahl einem breiteren Publikum präsentiert. Auch in der Lehre war das DFIU mit dem erfolgreichen Abschluss des „Team Project Cyber Security in the Upper Rhine Region" weiterhin aktiv. Studierende des KIT und der UHA konnten erste Erfahrungen in der binationalen, empirischen Forschung gewinnen. Insgesamt blickt das DFIU damit auf ein erfolgreiches Jahr der regionalen, deutsch-französischen und internationalen Zusammenarbeit zurück.

Karlsruhe, im Dezember 2024
Prof. Dr. Frank Schultmann

Préface

Le présent rapport décrit les principaux travaux et activités du DFIU dans les différents domaines de recherche en 2024. Un certain nombre de projets existants, tels que Annex89, TEFTEI, et CO2Inno, ont mis en évidence de nouveaux résultats de recherche. De nouvelles activités ont enrichi la coopération franco-allemande dans la région du Rhin supérieur avec le lancement du projet AsimutE, qui a ouvert de nouvelles perspectives de recherche dans le domaine des systèmes énergétiques intelligents. Au-delà de la région frontalière, la deuxième partie du panel franco-allemand sur la transition énergétique a été lancée en collaboration avec Grenoble Ecole de Management. Cette enquête a permis d'acquérir de nouvelles connaissances sur la perception, l'acceptation et les aspects politiques de la transition énergétique en Allemagne et en France. Ces résultats ont été présentés à un public plus large dans le cadre d'un webinaire précédant les élections européennes. Le DFIU a également continué à être actif dans l'enseignement avec l'achèvement réussi du « Team Project Cyber Security in the Upper Rhine Region ». Des étudiants du KIT et de l'UHA ont pu acquérir une première expérience en matière de recherche empirique dans le cadre de ce projet franco-allemand. Dans l'ensemble, le DFIU peut se prévaloir d'une année de coopération réussie au niveau régional, franco-allemand et international.

Karlsruhe, décembre 2024
Prof. Dr. Wolf Fichtner

Foreword

This report describes the main work and activities of the DFIU in the various research areas in 2024. A number of existing projects such as Annex89, TEFTEI, and CO2Inno have produced new research results. New activities have enriched Franco-German cooperation in the Upper Rhine region with the launch of the AsimutE project, which has opened up new research perspectives in the field of intelligent energy systems. Beyond the border region, the second round of the Franco-German panel on energy system transformation, together with the Grenoble Ecole de Management, has been launched and has revealed new insights into the perception, acceptance and political aspects of the energy system transformation in Germany and France. Selected results from the first round of the survey with data from December 2023 were presented to a broader audience in a webinar before the European elections. The DFIU also continued to be active in teaching with the successful completion of the "Team Project Cyber Security in the Upper Rhine Region". Students from KIT and UHA were able to gain initial experience in empirical research in this Franco-German project. Overall, the DFIU can look back on a successful year of regional, Franco-German and international cooperation.

Agenda

Key data and facts 2024

In terms of organization and personnel, the **DFIU** is closely linked with the **Institute for Industrial Production (IIP).** The initiation, planning and implementation of French-German projects in selected thematic areas are made possible by a matrix organization in which the DFIU takes a coordinating cross-sectional function for the various work areas organized in working groups.

Directors

Prof. Dr. Wolf Fichtner
Prof. Dr. Frank Schultmann

Deputy Directors

Dr. Daniel Sloot
Dr. Kristin Limbach
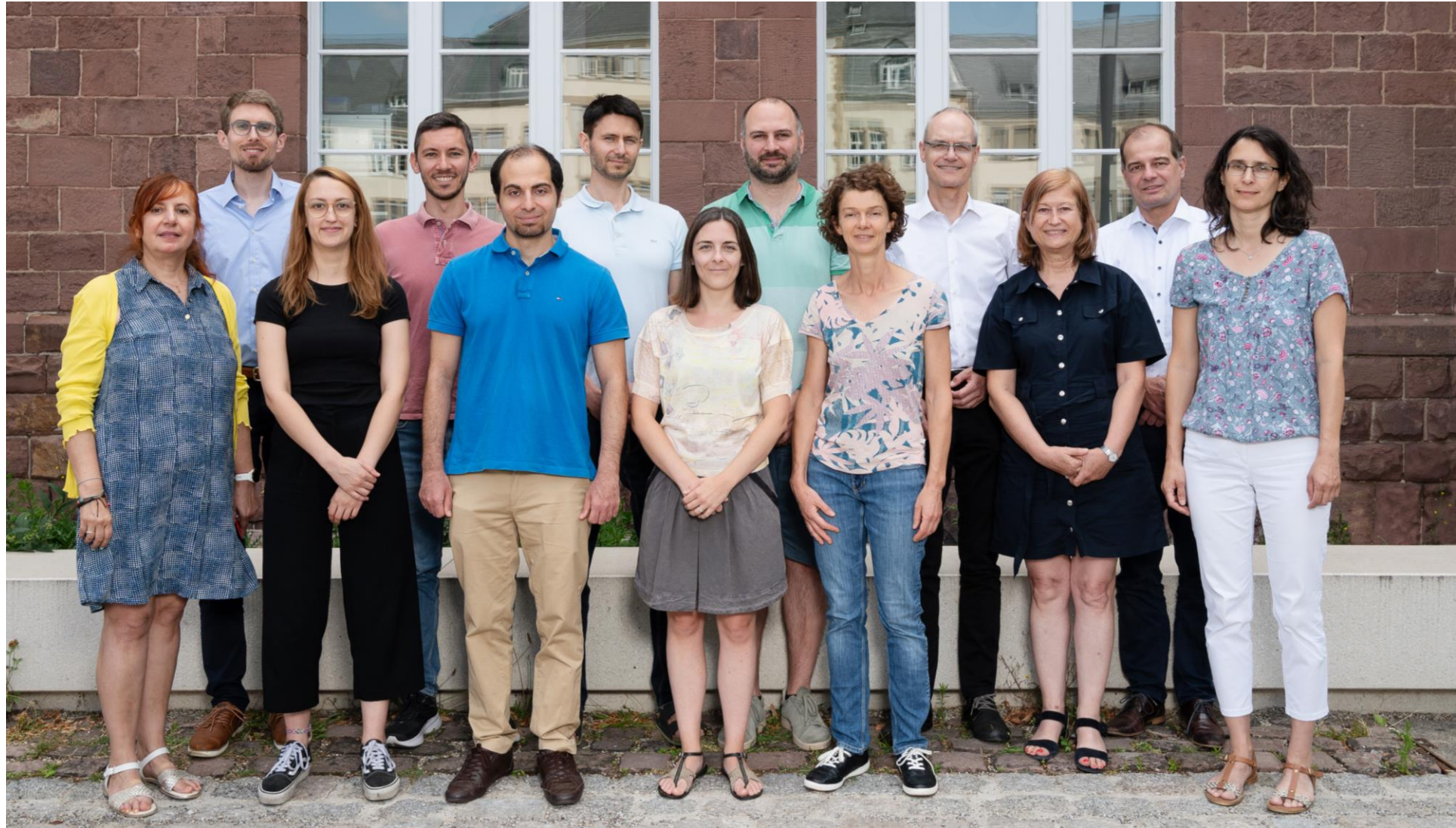
Coordination

Josiane Folk

Resources

12 DFIU employees and research associates
Budget: 450,000€ in external funds raised

Research and thesis

7 research projects
4 completed PhD:
    Dr. Sonja Rosenberg
    Dr. Jan Rafael Finck
    Dr. Max Kleinebrahm
    Dr. Viktor Slednev
23 bachelor and master theses

Main events at a glance

February 6th, Karlsruhe
Final presentation of the Team Project "Cyber Security in the Upper Rhine Region" with multiple partners from the CO2Inno project

May 13th, online
IEA Annex 89 Subtask 2: requirements for decarbonization methods and international climate policies

May 16th, online
AsimutE Kick-off Meeting with all partners (online)

May 28th, online
DFIU-GEM Webinar: On the basis of the first round of survey data from the DFIU-GEM Energy survey, the webinar presented insights into the acceptance of different energy technologies in Germany and France as well as the public support for cooperation in the energy transition between the two countries.

January	2024	July

February 27th, Karlsruhe
Seminar by Maart van der Kam on the development of agent-based models for energy policy

April 22nd, online
IEA Annex 89 Subtask 1: allocating GHG budgets in the construction and real estate sectors

May 21st, Berlin
Research & Innovation Day at the French Embassy in Berlin where funding programs for French-German research collaboration, mobility and advise for applications was discussed.

July 2nd, Colmar
CO2Inno Colloquium on sustainable mobility

July 25th, Karlsruhe
Visit of the French Counselor for Science and Technology at the KIT, with the participation of the DFIU

Main events at a glance

September 26th - 27th, online
DFIU researchers participated in the APA Division 34 Conference and presented research findings from a French-German-Swiss project

October 1st - 3rd, Strasbourg
European Mobility Expo

October 14th, Paris
IXe Forum européen et franco-allemand

November 29th, Mulhouse & online
AsimutE WP3 workshop to discuss theoretical approaches and methodologies for future joint studies

December 4th, Mulhouse
AsimutE 1st year project results meeting with all partners to present and discuss the research progress

August — 2024 — December

September 3rd -6th, Munich
OR Conference: presentation of work from AsimutE project

October 1st Freiburg
CO2Inno Project meeting with all project partners

October 9th, Karlsruhe
Seminar by Guiseppe Sciumè – U Palermo

November 18-22nd, Melbourne
IEA Annex Project Meeting

December 6th, Paris
DFIU participation in the political evening by OFATE/DFBEW at the German Embassy in France on Competitiveness of Industrial Locations in Germany and France: The Influence the European Green Deal Instruments

DFIU Research Groups

Research groups at IIP – DFIU

Risk Management

Development of methods and tools for systematic, scientifically sound and comprehensible decision support for complex, uncertain and dynamic systems for various stakeholders, such as companies, communities and individuals. Due to the variety, stakeholders' systems may be supply chain networks, markets or critical infrastructures and sectors. Methods to assess and manage complexity, uncertainty and dynamics include vulnerability and multicriteria assessment, simulation and robust or stochastic optimization.

Contact: Dr. Sonja Rosenberg

Resource Management in the Built Environment

Method-based decision support of stakeholders in project and resource management in the built environment. Deconstruction, recycling and circular economy of materials, resource efficiency, renewable energies in buildings, sustainable urban and district development, regional resource management. Use of urban data and optimization of the deconstruction of buildings, optimization of recycling material logistic networks

Contact: PD Dr. Rebekka Volk

Sustainable Value Chains

Sustainable concepts for material and energy flow management and decision support at regional, national and global level. Focus on industrial process chains, bioeconomy, industrial resource efficiency and production networks in the metal, energy, chemical and automotive industries as well as on the use of renewable raw materials. Investment and cost estimation, operations research, empirical social research, life cycle assessment (LCA)

Contact: Dr. Andreas Rudi

Research groups at IIP / DFIU

Sustainable Infrastructures for Renewable Energy Systems

The research group aims at developing tools, methods and datasets for scenario-based techno-economic analyses for electricity, gas and hydrogen transport networks in the context of European decarbonization goals. Research covers e.g. integrated planning and operation of coupled networks, new components for electricity grids, interdependencies between market design and grids and empirical behavior studies in the Energy Smart Home Lab.

Contact: Thorben Sandmeier, M. Sc.

Energy Demand & Mobility

The research group specializes in analyzing energy demand within the industrial, mobility, and household sectors. It explores interactions with the broader energy system and conducts socio-techno-economic assessments for sustainable technology investment and diffusion. Utilizing energy system optimization models, agent-based simulations, and data-driven machine learning, the group aims to understand and forecast sector-specific energy demands.

Contact: Dr. Max Kleinebrahm

Sustainable Energy Markets & Future Energy Commodities

Market price analysis and forecasting; Impact of storage and other flexibility options from a market and/or investor point of view;

Design and agent-based modeling of electricity markets and capacity mechanisms in systems with high shares of renewables including impacts from flexibility and cross-border effects; Model-based energy systems analysis from regional to global scale with high temporal and spatial resolution including optimized adaptation of infrastructures and energy commodity transportation; Future energy commodities including the option of reactive metals as a "Clean Circle"

Contact: Dr. Armin Ardone, Dr. Viktor Slednev

Energy and Behavior

The research group investigates the acceptance and adoption of innovations in the context of the energy transition, as well as other topics related to sustainability transformations, from a social and behavioral perspective. Using empirical social research theories and methods, the group primarily researches the individual drivers and barriers affecting acceptance and adoption. Current topics include the diffusion of electric heat pumps, acceptance of bidirectional charging of electric vehicles, and the acceptance of negative emissions technologies.
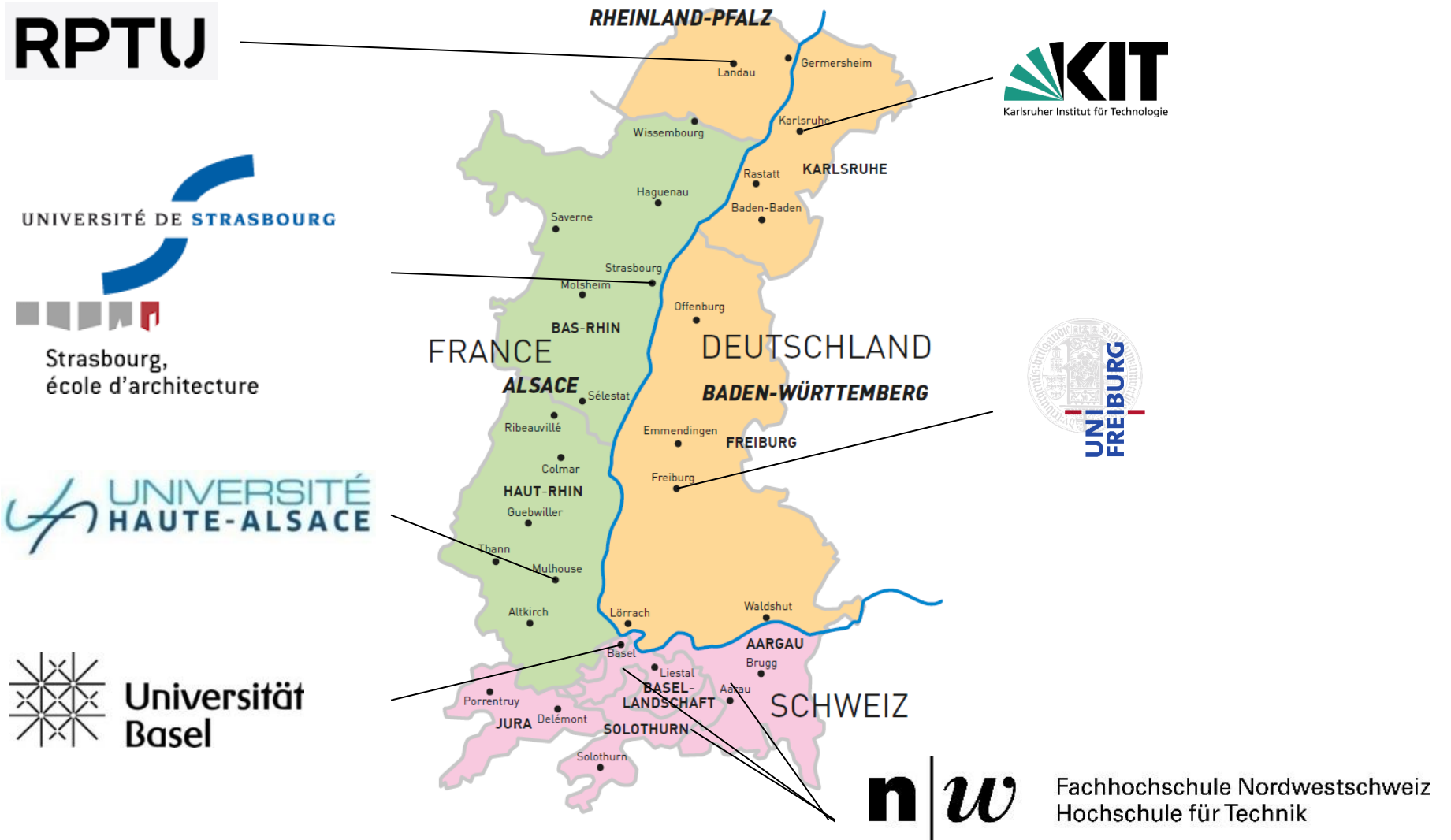
Contact: Dr. Daniel Sloot

DFIU Research Projects and Partners

DFIU Research Mission
DFIU develops joint solutions for environmental problems in the Franco-German and international context - particularly in the areas of energy, sustainable mobility, circular economy, risk management, air, water and land use.

Many of the research projects are undertaken in the Upper Rhine Region. In 2024, an active and sustainable cooperation brought partners from France, Switzerland and Germany together.

Other research partners

Beyond the Upper Rhine Region, DFIU partners extend to other parts of France and Germany, as well as to other countries like Austria, Denmark, Norway, Brazil and Australia. The DFIU further intensified the scientific cooperation with the Grenoble Ecole de Management that was started in 2023, and engaged in meetings and workshops with numerous other partners.
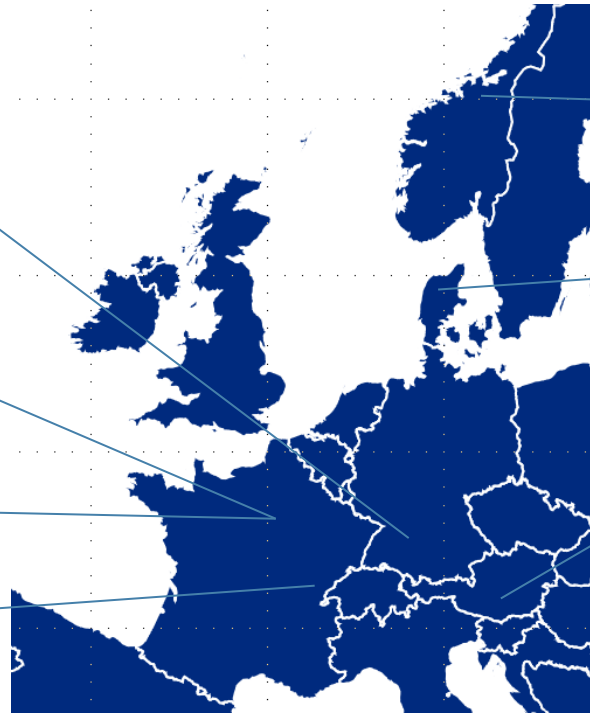
CO2Inno Real Laboratory CO2 neutral Innovation Region Upper Rhine

Duration: 2022 – 2025   Contact : Dr. Daniel Sloot; Nora Baumgartner, M. Sc.; Leonie Wagner, M. Sc.

Main Goals:

Within the framework of this real laboratory, selected key technologies as part of feasible transformation paths towards climate neutrality in the energy sector will be tested and improved with regard to their technical and legal feasibility as well as their social acceptance.
These include above all:

- Decentralized energy systems based on green hydrogen
- Multidisciplinary concepts such as cyber security in energy systems
- Technical, administrative and legal practicability potentials
- Societal acceptance
- Impact of nuclear power plant dismantling on the transformation towards new energy systems

DFIU focus / research progress:

In the project, the DFIU is responsible for carrying out accompanying research with a focus on technology acceptance. The aim is, on the one hand, to identify factors that influence the acceptance of the technologies examined and, on the other hand, to increase the acceptance of the most important interest groups within the project by integrating their contributions into the co-creation process:

- Assess and evaluate acceptance factors and barriers towards hydrogen-based energy and electromobility
- Assess and evaluate perceived risks and social acceptance factors with regard to intelligent infrastructure

Project partners

University of Freiburg, Université de Haute-Alsace, TRION-climate e.V., University of Strasbourg, and others

Funding

European Regional Development Fund (ERFD), INTERREG VI Upper Rhine

Link
https://co2inno.com/

AsimutE Auto-consumption & Intelligent Storage for a better UTilisation of Energy

Duration: Oct. 2023 – Dec. 2026   Contact: Dr. Daniel Sloot; Dr. Max Kleinebrahm; Dr. Thomas Dengiz; Stephanie Stumpf, M. Sc.; Jonathan Vogl, M. Sc.

Main Goals:

The AsimutE project aims to enable better energy use through intelligent self-consumption and energy storage solutions, with a focus on integrating end-users throughout the project. The primary objective is to balance energy demand with the production of renewable energy, taking into account advanced operation strategies and flexible technologies. This involves:

- Implementing intelligent solutions for reducing energy consumption and optimizing energy storage, considering end-user involvement
- Developing an AI tool for operating a heat pump for self-consumption and using batteries from electric vehicles as "stationary" energy storage
- Creating a tool for harmonizing strategies between citizens and public authorities for energy-saving, leading to a substantial reduction in the CO_2 footprint in the Upper Rhine Region
- Utilizing AI methods and surveys among consumers, energy suppliers, and stakeholders in the Upper Rhine Region.

DFIU focus / research progress:

At the DFIU, one emphasis is on multi-criteria optimization of heating systems in residential districts, aiming to balance energy costs, greenhouse gas emissions, thermal comfort, and electrical peaks. Utilizing a combination of multi-criteria optimization and machine learning, the project addresses the diverse objectives within residential areas. The other focus of the DFIU is on the behavior of private energy consumers, in particular compensatory consumption and the expectations of households regarding sustainable energy technologies.

Project partners

CNRS, Université de Haute-Alsace, Rhineland-Palatinate Technical University of Kaiserslautern-Landau, Offenburg University of Applied Sciences and others
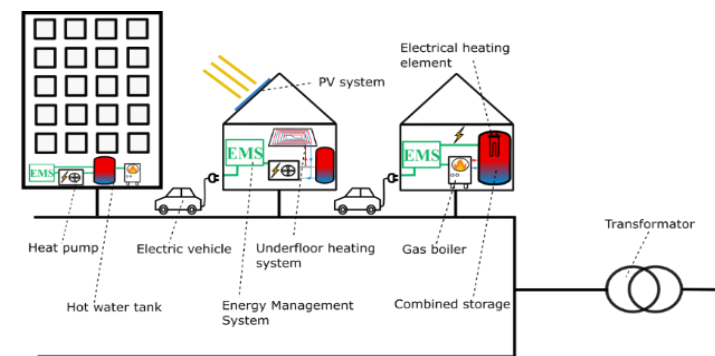
Funding

European Regional Development Fund (ERFD), INTERREG VI Upper Rhine

Link

[AsimutE: Intelligenter Eigenverbrauch und Speicherung für eine bessere Nutzung von Energie - Interreg (interreg-oberrhein.eu)](#)

DFIU-GEM Energy Survey on the Societal Acceptance of the Energy Transition

Duration: started in 2023, ongoing   **Contact: Dr. Daniel Sloot**

Main Goals:

The DFIU-GEM Energy Survey was initiated in 2023 together with the Grenoble Ecole de Management (GEM). The main aim of this survey is to gain continuous insights into the state and progress of the energy transition in Germany and France, in particular the different aspects of public support for these transitions. Yearly surveys among the general public provide deep insights into the dynamics of energy transition in both countries over time. The two partners DFIU and GEM bring together an interdisciplinary team with experts from energy economics, behavioral economics and behavioral science, as well as marketing. The project is especially interested in the following aspects of public perceptions of the sustainable energy transition:

- Assessing public support for different forms of energy supply, such as solar, wind, nuclear, and gas
- Examining the acceptance of different approaches on the demand side, such as a price on carbon for consumers
- Comparing attitudes toward the energy transition in Germany and France, and assessing public support for cross-country cooperation

Focus Rounds:

Next to recurring core modules that contain the same questions each year, each survey looks at a particular topic in focus. In 2023, the focus was on the role of energy security for the sustainable energy transition, as well as on the issue of cross-border electricity trading between Germany and France. In the current (2024) survey round, the focus lies on the public acceptability of controversial energy technologies, such as hydraulic fracturing and carbon dioxide removal technologies.

Project partners
Grenoble Ecole de Management

Funding
Internally funded

Output
- The Grenoble Ecole de Management and DFIU published a joint article with selected results from the first survey round in *The Conversation*, available here.
- First insights from the survey were presented at a webinar in May (see the next slide).
- Rounds from the round 2 survey will become available in 2025.

DFIU-GEM Energy Survey: Webinar on selected results from round 1

Date: May 28, 2024

On May 28, DFIU and the Grenoble Ecole de Management (GEM) hosted a joint webinar to present first results from the DFIU-GEM Energy Survey to an audience of researchers and beyond. The first round survey data was collected in December 2023, about five months prior to the European Union elections. The webinar took place just a few days before the elections and thus served to inform an interested audience about the public opinions on the course of the sustainable energy transition in Germany and France.

Insights from the first round of the survey pointed to consistent levels of support for the sustainable energy transition, with French and German respondents showing similar levels of support. Moreover, people in both countries support electricity generation from renewable energies (e.g., solar and wind) over electricity generated from fossil fuels (e.g., coal, gas). Attitudes were more polarized around nuclear power, with a substantial number of respondents in both countries supporting as well as opposing this technology. These results indicate that support for a sustainable energy transition remains high, despite other topics currently dominating public discourse.

In focus: Public opinions on French-German cooperation
One survey module taps specifically into public opinions on French-German cooperation in the energy transition. As the chart below shows, closer cooperation is something that is desired I both countries to an almost equal extent: about two-thirds of the German and French population support a more intensive cross-border cooperation to push forward the energy transition. Further analyses showed that this level of support was relatively robust to varying political preferences the respondents held.

Support for Cooperation — My country and the other country should cooperate more intensively to push forward the ET. (D / F). Legend: Totally agree, Agree, Indifferent, Disagree, Totally disagree.
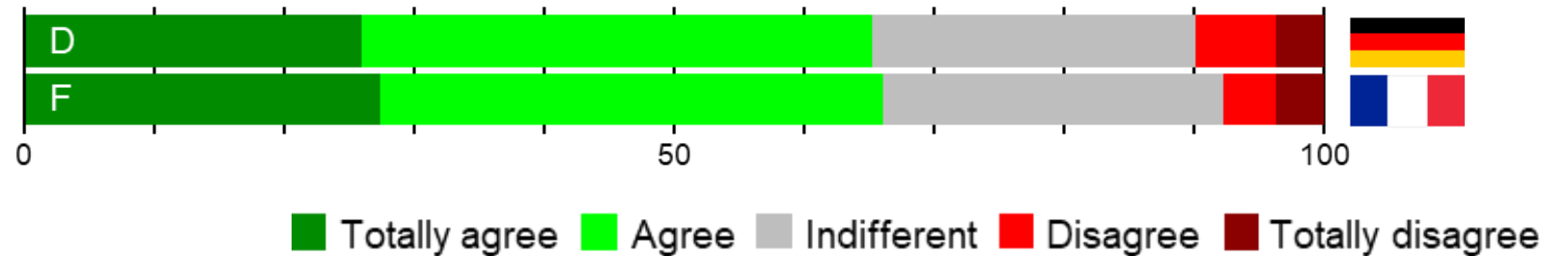
ReBioBW Potentials of agricultural residues for the bioeconomy in Baden-Wuerttemberg

Duration: 2022 – 2025　　　　　　　　**Contact: Raphael Heck, M. Sc.; Dr. Andreas Rudi**

Main Goals:

By substituting fossil resources with renewable resources, the bioeconomy in Baden-Wuerttemberg supports a climate-neutral economy. In order to avoid conflicting goals with food security, the focus is on agricultural residues. However, increased use of residues can cause conflicts of interest with existing use or climate protection if humus build-up and carbon storage in the soil are at risk. At the same time, the use of the residues offers opportunities for new regional value chains in rural areas. Realizing these opportunities and avoiding conflicting goals therefore requires a holistic evaluation of the residual material potential.

The aim of the ReBioBW project is to record the current and future potential of residues from agriculture and landscape conservation for the bioeconomy in Baden-Wuerttemberg. Using statistical data, the theoretical potential is calculated as the absolute volume of residues and, minus the quantities for humus build-up, the sustainable potential. A representative survey among farmers is intended to provide information on the current use of the residues in order to determine the economically available potential. Qualitative surveys among companies and farmers show hurdles and framework conditions for calculating the practical potential. By developing a regional bioeconomy sector model and coupling it with an agricultural operating model, the knowledge gained is used to estimate the effects of residue use and future residue potential against the background of economic, social and political drivers.

DFIU focus:
- Mapping of land use types in Baden-Wuerttemberg for agriculture and landscape management
- Categorizing, estimating and mapping of yields in Baden-Wuerttemberg for agriculture and landscape management
- Estimation of the theoretical and sustainable biomass residual material potential

Project partners

University of Hohenheim, the Departments of Bioeconomy, Production Theory and Resource Economics, Biobased Resources in the Bioeconomy

Funding

Ministry of Food, Rural Affairs and Consumer Protection

Publications

An Estimation of Biomass Potential and Location Optimization for Integrated Biorefineries in Germany (doi:10.1016/j.jclepro.2024.143497)
Simulation modelling in bioeconomy: Unraveling trends, gaps, and insights through bibliometric analysis (doi:10.3390/su16166781)

Link

ReBioBW - Potenziale landwirtschaftlicher Reststoffe für die Bioökonomie in Baden-Württemberg

IEA Annex89 - Ways to implement net-zero whole life carbon buildings

Duration: October 2023- December 2027   **Contact: PD Dr. Rebekka Volk, Theresa Kaya, M. Eng.**

Main Goals:

Up to 40 percent of all greenhouse gas emissions (GHG) can be attributed to the "construction, maintenance and operation of buildings" area of activity. The goal of projects run by the International Energy Agency (IEA) is to reduce this as a contribution to limiting global warming through net-zero GHG emissions across the whole life cycle of buildings in policy and practice. The aim of IEA EBC Annex 89 is to develop and introduce implementation-oriented strategies and instruments for climate protection in the construction and building sector. This includes developing guidelines and recommendations for establishing Whole Life Carbon targets at multiple scales and perspectives, identifying critical carbon reduction pathways and actions, creating Paris-compatible assessment frameworks, evaluating the application of diverse assessment methods, and examining the effectiveness of various tools and instruments for decision-making. Additionally, it aims to understand the conditions that enable the effective adoption of context-specific solutions by ensuring their practical application from local to global levels.

DFIU focus:

Research topics and the approaches pursued in Germany are:

- timetables and step-by-step plans for the cross-sectoral reduction of GHG emissions in the field of action, definition of GHG emission targets and remaining GHG emission budgets
- practical, targeted and legally secure requirements and verification procedures that can provide a national basis for the introduction of an environmental assessment in regulatory law;
- specific instruments for determining and influencing GHG emissions (planning and all decision-making processes of buildings in Germany)
- approaches to overcoming obstacles and strengthening the willingness to act among selected groups of actors, including real estate and finance.

Project partners

Graz University of Technology (AU)
University of Melbourne (AUS)
Aalborg University (DEN)
Norwegian University of Science and Technology NTNU (NOR)
and further partners

Funding

Bundesministerium für Wirtschaft und Klimaschutz (BMWK)

Link
Ways to Implement Net-zero Whole Life Carbon Buildings || IEA EBC || Annex 89

AI4EOSC – Artificial Intelligence for the European Open Science Cloud

Duration: 2022 – 2025   **Contact: PD Dr. Rebekka Volk, Elena Vollmer, M.Sc.**

Main Goals:

The AI4EOSC project aims to deliver an enhanced set of services for the development of Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL) models and applications. These services will allow for advanced features such as distributed, federated and split learning; provenance metadata; event-driven data processing services or provisioning of services based on serverless computing.

The project will focus on tools to provide AI, ML and DL services by integrating real life use cases to aid in the design process and showcase the afore-mentioned functionalities. AI4EOSC bases its activities on the technological framework delivered by the DEEP-Hybrid-DataCloud H2020 project. The DEEP platform is a production-ready system that is being effectively used by researchers in the EU to train and develop ML and DL models.

DFIU focus:

Research topics and the approaches pursued in Germany are:
- The focus lies on providing a use case on automated thermography, centered around thermal images of city infrastructure (such as buildings and the ground above district heating networks)
- These will form a basis to test the platform's functionality and proficiency in incorporating new AI-based models to - in this case - detect thermal bridges on buildings and common thermal anomalies
- If possible, new platform services such as federated learning can be showcased using the provided data and AI-model(s).

Project partners

Steinbuch Centre for Computing (KIT)
Universitat Politecnica De Valencia (UPV)
Istituto Nazionale Di Fisica Nucleare (INFN)
and further partners

Funding

European Union

Publications

Detecting district heating leaks in thermal imagery: Comparison of anomaly detection methods
https://www.sciencedirect.com/science/article/pii/S092658052400445X

Link

Build AI models in the EOSC - AI4EOSC

Task Force on Techno-Economic Issues (TFTEI)

Duration: since 2002   **Contact: Diana Temnov, M. Sc.; Dr. Andreas Rudi**

Main Goals:

On behalf of the French environment agency ADEME and with its French partner CITEPA, the DFIU has been the technical secretariat of the TFTEI (Task Force on Techno-Economic Issues) since 2002. The Task Force works by applying the rules on Long-Range Transboundary Air Pollution (LRTAP) of the UNECE (United Nations Economic Commission for Europe) Convention and, in this context, belongs to the WGSR (Working Group on Strategies and Review).

The aim of this cooperation is to analyze, from the point of view of environmental policy, the technical and economic issues of interest to politicians and economic decision-makers. Not so long ago, our priority was to develop two MS Excel-based tools for estimating the investment and operating costs of different technologies for reducing polluting emissions.

DFIU focus:

For 2024, the focus has been on revising the ERICCA tool for investigating the impact of decarbonization on emissions of atmospheric pollutants in for the industrial sector. The tool has been updated in terms of data input on emission figures, technological efficiencies and cost estimates.

The usability of the tool was improved, and errors were corrected by adjusting the underlying VBA code.

Project partners

CITEPA, ADEME

Link

Home - TFTEI (citepa.org)

Teaching Activities

Team Project Cyber Security in the Upper Rhine Region

Duration: October 2023 – February 2024   **Contact: Dr. Daniel Sloot, Nora Baumgartner, M. Sc.**

Main Goals:

This team project is an educational teaching format, to train students in empirical research, to promote the students' interdisciplinary knowledge and to foster cross-border cooperation and teaching. In the course of this seminar, the students studied the households' perceptions about potential risks, that are associated with smart meter technology. As France is a frontrunner regarding the smart meter roll out, and Germany only started to introduce this technology, a comparison between countries is of high interest. The team project therefore aimed to find out whether there is an awareness of these risks among the population and, if so, which risks dominate. Furthermore, the students investigated how perceptions differ between France and Germany. As a final outcome, the students developed a roadmap, to inform policy makers about potential avenues to introduce smart meters in Germany.

The focus of the DFIU was as follows:
1. Developing, coordinating and conducting the seminar
2. Fostering cross-border cooperation in teaching and research
3. Promoting interdisciplinary knowledge in teaching and research
4. Conducting a survey of German and French households on the risk perception of smart meters
5. Conducting interviews with experts in the field of energy economics to classify the perceived risks
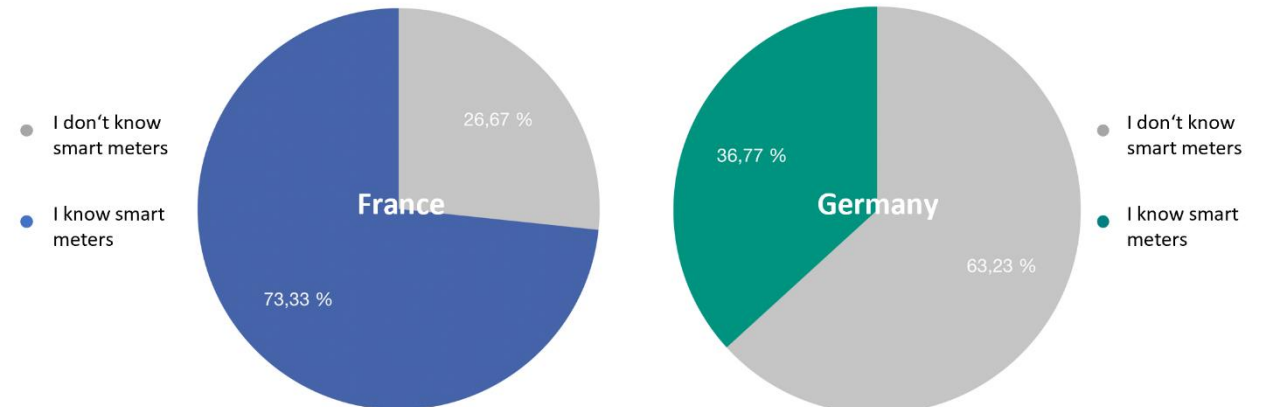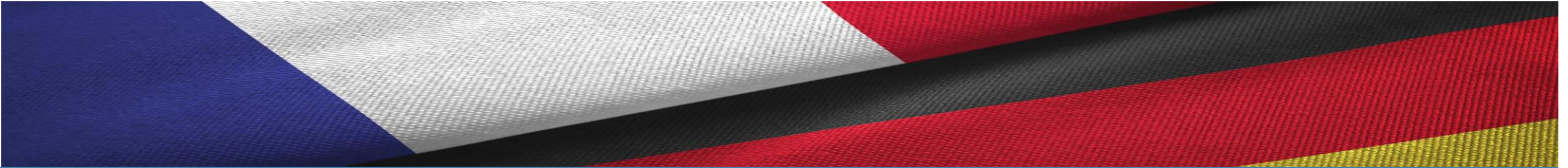
Project partners
Université de Haute-Alsace

Funding
European Regional Development Fund (ERFD),
INTERREG VI Upper Rhine

Link
[Project video (youtube.com)](youtube.com)

Outlook: The DFIU in 2025

Building on the successful research and teaching projects carried out in 2024, the DFIU will further develop both existing and new collaborations with French partner institutions and beyond, particularly in the following areas:

- Continuing the French-German DFIU-GEM Energy Survey on the Societal Acceptance of the Sustainable Energy Transition
- Organizing a DFIU-Seminar on April 8th by Jan-Horst Keppler from the Université Paris Dauphine
- Hosting a "DFIU Day" on May 16th with our partners in France, Germany and Switzerland to better connect researchers and identify common research interests
- Intensifying the cooperation with research institutions in key topics such as energy system analysis, renewable energies, material flow management, circular economy, sustainable mobility as well as electromobility and energy policy
- Expanding international activities in the areas of urban development, modeling and techno-economic assessment of environmental technologies, bioeconomy and circular economy
- Further developing French-German teaching activities by identifying new project topics for further interdisciplinary student research labs and summer schools for early-career researchers

Zusammenfassung

Im Jahr 2024 sind am DFIU vielfältige Ergebnisse in den neuen und laufenden deutsch-französischen Projekten entstanden: Die erste Runde des DFIU-GEM Energy Surveys wurde in einem Webinar und einem Artikel einem breiteren Publikum präsentiert. Die Projekte CO2Inno und AsimutE analysierten innovative Energiekonzepte boten neue Erkenntnisse sowohl in der sozialempirischen als auch der techno-ökonomischen Forschung. Außerdem wurden neue Projektideen im Bereich der nachhaltigen Mobilität entwickelt. Zahlreiche Veranstaltungen trugen zur Sichtbarkeit des DFIU und seiner Projekte bei. Unter anderem wurde ein weiteres deutsch-französisches Team-Projekt erfolgreich abgeschlossen, neue Lehrformate im deutsch-französischen Raum sollen auch in den nächsten Jahren weiter entwickelt werden. Mit den abgeschlossenen Promotionen und Publikationen konnte das DFIU zudem an die wissenschaftlichen Erfolge der letzten Jahre anknüpfen. Das Forschungsspektrum umfasste dabei Fragestellungen zur öffentlichen Meinung zur Energiewende, der nachhaltigen Mobilität, der Integration erneuerbarer Energie, des Risikomanagement, der Akzeptanz von Technologien sowie der Kreislaufwirtschaft. Mit diesem breiten, interdisziplinären Profil ist das DFIU auch für 2025 bestens aufgestellt, um aktuelle Problemstellungen in der Umweltforschung zu bearbeiten.
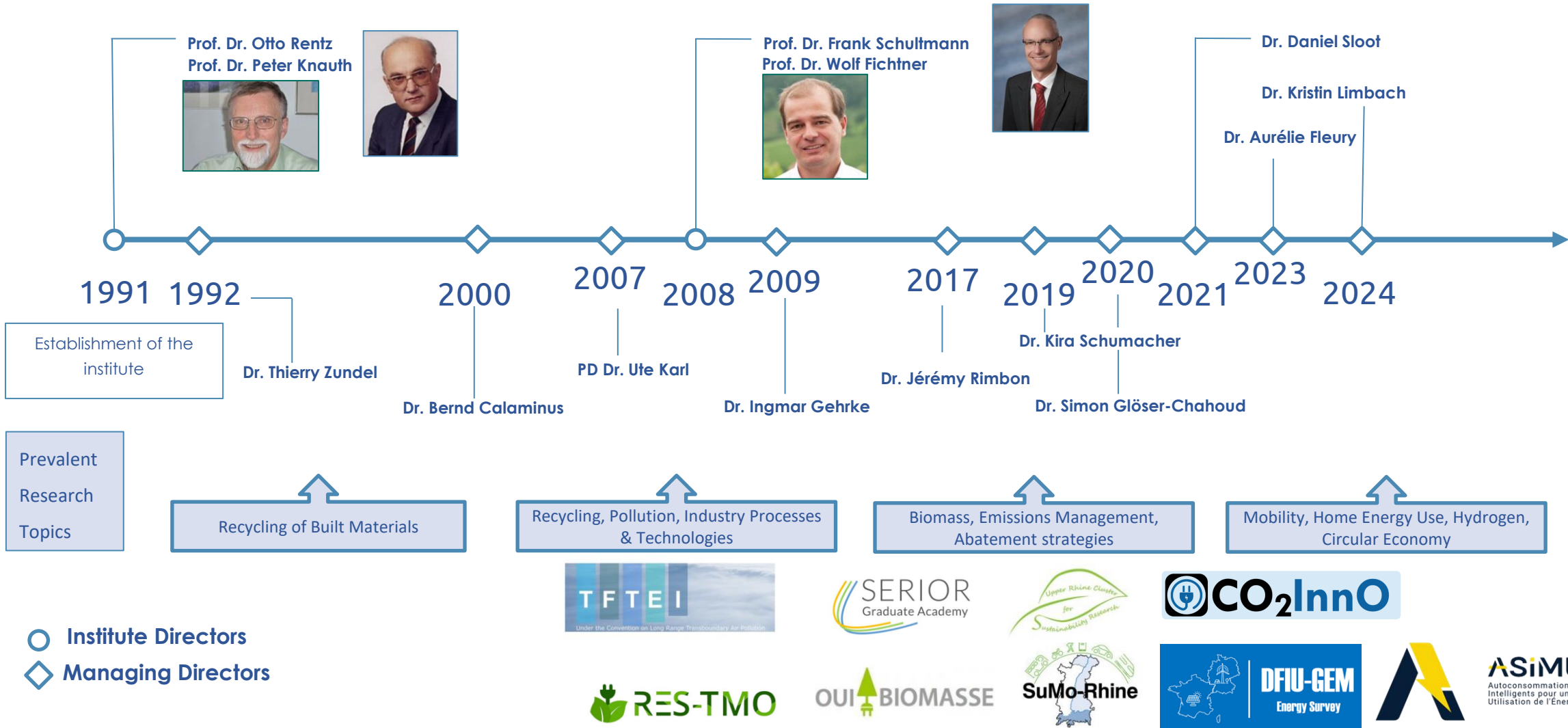
Résumé

En 2024, de multiples résultats ont été obtenus au DFIU dans le cadre des nouveaux projets franco-allemands ainsi que ceux en cours : le premier cycle du DFIU-GEM Energy Survey a été présenté dans le cadre d'un webinaire et d'un article, les projets CO2Inno et AsimutE analysant des concepts énergétiques innovants ont offert de nouvelles connaissances tant dans la recherche socio-empirique que dans la recherche techno-économique. De nouvelles idées de projets ont été développées dans le domaine de la mobilité durable. De nombreuses manifestations ont contribué à la visibilité du DFIU et de ses projets et de nouveaux formats d'enseignement franco-allemand ont été menés à bien et continuent à être développés dans les années à venir. Ainsi, à travers les thèses et publications achevées, le DFIU a pu renouer avec les succès scientifiques des dernières années. L'éventail des recherches comprend des questions relatives à l'opinion publique sur la transition énergétique, la mobilité durable, l'intégration des énergies renouvelables, la gestion des risques, l'acceptation des technologies et l'économie circulaire. Grâce à ce profil large et interdisciplinaire, le DFIU est bien placé pour traiter les défis actuels de la recherche environnementale en 2025.

Summary

In 2024, a wide range of results were produced at the DFIU in new and ongoing Franco-German projects: the first round of the DFIU-GEM Energy Survey was presented to a broader audience in a webinar and an article, the CO2Inno and AsimutE projects analyzed innovative energy concepts and provided new insights in both social-empirical and techno-economic research. In addition, new project ideas were developed in the field of sustainable mobility. Numerous events contributed to the visibility of the DFIU and its projects. Another Franco-German student team project was successfully completed, and new teaching formats in the Franco-German area are to be further developed in the coming years. With the completed doctorates and publications, the DFIU was also able to build on the scientific successes of recent years. The research spectrum included issues related to public opinion on energy system transformation, sustainable mobility, the integration of renewable energy, risk management, the acceptance of technologies, and circular economy. With this broad, interdisciplinary profile, the DFIU is well positioned to continue addressing current issues in environmental research in 2025.

Timeline DFIU since its creation in 1991

Prof. Dr. Otto Rentz
Prof. Dr. Peter Knauth

Prof. Dr. Frank Schultmann
Prof. Dr. Wolf Fichtner

Dr. Daniel Sloot

Dr. Kristin Limbach

Dr. Aurélie Fleury

1991 **1992** **2000** **2007** **2008** **2009** **2017** **2019** **2020** **2021** **2023** **2024**

Establishment of the institute

Dr. Thierry Zundel

Dr. Bernd Calaminus

PD Dr. Ute Karl

Dr. Ingmar Gehrke

Dr. Jérémy Rimbon

Dr. Kira Schumacher

Dr. Simon Glöser-Chahoud

Prevalent Research Topics

Recycling of Built Materials

Recycling, Pollution, Industry Processes & Technologies

Biomass, Emissions Management, Abatement strategies

Mobility, Home Energy Use, Hydrogen, Circular Economy

○ Institute Directors
◇ Managing Directors

TFTEI — Under the Convention on Long Range Transboundary Air Pollution

SERIOR Graduate Academy

Upper Rhine Cluster for Sustainability Research

CO₂InnO

RES-TMO

OUI BIOMASSE

SuMo-Rhine

DFIU-GEM Energy Survey

ASiMUTE — Autoconsommation et Stockage Intelligents pour une Meilleure Utilisation de l'Énergie

History of the DFIU

History
- Established in 1991 by Prof. Dr. Otto Rentz and Prof. Dr. Lothaire Zilliox
- Since 2009: Management of the DFIU by Prof. Dr. Frank Schultmann and Prof. Dr. Wolf Fichtner

Key numbers Since establishment:
- 18.6 Mio € funds raised
- 67 PhDs
- 7 habilitations
- 210 projects achieved
- 127 scientific researchers

Concept
- For common German-French problems, joint solutions are developed in joint German-French teams.
- Activities at regional (Alsace/Baden-Wuerttemberg), bi- and tri-national (France/Germany/Switzerland), European and international levels (Australia, USA, Chile, Brazil, etc.)