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
2023

KIT – The Research University in the Helmholtz Association

Vorwort

Der vorliegende Bericht beschreibt die wesentlichen Arbeiten und Aktivitäten des DFIU aus den verschiedenen Forschungsbereichen im Jahre 2023. Eine Reihe von Projekten wurde weitergeführt, z.B. das Interreg-Projekt CO2Inno. Neue Aktivitäten bereicherten die deutsch-französische Zusammenarbeit, sowohl in der Oberrheinregion mit dem Projekt AsimutE als auch über die Grenzregion hinaus mit einem neu angestoßenen deutsch-französischen Panel zur Energiewende mit der Grenoble Ecole de Management als neuem Projektpartner. Auch in der Lehre war das DFIU mit dem „Interdisciplinary Student Research Lab“ in der Entwicklung neuer Formate aktiv. Studenten aus Karlsruhe, Strasburg und Basel konnten interkulturelle Erfahrungen und Kenntnisse zur nachhaltigen Mobilität in der Oberrheinregion gewinnen. Im Rahmen von Workshops zu Risiko- und Krisenmanagement und Resilienz konnte über innovative Wege der grenzüberschreitenden Zusammenarbeit diskutiert werden. Das Projekt zu Potenzialen land-wirtschaftlicher Reststoffe für die Bioökonomie in Baden-Württemberg wurde weitergeführt. Ende 2023 startete das internationale Projekt zur Entwicklung von Klimaschutzstrategien und -instrumenten in Gebäuden. Insgesamt blickt das DFIU damit auf ein erfolgreiches Jahr der regionalen, deutsch-französischen und internationalen Zusammenarbeit zurück.

Karlsruhe, im Dezember 2023
Prof. Dr. Frank Schultmann

Préface

Ce rapport décrit les travaux et activités essentiels des différents domaines de recherche du DFIU au cours de l’année 2023. Un certain nombre de projets ont été poursuivis, par exemple le projet Interreg CO2Inno. De nouvelles activités ont enrichi la coopération franco-allemande, tant dans la région du Rhin supérieur avec le projet AsimutE qu’au-delà de la zone frontalière avec un nouveau panel franco-allemand sur la transition énergétique avec l’Ecole de Management de Grenoble comme nouveau partenaire de recherche. Dans le domaine de l’enseignement, le DFIU a été actif avec le «Interdisciplinary Student Research Lab». Des étudiants de Karlsruhe, Strasbourg et Bâle ont pu acquérir une expérience interculturelle et des connaissances sur la mobilité durable dans la région du Rhin supérieur. Des ateliers sur la gestion des risques et des crises et la résilience ont été organisés pour discuter de moyens innovants de coopération transfrontalière. Le projet sur le potentiel des résidus agricoles pour la bioéconomie dans le Bade-Wurtemberg a été poursuivi. Un projet international visant à développer des stratégies et instruments de protection du climat dans les bâtiments a été lancé fin 2023. Le DFIU peut se targuer d’une année réussie de coopérations régionales, franco-allemandes et internationales.

Karlsruhe, décembre 2023
Prof. Dr. Wolf Fichtner

Foreword

This report describes the main projects and activities of the DFIU in the various research areas in 2023. A number of projects were continued, e.g. the Interreg project CO2Inno. New activities enriched the German-French cooperation, both in the Upper Rhine Region with the AsimutE project, and beyond the border region with a newly launched German-French panel on the energy transition with the Grenoble Ecole de Management as a new project partner. The DFIU also developed new teaching formats, such as the “Interdisciplinary Student Research Lab”. Students from Karlsruhe, Strasburg and Basel were able to gain intercultural experience and knowledge about sustainable mobility in the Upper Rhine Region. Innovative ways of cross-border cooperation were discussed during workshops on risk and crisis management and resilience. The project on the potential of agricultural residues for the bioeconomy in Baden-Wuerttemberg was continued. The international project to develop climate protection strategies and instruments in buildings started at the end of 2023. Overall, the DFIU looks back on a successful year of regional, German-French and international cooperation.

Agenda

DFIU annual report in a new format

Alongside the many new activities and projects that started in 2023, the DFIU is also introducing the annual report in a new, contemporary format. Up to now, the report was available both in print and as a pdf document. Starting with the year 2023, the annual report will now be delivered in a presentation format that captures the most important activities in a compact and accessible way.

Transitioning to this modern format has several benefits:

- **Better readability**: activities are presented in short texts that capture the essential information
- **Interactivity**: hyperlinks allow the reader to easily access project or staff pages to get deeper insights
- **Broader audience**: the main report is now in English to reach readers beyond the German-French context; however, to emphasize the importance of intercultural connectedness, the foreword will also be provided in German and French

Key data and facts 2023

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. Aurélie Fleury

Coordination

Josiane Folk

Ressources

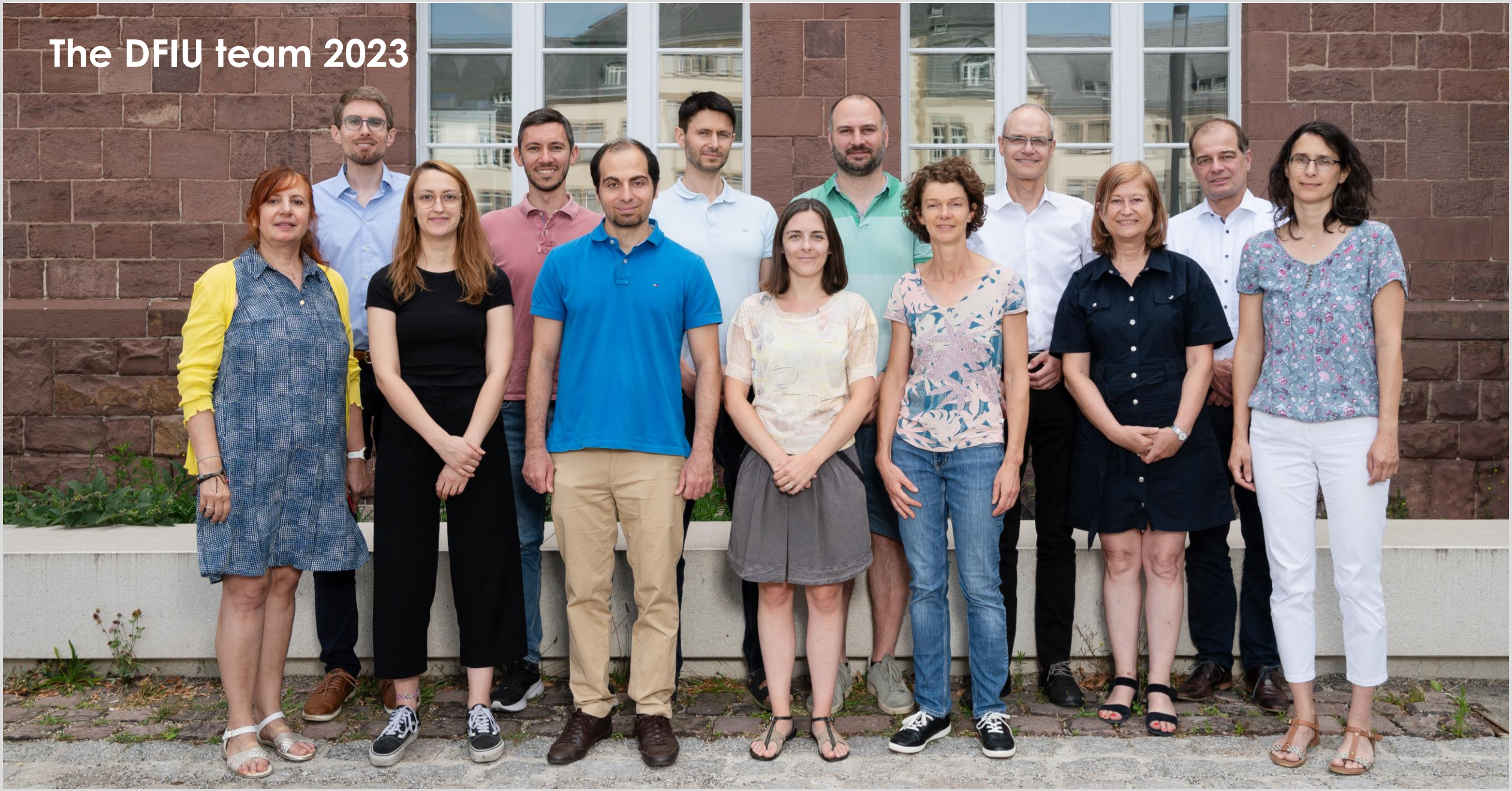
14 DFIU employees and research associates
Budget: 450.000€ in external funds raised

Research and thesis

7 research projects
3 completed PhD:
- Dr. Andreas Rudi
- Dr. Markus Lüttenberg
- Dr. Florian Zimmermann

20 bachelor and master thesis

The DFIU team 2023



Main events at a glance

February 1st, Karlsruhe
Article published in the Journal „Energy policy“:
State or market: Investments in new nuclear power plants in France and their domestic and cross-border effects

April 18th, Freiburg
French-German project meeting CO2InnO: presentation of first results, planning of further steps and networking of the partners

July 4th, Basel
Presentation of results of the Eucor-funded "Interdisciplinary Student Research Lab in the URR“, DFIU, universities of Basel and Strasbourg

September 21st, Karlsruhe
CO2InnO Project : Co-Creation Workshop

November 28th-29th, Maastricht
BEHAVE conference in Maastricht with presentations and publication in proceedings

2023

March 3rd, Karlsruhe
Kick-off event of the Eucor-funded "Interdisciplinary Student Research Lab in the URR“, DFIU, universities of Basel and Strasbourg

June 26th - 28th , Sophia-Antipolis
French-German Workshop on Engineering Secure and Reliable Systems -Boundaries and Resilience

September 1st Karlsruhe
AsimutE presented in a report on Baden-TV channel

November 22nd, Online
Kick-off for the AsimutE project together with the German, French and Swiss partner

December 5th, Freiburg
CO2InnO project colloquium

DFIU Research Groups

Research groups at IIP – DFIU

Risk Management

Supply chain risks, market risks and crisis management.

Industrial risk management: risk analysis, risk assessment and mitigation, strategic risks (e.g. market entry and competition, industry 4.0), adverse risks (e.g. economic crime), behavioral risks (e.g. non-compliance, moral hazard, trust-erosion within organizations) and corporate governance, supply chain risks and business continuity management

Systemic Risk Management: vulnerability assessment of critical infrastructures (e.g. network related goods, critical supply chains), system modelling: simulation of (interdependent) market risks and complex, systems modelling of behavior in complex systems: cascading effects (e.g. scenarios for information cascades or panic phenomena), evaluation of robustness, stability and resilience of systems

Contact: Dr. Florian Kaiser

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: 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 (since October 2023)

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: Rafael Finck, 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: Max Kleinebrahm, M. Sc.

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, Viktor Slednev, M. Sc.

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.

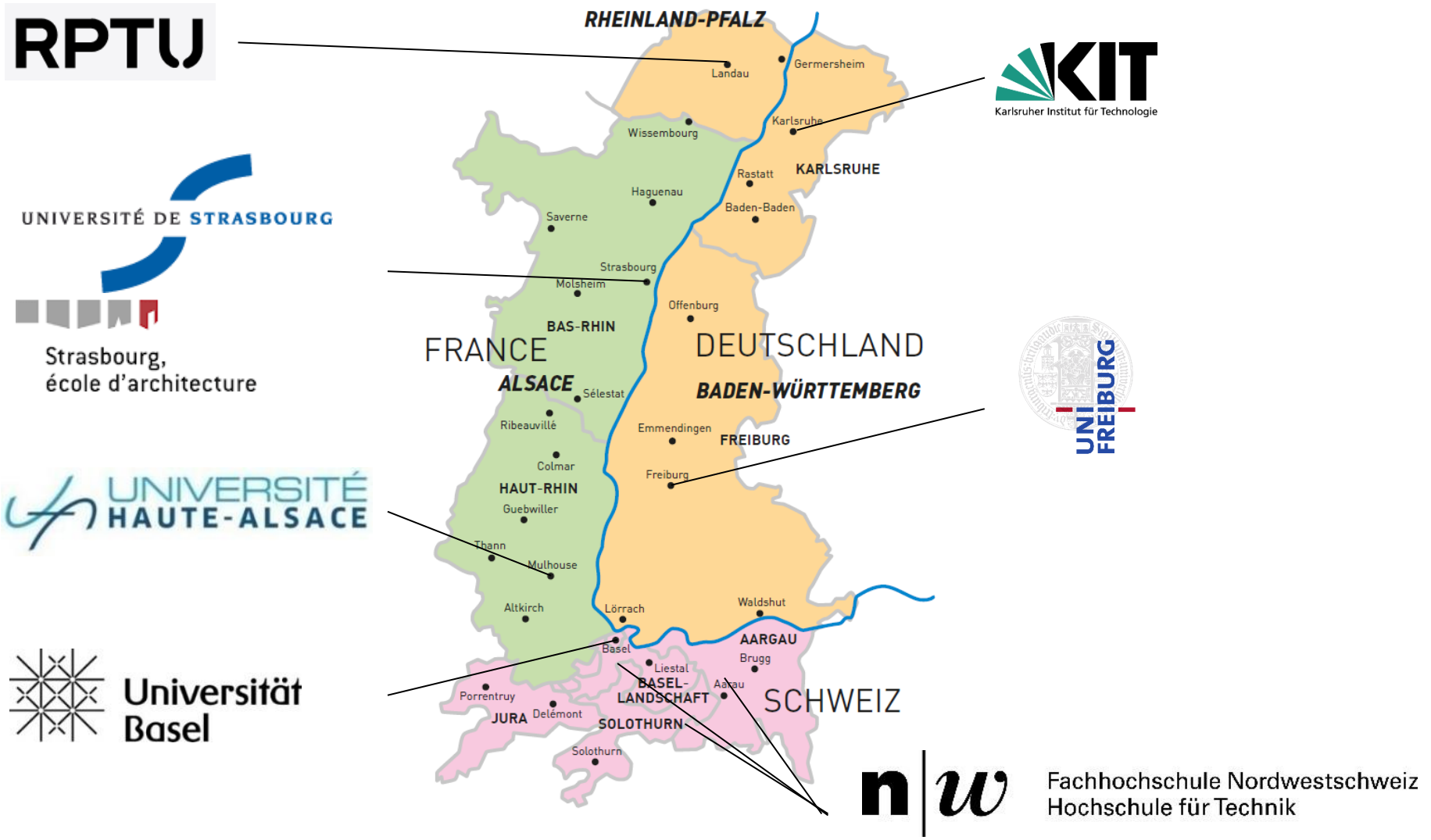
Contact: Dr. Daniel Sloot

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.

Research Partners in the Upper Rhine Region

Many of the research projects are undertaken in the Upper Rhine Region. In 2023, 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. A new cooperation with the Ecole de Management in Grenoble started in 2023. Common workshops and activities took place with Paris Dauphine and Mines Paris.

CO2Inno Real Laboratory CO2 neutral Innovation Region Upper Rhine

Duration: 2022 – 2025 **Contact : Nora Baumgartner, 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 (2,556,522 Euro)

Link
https://co2inno.com/

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

Duration: Oct. 2023 – Dec. 2026 **Contact: Dr. Daniel Sloot; Max Kleinebrahm, M. Sc.; Dr. Thomas Dengiz; Stephanie Stumpf, 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 capacity of renewable energy, taking into account existing storage capabilities. This involves:

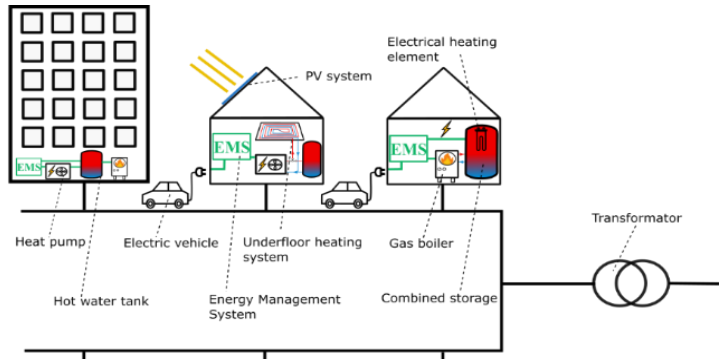
- Implementing intelligent solutions for reducing energy consumption and optimizing energy storage, considering end-user involvement
- Developing an AI tool for operating a heat pump for self-consumption and using batteries from electric vehicles as "stationary" energy storage
- Creating a tool for harmonizing strategies between citizens and public authorities for energy-saving, leading to a substantial reduction in the CO2 footprint in the Upper Rhine Region
- Utilizing artificial intelligence 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
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
(4,126,596 Euro)

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



French-German Survey on the Societal Acceptance of the Energy Transition

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

Main Goals:
The DFIU's French-German Energy Transition Survey is a new project that was initiated in 2023 together with the Grenoble Ecole de Management. 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 will 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 of Survey Round 1 (December 2023):
The first survey was initiated less than one year after the invasion of Ukraine, which led to significant turmoil in the energy market and resulted in price increases for consumers as well as worries about the security of energy supply in Europe. Consequently, the first survey focused on public perceptions of the energy crisis in Germany and France as well as responses to this crisis, in particular the public's support for the sustainable energy transition in the wake of the crisis. The aim is to examine in what the perception of different crisis dimension (such as security of supply, increased costs, or environmental and climate impacts, are related to greater or less support for the sustainable energy transiton.

Project partners
Grenoble Ecole de Management

Output
Initial results from the first survey round in December 2023 will be available in 2024.

Funding
Internally funded

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

in preparation

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: Dr. Rebekka Volk**

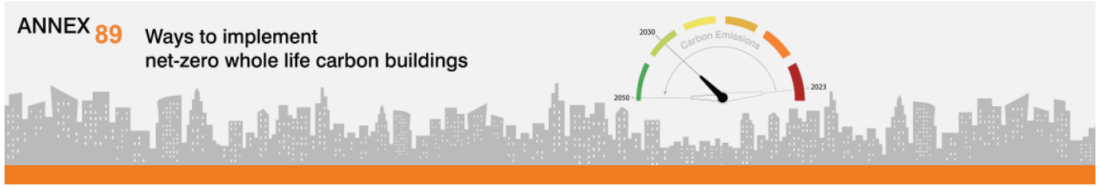
Main Goals:
Up to 40 percent of all greenhouse gas emissions (GHG) can be attributed to the "construction, maintenance and operation of buildings" area of activity. The goal of projects run by the International Energy Agency (IEA) is to reduce this as a contribution to limiting global warming.

While the basis for assessing GHG emissions in the life cycle of buildings was developed in the predecessor project IEA EBC Annex 72, 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.

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 remining 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



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

Funding
Bundesministerium für Wirtschaft und Klimaschutz (BMWK)

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 2023, the focus has been on revising the limit values for cross-border emissions. The impact of decarbonization on emissions of atmospheric pollutants in certain selected industrial sectors is currently being analyzed. The cement, steel, glass and aluminum industries have been examined more closely, as have certain processes in the chemical industry. In addition, there is an ongoing exchange with experts from industry and environmental institutions on the subject of air pollution and relevant emission reduction technologies.

Project partners

CITEPA, ADEME

Link

Home - TFTEI (citepa.org)

Teaching Activities

Interdisciplinary Student Research Lab in the Upper Rhine Region

Duration: March – December 2023 **Contact: Nora Baumgartner, M. Sc.**

Main Goals:
Coordinated by the DFIU, students from the KIT and the universities of Basel and Strasbourg investigated in the context of the interdisciplinary student research lab the extent to which energy communities can be a driver for the bidirectional charging of electric vehicles. The interdisciplinary and international team went through a complete research process within one semester and was supervised by scientists from the three universities. The objectives of this project were on the one hand to develop a new seminar format in a cross-border and intercultural context and on the other hand to train students in the application of social science research methods and transfer expertise on the role of technological innovations that can shape the mobility and energy transition on a community level in the Upper Rhine Region (URR). Training students to cooperate on these levels is paramount. The blended-learning seminar format provided students and supervising researchers with the opportunity to collaborate internationally and across disciplines on a real-world sustainability issue.

DFIU focus:
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 representative survey of German, French and Swiss households in the field of vehicle to grid (V2G) technology and the role of energy communities to foster this technology
5. Conducting interviews with organizers from energy communities to learn about the role of energy communities in the energy transition, and their role to foster innovative energy technologies, such as V2G

Project partners
Laboratoire Image Ville Environnement, University of Strasbourg
Faculty of Psychology, University of Basel

Funding
Eucor Teaching Grant

Publications
Baumgartner, N.; Sloot, D.; Fichtner, W. (2023): Energy Communities as Eneablers for innovative Technologies? The Case of Vehicle-to-Grid in Three European Countries, BEHAVE 2023 Conference Proceedings, 216–227, Netherlands Enterprice Agency (RVO)

Links
Interdisciplinary student research lab in the Upper Rhine Region | Eucor DE (eucor-uni.org)
Project video (youtube.com)

French-German Workshop on Engineering Secure and Reliable Systems

Duration: June 2023 **Contact: Katharina Eberhardt, M. Sc.**

Main Goals:
The French-German Workshop on Engineering Secure and Reliable Systems is an educational and scientific workshop on cross-border risk management. The workshop took place in Sophia Antipolis, France. From June 26th to 28th, researchers and practitioners from France, Italy, and Germany came together to exchange research outcomes within the research field on engineering secure and reliable systems. Approximately ten researchers attended the event. During the workshop, four keynote speeches were scheduled. The French-German Workshop on Engineering Secure and Reliable Systems received four papers submitted for peer review. Out of these, three papers were accepted for inclusion in the post-proceedings.
The workshop, specifically aimed at young scientists, provided participants with the opportunity to gain valuable insights into current projects in the field of cross-border collaboration.

DFIU focus:
1. Co-Organization of the workshop by the Risk Management Research Group from the Karlsruhe Institute of Technology (IIP / DFIU) and the French university Université Paris-Dauphine
2. Presentation at the workshop
3. Membership on the editorial board of the post-proceedings
4. Networking with other workshop organizers and participants
5. Potential involvement in future collaborative initiatives or research projects arising from the workshop

Project partners
Université Paris Dauphine

Funding
UFH – French-German University

Publications
- Eberhardt, K.; Kanaan, N.; Kaiser, F. K.; Schultmann, F. (2023): Public-Private Partnerships in Disaster Management: A Systematic Review of Incentives and Challenges
- Rondeau, B.; Kaiser, F. K.; Schultmann, F. (2023): SoK: Mitigation and Adaptation Strategies for Heat Waves
- Schwärzel, A.; Adrot, A.; Kaiser, F. K.; Schultmann, F. (2023): From Data Fragmentation to Integration - Data Management for Engineering Cross-Boarder Disaster Resilience: A Systematic Literature Review

Team Project Cyber Security in the Upper Rhine Region

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

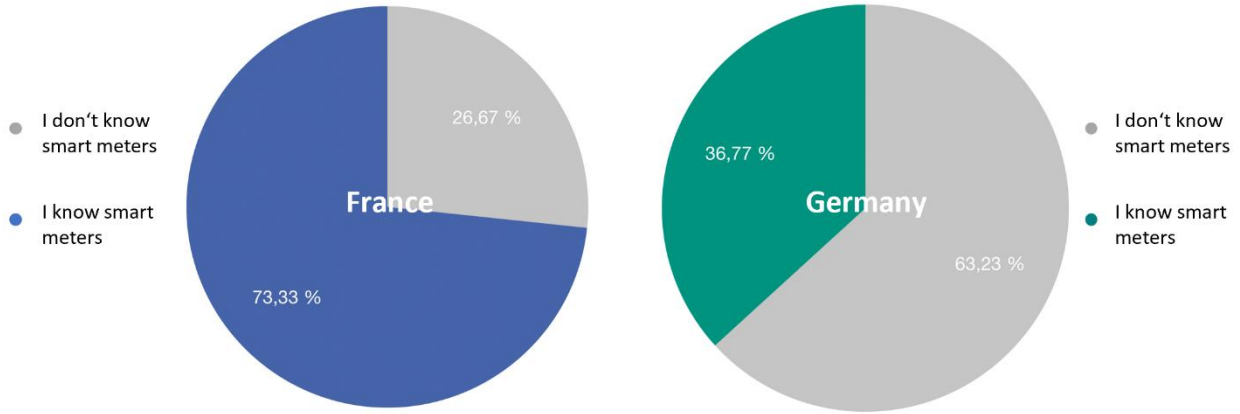
Main Goals:
This team project is an educational teaching format, to train students in empirical research, to promote the students' interdisciplinary knowledge and to foster cross-border cooperation and teaching. In the course of this seminar, the students studied the households' perceptions about potential 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 (2,556,522 Euro)

Link
Project video (youtube.com)



Outlook: The DFIU in 2024

Building on the successful research and teaching projects carried out in 2023, the DFIU will further develop both existing and new collaborations with French partner institutions and beyond, particularly in the following areas:

- Intensifying the cooperation with research institutions in key topics such as energy system analysis, renewable energies, material flow management, sustainable mobility as well as electromobility and energy policy
- Strengthening the DFIU's activities in the area of empirical social science research, especially by further developing the French-German Survey on the Societal Acceptance of the Sustainable Energy Transition
- 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 student excursions

Zusammenfassung

2023 wurden mehrere Projekte erfolgreich angestoßen und fortgeführt: mit den Projekten CO2Inno und AsimutE werden neue Themen aufgegriffen und um sozialempirische Forschungsansätze im deutsch-französischen Kontext ergänzt. Zahlreiche Veranstaltungen trugen zur Sichtbarkeit des DFIU und seiner Projekte bei. Mit den abgeschlossenen Promotionen und Publikationen konnte das DFIU zudem an die wissenschaftlichen Erfolge der letzten Jahre anknüpfen. Das Forschungsspektrum umfasste dabei Fragestellungen des Risikomanagements, der nachhaltigen Mobilität, der Integration erneuerbarer Energien in das Energiesystem, der Akzeptanz von Technologien sowie der Kreislaufwirtschaft. Der relativ neue Forschungszweig zu sozialempirischen Themen der Energie- und Umweltforschung etabliert sich zunehmend und ergänzt die bisherigen Schwerpunkte im techno-ökonomischen Forschungsbereich. Dadurch ist das DFIU noch interdisziplinärer aufgestellt. Weitere Kooperationen mit europäischen Ländern und darüber hinaus tragen zur internationalen Ausrichtung bei.
Die kontinuierliche Weiterentwicklung der Schwerpunkte des DFIU wird auch im Jahr 2024 weiter vorangetrieben, neue und bestehende Kontakte zu französischen Einrichtungen sollen geknüpft und intensiviert werden.

Résumé

En 2023, plusieurs projets ont été initiés et poursuivis avec succès : avec CO2Inno et AsimutE, de nouveaux thèmes ont été abordés et complétés par des approches de recherche socio-empiriques dans le contexte franco-allemand. De nombreux événements ont contribué à la visibilité du DFIU et de ses projets. Avec les doctorats et publications complétés, le DFIU a pu s'inscrire dans la continuité des succès scientifiques de ces dernières années. Le spectre de recherche a couvert les questions de gestion des risques, de mobilité durable, d'intégration des énergies renouvelables dans le système énergétique, d'acceptation de technologies et d'économie circulaire. La branche relativement nouvelle de recherche socio-empiriques dans le domaine de l'énergie et l'environnement s'établit de plus en plus et complète l'approche techno-économique des thèmes de recherche précédents. De ce fait, le DFIU est encore plus interdisciplinaire. Des collaborations avec des pays européens et au-delà contribuent à l'orientation internationale de l'institut.
Le développement continu des axes de recherche du DFIU se poursuivra en 2024, les contacts existants avec les institutions françaises seront intensifiés et de nouveaux seront noués.

Summary

In 2023, several projects were successfully initiated and continued: With the CO2Inno and AsimutE projects, new topics are being developed and supplemented by social-empirical research approaches in the German-French context. Numerous events contributed to the visibility of the DFIU and its projects. With the completed doctorates and other publications, the DFIU was also able to build on the scientific successes of the previous years. The research spectrum included issues of risk management, sustainable mobility, the integration of renewable energies into the energy system, the acceptance of technologies and the circular economy. The relatively new research branch on socio-empirical topics is becoming increasingly established and complements the historic focus on techno-economic research topics. This makes the DFIU even more interdisciplinary. Further collaborations with European countries and beyond contribute to the international orientation. The continuous development of the DFIU's priorities will continue in 2024; new and existing contacts with French institutions will be established and intensified.

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:
	• 18.15 Mio € funds raised
	• 64 PhDs
	• 7 habilitations
	• 210 projects achieved
	• 115 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.)