ReLUT

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Welcome!

ReLUT
RESEARCH LAB FOR URBAN TRANSPORT
FRANKFURT UAS

Updates from Frankfurt University ReLUT

ReLUT - Research Lab for Urban Transport is an interdisciplinary team of researchers in Frankfurt, Germany working on current and future challenges of mobility. Our research focuses on the development of economic and ecological solutions for new mobility models. In addition to the disciplines of transport planning and logistics, ReLUT combines a wide range of competencies: urban planning, social science, data science (Big Data), computer science (AI), geoinformation, law, automotive engineering, and economics.

In the first half of 2025, we continued to work on various research projects in the areas of mobility in rural areas, emissions reduction and simulation-based analysis.

We hope you enjoy reading about what we are working on. We are always open for collaborations on existing and new projects. Please contact us if you have any ideas of future endeavors.

Best wishes,


Petra Schäfer


Tobias Hagen


Anne Lange


Dennis Knese

NaTourHuKi

New Strategies for Sustainable Mobility in the Kinzig-Auental - Research project NaTourHuKi completed

The NaTourHuKi research project has developed a sustainable local recreation and day tourism strategy for the Kinzig-Auental. The region between Hanau and Steinau an der Straße is characterized by a rich cultural landscape, significant transportation routes, and high recreational value. A key aspect of the strategy is the promotion of sustainable mobility to improve both the quality of life for residents and the experience for visitors.

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

STADT LAND PLUS

Despite good transportation connections, there are several challenges in mobility that hinder sustainable development. The Hessian long-distance cycling route R3 runs in some sections directly alongside the A66 motorway, which reduces its attractiveness for cyclists. Additionally, there are conflicts of use, as recreation seekers, farmers, and nature conservationists have different demands on the landscape, leading to tensions. Another problem is the inadequate public transport offering, which is not optimally aligned with local recreation and tourism traffic.

To address these issues, practical recommendations have been developed. A key measure is improving public transport connections for leisure and tourism. In the short term, new travel concepts for tourist destinations such as Bad Orb or the Kinzig Reservoir are to be implemented. In the medium term, better connections between train stations and cycling or hiking routes are planned. Optimizing the cycling network is also crucial. The R3 is to be made more attractive and linked with the Main-Kinzig district's cycling infrastructure plan.

Another important aspect is the stronger integration of local recreation and tourism into cycling traffic concepts. Municipal cycling plans should better accommodate the needs of recreational users by establishing new rest areas, improving signage, and providing digital information services. Intermodal mobility will also be promoted by linking bicycle and public transport services more

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effectively. For example, more bike-and-ride stations will be set up to facilitate sustainable mobility solutions.

Raising awareness and communication play a crucial role in encouraging sustainable mobility. Targeted information campaigns and digital platforms will help promote the use of environmentally friendly transportation. The sustainable development of mobility in the Kinzig-Auental is an essential step toward improving the quality of life in the region. Through better infrastructure, coordinated concepts, and targeted communication, the Kinzig-Auental can be strengthened as a sustainable local recreation area. The implementation of the proposed measures requires collaboration between municipalities, the Main-Kinzig district, as well as transport associations and mobility service providers. If all stakeholders work together, the region can become a model for sustainable mobility in rural areas.

Dana Stolte, M. Eng.
Research Assistant

MAKoMo

Do we see a ‘Generation Public Transport’?

Our research project “MAKoMo” – New Methods for Analyzing Cohort Effects in Mobility Behavior – is entering its final stages. Over the past one and a half years, we have examined how travel behavior varies between birth generations in Germany. In theory, travel behavior is shaped by a combination of factors including:

- current societal and economic developments (like rising energy prices or the COVID19 pandemic),
- the individual’s life phase (e.g., being a student or retired), and
- generational characteristics or so-called “cohort effects” (e.g., GenZ, Baby Boomers).

In the past, young adults aged 18 to 29 were once among the most car-oriented groups in German society and served as early indicators of mobility trends (Kuhnimhof et al., 2012). However, this pattern is changing. Car use has declined in this age group, while daily passenger kilometers on public transport have doubled. At the same time, the number of students has risen sharply—by 63.3% between 2000 and 2020 (Destatis). Many

of these students benefit from discounted public transport passes provided by universities and may not have the financial means to own a car. This raises an important question: Are we witnessing the rise of a “Generation Public Transport”?

To answer this question, we analyzed representative survey data for Germany. Even after controlling for factors like age, gender, and employment, public transport use remains higher among younger generations (Gen Y and Gen Z) than among older ones.

To gain deeper insights whether this behavior will remain stable in the future, we held two focus group workshops with students (see pictures). Our student assistant Stefanie Ghazali is currently analyzing these discussions as part of her master’s thesis. Initial impressions suggest that students’ current transport choices are strongly influenced by income and time constraints, access to discounted public transport passes, and proximity to university. When discussing future mobility, students’ responses varied—depending on whether they plan to live in urban or rural areas, or have caregiving responsibilities. However, one trend was clear: decisions about where to live and work tend to outweigh decisions about how to travel.

The MAKoMo project will officially end in May 2025. The project ends in May 2025. We are currently working on two publications and will share the final results on the ReLUT blog once they’re available.

Nicole Reinfeld, M. Sc.
Research Assistant

Transport Research Board (TRB)

At the beginning of January, Nicole Reinfeld and Jonas Hamann represented the Research Lab for Urban Transport (ReLUT) at the annual Transportation Research Board (TRBA) Meeting in Washington, D.C.—a great start to the year for both researchers and the lab.

Nicole Reinfeld contributed with a poster titled “Using Entropy Balancing to Decompose Changes in Observed Commuting Mode Choice Over Time in Repeated Cross-Sections.” During a two-hour poster session, she engaged in discussions about changes in commuting mode choice from 1980 until 2020. Her research uses data from multiple waves of the German Microcensus to analyze which factors influenced chages in car choice over time.

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Jonas Hamann gave a presentation entitled “Comparing the Comparable: A Method for Finding Best Practice Cases for Park and Ride Facilities.” His talk focused on identifying representitive Park and Ride facilities. In order to do that, all PnR Facilities in Germany are clustered. Using statistical models, representative facilities are selected for each cluster. The objective is to find best-practice cases that can extend guidelines and provide recommendations and decision support on the design and features of successful P+R infrastructures.

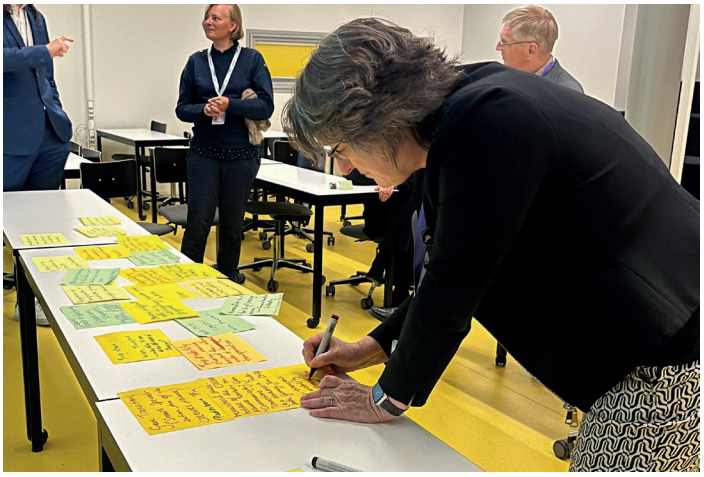
Beyond the presentations, the TRBA conference offered many valuable discussions and opportunities for international exchange. The event served as an inspiring platform for knowledge sharing and collaboration, and reinforced ReLUT’s presence in the global research community.

Jonass Hamann, M. Sc.
Research Assistant

Nicole Reinfeld, M. Sc.
Research Assistant

U!REKA

U!REKA Connects 2025: Strengthening Collaboration in Mobility and Logistics



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On May 21–22, we participated in U!REKA Connects 2025 in Helsinki together with partners including urban-focused Universities of Applied Sciences. In a vibrant setting with highly motivated and open participants the aim was to co-create solutions for sustainable and inclusive urban development through collaboration in research, education, and innovation.

As part of the event, we hosted a workshop on collaboration in the field of mobility and logistics, where we explored opportunities for joint projects, shared best practices, and connected with inspiring colleagues from across the network. The session helped to spark new ideas and initiated valuable contacts for future partnerships. We identified common and complementary research interests and thereby contributed to stronger ties between universities working on urban mobility challenges.

In addition to our own workshop, we also took part in a research-focused session aimed at shaping a shared understanding of research within the U!REKA alliance. The discussions highlighted diverse perspectives and laid the groundwork for more integrated and interdisciplinary research cooperations.

Nicole Reinfeld, M. Sc.
Research Assistant

Prof. Petra Schäfer
Professorship of Transport Planning,
Speaker of the ReLUT

ComCost

Commuting Costs an Their Impact on Commuting Decisions

Our new research project "ComCost – Commuting Costs and Their Impact on Commuting Decisions" will start in July 2025. The one-year study aims to provide a comprehensive, data-driven analysis of direct and indirect commuting costs in Germany, including the monetary valuation of travel time.

Commuting represents over 20% of daily travel in Germany. However, the financial and time-related burdens that commuters face remain poorly understood. While distance and travel time have been widely studied, the actual monetary costs—such as fuel, public transport fares, maintenance, parking, and insurance—have rarely been quantified with robust data. Our project will close this gap using a combination of recognized national datasets (e.g., travel surveys such as MiD, MOP, and SrV combined with a survey on household income and spending EVS) and advanced statistical methods.

Special focus will be placed on the state of Hesse and the Rhine-Main metropolitan region, which shows particularly high commuting activity. The project will explore how recent developments—such as increased remote work, the introduction of the "Deutschlandticket" for public transport, and the rise of electric vehicles—are influencing commuter behavior and cost structures.
Key project outcomes will include:

- Quantified commuting costs by distance, household type, region, and mode of transport.
- Insights into how these costs shape commuting behavior.
- Policy-relevant findings for improving public transport offerings and reducing car dependency.
- Data-driven implications for both transport providers and new mobility service models.

We will share our findings through scientific publications andconferences, with close collaboration from local transit agencies and mobility companies.

The project is funded by the State of Hesse and HOLM funding under the "Innovations in Logistics and Mobility" measure of the Hessian Ministry of Economics, Energy, Transport and Housing. The project will continue until June 2026.

Nicole Reinfeld, M. Sc.
Research Assistant

International Collaborations

ReLUT maintains numerous international collaborations.
In addition to the predominantly European relationships, we also have research contacts in America, Asia and North Africa.

International Project Week

For around 15 years, six international universities have met once a year for the International Project Week at one of their respective campuses.
This year, 25 students from Frankfurt visited the Amsterdam University of Applied Sciences. Dominic Hofmann accompanied the group, which of course travelled to the Netherlands by train.
In addition to the exchange and networking of overall around 125 students and lecturers, a number of practical excursions were on the agenda. The theme of this year‘s IPW was the challenge of building under the influence of water and the sea. The participants were presented the challenges in the construction industry. These included quay walls, building constructions and transport infrastructure. Beside the lectures and excursions, the students also had some time to explore the historical city of Amsterdam, it’s fascinating architecture and the local lifestyle.

In 2026, the six participating universities of the International Project Week will meet in Copenhagen.

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Prof. Dominic Hofmann
Professor for Infrastructure and Enviroment

DZwEI

The DZwEI project—an acronym for „Digitaler Zwilling für Echtzeitanalysen der Wirkungen von Infrastrukturmaßnahmen“—is focused on creating a digital twin for the analysis of transport infrastructure measures using real-world data. This project is a step towards understanding and enhancing urban mobility and emissions efficiency by developing a prototype technology to evaluate the effects of local policies.

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A primary project goal is to measure the effectiveness of local parking policies, which first required addressing a significant data gap for on-street parking in Frankfurt. To systematically map both parking supply and regulations, a team of student assistants conducted an extensive manual data collection effort. Using street-view imagery and aerial photographs, the team mapped curb-side parking restrictions and parking signs directly onto OpenStreetMap (OSM), creating a foundational dataset where none previously existed.

Leveraging the open-source OSM Parkraum-Projekt and the dedicated effort of our team, this work produced a rich dataset with street-level granularity, detailing individual parking spots along each street segment. The data includes attributes such as the type of parking (e.g., on-curb, parallel, perpendicular), associated costs, and residential parking restrictions ("Bewohnerparken"). This dataset has been delivered to our project partner, Mercedes-Benz AG, for integration into the project's central dashboard. It will also be released publicly and will serve as a critical ground-truth data source for training future machine learning models to automate parking detection from imagery.

To build a comprehensive view of the city's traffic state, we are integrating multiple data sources. We utilize data from Frankfurt's existing loop detectors, which provide traffic flow and occupancy values at key intersections. This is complemented by a network of 32 traffic cameras installed for the project that collected data for two-weeks spread over the course of the project, offering more granular data, including vehicle classifications and on-street parking occupancy. The accuracy of these cameras was validated through a series of manual counts at randomly selected locations, conducted using an in-house custom-developed mobile application for timestamping vehicle movements.

In addition to fixed sensor data, the project has acquired Floating Car Data (FCD), which consists of anonymized vehicle trip trajectories. This often-noisy raw data required a sophisticated map-matching process to align GPS waypoints with the correct street segments, a task carried out by our project partner, MBition GmbH. The processed data is now accessible to the project team via an API.

The current work-in-progress focuses on fusing these heterogeneous data sources. FCD provides broad spatial coverage but suffers from variable penetration rates, meaning it only captures a fraction of the total traffic. Conversely, loop detectors are highly accurate for specific locations but have very limited spatial coverage. To overcome these inherent limitations, we are developing a Graph Neural Network (GNN). This architecture is uniquely suited to model the transport network's spatial structure and integrate sparse and dense data sources. The resulting GNN model will provide a complete, real-time estimation of the traffic state at any location, forming the analytical backbone for measuring the impacts of policy interventions later in the project.

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