Karlsruher Institut für Technologie

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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
# 2025

KIT – The University in the Helmholtz Association

# Vorwort

Der vorliegende Bericht beschreibt die wesentlichen Arbeiten und Aktivitäten des DFIU aus den verschiedenen Forschungsbereichen im Jahr 2025. Drei Jahre nach Projektstart wurde das Interreg-Projekt CO2Inno in diesem Jahr erfolgreich abgeschlossen und die Ergebnisse unter anderem beim Abschlusskolloquium in Straßburg präsentiert. Weitere noch laufende Projekte wie Annex89, TFTEI, und Asimute haben ebenfalls neue angewandte und interdisziplinäre Forschungsergebnisse aufgezeigt. Das dritte Jahr in Folge wurden im Rahmen des deutsch-französischen Panels zur Energiewende mit der Grenoble Ecole de Management neue Daten erhoben. Der DFIU-Tag im Mai hat mit Vorträgen und Diskussionsrunden die Vernetzung und Zusammenarbeit im deutsch-französisch-schweizer Raum bereichert und erste, ausgewählte Ergebnisse des Panels präsentiert. Auch in der Lehre war das DFIU mit einem 7-köpfigen Teamprojekt zur Gestaltung eines interaktiven Dashboards zur Visualisierung der Paneldaten zur Energiewende aktiv. Zudem wurden 2 Studentinnen aus Nordamerika für ein 4-monatiges Praktikum im Rahmen von MINTernship betreut. Externe Impulse kamen von Forschenden der Universitäten Paris Dauphine, Oxford und Waterloo, die spannende Seminare beigetragen haben. Insgesamt blickt das DFIU damit auf ein erfolgreiches Jahr der deutsch-französischen und internationalen Zusammenarbeit zurück.

Karlsruhe, im Dezember 2025
Prof. Dr. Frank Schultmann

# Préface

Le présent rapport décrit les principaux travaux et activités menés par le DFIU dans différents domaines de recherche en 2025. Trois ans après son lancement, le projet Interreg CO2Inno s'est achevé avec succès cette année et ses résultats ont été présentés lors du colloque de clôture à Strasbourg. D'autres projets en cours, tels que les projets Asimute, Annex89 et TFTEI ont également produit de nouveaux résultats de recherche appliquée et interdisciplinaire. Pour la troisième année consécutive et en coopération avec l'École de management de Grenoble le sondage franco-allemand sur la transition énergétique a permis de collecter de nouvelles données. L'atelier DFIU en mai, a enrichi le réseautage et la coopération dans l'espace franco-germano-suisse avec des conférences et tables rondes ainsi qu'un aperçu des résultats du sondage. Dans le domaine de l'enseignement, le DFIU a encadré un projet d'équipe, durant lequel 7 étudiants ont conçu un tableau de bord interactif pour la visualisation des données panel du prédit sondage. De plus, deux étudiantes d'Amérique du Nord ont été encadrées dans le cadre d'un stage de 4 mois dans le cadre du programme MINTernship. Des chercheurs des universités Paris Dauphine, Oxford et Waterloo ont apporté des impulsions externes à travers des séminaires stimulants. En rétrospective, le DFIU a achevé une année riche en matière de coopération franco-allemande et internationale.

Karlsruhe, décembre 2025
Prof. Dr. Wolf Fichtner

# Foreword

This report describes the main work and activities of the DFIU in various research areas in 2025. Three years after the project started, the Interreg project CO2Inno was successfully completed this year and the results were presented at the final colloquium in Strasbourg, among other places. Other ongoing projects such as Annex89, TFTEI, and Asimute have also produced new applied and interdisciplinary research results. For the third year in a row, new data was collected as part of the Franco-German panel on the energy transition with Grenoble Ecole de Management. The DFIU Day in May enriched networking and cooperation in the German-French-Swiss region with lectures and discussion panels as well as a first insight on the panel data. The DFIU was also active in teaching with a 7-member team project to design an interactive dashboard for visualizing the data from the Franco-German panel on the acceptance of the energy transition. In addition, two students from North America were supervised for a four-month internship as part of MINTernship. External input came from researchers at the Universities of Paris Dauphine, Oxford, and Waterloo, who contributed stimulating seminars. Overall, the DFIU can look back on a successful year of French-Germanand international cooperation.

# Agenda

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# Key data and facts 2025

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: 570,000€ in external funds raised

**Research and thesis**

7 research projects

3 completed PhD:
- Dr. Nora Baumgartner
- Dr. Sandra Huster
- Dr. Katharina Eberhardt

25 bachelor and master theses

# The DFIU team 2025

# Main events at a glance

**April 4th, Freiburg**
Kick-off meeting of the KORpsa project

**April 8th, Karlsruhe**
Visit and talk by Jan-Horst Keppler (Paris Dauphine)

**April 15th, online**
Launch of the FORSEE programme at the University Grenoble-Alpes

**April 16th, KIT**
Canada-Germany Workshop between the University of Waterloo (Canada), DFIU, Fraunhofer ISI and ITAS

**April 25th, Karlsruhe**
Kick-off meeting "Team project" to develop a data dashboard for the DFIU-GEM Survey data

**May 5th, KIT**
Start of 2 MINTernships: arrival of students from the University of Waterloo (Canada) and UNC Charlotte (USA)

**May 5th- 16th, Karlsruhe**
Research visit by A/Prof Dr Larissa Statsenko from the University of South Australia

**May 16th, Karlsruhe**
DFIU Day: Hosted by the DFIU, researchers from France and Germany met in Karlsruhe for a day of presentations and, discussions, and networking, to facilitate ongoing and future cross-national cooperation

**June 6th, Freiburg**
10th Climate and Energy Colloquium organized by TRIONclimate

**June 16th-22nd, Vilnius, Lithuania**
International Conference on Environmental Psychology (ICEP) 2025: DFIU researchers presented their research at the conference, sharing, among others, insights from the first round of the DFIU-GEM Energy Survey on the role of energy security and energy transition support.

January 2025 July

**July 1st, online**
CO2Inno meeting of the project consortium

**July 25th, Kehl**
Mid-term meeting of the Asimute project: DFIU researchers presented their preliminary results at the meeting.

# Main events at a glance

**July 17th, Karlsruhe**
DFIU researchers visited the Fraunhofer ISI for an exchange about research interests and joint activities.

**August 22nd, KIT**
Final presentations of the DFIU-Dashboard artefact by our "Team project" students

**October 9th, Strasborug**
Xe Forum Européen Franco-Allemand "Prosperity, competitive advantage and peace."

**October 20th, Melbourne**
Start of a 3-months research stay at the University of Melbourne, Australia

**December 15th, KIT**
Research visit & lunch talk by Dr. Emilie Vrain, University of Oxford

**December 16th, KIT**
Visit and talk by Prof. Ian Rowlands, University of Waterloo

August 2025 December

**August 7th, KIT**
MINTernship final presentations and farewell ceremony

**September 25th, Strasbourg**
Final colloquium of the CO2Inno project: DFIU researchers presented their final project results together with the other project partners.

**October 14th, Kehl**
TRIONclimate organized workshop on "Agri-Photovoltaics in the Upper-Rhine region"

**November 5th, Strasbourg**
General assembly of Trion Climate e.V.: The DFIU, which is involved in several activities together with Trion, participated in the meeting on behalf of the KIT.

**December 19th, online**
Participation at the Kick-Off Event for Interreg Project CHARGE as guest, following invitation of Technologie Region Karlsruhe.

# DFIU Research Groups

# Research groups at IIP – DFIU

## Resilient Systems and Risk Management

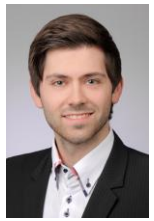
Development of methods and tools for systematic, scientifically sound and comprehensible decision support for complex, uncertain and dynamic systems for various stakeholders, such as companies, communities and individuals. Due to the variety, stakeholders' systems may be supply chain networks, markets 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 resource management in the built environment. Deconstruction, recycling and circular economy of materials, resource efficiency, sustainable urban and district development, regional resource management. Life cycle assessment, optimization of recycling material logistic networks, use of urban data and optimization of the deconstruction of buildings.

**Contact**: Dr. Justus Steins



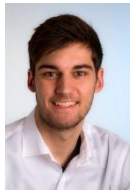
## Sustainable Value Chains

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 the influence of climate change and extreme weather events on energy systems. **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

The goal of the research group Sustainable Energy Markets (SEM) at the Chair of Energy Economics is the formulation and application of mathematical models to analyse the implications of political and economic framework conditions as well as technological trends onto the future development of energy systems. **Contact**: Dr. Armin Ardone

## Future Energy Commodities

The research group's aim is the model-based techno-economic analysis of the global conversion, storage, and transport of energy carriers along the entire process chain – from primary to final energy conversion. The focus is on existing and potential infrastructures considered in high spatial and temporal resolution. **Contact**: 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. **Contact**: Dr. Daniel Sloot

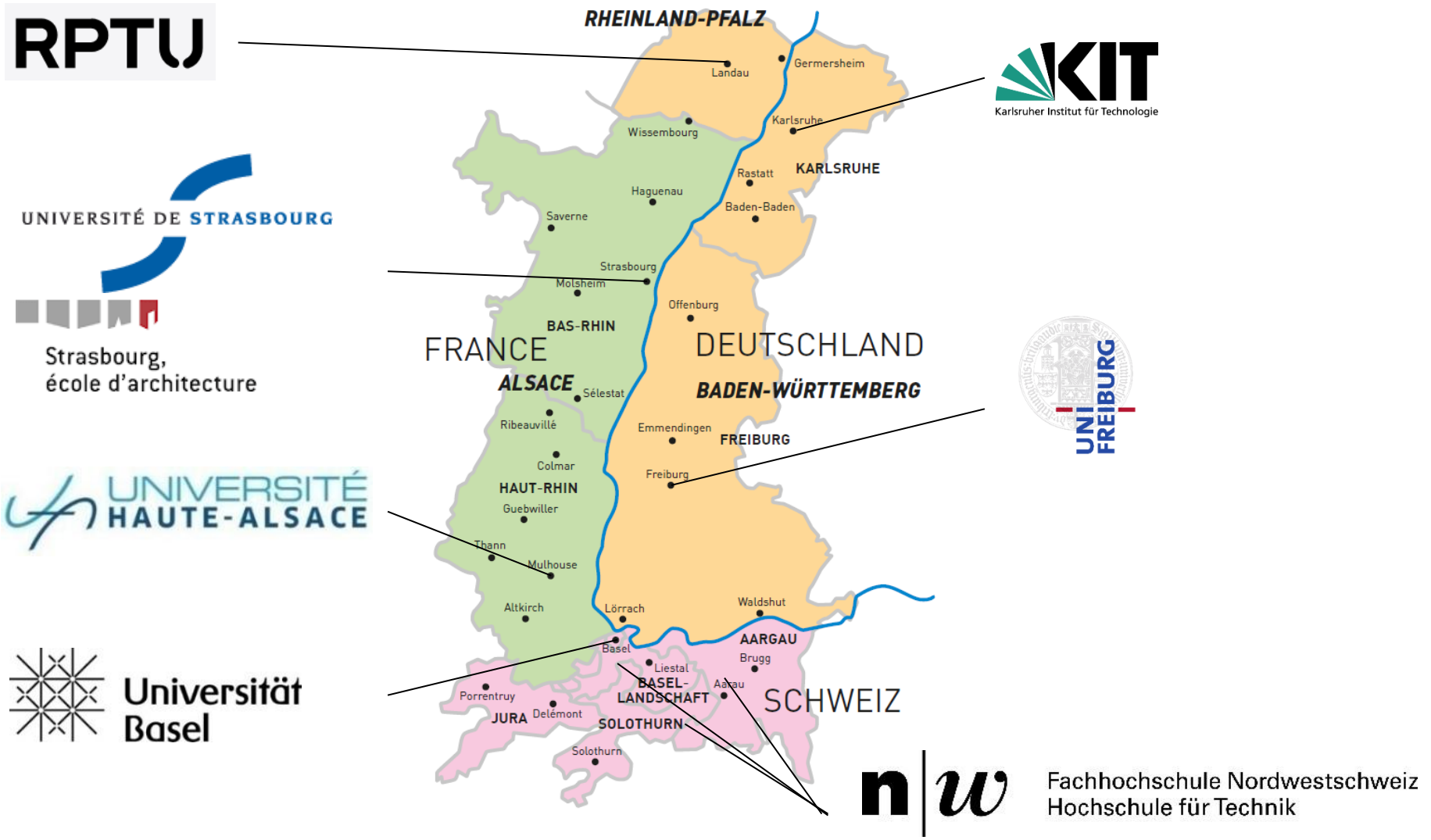
# DFIU Network and Partners

**DFIU Network**

Throughout the portfolio of its diverse research projects, the DFIU cooperates with a variety of public and private international partners. Moreover, the DFIU is involved in various networks to maximize knowledge transfer across different societal groups and to strengthen the societal impact of the insights derived from its research output.

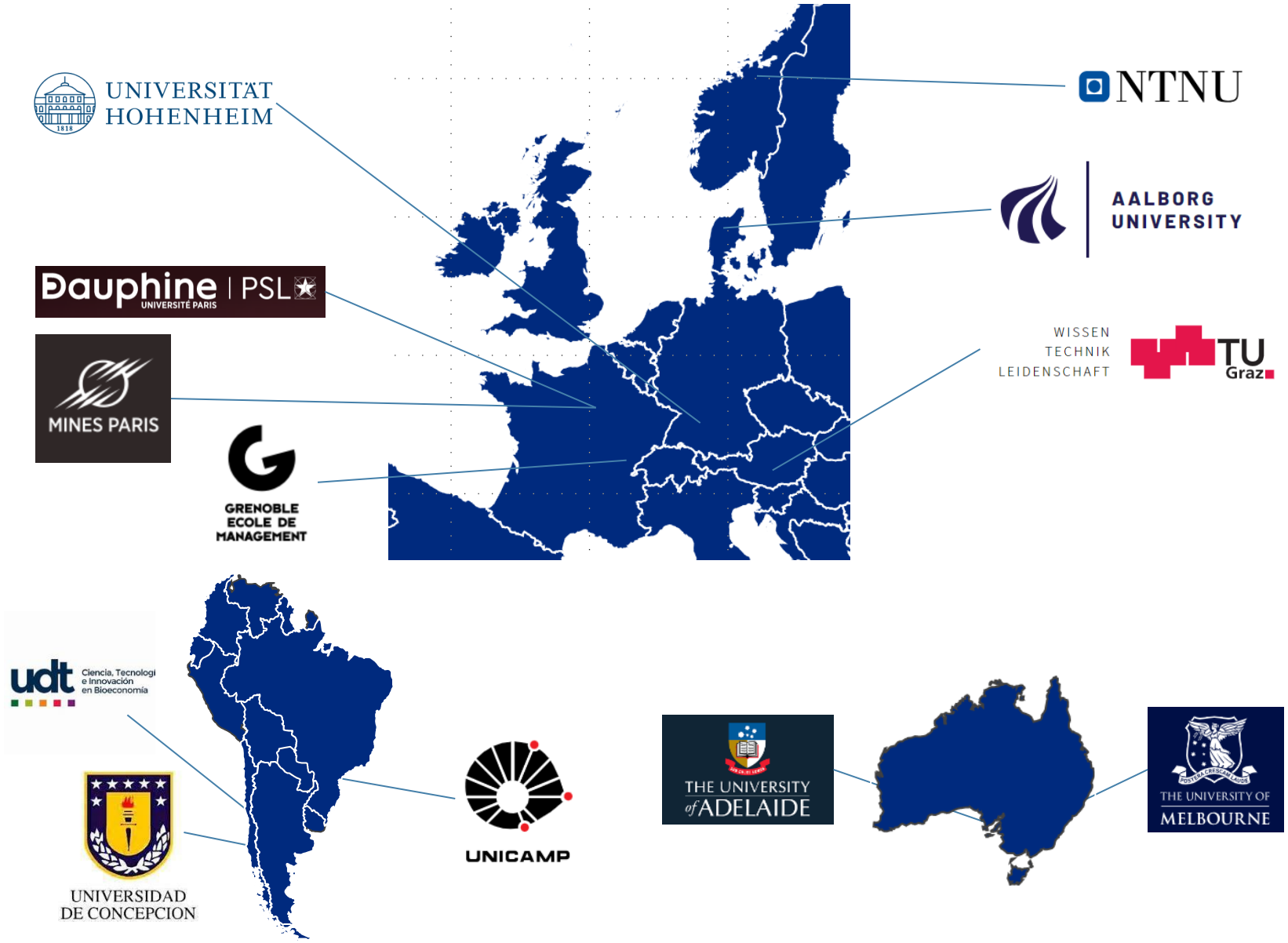
# Research Partners in the Upper Rhine Region

Many of the research projects are undertaken in the Upper Rhine Region. In 2025, 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.



# DFIU DAY – a workshop to explore future opportunities with our academic partners and to disseminate our current research findings

## May 2025

The workshop provided DFIU partners with an opportunity to meet in person and discuss current research topics. Doctoral students were also invited to give poster presentations. We took advantage of the day to build on existing scientific collaborations and initiate new ideas, including for teaching.

### Workshop Program

From 9:30 - Reception & coffee

10:00 – Words of Welcome
Prof. Marc Wouters - Dean of the Faculty of Economics at KIT
Prof. Frank Schultmann and Prof. Wolf Fichtner - Directors of IIP and DFIU
Dr. Kristin Limbach (DFIU) - Introduction on DFIU

10:30 - Keynote: Prof. Corinne Faure (GEM)
**Behavioural Insights on Acceptability of Low Carbon Energy**
Insights from large-scale experiments on technology adoption (e.g. smart thermostats, appliance ownership) and policy acceptance (e.g. energy labels, electricity imports, wind power)

11:20 - Presentation: Dr. Daniel Sloot (DFIU-KIT)
**DFIU-GEM Survey on Public Attitudes towards the Energy Transition: Combined Results from 2023 and 2024**

12:15- Lunch buffet

13:15 - Keynote: Dr. Nadège Blond (CNRS-LIVE)
**Urban transformations in a context of global changes : Interdisciplinary and integrated research on energy, air pollution, and climate issues**
The context of global change, and climate change in particular, is a major driver of urban transformation. Cities are major contributors to emissions, pollutants and exacerbating local climate conditions, but they also offer numerous opportunities in response to the many challenges faced by our societies.

14:00 – Roundtable Discussion: **Innovative Interdisciplinary Teaching Formats for the Energy Transition**
B. Canaan – B. Laroze – D. Ould Abdeslam – S. Rosenberg – P. Sawant

15:00 - Coffee break

15:30 – PhD & Postdoc Poster Session

17:00 - Wrap-up of the workshop

# Forum Européen Franco-Allemand

**October 2025** **Co-Organizer: Dr. Kristin Limbach**

The 10th Franco-German Economic Forum (FEFA), a platform for forward-looking European cooperation. The forum is taking place in a context of considerable economic and environmental challenges: faced with persistent geopolitical tensions and growing economic rivalry, the Franco-German duo is seeking to ensure safety and prosperity in the European Union, decarbonize its economy, and guarantee develop innovative solutions to energy supply and sustainability matters.

Xème Forum Européen et Franco-Allemand (FEFA)

Université de Strasbourg, Amphithéatre Beretz, bâtiment Le Patio

20A Rue René Descartes, 67000 Strasbourg

**9 octobre 2025**

**Pour une Europe de la prospérité, de la compétitivité, de la puissance et de la paix**

# DFIU Projects

**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.

# CO2Inno Real Laboratory CO2 neutral Innovation Region Upper Rhine

**Duration: 2022 – 2025, concluded** **Contact : Dr. Daniel Sloot; 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 were tested and improved with regard to their technical and legal feasibility as well as their social acceptance.
Research topics included:

- 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 was responsible for carrying out accompanying research with a focus on technology acceptance. The aim was, 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

**Links and selected outputs**

- The project website can be accessed via https://co2inno.com/ and also contains the final project report (in German and French)
- Final project colloquium on September 25, with presentations from DFIU researchers
- Policy briefs and guidelines for the implementation of innovative technologies

# 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 CO2 footprint in the Upper Rhine Region
- Utilizing AI methods and surveys among consumers, energy suppliers, and stakeholders in the Upper Rhine Region.

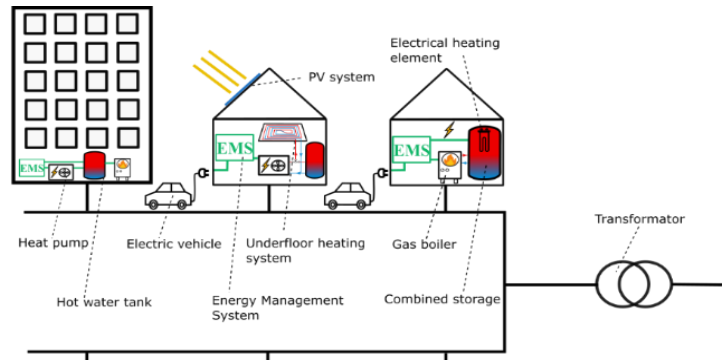
**DFIU focus / research progress:**
At the DFIU, one emphasis is on multi-criteria optimization of heating systems in residential districts, aiming to balance energy costs, greenhouse gas emissions, thermal comfort, and electrical peaks. Utilizing a combination of multi-criteria optimization and machine 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

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

**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 of 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 2024, the focus was on the public acceptability of controversial energy technologies, such as hydraulic fracturing and carbon dioxide removal technologies. The current (2025) survey round investigates the effects of criticism of a country's energy transition strategy by another country.

**Project partners**
Grenoble Ecole de Management

**Funding**
Internally funded

**Output**

- Insights from the survey were presented at the DFIU Day in May (see the next slide).
- Results from the round 3 survey will become available in 2026.

# DFIU-GEM Energy Survey: Selected results from rounds 1 & 2 (DFIU Day 2025)

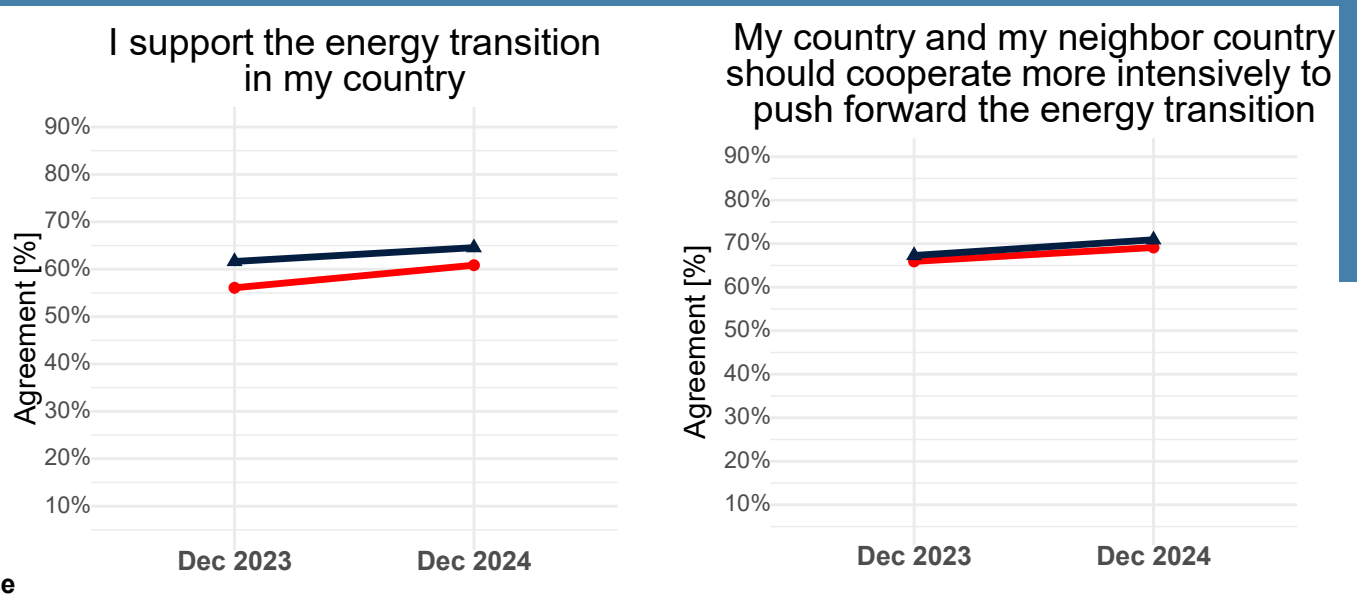
## Date: May 16, 2025

On May 16, the DFIU hosted the first DFIU Day, with the aim of disseminating and discussion research insights and facilitating cooperation and exchange between German and French researchers. The day included a presentation of the results from rounds 1 and 2 (2023-2024) of the DFIU-GEM Energy Survey, which is conducted jointly between DFIU and the Grenoble Ecole de Management (GEM).

Insights from the first two rounds of the survey pointed to high 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. Importantly, support for renewable energies did not decline but slightly increase over time, whereas this was not the case for electricity generated from nuclear power or coal. 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 shows, closer cooperation is something that is desired I both countries to an almost equal extent, with a slight increase from 2023 to 2024 in both countries (right panel). Support for cooperation was relatively higher than energy transition support in general (left panel).



# 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

**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)

**Funding**

Ministry of Food, Rural Affairs and Consumer Protection

**Link**

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

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

**Duration: Oct. 2023- Dec. 2027** **Contact: Theresa Kaya, M. Eng., Dr. Justus Steins, Prof. Dr. Rebekka Volk**

**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 residential real estate

**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: Elena Vollmer, M. Sc., Dr. Justus Steins, Prof. Dr. Rebekka Volk**

**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 focuses 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 Temnova Deguy, 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:**

- 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.

- Input for a presentation at the EU workshop on Methane in the context of the Gothenburg protocol revision

**Project partners**

CITEPA, ADEME

**Link**

Home - TFTEI (citepa.org)

# Teaching Activities

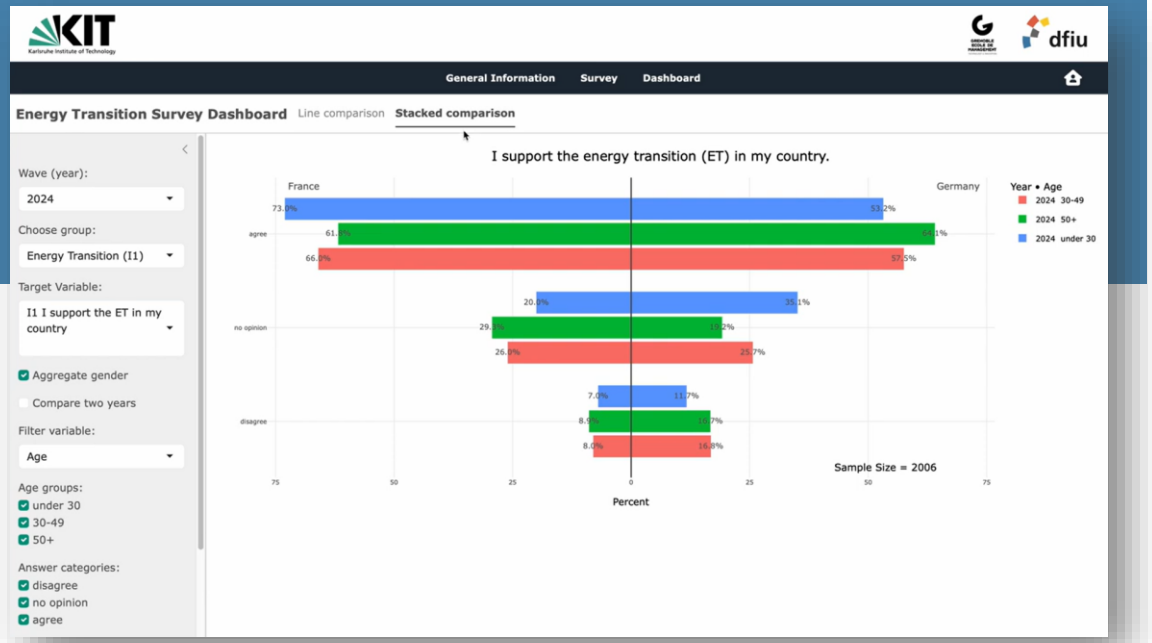
# Team Project “Development of an interactive online dashboard for survey data”

**Duration: April to July 2025** **Contact: Dr. Kristin Limbach, Dr. Daniel Sloot**

**Main Goals:**
The dissemination of scientific insights to a broader audience is imperative for ensuring research's societal impact and an integral part to the DFIU mission statement. The aim of this Team Project was to develop a user-friendly dashboard embedded into a KIT website for public access to our DFIU-GEM Energy Survey data. This way, the dashboard will serve to display the longitudinal survey data in an accessible way, yielding detailed insights into developments and trends over time such as changes in opinions or attitudes. Through interactive elements, users should be able to select certain aspects or segments of the data, such as specific years or certain age groups among the respondents.
Thus, the Team Project set out to develop an online platform where to enter our data from several panel waves of the survey. The students then programmed an interactive user interface in the form of graphics and visually appealing summaries. Great emphasize was given to the goal to create a dashboard that is understandable and accessible, allowing users to view the survey results and, using a selection of criteria, display group means and graphs of the aggregated data with just a few clicks.

The steps of the project were as follows:

1. Coordinating different tasks in a team of students
2. Conceptualizing different ways to visualize survey data
3. Implementing tools to create interactive data charts
4. Preparing the integration of future rounds of survey data
5. Making the dashboard's interface accessible via integration into a KIT-website




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

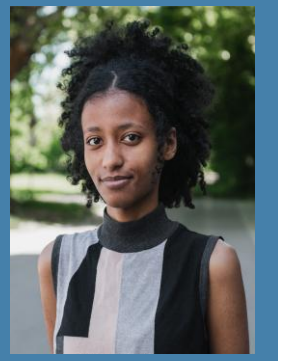
# MINTernship at DFIU

## Duration: May to August 2025

## Contact: Dr. Kristin Limbach

**Main Goals:**
In 2025, we welcomed two overseas students for their research internship at DFIU. The MINTernship programme proposes research internships for projects in the field of energy research to students and doctoral candidates from the Energy Production & Infrastructure Center (EPIC) at the University of North Carolina at Charlotte (UNCC) as well as to students from the University of Waterloo, Canada. The projects are proposed and supervised by KIT researchers and the North-American students complete work on their project during their research stay at KIT. The project outcomes were presented at the MINTernship ceremony in August followed by a farewell gathering among the visiting students and KIT supervisors.

**Hermela Gebretsion, University of Waterloo, Canada**



As a third-year student at the University of Waterloo (Canada) in Computer Engineering, she enjoys the technical and programming aspects of her degree. However, she has also long been interested in the social sciences. The MINTernship at DFIU offers her the chance to explore these interests in a cross-disciplinary environment.

Previously, she gained experience in electrical design and mobile games. At DFIU, she could dive into topic of energy economics and the steps of a research project. During her visit, she programmed an online experiment and explored related literature on smart homes.

**Sabrin Nowrin, University of North Carolina at Charlotte (UNCC), USA**

As a second-year PhD student in Computer and Information Systems, she is curious about how technical research interfaces with real-world systems and societal challenges. Nowrin saw the MINTernship as a chance to step outside her usual academic focus and broaden her perspective.

During her time at DFIU, she conducted a thorough literature analysis on economic approaches to formally represent mechanisms within energy communities.
While this topic differs from her PhD focus on reinforcement learning and human centered-AI, she saw the project as a stimulating and valuable learning opportunity.

# DFIU Student Assistants

**Main Goals:**
In 2025, DFIU activities were supported by two KIT students who worked part time as our student assistants.

**Claudia Welter, Bioengineering**

Claudia pursued her Master's degree in Bioengineering at KIT and supported the DFIU as a student assistant in numerous activities. Originally from Luxemburg, she could support our outreach and social media activities in German, French and English.

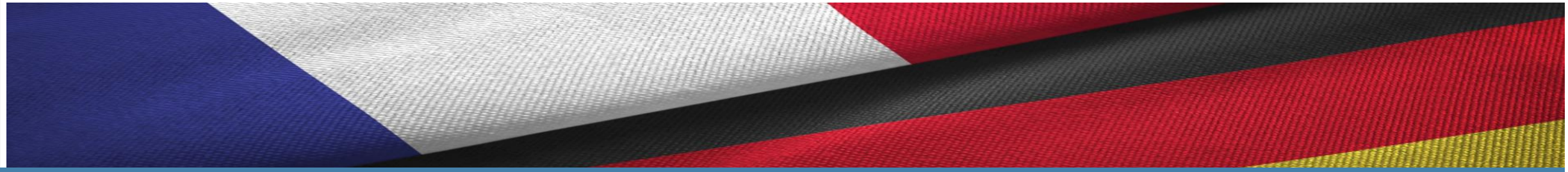
Claudia helped organizing the DFIU Day, contributed support to the preparation of teaching activities and screened the literature on various topics for our research projects.

**Özcan Cangür, Computer Sciences**

Özcan pursues his Master's degree in Computer Sciences at KIT and supported the DFIU as a student assistant for programming tasks. Following up on the initial development of the dashboard in our Team Project, he further expanded its features.

Özcan extended the scope of the dashboard and refined the components of the interactive interface. He also established a traceable documentation for the code of the dashboard's elements.

# Outlook: The DFIU in 2026



**Building on the successful research and teaching projects carried out in 2025, 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
- Continuing outreach activities such as the "DFIU Day" or webinars to disseminate research insights, better connect researchers in France and Germany, 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 2025 sind am DFIU vielfältige Ergebnisse aus den deutsch-französischen Aktivitäten hervorgegangen: Die Erkenntnisse der ersten beiden Jahre des DFIU-GEM Energy Surveys wurden im Rahmen des DFIU-Tags präsentiert und mit Teilnehmenden aus Frankreich und Deutschland diskutiert. Das neue Format des DFIU-Tags mit Keynotes und Diskussionsrunden bot dabei eine ausgezeichnete Gelegenheit zur Vernetzung mit bestehenden und neuen Kooperationspartnern. Das DFIU hat dieses Jahr bei der Organisation des Forum Européen Franco-Allemand an der Universität Straßburg mitgewirkt und zur Paneldiskussion rund um Umwelt- und Energiefragen in Europa beigetragen. Das Projekt CO2Inno wurde erfolgreich abgeschlossen, die Ergebnisse wurden unter anderem beim Abschlusskolloquium in Straßburg einem breiten deutsch-französischen Publikum präsentiert. Neue Projektideen im Bereich der Tiefengeothermie, zu innovativen urbanen Mobilitätssystemen, zu Wahrnehmungen von Energiegemeinschaften und der Agrivoltaik sind in unseren internationalen Kooperationen entwickelt worden. Interdisziplinäre Lehrimpulse und externe Seminarbeiträge haben Einblicke ins DFIU für Studierende und KIT-Kollegen geboten. Mit diesem facettenreichen Profil ist das DFIU auch für 2026 bestens aufgestellt, um aktuelle Fragestellungen in der Umwelt-forschung zu bearbeiten.

# Résumé

En 2025, les activités franco-allemandes menées au sein du DFIU ont donné lieu à de nombreux résultats : les conclusions des deux premières années de l'enquête DFIU-GEM Energy Survey ont été présentées lors de la journée DFIU et discutées avec des participants venus de France et d'Allemagne. Le nouveau format de la journée DFIU, avec des discours et des tables rondes, a offert une excellente occasion de nouer des contacts avec des partenaires de coopération existants et nouveaux. Cette année, le DFIU a participé à l'organisation du Forum Européen Franco-Allemand à l'Université de Strasbourg et a contribué à la table ronde sur les questions environnementales et énergétiques en Europe. Le projet CO2Inno a été mené à bien et ses résultats ont été présentés à un large public franco-allemand, notamment lors du colloque de clôture à Strasbourg. De nouvelles idées de projets dans le domaine de la géothermie profonde, des systèmes de mobilité urbaine innovants, de la perception des communautés énergétiques et de l'agrivoltaïque ont été développées dans le cadre de nos coopérations internationales. Des impulsions pédagogiques interdisciplinaires ainsi que nos séminaires externes ont permis aux étudiants et aux collègues du KIT de découvrir le DFIU. Grâce à ce profil varié, le DFIU est parfaitement positionné afin de mener la recherche dans le domaine de l'environnement en 2026.

# Summary

In 2025, the DFIU produced a wide range of results from its German-French activities: The findings from the first two years of the DFIU-GEM Energy Survey were presented at the DFIU Day and discussed with participants from France and Germany. The new format of the DFIU Day, with keynotes and discussion panels, provided an excellent opportunity to network with existing and new cooperation partners. This year, the DFIU helped organize the European French-German Forum at the University of Strasbourg and contributed to the panel discussion on environmental and energy issues in Europe. The CO2Inno project was successfully completed, and the results were presented to a broad German-French audience at the final colloquium in Strasbourg, among other venues. New project ideas in the fields of deep geothermal energy, innovative urban mobility systems, perceptions of energy communities, and agrivoltaics have been developed in our international collaborations. Fascinating teaching impulses and external seminar contributions have provided insights into the DFIU for students and KIT colleagues. With this broad, interdisciplinary profile, the DFIU is also well positioned for 2026 to address current issues in environmental research.

# Timeline DFIU since its creation in 1991

**1991** Establishment of the institute

**1992** Prof. Dr. Otto Rentz, Prof. Dr. Peter Knauth

**2000** Dr. Thierry Zundel

**2007** Dr. Bernd Calaminus

**2008** PD Dr. Ute Karl

**2009** Prof. Dr. Frank Schultmann, Prof. Dr. Wolf Fichtner

**2017** Dr. Ingmar Gehrke

**2019** Dr. Jérémy Rimbon

**2020** Dr. Kira Schumacher

**2021** Dr. Simon Glöser-Chahoud

**2023** Dr. Daniel Sloot

**2024** Dr. Aurélie Fleury, Dr. Kristin Limbach

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

# History of the DFIU

**History**

- Established in 1991 by Prof. Dr. Otto Rentz and Prof. Dr. Lothaire Zilliox
- Since 2008: Management of the DFIU by Prof. Dr. Frank Schultmann and Prof. Dr. Wolf Fichtner

**Key numbers**

Since establishment:

- 19,170 Mio € funds raised
- 70 PhDs
- 7 habilitations
- 212 projects achieved
- 129 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.)