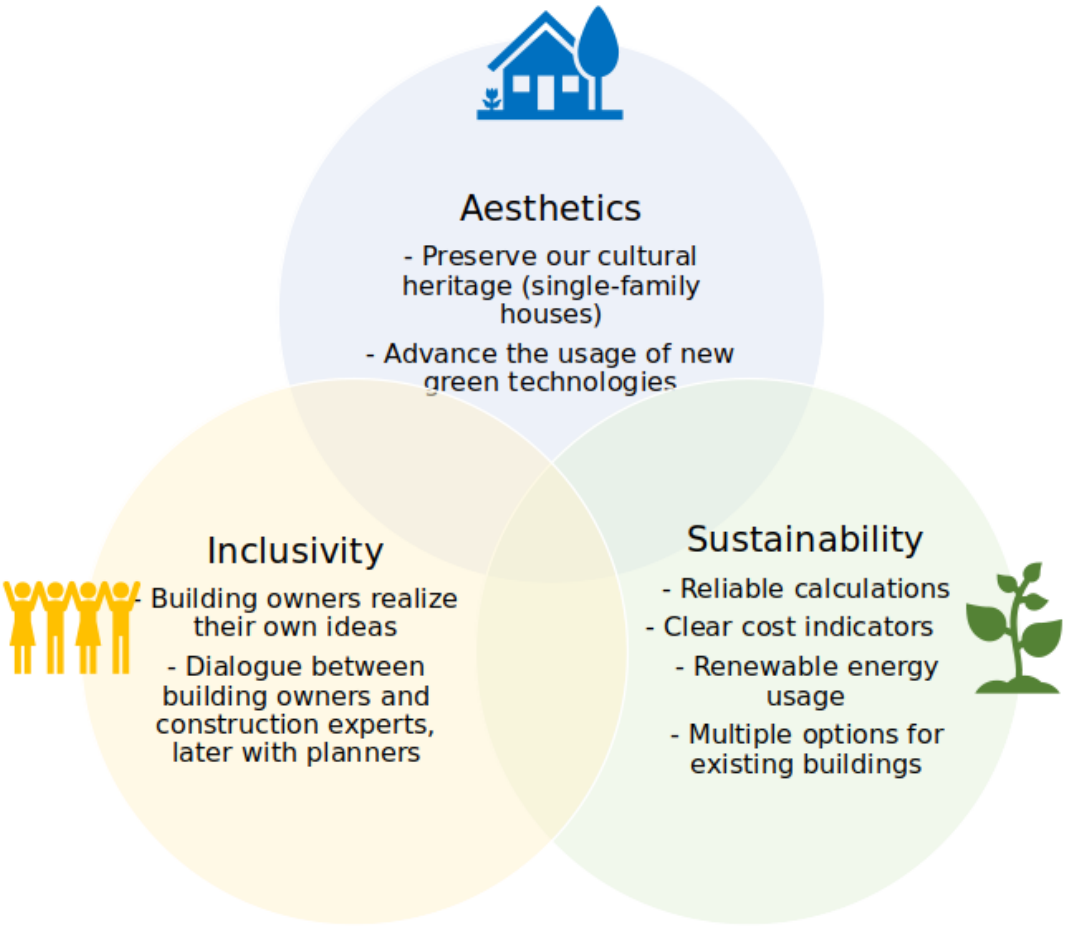

Figure 1: Project idea within the background of the New European Bauhaus aims

BIM4OWN Retrofit Checker for Building Owners of Single and Multi-Family Houses based on generic BIM models

Prof. John Grunewald; Peggy Freudenberg; Mira Dolzmann, Mirjam Dresel.

Single-family homes account for a significant share of the building stock in Europe, at almost 49% (Figure 1). The majority of these residential buildings are owner-occupied, with the rate being significantly higher in peripheral European countries than in central European countries (Figure 2).
To improve the renovation rate, which is currently still too low to achieve the energy policy targets, building owners should be provided with much more comprehensible information on the economic and ecological impact of possible renovation activities in the future. They are directly affected by these measures, especially through their impact on follow-up costs, i.e. financing and maintenance costs, utility costs for heating, cooling, electricity consumption etc. In addition, owners can make their own contribution to energy-saving policies through their properties and implement their own ideas on sustainability and environmental protection. In many cases, these aspects already play a major role when buying a property, and the wide range of options makes new buildings appear more attractive than existing ones to be renovated. A major challenge in this context is the expert knowledge of the interrelationships between feasible refurbishment costs, possible energy savings, economic efficiency and sustainability. These interre-

lationships are all the more decisive when regenerative energies such as photovoltaics or geothermal energy are used, which must be evaluated in a very differentiated manner in terms of time and location and whose assessment can only be made reliably with transient calculations. On the other hand, their use is additionally attractive due to extensive subsidy programs. Due to the abundance of information, the choice of sustainable and recyclable building materials is further hampered. However, there is a great risk of making decisions that are neither economical nor sustainable in the long term. This project aims to support building owners with a tool that enables the creation of a full BIM model of their own house based on a few building properties. This model is used to carry out full energy performance simulations for chosen degrees of retrofit standards of the envelope and the HVAC system, considering optimal application of regenerative energy technologies like photovol-

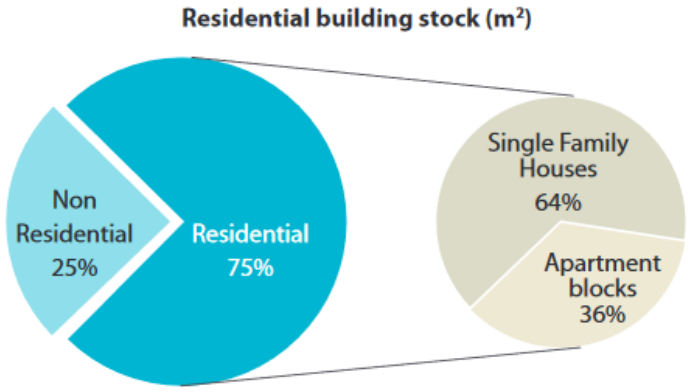

Figure 2: The European building stock (Source: Economidou u. a. 2011)

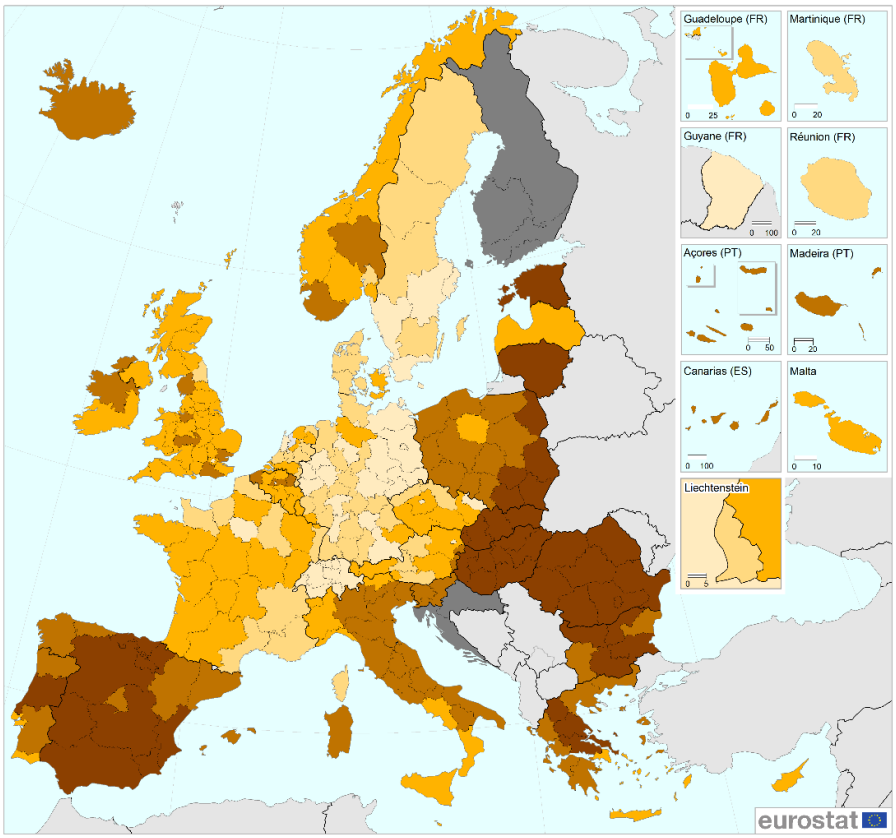

Figure 3: Ownership situation for dwellings in Europe (Source: Eurostat Census hub HC41) 1)

taics or geothermal systems. Based on the key performance and cost parameters, the building owner is able to decide on subsequent refurbishment activities.

Project vision

The project vision is to provide building owners of single-family and smaller multi-family houses with an easy-to-understand decision-making guidance that helps them to identify economic and sustainable refurbishment options with little input effort and without the support of expert planners.

Based on freely available online databases (Google Maps via JavaScript API, CDC (Climate Data Center) of the DWD (Deutscher Wetter Dienst) and others) as well as further framework data on the building and its property (building height, gross areas, type of use, window characteristics), the application enables the creation of a digital building model. These models are created using algorithms for generating generic floor plans. A generic building simulation model is created from these by enriching them with building physics (component characteristics, area characteristics) and cost-related properties. With the help of this model, variants for the renovation of the buildings can be calculated and evaluated in terms of investment costs, utility costs and sustainability. The variants include different possible standards of the building envelope and different degrees of utilization of renewable energies. Energy requirements (Germany: National Building Act), sustainability aspects (ÖKOBAUDAT) and funding opportunities (national such as KfW and regional funding such as SAB) are taken into account. As a result, the building owner can make a renovation decision based on comprehensible results, such as the savings in utility costs or the required investment costs, and thus approach executing companies and specialist planners in a further step. The generic building model variants (BIM models) can be passed on to planners and modified based on detailed site measuring carried out later on in an optional full planning process.

Read more

https://tu-dresden.de/bu/architektur/ibk

http://forschung.bauklimatik-dresden.de/

Funding organization

Not yet defined

Funding period

Not yet defined

Project manager

Dipl.-Ing. Mira Dolzmann

Contributors

Dr.-Ing. Peggy Freudenberg, Dipl.-Ing. Mirjam Dresel

Project partners

Not yet defined

Camper - CAMPus Energy consumption Reduction

Prof. John Grunewald, Dr.-Ing. Peggy Freudenberg, Mira Dolzmann, and Mirjam Dresel

The target of the project was to create an energy development plan with measures that can be implemented in the short, medium and long term to reduce energy consumption on the campus of TU Dresden. This included the elaboration of an optimized energy supply strategy for the CAMPUS of TU Dresden. The strategy considers the urban context, scientific monitoring of practical construction measures, and testing of innovative energy management systems. A development concept for the energy supply of the campus and more efficient energy systems for buildings are formed on the basis of a detailed analysis of the current situation. The network between the buildings with regard to the heating and cooling supply is also taken into account.
CAMPER-MOVE follows up focusing on the transformation processes required for the energy transition at neighborhood scale and city level. Supported by scientific monitoring and optimization, practical implementations are to be evaluated with regard to impact and practicality. The experience gained will be incorporated into further conceptual considerations. "MOVE" symbolizes the transformation process towards an energy efficient campus, which is driven forward by scientific contributions.

Bauhaus Vision

The CAMPER project points out possibilities of transformation for several buildings at the neighborhood scale. The practical implementation is scientifically accompanied and optimized. The project aims to promote interdisciplinary cooperation between the individual departments of TU Dresden. Only through this fusion of knowledge a sustainable transformation of neighborhoods can take place towards an efficient energy transition. Within the city of Dresden, the campus of TU Dresden has a special position due to its central location, size and the high number of people concerned. Approximately 8,300 employees and 36,000 students make up a considerable part of the urban energy and traffic volume. Therefore, the vision of this project is for TU Dresden to assume responsibility regarding the energy transiti-

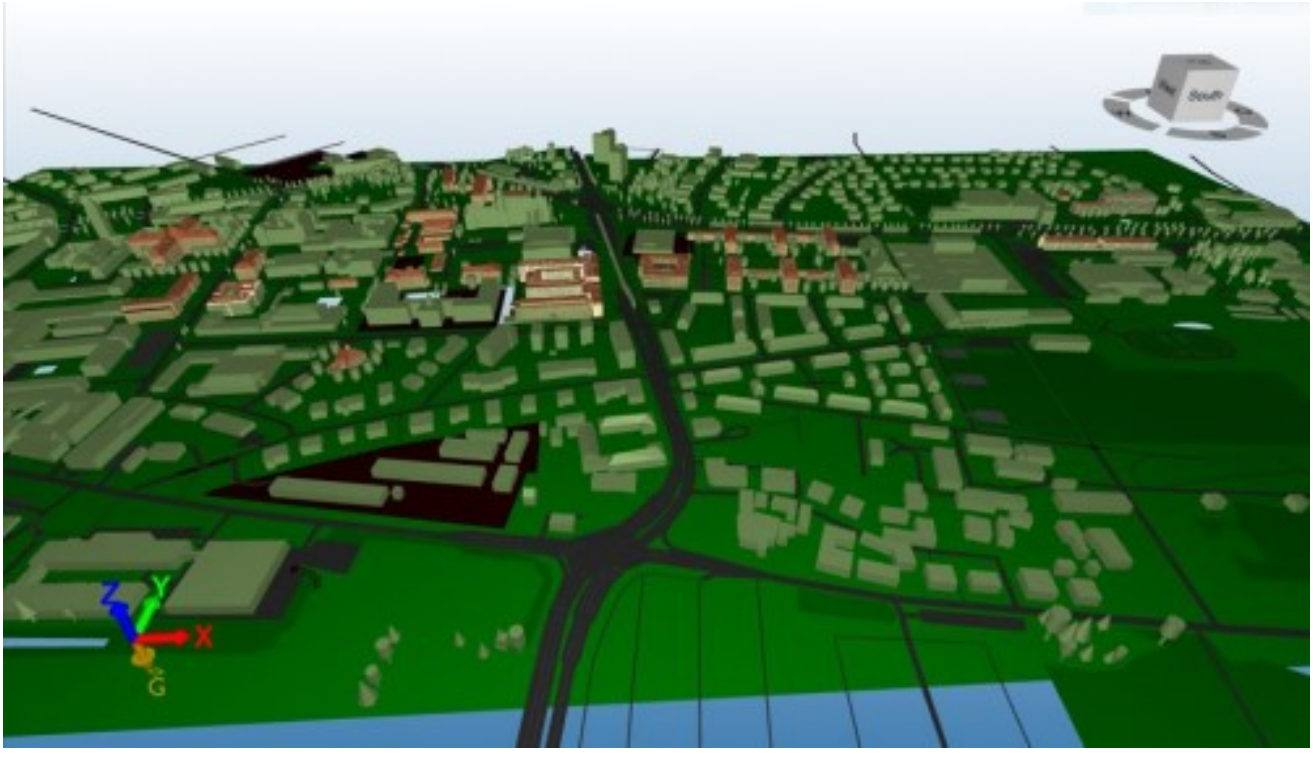

Figure 1. Presentation of the global simulation model; source: IBK TU Dresden

on and to set a good example.

Read more
https://tu-dresden.de/ing/maschinenwesen/iet/gewv/camper#intro

Funding organization
BMW; Under Project: CAMPusEnergieverbrauchsReduktion - Auf dem Weg zum Energieeffizienz-Campus der TU Dresden | CAMPus Energy consumption Reduction - steps to a energy-efficient campus of TU Dresden

Funding period
10.2015 – 09.2018, continued 04.2019 – 31.03.2024

Project Manager
Prof. Dr.-Ing. John Grunewald

Contributor
Dipl.-Ing. Heike Sonntag

Project partners (all TU Dresden)
- Institut für Energietechnik, Professur Gebäudeenergietechnik und Wärmeversorgung, Fakultät Maschinenwesen;
- Professur für Betriebliche Umweltökonomie, Fakultät Wirtschaftswissenschaften
- Professur Baukonstruktionslehre, Institut für Baukonstruktion, Fakultät Bauingenieurwesen;
- Institut für Verkehrsplanung und Straßenverkehr, Lehrstuhl für Verkehrsökologie (VÖK);

Figure 2. Simulation of individual builldings; source: Niels Eisfeld

Figure 1:. Karl-Lederer-Platz Neighborhood in Geretsried; source: Krämmel Wohn- und Gewerbebau GmbH

+EQNet

Prof. John Grunewald; Peggy Freudenberg; Mira Dolzmann; Mirjam Dresel.

The "+EQ-Net" research project demonstrates opportunities to achieve grid-neutral electrical operation of supply concepts. Science and industry both play an important role in this. Within the framework of the research projects "+Eins" and "+EQ-Net", new insights were gained in real-life implementation on demonstration projects, which are to be applied in future construction projects. It was necessary to develop validated tools for planners, operators and residents of single buildings, up to entire city districts to make this possible.

The building in Geretsried, depicted in Figure 1, was chosen as a best-case example. Analyses for the energy demand of this building were created and evaluated. The thermal multi-zone simulations contain innovative energy concepts for implementation. The optimization potentials for the building project could be discovered in early planning phases by means of simulation and improved in further proceedings. The focus was on a step-by-step improvement of the building performance. One focus was investigating the feasibility of hybrid energy generation, storage and supply. The integration of heat and electricity storage systems (decentralized and centralized) and the use of hybrid heating of drinking water were investigated. Furthermore, evaluations of the economic and energy concept, possible peak load coverage for heat as well as the use of solar collectors were considered. Innovative simulation tools were used in the planning phase to evaluate concepts with the aim of grid neutrality. Simulation methods were used consistently to capture the dynamics of processes more precisely and minimize the use of standard values. Reliable design values are essential for the integral planning of complex projects and must be provided by calculation tools. Only in this way is it possible to make reliable statements about rates of direct consumption and self-sufficiency of electrical

energy already during the planning phase. Completing the planning phase, it was possible to realize the implementation of the construction project in the further course. Also, extensive monitoring of the actual energy consumption of the construction pilot was realized.
The project results include dynamically simulated demand data for the pilot building project. In addition to the research results of the completed work packages, indirect results for the improvement of planning tools were collected, documented and published. This enables the direct transfer of knowledge into practice, with the aim to increase quality during the planning phase.

Project vision

The project enables planners to focus on a sustainable and energy-efficient implementation of the building already during planning phase. This facilitates the development of designs with sustainability as a focus in mind. Affordability is also affected, since an energy supply that is optimally adapted to the needs can save operating costs sustainably. With the help of models like the one portrayed in Figure 2, decisions can be made for an efficient energy supply ranging from single-family houses to small districts (building complexes at the neighborhood scale).

Read more

- *https://tu-dresden.de/bu/architektur/ibk*
- *http://forschung.bauklimatik-dresden.de/*
- *https://projektinfos.energiewendebauen.de/forschung-im-dialog/neuigkeiten-aus-der-forschung/detailansicht/ein-netzneutrales-plusenergie-quartier-entsteht/*

Funding organization

Bundesministerium für Wirtschaft und Energie (BMWi);

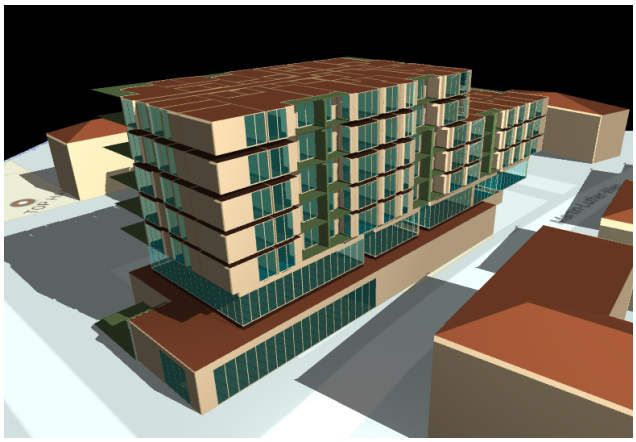

Figure 2:. Simulation model of the building; source: IBK TU Dresden

Netzneutrales Energie -Quartier am Karl-Lederer-Platz in Geretsried | Net-neutral Energy-Quarter at Karl-Lederer-Platz in Geretsried

Funding period

05.2015 – 06.2021

Project manager

Prof. Dr.-Ing. John Grunewald

Contributors

Dipl.-Ing. Dirk Weiß

Project partners

Competence Center - Energieeffiziente Gebäude, Hochschule für angewandte Wissenschaften München

Centre for Tactile Internet with Human-in-the-Loop (CeTI)

Tina Bobbe, Lisa-Marie Lüneburg and Robert Fischer

The Centre for Tactile Internet with Human-in-the-Loop (CeTI) at Technische Universität Dresden (TUD) was established to achieve significant breakthroughs for enhancing collaborations between humans and machines or, more generally, cyber-physical systems (CPS) in real, virtual, and remote environments. CeTI's vision is to enable humans to interact with co-operating CPS over intelligent wide-area-communication networks to promote equitable access to remote work and learning environments for people of different genders, ages, cultural backgrounds, or physical limitations. Thus, going far beyond the current state of the art, CeTI democratises the access to skills and expertise the same way as the current Internet has democratised the access to information. New communication technology allows faster and further reaching data transfer than ever before, enabling new ways for an exchange of skills between humans.

We, as industrial designers, support CeTI by trying to shape the future, starting from the human perspective and working in a systematic way towards creative and meaningful solutions. We face the challenge to develop wearable devices, containing fast sensors for full-body movement recognition and actuators for real-time haptic feedback, trying to promote the learning of motoric skills in order to make these skills available potentially for everyone. These systems are worn directly on the human body, it is indispensable to create a high level of trust and approval within society. A first step in this process is to identify application areas for improving equal access to remote work and learning environments for people of different genders, ages, cultural backgrounds, or physical limitations.

Besides its research objectives CeTI will also take care of societal aspects. Special efforts will be undertaken to create socio-economic impact. In the long run, the planned measures will address broader aspects touching the whole society, however, right now first activities on a regional level has been already initialised. For example, we plan on getting in contact with schools in Saxony via mobile labs and transport our idea of democratizing skills in an interactive way.

Bauhaus Vision

The aim of the Tactile Internet with Human-in-the-Loop (TaHiL) is to democratise access to skills and expertise in order to promote equity for people of different genders, ages cultural backgrounds, or physical limitations.

Funding Organization

DFG – Deutsche Forschungsgesellschaft (German Research Foundation)

Funding organization

On-going since 2019

Project manager

Professor Dr.-Ing. Dr. h.c. Frank H. P. Fitzek; Professor Dr. Shu-Chen Li; Professor Dr.-Ing. Thorsten Strufe.

Figure 1. CeTI – robot hand, source by CeTI

Figure 2. CeTI truck; source by CeTI

Contributors

Tina Bobbe and Lisa Lüneburg

Project partners

Tina Technical University of Munich, Chair of Media Technology (LMT) and Chair of Robotics and System Intelligence (RSI), Munich; German Aerospace Center (DLR), Cologne; Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e.V., Fraunhofer-Institut für Organische Elektronik, Elektronenstrahl- und Plasmatechnik (FEP), Dresden;´German Cancer Research Center (DKFZ), National Center for Tumor Diseases (NCT), partner site Dresden

Read more : **https://ceti.one/**

Figure 3. School kids visiting the CeTI truck; source by CeTI

Figure 4. Curious kid looking into the CeTI truck; source by CeTI

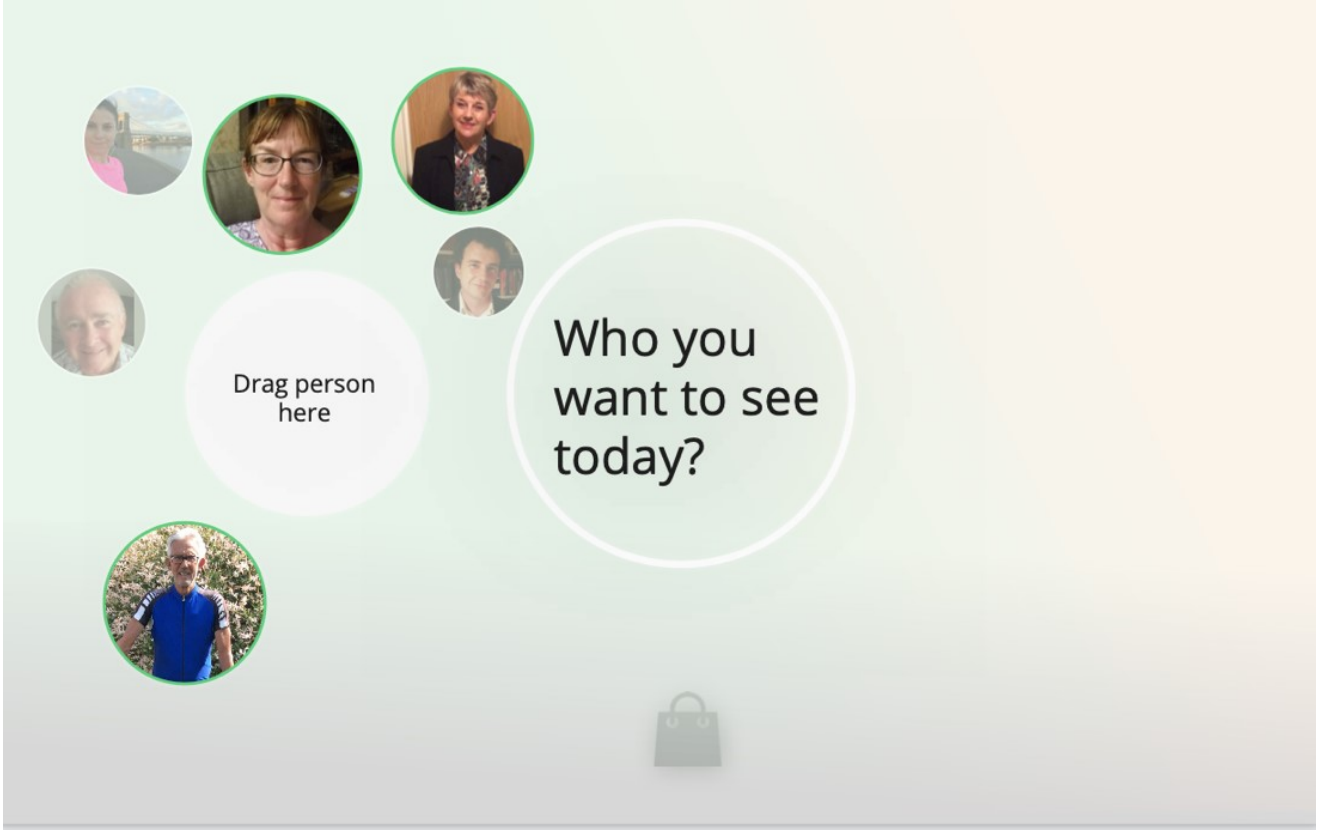

Figure 1. Designing Connections for People with Dementia; source: Lisa-Marie Lüneburg

MinD
Designing for People with Dementia: Designing For Mindful Self-Empowerment and Social Engagement

Mind Project Consortium

Researchers from 17 partner organisations in six European countries + Australia and Russia came together to collaborate in the area of designing for the mindful self-empowerment and social engagement of people with dementia. The project aims were to develop a mindful design approach to dementia care to help people, who experience psychosocial difficulties as a result of dementia, to improve their subjective wellbeing – as the individual's perception of their emotional wellbeing, sense of purpose and meaning of life (Steptoe et al 2015) – and engagement in social contexts.

The project brought together the areas of design and dementia care within a mindfulness framework to create a holistic person-centred approach to enable individuals to manage their condition, to develop perceptions of self-empowerment, and to gain confidence with engaging socially. Design can offer novel ways of complementing existing care approaches to empower people with dementia in everyday social situations.The project used the concept of mindfulness both as a framework and as a design approach to enable the integration of mindfulness into everyday social life (Ie, Ngnoumen and Langer 2014). MinD focused specifically on two areas:

1) personal difficulties with social interaction;
2) environmental influences on social engagement. In these two contexts, the study investigated how designs can help mediate perceptions of identity and emotional wellbeing, support social interaction and instill feelings of self-empowerment.

Bauhaus Vision

Utilising the concept of mindful design, MinD has investigated innovative design solutions to promote the wellbeing, confidence and self-empowerment of people living with dementia. As a result of the project a network was formed which continues to work in the area of mindful design.

Read more: https://designingfordementia.eu

Funding organization
European Commission, Horizon 2020: Marie Skłodowska-Curie GA No. 691001

Funding period
03/2016 – 02/2020

Project coordinator
University of Wolverhampton

Project lead
Prof. Kristina Niedderer, Manchester Metropolitan University, UK

Contributors
Dr.-Ing. Christian Wölfel; Lisa-Marie Lüneburg

Project Partners
University of Wolverhampton (UK);Manchester Metropolitan University (UK); Nottinghamshire Healthcare NHS Trust (UK); Etic Lab (UK); Alzheimer Europe (LU); Universite du Luxembourg (LU): Universiteit Twente (NL); Zorggroep Sint Maarten (NL); Panton bv (NL); Technische Universität Dresden (DE); Alexianer Krankenhaus Hedwigshoehe, St. Hedwig Kliniken, Berlin (DE); Picharchitects (ES); Universitat Politècnica de Catalunya (ES); Fundacion Intras (ES); DUIT (IT); Queensland University of Technology (AU); ITMO University St Petersburg (RU)

Figure 2. Co-designing with people with dementia and carers: Trying out mock-ups; source: MinD

Figure 3. MinD Conference 2019,;source: Christian Wölfel

Figure 1. OFL – Outside perspective; source: OFL

OFL – Open Future Lab

Robert Fischer

The Open Future Lab (OFL) is to become one of the places in the middle of Dresden where citizens, cultural, scientific, political and economic institutions of the city work together. Here they can discuss together, experiment with each other and learn from each other to develop, implement and test responsible innovations for their city. The multitude and diversity of people and disciplines, as well as their intensive networking in and around this central location, thus becomes an essential driver for a positive development of our city.

The OFL acts as a platform where creators and recipients meet without hierarchical structures across the disciplines. And it acts as a collaborative hub where a local and international audience becomes a partner for the elaboration of new ideas and technologies for a sustainable and livable future.

On this platform, we will use the possibilities of futurology, tools of participation, and diverse formats of the art and creative industries. Thus, we can jointly set impulses for city and country as well as economy and culture to shape our society in a meaningful way for all of us. In the design process we permanently design and implement to make relevant ideas and products effective for Dresden without detours. Accordingly, the OFL functions as a speculative laboratory where interested parties explore, debate and think through current challenges of change together.

In the OFL, various topics are to be worked on: How do we want to work, live and move around in the future? Regionally or globally? Real or virtual? Together or everyone for themself? With all or for a few? The manifold answers will be worked out with all those who are already shaping the future of their city today and with many more. In this sense, the OFL is consistently designed as a (free) space for productive discussion and as a sustainable impulse generator. The OFL is open to all and acts as an inclusive platform for both traditional formats and new initiatives from culture, science and creative+business. It is home to the new and a new home for international initiatives as well as for a diverse and cultural life in Dresden. All scientists, cultural and creative professionals, companies and citizens are invited to make the OFL their own. Together we set impulses for Dresden and the future of the whole region.

Bauhaus Vision

In the OFL all stakeholders and citizens are

welcome to participate in a multitude of different projects. Central assumptions for all projects are that they need to be sustainable and are to be guided by a human-centered design process that values the humanity of innovations.

This project is a vision. There is currently no direct project framework linked with the OFL that would fund the project in its entirety or its structure.

Read more: https://openfuturelab.de/

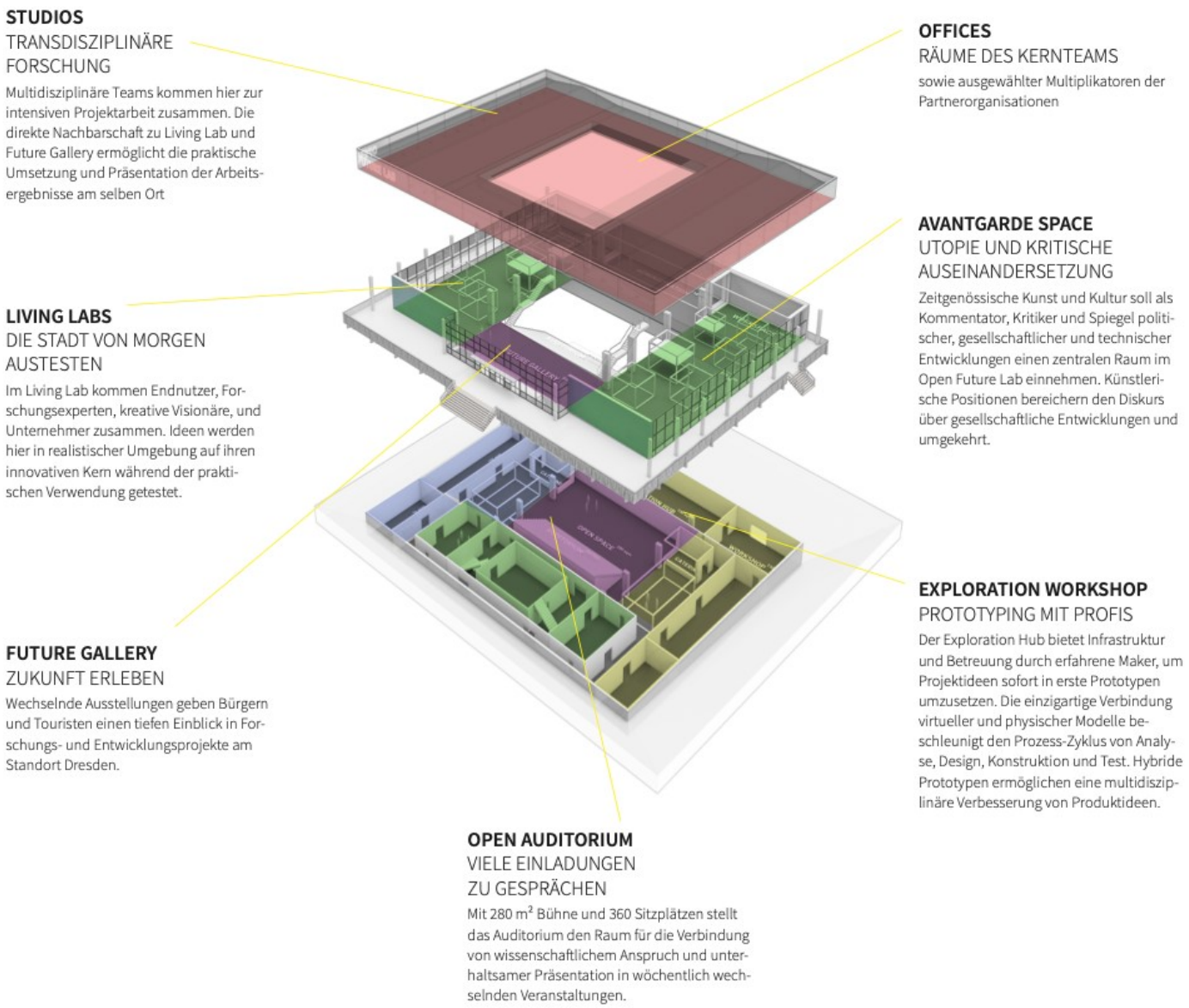

Figure 2. OFL – Inside perspective and content; source: OFL

PrIME

Martin Fiedler and Juliane Horn

SMEs are innovation drivers of the German economy. However, the development of new products and business models is becoming increasingly complex, as a wide variety of perspectives must be considered. Only in the interplay of technical requirements, economic efficiency, customer preferences and aesthetic demands do innovations with a unique selling proposition emerge.
Only rarely, however, is a company alone able to combine all these requirements.
PrIME follows the approach of cross-industry innovation processes. The network brings together SMEs with players from the creative industries and the research and development landscape. The aim is to open up research in an application-oriented way and to establish new fields of innovation in companies using the methods of the creative industries. The focus is on testing new application scenarios and developing new service or business models; projects such as smart concrete carbon were created.

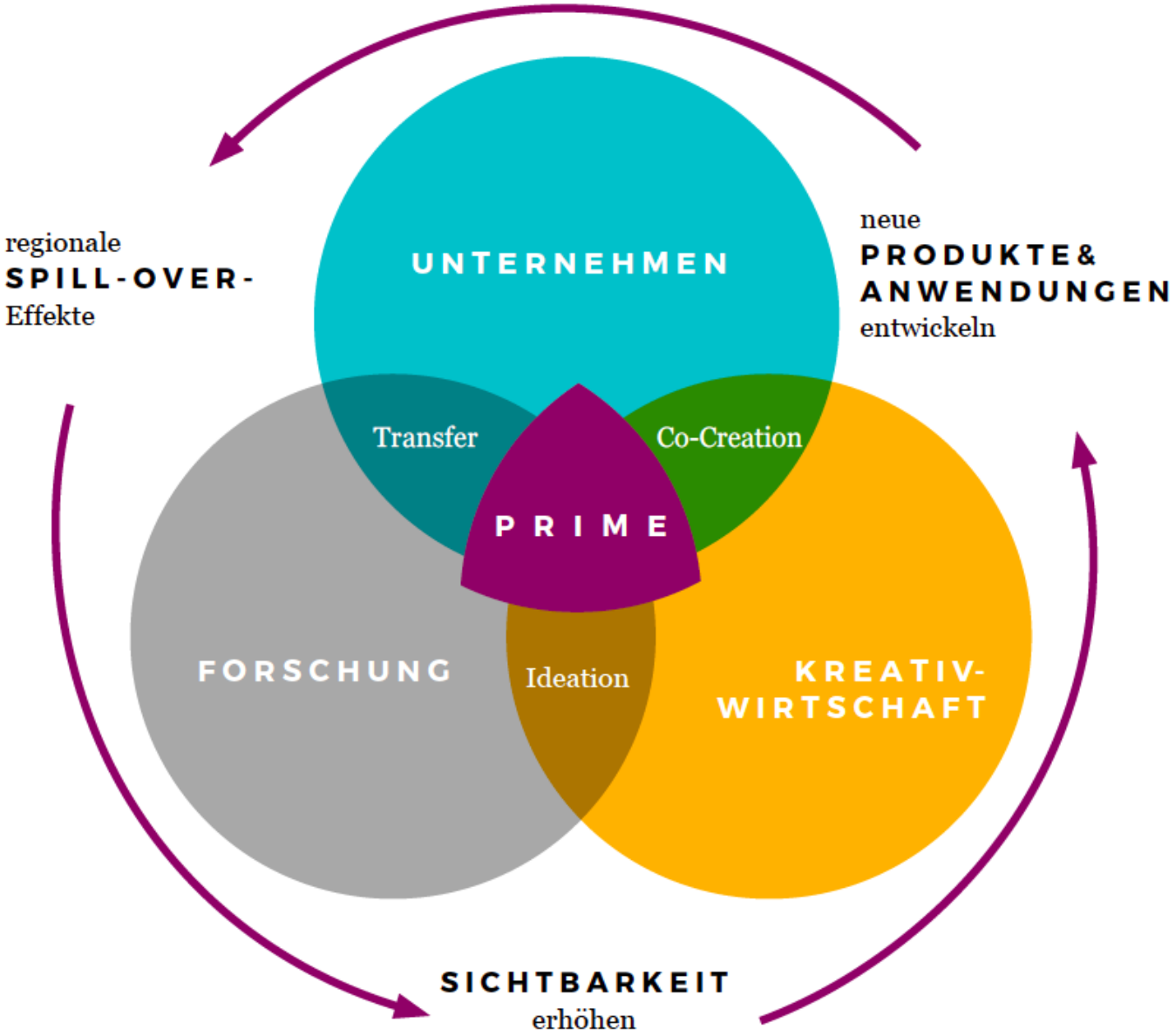

Figure 1. Business and Service Model, source: PrIME

Carbon concrete is considered one of the building materials of the future. The building material, which combines concrete with a scrim of carbon fibers, offers a variety of advantages over conventional materials, especially reinforced concrete. The latter is not only much heavier and therefore has to be processed much thicker but is also not as durable and resilient as carbon concrete.

Within the framework of PrIME, the aim was to further explore this potential and to translate it into a demonstrator that is accessible to the public, showing the functionality of intelligent carbon concrete and at the same time making it possible to experience it.

In addition to the project partners C³, Cool Silicon and the TU Dresden, the design office neongrau was brought into the project team. It developed an application scenario for the semi-public space, in which functional elements such as heating, inductive charging, Wifi screens and lighting could be integrated into the carbon concrete.

Read more: https://www.primeprojekt.de

Title (DE/EN): Prozesse und Tools der Kreativwirtschaft für ressourceneffiziente Innovationen für klein- und mittelständische Unternehmen durch Cross-Clustering von Materialforschung und Creative Entrepreneurship / Processes and tools from creative economy for resource-efficient innovations for SME through cross-clustering of materials research and creative entrepreneurship

Funding Organization
Förderung im Rahmen der Innovationsforen Mittelstand

Funding Period
03.2017 – 11.2017

Project manager
Wir gestalten Dresden

Project partners
Materialforschungsverbund Dresden e.V.; Technische Universität Dresden - Wissensarchitektur; Deutsche Gesellschaft für Materialkunde e. V. (DGM)

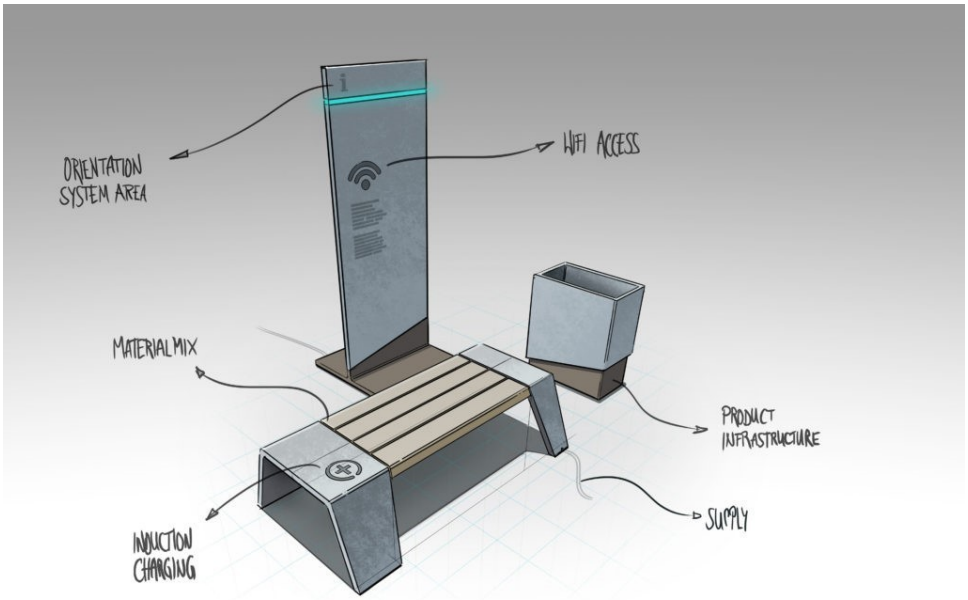

Figure 2. Carbon Concrete Bench; source: PrIME

TRACE

Tina Bobbe

Our future mobility behavior will be predominantly characterized by automation. The prevailing concepts on the market are often aimed at the (sub)urban high-income earners, so that they can devote themselves to work while commuting thanks to the fact that they no longer have to drive. Afterwards, the car dutifully looks for its own parking space in the urban maze.

TRACE, however, demonstrates the social potential of this technology and draws the vision of a mobility concept that primarily benefits people in structurally weak regions, regardless of their age and wealth.

Based on a detailed analysis of the mobility behavior of older people and considering the sociodemographic characteristics of the so-called "Silver Agers", a utilization concept for the year 2035 was outlined. In a workshop with the Senior Research Group Berlin, it was then possible to determine the mobility needs of potential users and the explicit requirements for the interior. In the design, the results of the workshop lead to an age-appropriate ride-sharing concept for up to four people that invites communication through its seating arrangement. Equally robust and inviting, the interior is primarily designed to ensure comfort and safety for all people - even with potential limitations in mind - yet endure in shared use. Financially less advantaged population groups are increasingly being pushed to the outskirts of cities or into rural regions as a result of increasing urbanization. Here in particular, there is a high dependency on motorized individual transport. If people lose their ability to drive due to physical limitations in old age, this is often synonymous with a loss of personal mobility.

TRACE aims to keep people in rural areas mobile into old age by providing a cost-effective, flexible and needs-oriented mobility service, thus preventing social isolation. Following the principle of "using instead of owning," people can come together in a ride-sharing concept for planned activities and thus share not only the costs but also the resources.

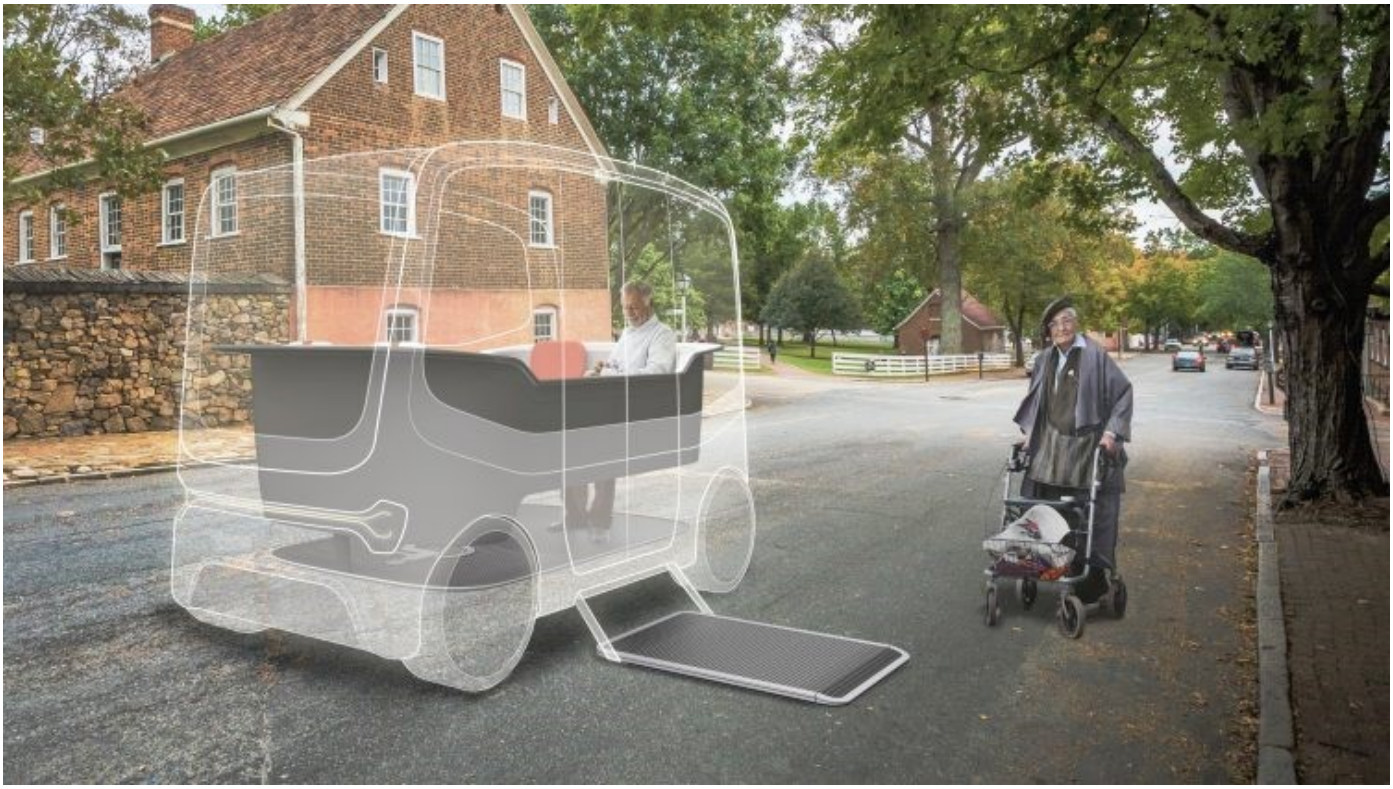

Figure 1. TRACE Application , source: Industrial Design Engineering, TU Dresden, Lenard Opeskin

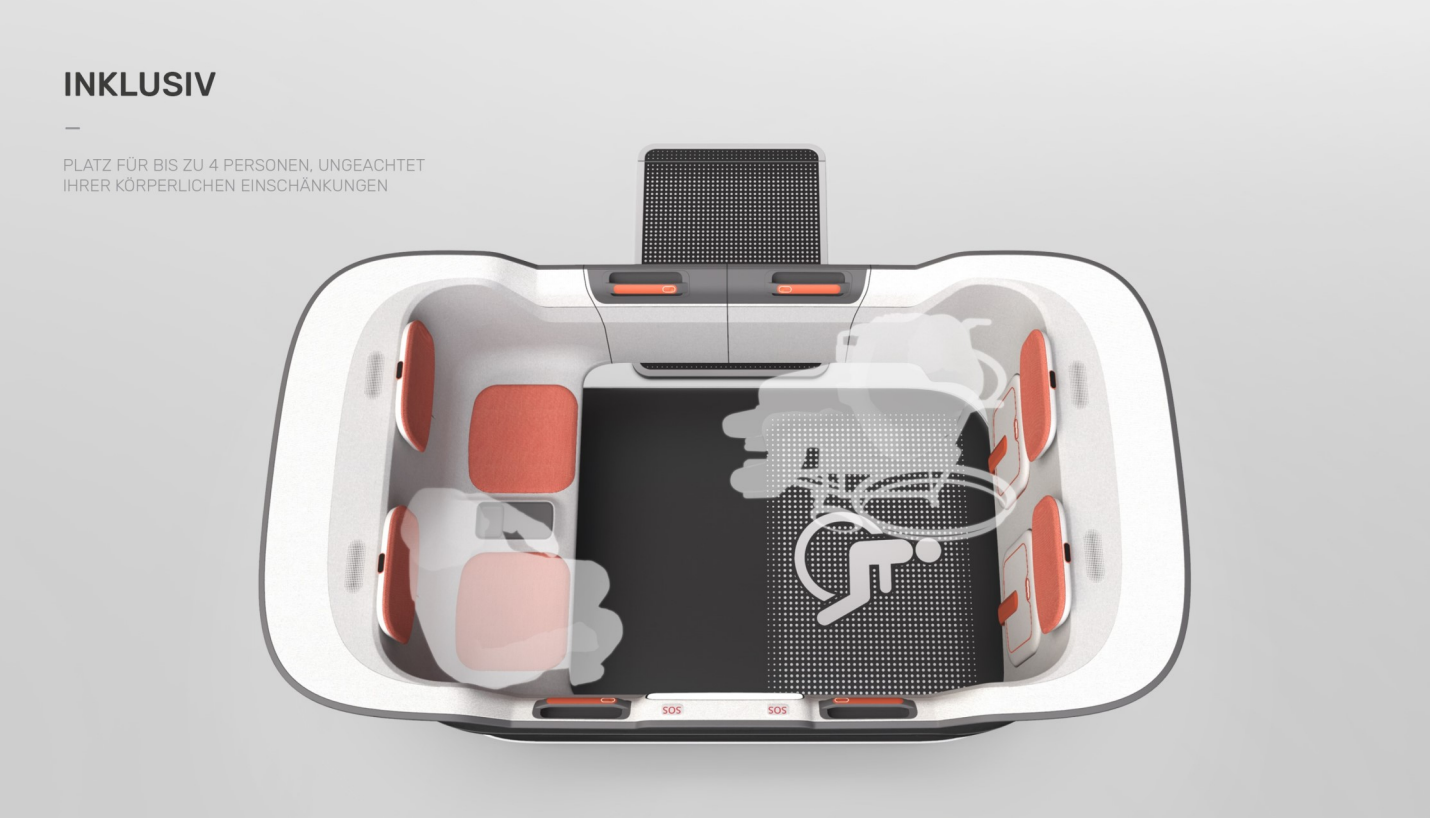

Figure 2:. TRACE Application, interior; source: Industrial Design Engineering, TU Dresden, Lenard Opeskin

Read more

https://www.designpreis-sachsen.de/2020/leistungsschau/scenes.ph?room=02-industrie-nw&plane=planeNord1#20

Project Partners

The project TRACE was initiated by Prof. Hubert Jäger from ILK, TU Dresden. The application concept was developed by Lenard Opeskin at Industrial Design Engineering, TU Dresden.

Low-waste non-crimp fabrics

Dipl.-Ing. Konrad Zierold

Ecological and economic sustainability are becoming increasingly urgent topics. The fiber-reinforced plastics (FRP) industry can no longer avoid this trend. Technologies that reduce the use of resources in the manufacturing process of FRP components are therefore of particular relevance. Currently, multiaxial fabrics can only be manufactured with a constant material width. Within the sequential preform production, this still leads to extremely waste-intensive assembly processes. The waste incurred in industrial processing for complex FRP components is up to 50%.

The weft insertion for multiaxial fabrics is based on firmly positioned transport chains. The weft thread lengths cannot be changed during the manufacturing process. Thus, when using conventional lay-up technologies, weft threads must always be laid across the entire width of the machine, even if only a fraction of the resulting lay-up area is required by the end user. Particularly when using expensive carbon fibers, costly waste is created.

The approach pursued by the ITM of the TU Dresden in the IGF project "Low-waste non crimp fabrics" is to lay the high-performance threads only in the lengths required by the subsequent product. The innovation lies in the usage of a weft thread, which is alternating between two components. For this purpose, the expensive reinforcement thread is fixed between two inexpensive holding threads, which are then inserted into the transport chains. Thanks to the defined, component-specific control of the respective holding and reinforcing thread lengths, a wide range of contours can be produced with little waste.

In order to be able to provide the weft layer with such an alternating weft thread, a joining process is required that creates sufficiently strong connections quickly and reproducibly. To determine the necessary strength of the joint, the weft thread tensions occurring in the manufacturing process were measured and evaluated. Joining by means of splicing was developed as the preferred solution.

Since there was no splicing technology for the production of an alternating weft thread from two parallel threads, a splicing device was

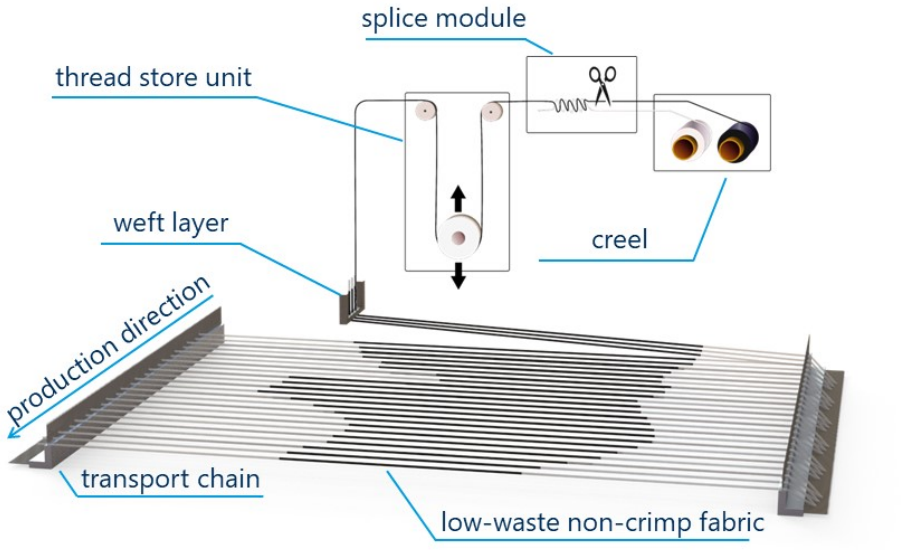

Figure 1. Functional principle for the production of cost-reduced, low-waste non-crimp fabrics; source: Konrad Zierold

newly developed and manufactured as a prototype using the 3D printing process. The integration of the discontinuous splicing process into continuous weft laying presented a particular challenge. For this purpose, a powerful control system consisting of drives and thread stores was developed.

Bauhaus Vision

With the successful development of a retrofittable splice module as well as a control system, the ground is laid for affordable reinforcement structures with high material efficiency, and therefore sustainability, using the highly productive multiaxial chain knitting technology.

Read more

https://tu-dresden.de/ing/maschinenwesen/itm

https://forschungsinfo.tu-dresden.de/detail/forschungsprojekt/18282

Titel | Title

Entwicklung verschnittarmer Biaxialgelege auf Basis der Kettenwirktechnik für großserientaugliche Leichtbauanwendungen | Development of low-waste biaxial non-crimp fabrics based on warp knitting technology for lightweight construction applications suitable for mass production

Funding Organization

Bundesministerium für Wirtschaft und Energie (BMWi)- IGF-Vorhaben-Nr: 20396 BR, Forschungskuratorium Textil e.V.

Funding Period

04.2019 – 06.2021

Project manager

Prof. Dr.-Ing. habil. Dipl.-Wirt. Ing. Chokri Cherif

Contributors

Dr.-Ing. Lars Hahn; Dipl.-Ing. Konrad Zierold; Dipl.-Ing. Ralf Müller

Project partners

Project-accompanying committee consisting of 14 german companies, including 10 SMEs

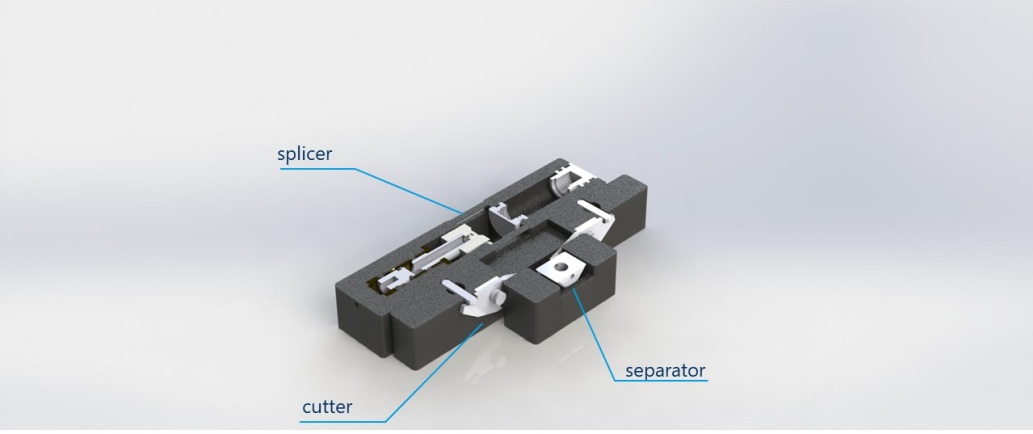

Figure 2. Representation of the retrofittable splice module as a CAD model; source: Konrad Zierold

rCF Hybrid yarns for Composites

Prof. Dr.-Ing. habil. Dipl.-Wirt. Ing. Chokri Cherif

Because of current megatrends in terms of material efficiency, electromobility, CO2 reductions, and high-performance requirements, the application of carbon fibre reinforced composites (CFRP) across different industries is steadily increasing. On the other hand, a high volume of recycled carbon fibre (rCF) is produced through a number of different processes. The composites, which are currently produced based on nonwovens and injection-moulded components consisting of rCF are characterized by low performance. The maximum strengths of rCF composites made of nonwovens or injection moulded parts are 400 MPa or 300 MPa, respectively. These values are very low compared to composites made from virgin CF filament and, for example, a polyamide 6 (PA6) matrix, where values up to 1500 MPa can be reached depending on the impregnation process and fibre volume content. Therefore, there is a need to develop novel fibre structures based on CF recycling material, which offer a significant increase in composite performance up to close to that of virgin CF.

For this reason, the main focus of the project at the ITM is on the development of technology for the manufacturing of composites with higher mechanical properties based on hybrid yarns consisting of rCF and thermoplastic fibres (For example PA6). For this purpose, a process chain starting from fibre preparation, carding, drawing and spinning is developed at the ITM (Figure 1). New technological and machine modifications are carried out for a gentle processing of the brittle rCF. High performance CFRPs are manufactured based on different hybrid yarns (Figure 2) with an utmost consideration for a gentle processing of rCF and high productivity. The tensile strength of composites made of rCF hybrid yarns currently amounts to up to 1150 MPa depending on the fibre type, the fibre volume content and fibre length. Furthermore, various testing techniques are developed for the characterisations of rCF fibre structures.

The novel CFRP components made from rCF hybrid yarns possess a number of advantages compared to those of conventional CFRP components manufactured from endless filaments: economic manufacturing because of cheap rCF materials, higher drapeability of textile semi-finished products, higher suitability for the design of a complex 3D composites.

This R&D work makes a very high contribution to environmental protection, resource conservation and sustainability.

Bauhaus vision

Through different research projects, the ITM has developed a very high competency for the processing of rCF into hybrid yarn structures. The results show high potentials to increase the performance of rCF-based composites significantly. Due to the still existing high fibre damage in the yarn formation process (>50%), however, the potential of the rCF hybrid yarn and the composites based on it cannot yet be fully exploited. There is still a great need for research. Additionally, there is a requirement

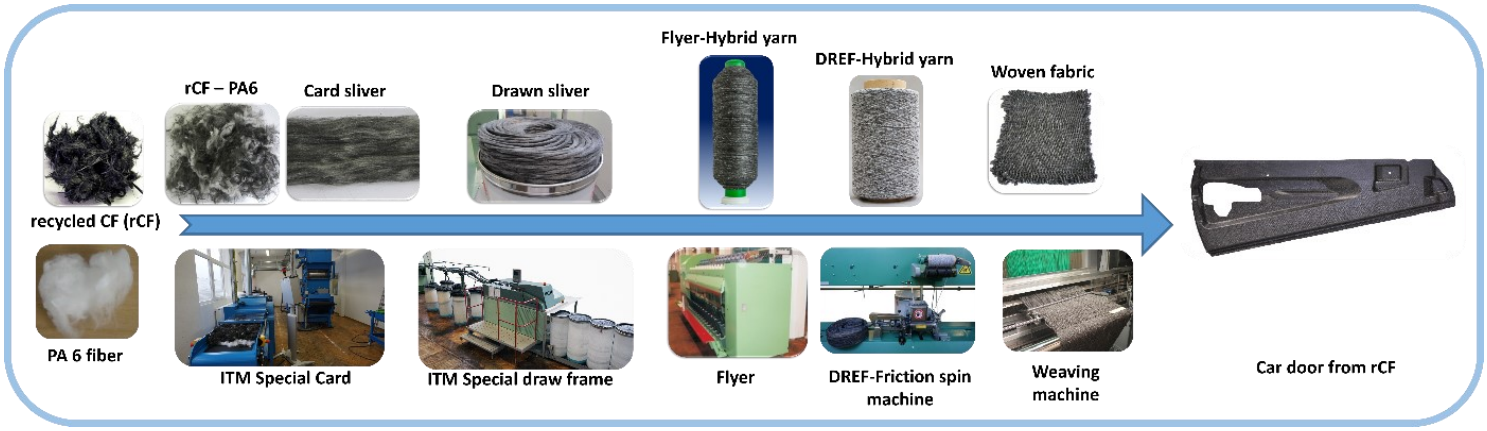

Figure 1. Process chain for the manufacturing of fibre reinforced composites from rCF Hybrid yarns at the ITM; source: ITM

of further research for example for the development of organic sheet from rCF, development of yarn structures consisting solely of rCF for thermoset applications and development of fibrous structures suitable for multiple stages of recycling.

Read more

https://tu-dresden.de/ing/maschinenwesen/itm

https://forschungsinfo.tu-dresden.de/detail/forschungsprojekt/16038

Titel | Title

Spinning of hybrid yarns from short carbon fibre for composites (DFG CH 174/34-1)
Flexible Prozessketten für thermoplastische integral gefertigte FKV-Bauteile mit komplexer Geometrie. Teilprojekt:
Entwicklung von Faser-, Textil-, Preforming- sowie Konsolidierungsverfahren zur Fertigung komplexer Faserverbundstrukturen|
Flexible process chains for thermoplastic integrally molded FRC components with complex geometry. Sub-project: Development of fibre, textile, preforming and consolidation process for the manufacturing of complex fibre reinforced composites (BMBF/Forel/3DProCar 02P14Z020 – 02P14Z030)

Funding Organization

German Research Foundation
(DFG CH 174/34-1) Bundesministeriums für Bildung und Forschung (BMBF)-(Förderkennzeichen 02P14Z020 – 02P14Z030)

Figure 2. Different rCF hybrid yarns developed at the ITM; source: ITM

Funding Period

01.10.2013 - 31.03.2017 (DFG CH 174/34-1)
01.07.2015 - 30.09.2019 (BMBF/Forel/3D ProCar 02P14Z020 – 02P14Z030)

Project manager

Prof. Dr.-Ing. habil. Dipl.-Wirt. Ing. Chokri Cherif

Contributors

Dr.-Ing. Anwar Abdkader

Project partners

10 companies and 2 research institutes are involved in the project (BMBF/Forel/3DProCar 02P14Z020 – 02P14Z030).

Robot-supported technology for direct yarn placement for concrete applications

Dipl.-Ing. Martin von Zuben; Dipl.-Ing. Danny Friese

The focus of this research project was on the conceptual design and constructive-technological development of a robot-based manufacturing system for direct 2D yarn laying, thus enabling the production of textile high-performance reinforcement structures for concrete construction. The main objective of this project was to generate functional individual modules for the direct laying of impregnated Carbon Fibre Heavy Tows and a robot program suitable for manufacturing on industrial robots. Extensive research and development efforts resulted in a field-tested machine concept that is scalable for industrial applications; hence, the value-added chain for cost-efficient precast construction can be optimized and extended based on this concept. Moreover, an online impregnation unit with a flexible two-dimensional position for homogeneous roving impregnation was developed and successfully implemented. These research works are a sound foundation for the future development of a manufacturing technology for the three-dimensional, automated production of reinforcement structures.

Bauhaus Vision

This automatic, robot-supported, online-manufacturing system enables the streamlined production of precast concrete elements with waste-free textile reinforcement structures. Due to a distinct material reduction up to 35 % in the case of a 1.5 x 3 m² wall with openings, this elaborated novel textile technology paves the way for a cost-efficient and resource-saving producing method. Furthermore, the low repair and maintenance efforts of buildings, precast concrete parts or strengthening layers contribute to a long lifetime, thus resulting in reduced overall costs. The affordability of aesthetic thin-walled concrete elements with durable textile reinforcement ensures an industrial robot, which produces reinforcement components automatically and highly efficiently.

Read more

https://www.bauen-neu-denken.de/vorhaben/v-4-1-multiaxiale-garnablage/

Figure 1: Robot-supported yarn placement technology for the production of cost-efficient carbon concrete precast elements; source: Rico Pöschel (ITM)

https://tu-dresden.de/ing/maschinenwesen/itm

Titel | Title
Multiaxiale Garnablage im automatisierten Umlaufprozess (Multi-2D Druck) | Automatic Circulation Process for Multi-Axial Yarn Placement (Multi-2D Printing)

Funding Organization
Bundesministerium für Bildung und Forschung | Federal Ministry of Education and Research

Funding Program
Zwanzig20 – Carbon Concrete Composite C3. C3 V-4 sub-project

Funding Period
08.2016 – 10.2019

Project manager
Dipl.-Ing. Matthias Schurig M.Sc. (Betonwerk Oschatz GmbH)

Contributors
Dr.-Ing. Lars Hahn

Project partners
Betonwerk Oschatz GmbH; Hochschule für Technik, Wirtschaft und Kultur Leipzig, Institut für Betonbau

Figure 2 Cost-effective wall element with openings consisting out of carbon fibre reinforced concrete; source: Martin von Zuben (former: ITM)

*Land*City Shaping Transformation*
*Stadt*Land – Transformation gestalten*

Prof. Melanie Humann

In the transdisciplinary research project "Land*City Shaping Transformation" we investigate the importance of urban-rural linkages for the "Great Transformation" (WBGU). The starting point of the project is the observation that societal spatial transformation is usually related either to "the city" or to "the countryside" only. This separate consideration of these subspaces is - according to the hypothesis - causal for transformation requirements and obstacles, since complex systemic interrelationships remain unconsidered. As a possible corrective, we examine with the by us developed concept of the "Transformative Cell" an approach that aims at overcoming the undercomplex urban-rural dichotomy. In line with the practice-oriented transformative research, the conceptual development of the "Transformative Cell" takes place within the framework of a reciprocal process between living-lab research, reflection and theoretical concept design. As part of a larger research association we examine urban-rural connections and their role in the process of major societal transformation. We think of societal transformation, insofar as it refers to places, as applying either to 'the city' or 'the countryside' – and you often only hear the question: How will the city of the future look? We believe this divided way of looking at these topics slows down transformation processes as it allows systemic correlations to go unnoticed. We're developing a new approach for geospatial transformation research that seeks to overcome the undercomplex urban-rural dichotomy.

Bauhaus Vision

The relationship between urban and rural spaces is changing at a very dynamic pace and is subject to a process of transformation. We believe that transformation research needs to look at the topic from a different angle as cities and rural areas are usually considered, analysed and categorised separately.

Read more

https://landstadt.net/

Project Partners

Karlsruher Institut für Technologie; Thünen-Institut; Wuppertal Institut.

*Figure 1: Reallabor Betonwerk Stolpe – credits: Stand*Land Transformation*

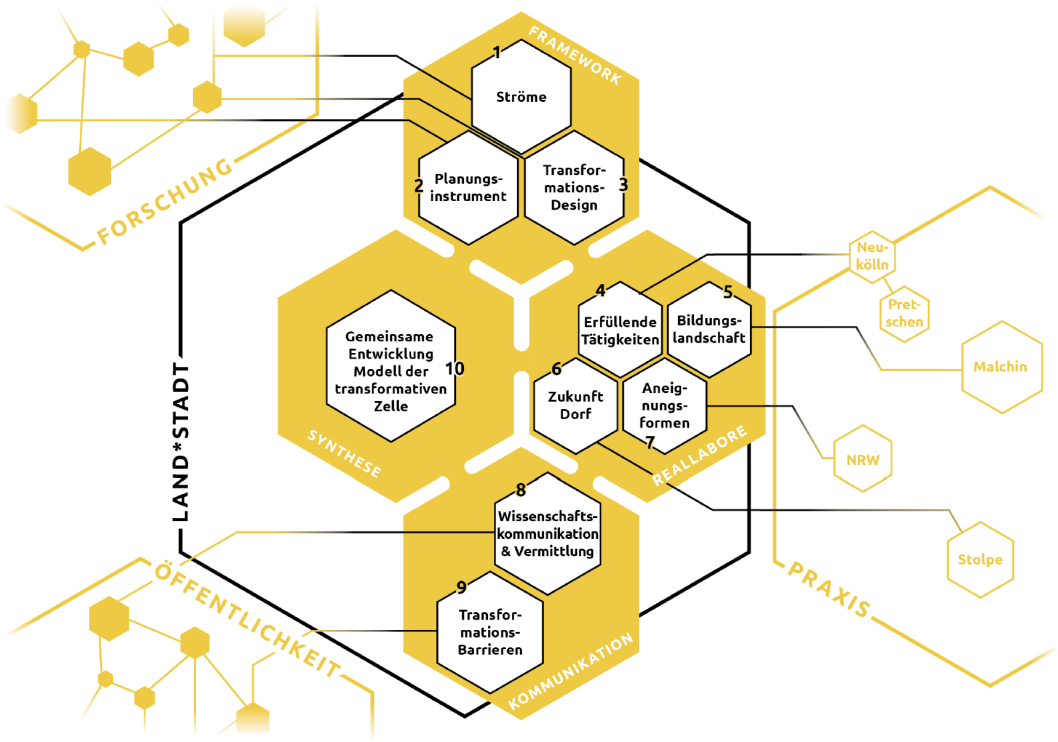

*Figure 2: Transformative Cell ; source:Stand*Land Transformation*

Made in Pieschen
Mix-used urban design with local stakeholders in Dresden Pieschen

Prof. Melanie Humann

How can urban design shape the common good? What kind of planning processes support urban inclusiveness? Which spaces are needed for local urban production as an alternative to global mass production and how can we design new types of mix-used neighborhoods?

On invitation of the artist collective GEH8 25 students of the TU Dresden looked for answers to these questions in the summer term 2020 as part of the urban design studio MADE IN PIESCHEN.

The focus area is one of the last large vacant sites in the northwest of Dresden and located near the public transport station Dresden-Pieschen. The approximately 7.5 hectare of a former railway area is framed on two sides by railway lines and hardly perceptible from the urban context. The high potential of these urban island attracted various stakeholders of cultural and public institutions around the area: From their point of view, the area offers space for an urban development considering the common good - as an urban mix of creative neighborhood, sports park, green space and location for new forms of local production.

The students developed various urban design approaches for the area including urban production and circular economy, studios and workshops for artists from the GEH8 and the Zentralwerk as well as sport areas for the public sports club Motor Mickten. Additional public green and open spaces were created for expanded neighborhood use.

Figure 1: Exhibition GEH 8 – Credits: Melanie Humann

14 different urban design approaches, showing a wide range of possibilities for a sustainable and inclusive urban planning, were presented in a public exhibition at the GEH8 and discussed with the different stakeholders, including the political representative and the planning department of Dresden.

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Bauhaus Vision

The urban design approaches take into account the needs of the local context and at the same time develop a future vision of a mixed-used productive neighborhoods. This initiated an ongoing bottom-up planning process leading to a sustainable and inclusive urban development of the area.

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Read more

https://tu-dresden.de/bu/architektur/istb/urb/die-professur/news/MADE-IN-PIESCHEN-Ausstellung-in-den-Raeumen-der-GEH-8-29-10-15-11.2020

Project Partners

Artist Collective GEH8 Dresden; CO-WORKING Zentralwerk Dresden; town planning department of the City of Dresden; Chair of Landscape Engineering, TU Dresden; Motor Mickten e.V. sports club Dresden;

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Figure 2: Exhibition GEH 8 – Credits: Melanie Humann

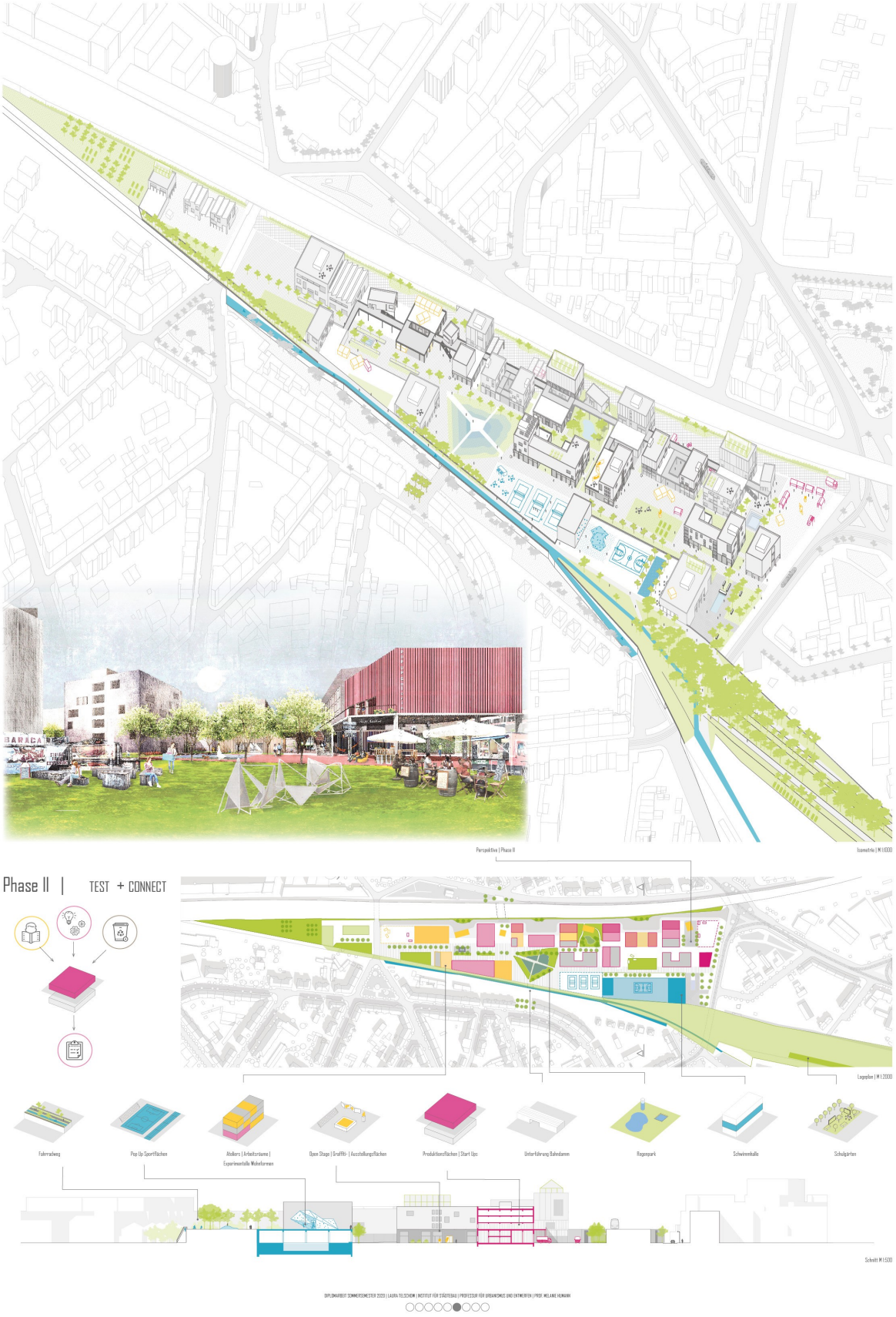


Figure 3: Urban Design Project; source: Laura Telschow

LAB of Inclusive Urbanism as a Format to Educate Urban Designers in Europe

Prof. Angela Mensing-de-Jong

In recent years, there has been much international debate on contemporary approaches to urban design education, the current state of the discipline and practical experiences in urban design from countries with different social, cultural and economic conditions. Universities face the challenge of ensuring that students do not view the future as a mere projection of the present but, instead, consider alternative ways of urban living, leisure or modes of work. One outcome of the fruitful discussions has been to rethink the educational aspect of urban design.

Within the field of urban design, education workshops are a particularly useful tool. They offer participants from diverse backgrounds the conditions of an on-site laboratory, which cannot be offered in a standard curriculum. The particularities of the applied methodology can vary from programme to programme, depending on the collaboration of universities and local partners, their interests and challenges. The involvement of professionals, urban designers and city planners will influence the educational outcomes. Inclusiveness is a critical aspect of the urban design workshop, as this can significantly expand the spectrum of possible dissemination.

The more than 9 cities and regions which we have worked on since 2009 present complex historical, political and social settings. We quickly realized that regular revitalization and urban redevelopment projects would be insufficient in such cases. Therefore, the new LAB format was created to offer students an educational and intellectual environment that would foster an intensive study of complex problems and aid the search for the best responses.

LAB is a workshop format specifically designed for the modelling of alternative urban strategies and to enable directed comparative analysis. The specifics of the LAB idea as formulated by the university teams allow for the parallel development of various spatial-social concepts, each representing one potential urban model.

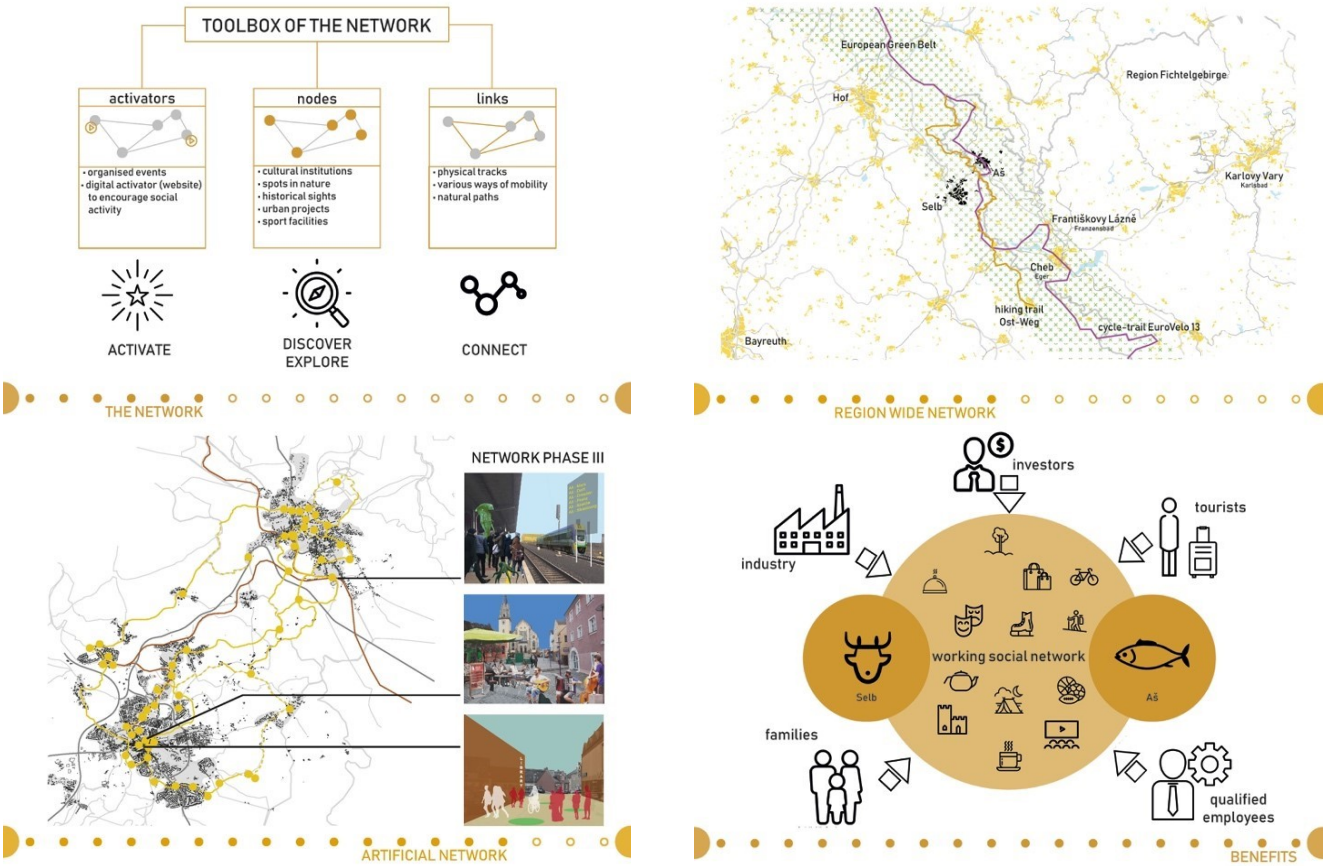
LAB in Halle-Neustadt (D) March 2014 " Reinterpreting Utopa: HaNeu 3.0" Concept for a new productive community ' Halle Neudorf' with urban agriculture on vacant lots and vertical farming in the empty high-rise buildings in the centre (Source: Workshop 2014, group 2: A. Anwar, A. Bogaert, J. Forner, K. Glodowska, M. Matraszek, W. Shang).

We also include methods of a participatory or multi-disciplinary approach to allow for intense site analysis and strategy-based thinking as the foundation for further urban development. The process – on-site and with the support of various stakeholders – requires an inclusive approach.

The process – on-site and with the support of various stakeholders – requires an inclusive approach. By replacing conventional design thinking with multi-faceted strategies, the innovative LAB format extends the potential areas of application.

in the LAB, approx. 35 to 60 students of up to five different universities consider complex historical, political, natural and cultural conditions, placing these in the context of the current spatial and social situation of the city. The added value is also the possibility of exchanging ideas, working methods and individual mapping skills by participants from various countries and curricula (such as architecture, urban design, spatial planning and landscape architecture). Furthermore, the LAB serves as a useful platform for open discussion between local stakeholders and representatives of the administration. It supports objective debate, free of potentially conflicting political and financial considerations.

The focus of the investigation initially dealt with the repercussions of World War II on the spatial and social structure of cities today (Erasmus intensive programme 'Facing the



LAB at the Czech-German border, March 2019: " Aš (CZ) and Selb (D): Unified by the Border". Concept for a new social and spatial network between the two towns (Source: Workshop 2019, group 4: P. Berger, V. Felbrich, M. Garncarczyk, D. Maassen, H. Song).

Impact of the Second World War: Urban Design in Contemporary European Cities' in Oświęcim 2009, Rotterdam 2011 and Dresden 2021 coordinated in the years 2009- 2012 by CUT).

Due to the complexity of these issues and the difficulty of applying them to the study cases, the team of tutors started to formulate the new LAB format. Questions that kept recurring were: How can we keep the programme of the LAB workshop coherent when it moves on to other emerging topics? Are we able to transfer the methods developed in the context of the urban history of WWII to other case studies?

These questions became crucial as the programme was further expanded to encompass cities with difficult demographic conditions, such as those arising from Europe's political convulsions after the fall of the Iron Curtain. These activities also received stronger formal support under the aegis of the Competence Center Urban Renewal of the Federal State of Saxony-Anhalt based in Magdeburg with two LABs being carried out: Schierke (a part of the city of Wernigerode/Harz) in 2013, Halle-Neustadt in 2014 and Magdeburg 2015. The realization required much stronger participation of stakeholders. The spectrum of educational partners was also broadened to include - alongside the HTW Dresden, the TU Delft and the CUT Krakow - the Universiteit of Chalmers in Gothenburg and Gent Universit.

Their success led to the continuation of the format in 2018 in Gothenburg and 2019 where the focus on cross-border cooperation was on border towns of Selb (Germany) and Aš (Czech Republic). This LAB was coordinated by the TU Dresden with the participation of TU Delft, University of Chalmers Gothenburg, CUT Krakow, CTU Prague and ENSA Strasbourg. The last LAB of this format took place in 2019/2020 in the Saxon town Freiberg under the title "City_Campus_City". The focus laid on the potential of the interaction of the TU Bergeakademie and the city regarding

sustainable development and competitiveness of both in terms of being more attractive for the "Knowledge Society".
The LAB which was planned for March 2020 in the Euroregion Strasbourg-Ortenau on cross-border cooperation along the river Rhine had to be cancelled because of the Corona crises. The cooperation moved exclusively to the digital platform, but we hope to be able to continue with the LAB format in the future.

Bauhaus Vision

The LAB format is developing into an integral part of the urban design curriculum at European architecture faculties and allows students and teachers of different disciplines and nationalities to learn from each other and at the same time brings added value for the regions and topics that the lab makes the focus.

Project Partners:

Cracow UT; TU Delft; CTU Prague; Ghent University; Chalmers UT Gothenburg; University of Padua; École Nationale Supérieure de Strasbourg; Stakeholders in the participating regions and municipalties.

Read more:

- LAB Format: https://www.rius.ac/index.php/rius/article/view/98
- Case Study "Aš and Selb: Unified by the Border": https://tu-dresden.de/bu/architektur/istb/stb/studium/dokumentation-1/entwurf/sose-19-as-cz-selb-d/copy_of_sose-19-as-cz-selb-d-entwurf
- Case Study "City_Campus_City: TU Bergakademie Freiberg": https://tu-dresden.de/bu/architektur/istb/stb/studium/dokumentation-1/entwurf/wise-18-19-freiberg/index

Lingner.Park.Stadt
A Quarter for Living and Working, for Science, Art and Culture

Prof. Angela Mensing-de Jong

What could a real vision for the city of the future in the centre of Dresden look like? This is the question, which the Chair of Urban Design at the Technical University of Dresden posed to 27 students in the 2020 summer semester. During the seminar, some of the students dealt with example districts in other cities that are used by mixed and creative milieus. They then researched key topics (new forms of mobility, participation processes, sustainable cycles, attractive ground floor zones, etc.) to transfer the results to the situation in Dresden. The students in the design studio developed urban projects for the former Robotron (manufacturer of computers during the GDR time) site in Dresden. The current state of planning for the "Lingner.Park.Stadt" was critically discussed and questioned. Ten projects were created that put very different development options for this urban quarter up for discussion.

Today the area is only perceived as a transit zone between the city centre and the park "Großer Garten". It is characterized by heterogeneous building typologies and many underused or fallow open spaces. In addition to the Deutsche Hygiene Museum Dresden (DMHD), the former Robotron canteen could play a key role in the process of transformation. The building, which was already planned for demolition, was to be developed into a so-called "third place" as part of Dresden's failed application for the European Capital of Culture. During the application process, numerous needs of the city's "creative milieus" were formulated, which should be implemented in the Robotron canteen. With a new use by institutions of culture, art and science, the building could become an important source of inspiration for the development of "Lingner.Park.Stadt" and the city of Dresden as a whole.

An exhibition in the Deutsche Hygiene Museum Dresden (DHMD) that took place in October 2020 made these visions vivid and open to the public.

Bauhaus Vision

The resulting projects could encourage stakeholders to reconsider the existing plans for this area and implementing a sustainable urban development model that could become a "Real LAB" and showcase for current topics and discussions in Dresden and beyond.

Project Partners

Major's office and town planning department of the City of Dresden; Chair of Industrial Design Engineering, TU Dresden; Deutsches Hygiene Musuem Dresden; Gerch Group Düsseldorf.

Read more

https://tu-dresden.de/bu/architektur/istb/stb/studium/dokumentation-1/entwurf/sose-20-lingner-park-stadt-1

Figure 1. Opening of the exhibition in the Deutsches Hygiene Museum October 15th 2020
© DHMD

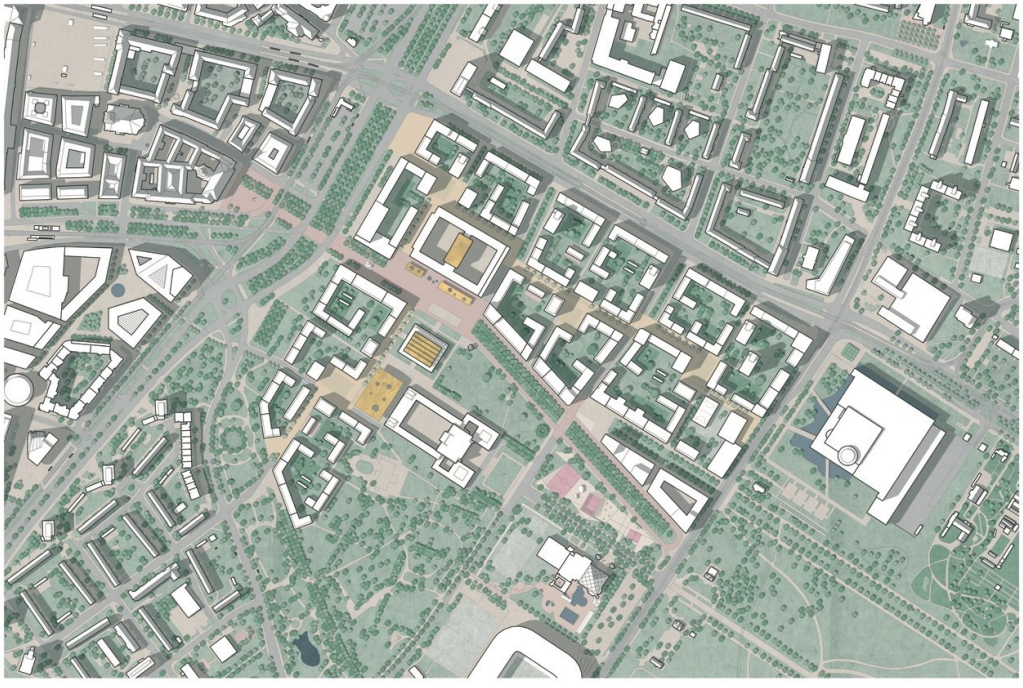


Figure 2. Urban Design Project by Ludwig Weimert and Robert Wehner
© L. Weimert/R. Wehner

Structural Change in Weißwasser: Innovative Living and Working Environments

Prof. Angela Mensing-de Jong

The city of Weißwasser, embedded in the Lusatia region in the federal state of Saxony, is characterized by major structural change. While over 38,000 people lived in Weißwasser in 1990, there were just under 16,000 in 2020. The social and at the same time economic change took place gradually, in recent times especially in the course of German unification as well as through the socially desired and ecologically necessary coal phase-out. The coal phase-out is an important milestone in the energy transition of the Federal Republic of Germany to achieve the global climate goals. The coal mining areas in Lusatia will be closed in the years 2028 to 2038. With the structural strengthening law passed by the German Bundestag, the regions affected will receive considerable financial aid to promote significant investment measures for more growth and jobs. Lusatia and thus also the city of Weißwasser are facing serious structural changes, which at the same time offer a great opportunity for renewal.

With this positive understanding of seeing structural change as an opportunity, a student competition was organized as a networked and a joint project by the Federal Office of Economics and Export Control (BAFA), the Chair of Urban Dresden and the Chair of Design and Construction of the Architecture Faculty of the TU Dresden.

The goal is to create a model district with future-oriented ideas and innovative concepts for new living and working environments to develop. In this context, local potentials are to be identified and taken up to create and develop perspectives for the people in Weißwasser and the region.

The jury will meet on April 8, 2020 to find the best work in the two fields urban design and architecture. In mid-June 2021, Minister Altmaier and Federal Prime Minister Kretschmer will award the prizes at a public event in Weißwasser.

Project Partners

Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA); Sächsische Agentur für Strukturentwicklung; City of Weißwasser; Chamber of Architects Sachse;, Chair of Design and Construction II, TU Dresden.

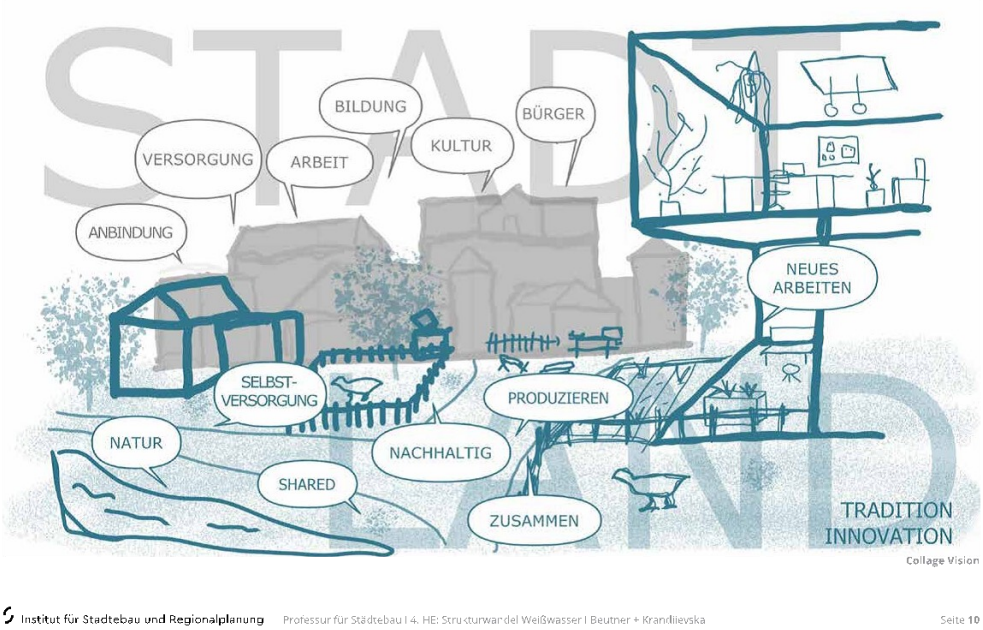


Figure 1. Collage by Lisa Beutner and Kateryna Krandiievska, © L. Beutner/K. Krandiievska

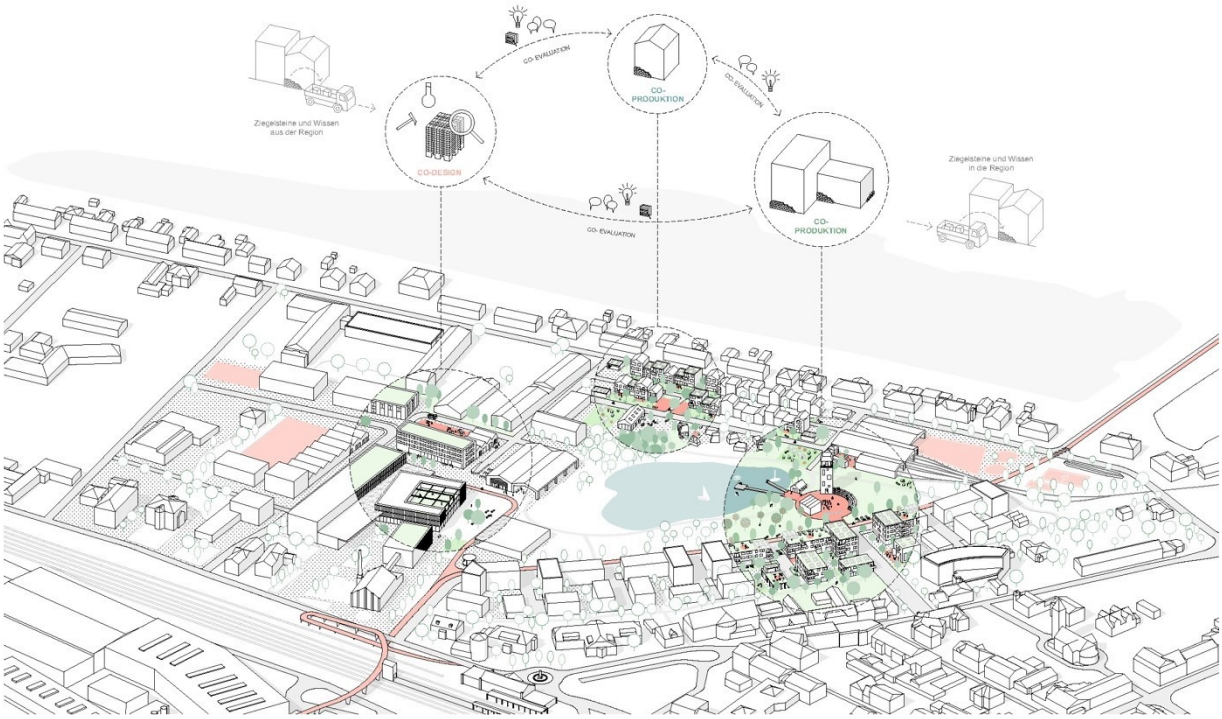


Figure 2. Urban Design Project by Paul Gucinski and Carlotta Ickert, © P. Gucinski/C. Ickert

Sustainable thin glass composite panels

Prof. Christian Louter, Daniel Pfarr, Silke Tasche

The Institute of Building Construction is developing novel thin glass composite panels that are to be used as sustainable glazing. This is done by combining thin glass sheets with 3D printed cores that stiffen the panel. The 3D printed core enables a variety of structures that can be adapted to mechanical, physical or aesthetic requirements. An adhesive bond between the lightweight core structure and the flexible thin glass creates a rigid sandwich element for use as interior separation walls, façades and various other applications. The result is a lightweight and insulating glass panel for architecturally appealing glazing. Compared to traditional glazing, the novel thin glass composite reduces the use of raw materials and reduces the CO2 emissions related to its transport and installation. Also, by means of the 3D printed core, a sun shading effect is created thereby preventing overheating of the indoor environment and reducing cooling energy consumption.

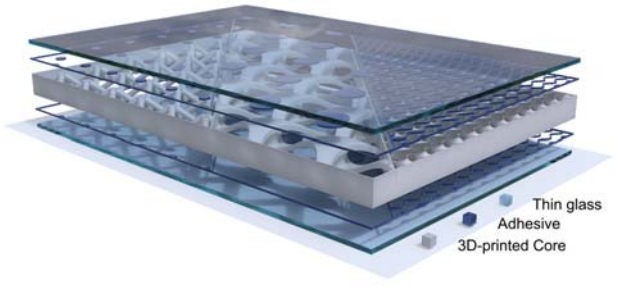


Figure 1: Exploded view of the sandwich panel; source: Daniel Pfarr - Institute of Building Construction - TU Dresden

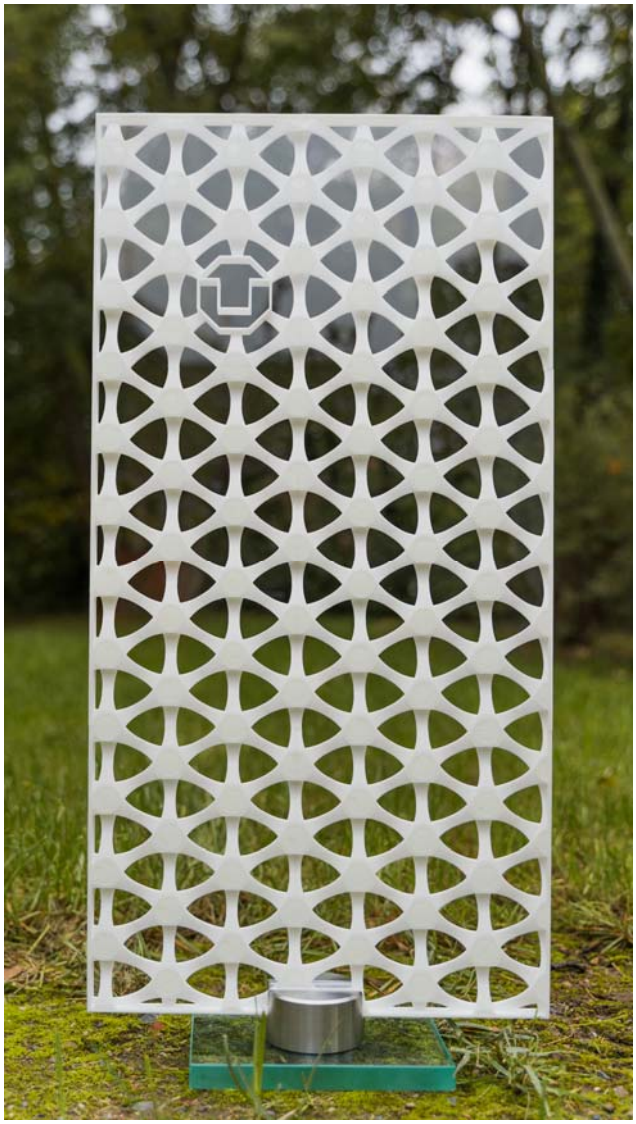


Figure 2: Thin Glass Sandwich Panel with 3D-printed Core; source: Daniel Pfarr - Inst. of Building Construction - TU Dresden

Bauhaus Vision

Sustainability: This project provides a sustainable glazing solution and targets for a reduced material use and reduced CO2 emissions compared to traditional glazing.
Aesthetics: Compared to traditional glazing the 3D printed cores provide the opportunity to individualise the glass panels and to enhance the aesthetic quality of the panels.

Read more

https://tu-dresden.de/bu/bauingenieurwesen/bauko/forschung/forschungsprojekte/projekte/Glasfur-3D

https://doi.org/10.1002/bate.202000025

Titel | Title
Glasfur-3D

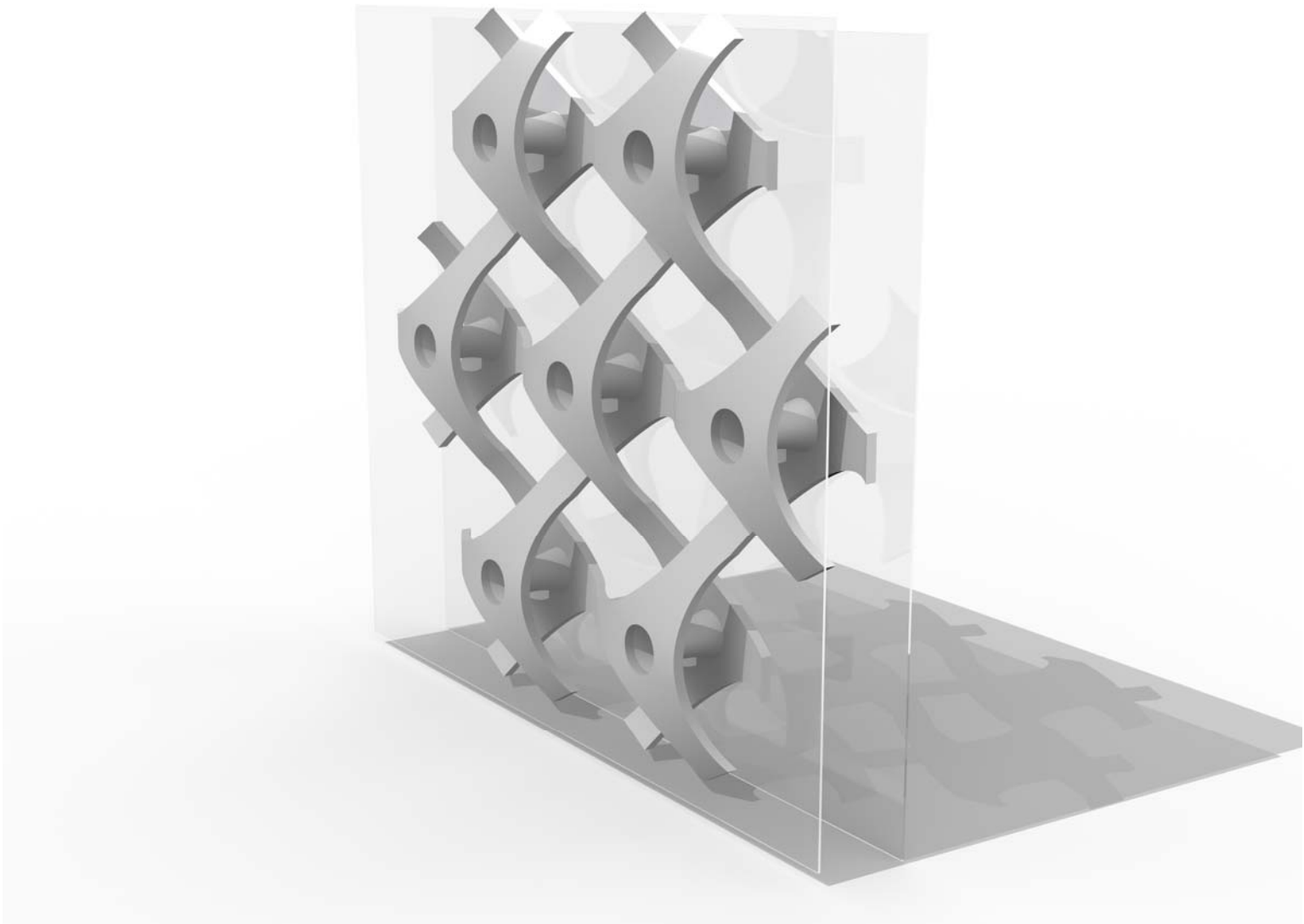
Funding Organization
BMWi - Zentrales Innovationsprogramm Mittelstand (ZIM)

Funding Period
2020 – 2022

Project manager
Prof. Dr. ir. Christian Louter

Contributors
Dr.-Ing. Silke Tasche; Dipl.-Ing. Daniel Pfarr

Project partners
Glaswerkstätten Frank Ahne GmbH



Rendering of a detail of the sandwichpanel;
source: Daniel Pfarr - Institute of Building Construction - TU Dresden

Durable pavements for the traffic of the Future "Couple System: Road-Tire-Vehicle"

Prof. Michael Kaliske

Road infrastructures are one main precondition and an essential component of a competitive and successful industrialized society. Further, the infrastructure represents a huge economic worth.

While the development of new vehicles and intelligent transport concepts in Germany is mainly pushed by industry, big innovations in the field of pavement structures are rarely known in the recent decades. On the one hand, this deficit is due to missing research funds that have to be mainly supplied – in contrast to commercial automotive products – by public resources and on the other hand due to relatively strict and inflexible regulations, that are little suitable to stimulate the creativity and innovative capacity of German industry, engineers and scientists.

These circumstances contributed to the fact, that it is worked not or rarely with concepts and methodic approaches of progressive engineering sciences at building and maintenance of pavement infrastructures. Thus, often inadequate and little durable solutions are obtained. To overcome this problem and to prepare the pavement infrastructure for future requirement, a paradigm change at dimensioning, structural realization and maintenance of pavements is aimed. The research group intends to develop the scientific base for this.

The superior goal of the research group is to provide a coupled thermo-mechanical model for a holistic physical analysis of the pavement – tire – vehicle system. Based on this model, pavement structures and materials might be optimized so that new demands become compatible to the main goal durability of the structures and the materials. The development of the scientific base for these new and qualitatively improved modelling approaches requires a holistic procedure through coupling of theoretical numerical and experimental approaches as well as an interdisciplinary and linked working on coupled pavement – tire – vehicle system. This interdisciplinary research will provide a deeper understanding of the physic of the complete system and progress in terms of improved and therefore more durable and sustainable structures.

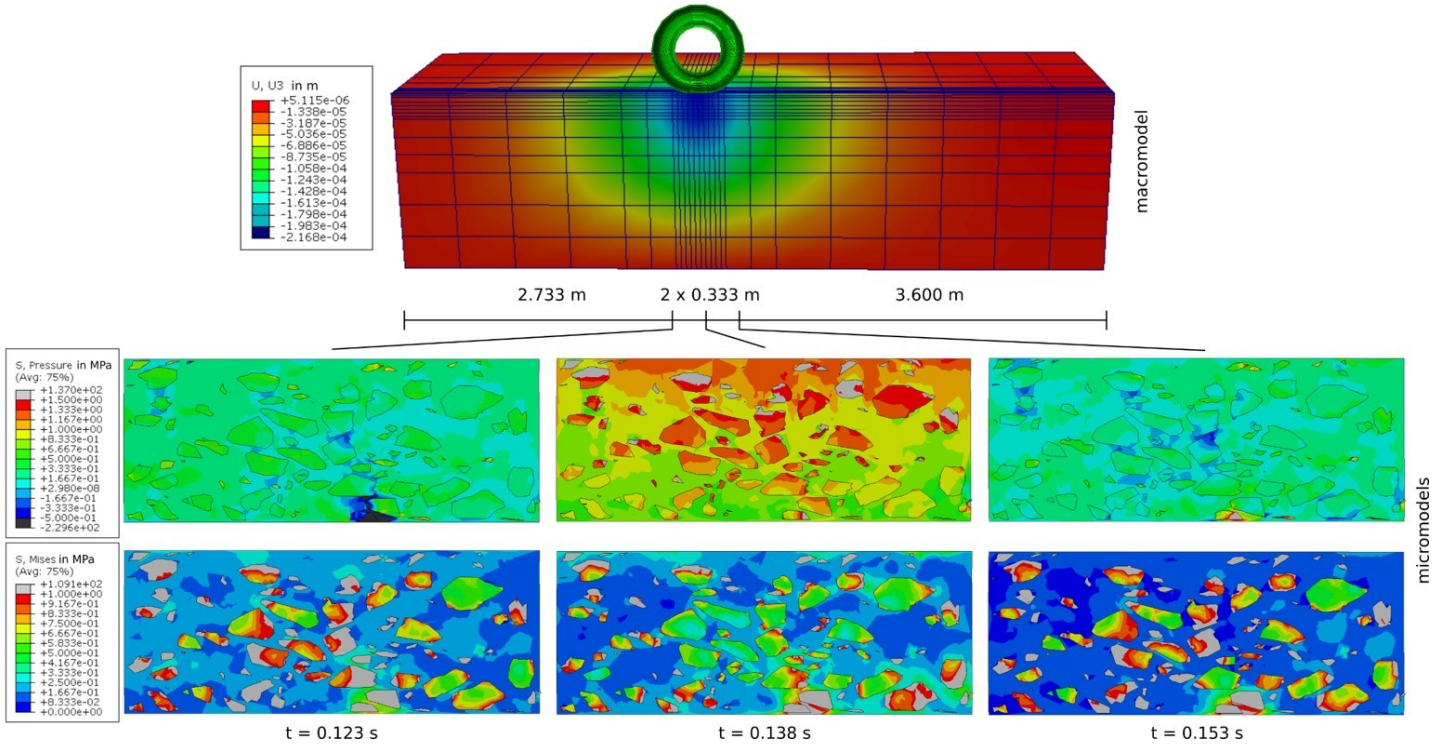


Figure 1. Coupled tire-pavement-system (micro-macro-interaction)´; source: Michael Kaliske

Bauhaus Vision
Due to the holistic digital approach, we can achieve more durable and sustainable structures

Titel/Title
DAUERHAFTE STRASSENBEFESTIGUN-GEN FÜR ZUKÜNFTIGE VERKEHRSBELASTUNGEN "GEKOPPELTES SYSTEM STRASSE - REIFEN - FAHRZEUG" | DURABLE PAVEMENTS FOR THE TRAFFIC OF THE FUTURE "COUPLED SYSTEM: ROAD-TIRE-VEHICLE"

Funding organization
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Project manager
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https://tu-dresden.de/bu/bauingenieurwesen/sdt/forschung/for2089

Advanced Computational and Civil Engineering Structural Studies (ACCESS)

Prof. Michael Kaliske

The Faculty of Civil Engineering at Technische Universität Dresden offers an international MSc program in the field of computational and advanced civil engineering. The program is taught in English and addresses a broad international community. The expertise of the faculty with a strong emphasis on numerical methods and a large field of research topics in engineering is associated to a wide national and international research network. The goal of the program is to impart knowledge leading to research competence and to high level engineering skills based on an individual choice of modules by the participants. Moreover, the program is intended to provide a close individual supervision of the participants by the teaching staff in order to achieve highest goals most efficiently. ACCESS seeks to facilitate the development of a strong knowledge base in the field of computational mechanics and structural analysis, working collaboratively with advanced civil engineering design. Technical innovations for challenging engineering tasks rely heavily on numerical simulation tools. Therefore, the goal of the programme is to provide the skills for understanding, modelling and analysis of these approaches in the broader context of application and design by focus on:

- state-of-the-art computational mechanics
- current numerical structural analysis
- research in structural modelling and analysis
- current developments in civil engineering design
- advanced construction methods

Engineers with a strong computational background are in high demand in international companies, consultant agencies, engineering offices, construction enterprises and research.

Bauhaus Vision

Provide an international, inter-cultural state-of the-art Master's of Science course based on digital technologies and advanced construction methods to enable engineering of durable and sustainable structures.

Funding organization

TU Dresden

Funding period

10.2010 – Present

Program Director

Prof. Dr.-Ing. habil. Michael Kaliske

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Faculty of Civil Engineering

Read more

https://tu-dresden.de/bu/bauingenieurwesen/studium/im-studium/access?set_language=en

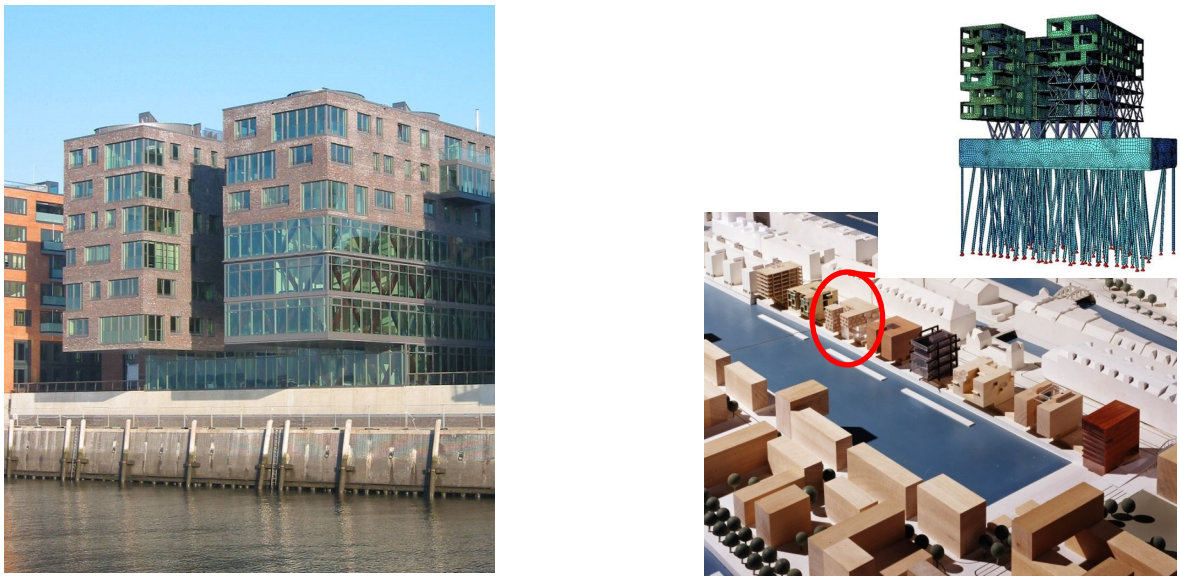

Figure 1. „H2O" Office Building in Hamburg; source: Michael Kaliske