Draft

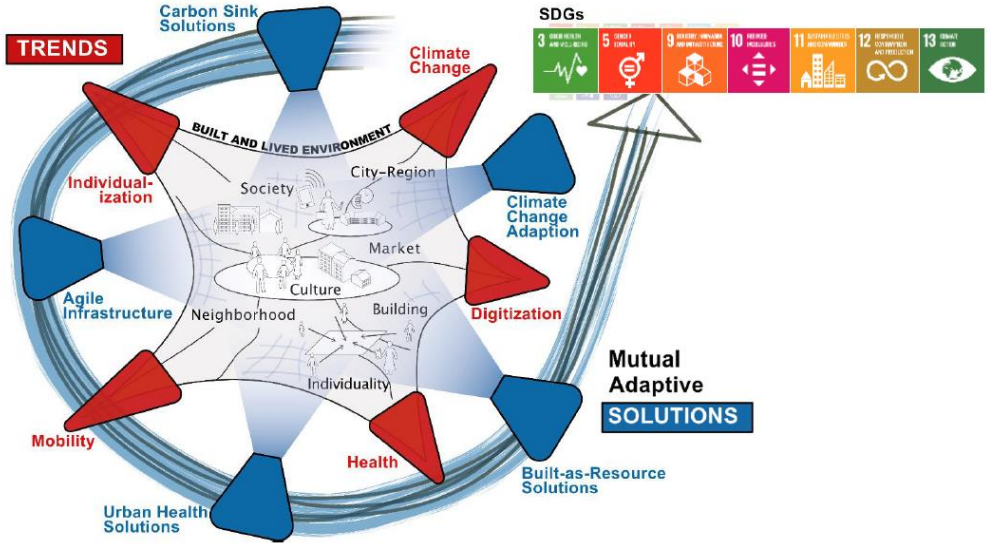
Built and Lived Environment

Towards a Sustainable and Livable Urban and Regional Future

Science Day 30.06.2022 at Pop-up Campus in Aachen

Built and Lived Environment (BLE) – a Growth Area of RWTH Aachen University

A Research Cooperation of the Faculties of Architecture, Civil Engineering, Georesources and Materials Engineering, Arts and Humanities, School of Business and Economics, Medicine



The Science Day 2022 of the growth area ‘Built and Lived Environment’ aims to foster inter- und transdisciplinary exchange around urgently needed solutions for a livable future of cities and human settlements. In times of multiple and accelerating trends and drivers such as climate change, individualization, digitization as well as energy or mobility transition the built and lived environment has to be adapted, reoriented and profoundly restructured towards sustainability and resilience. In a ‘full world’ of existing settlements and infrastructures such as in Western Europe, the transition processes will only succeed, if solutions are context-specific, sensitive to the shifts and interrelation of different spatial scales – from the component to the construction up to the district, city, and region – as well as ‘error-friendly’ or even self-repairing. The scarcity of material resources as well as of habitable and productive land are, for their part, driving innovation, more specifically they are stimulating spatial, technological, and social innovation in a very close interplay. Moreover, solutions are seldom products to implement once, but rather a set of interventions that are expected to change an existing system carefully and very precisely. Hence, solutions should be ‘mutual adaptive’ – this also means that the interaction with the user and their performance in time are key success factors.

BLE focuses on five ‘mutual adaptive solutions’:
Urban Health Solutions | Carbon Sink Solutions & Materials | Built-as-Resource |
Climate Change Adaptation | Agile Infrastructure Solutions

Science Day 2022

BLE invites researchers from a broad range of disciplines within RWTH as well as collaborators from different institutions and fields of action to share their knowledge and to further discuss research perspectives in each of the five solutions. **BLE addresses especially young researchers, doctorate students and post-doc, to join the research groups of the solutions and to give insight into their work in short presentations!**

The event will be an occasion to experience the unique atmosphere of the BBSR Pop-up Campus – an excellent demonstrator for a 'built-as-resource' solution in the city of Aachen and a place to share R&D outputs and outcomes on sustainable building with colleagues from all over Germany.

The Science Day is **open the interested public** in the city and region of Aachen. From 4 pm on the event will focus on the inter- and transdisciplinary dialogue and hence actively involve external partners in the scientific debate. The event concludes with a public lecture and a get-together at the roof-top bar.

Program | Location: Theaterstraße 92-94

09:30	**Get-together**				
10:00	**Welcome | Rector Ulrich Rüdiger** **Introducing BLE | Prof. Dr. Frank Lohrberg & Prof. Dr. Tobias Kuhnimhof** **The program of the day | Prof. Dr. Agnes Förster**				
11:00	**Parallel Sessions I**				
	Urban Health	**Carbon Sink Solutions & Materials**	**Built-as-Resource**	**Climate Change Adaptation**	**Agile Infrastructure**
	Short presentations	…	…	…	…
12:30	**Lunch & Get-together**				
13:30	**Parallel Sessions II**				
	Urban Health	**Carbon Sink Solutions & Materials**	**Built-as-Resource**	**Climate Change Adaptation**	**Agile Infrastructure**
	Discussion	…	…	…	…
15:30	**Break**				
16:00	**Discussing the connections of the solutions**				
	Focus A: **Partnerships with the City of Aachen and regional partners**	Focus B: **European dimension**	Focus C: **Method development for 'mutual adaptive' solutions**		
17:30	Break				
18:00	**Public Lecture | Uta Pottgiesser** Professor for Heritage & Technology, TU Delft Professur für Baukonstruktion und Baustoffe, TH OWL Chair DOCOMOMO International				
19:00	**Reception and Get-together at the roof-top bar**				

Call for Abstracts

Researchers are invited to contribute to the science day with an **abstract** – each abstract shall address one solution. All authors are invited to join the parallel sessions. Selected abstracts will be presented and discussed. All abstracts will be published in the **book of abstracts** that will be available during the event.

Deadline for abstract submission: 15. Mai 2022

Abstracts shall be handed-in as **open word-files using the template**.

Please send your abstract to:

Urban Health Solutions | mschweiker@ukaachen.de
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Built-as-Resource Solution | carola.neugebauer@rwth-aachen.de
Climate Change Adaptation | kemper@cwe.rwth-aachen.de
Agile Infrastructure Solutions | stefan.boeschen@humtec.rwth-aachen.de

As well as to ble@cwe.rwth-aachen.de in cc.

Urban Health Solutions

Urban spaces and buildings are one of the most important contributors to greenhouse gas emissions. Much of the building sector's contribution to global warming is due to its influence on thermal, visual, and olfactory conditions of indoor spaces, where we humans spend 90% or more of our time. At the same time, people living indoors and in urban spaces are also among those most affected by climate change (e.g., greater number and severity of heat waves or floods). More than half of the world's population lives in cities, which exacerbate the negative impacts of climate change (e.g., synergistic interactions between heat waves and urban heat island effects). Research suggests that energy-intensive solutions not only accelerate climate change (and further degrade outdoor environmental quality), but also harm human health and reduce human resilience. Urban Health Solutions (UHS) therefore addresses the core of BLE: the interactions between space and people - between the "built" and the "lived" environment.

Due to the complex interactions between people and space, solutions to increase the resilience of urban spaces and their inhabitants require multi-disciplinary and multi-scalar approaches. UHS stakeholders from all faculties are invited to present their work related to one or more of the following four scales: (1) component & interior, (2) house & ensemble, (3) site & neighborhood, and (4) city & region and consider one or more of the topics: (I) multimodality, (II) interaction and role of the user, and (III) quality and value. *Multimodality* includes consideration of multiple sensory modes (e.g., thermal, acoustic), disciplinary backgrounds and targets (e.g., architecture and medicine; aesthetics and health). *Interaction and role of the user* considers people in the urban context as active designers: indoors through their interactions to ensure comfortable environmental conditions and in the urban context for the co-design of transformation processes towards health-promoting urban districts. *Quality and value* represent the objectives of research and action defined on different scales and differentiated according to the disciplines. Methodologies may include among others (a) new/mixed methods, (b) Theorizing Healthy Cities & Regions, and (c) Understanding of Health Through the Salutogenic Model.

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Carbon Sink Solutions & Materials

New solutions to close the gap

The construction sector is currently responsible for ~40% of the global CO_2 emissions out of which ~11% can be directly attributed to the manufacturing of building materials e.g. cement, steel, etc. The growing world population and increasing global demand for comfortable living space magnify the problem still further. In order to fulfil the current demand for housing and infrastructural development more than 40bn tons are annually mined. These consist of mainly primary materials. On the other side ~33bn tons of waste are generated every year out of which the majority is lost due to landfilling, incineration, etc.. There must be smarter ways to close these 'circularity and carbon gaps'. We have to search for material solutions that utilise CO_2 instead of emitting even more. Improved design principles enable material minimised structures. Alternative material streams, novel co-processing pathways and new construction technologies may pave the way towards net-zero or even climate positive construction strategies. In any case individual silo approaches are not an option for the future. Only a collective synthesis of integrated interdisciplinary viewpoints will provide a way to more circularity, less materiality and novel carbon sink solutions.

In this session we therefore aim to have a variety of impulses focussing on one or more of the following sub-topics

- New materials as enablers for a decreased resource and carbon footprint in construction
- Circularity in construction (less primary more secondary)
- Novel design principles and manufacturing technologies for material minimised structures
- New approaches to assess sustainability and materiality of construction
- Treatment and utilisation of wastes form humps and landfills

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Built-as-Resource Solutions

The Built Urban as potential and challenge for sustainability

The exorbitant amounts of energy invested in existing buildings and the bound socio-cultural values on the one hand, and the high consumption of materials and energies in new buildings on the other, turn the existing building stock itself the most precious resource. It is therefore important to focus on built-as-resource solutions and to establish and profile them as an interdisciplinary field of research and practice. Planning and construction solutions must be developed to protect, redevelop and/or adapt existing buildings to significantly promote the socio-ecological transformation in our cities and regions. These solutions must be linked to historical, cultural, social and design practices, which enable and condition new forms of careful use, as well as taking engineering, economic and environmental science issues into account.

The confrontation with existing settlements, urban fabrics and districts is central here, as these require causally integrated – that means inter- and transdisciplinary approaches. Current debates point to the urban districts as *the* key arena, where measures for shaping the socio-cultural, ecological transformation are particularly effective. This session will therefore focus on the further development of existing settlement structures and urban neighborhoods into resilient and sustainable places.

We warmly invite young researchers to present their work and contribute to the book of abstracts! We are eager to engage in mutual learning and networking. Your research could focus on one or more of the following sub-topics:

- Conceptual approaches to link resilience, sustainability and resource discourses to debates of heritage and building-stock;
- Risks and benefits of urban heritage and urban neighbourhoods in times of climate crisis and societal polarization, including tools of Risk Assessment;
- Instruments and tools of Risk management and Climate change mitigation and adaptation for historic urban neighbourhoods;
- Carbon footprint assessments of historic urban districts
- ….

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Climate Change Adaptation

The consequences of climate change can be observed worldwide in similar patterns: slower variations of weather events cause more prolonged phases of rain and heat, leading to more frequent occurrences of flooding and drought, respectively. Extreme events of precipitation, windstorms, and heat waves tend to occur with shorter return periods and locally with higher amplitudes. In short: The natural equilibrium and the ability to balance weather phenomena is more and more tending to reach and exceed its limits.

For instance, in July 2021, a flood disaster occurred in West Germany that also hit and damaged the region of RWTH Aachen University. The flooding incident was caused and aggravated by multiple factors: prolonged and intense heavy rain, topography, soil saturation and soil conditions in the areas of rainfall – but also by interventions in natural river courses and peripheral buildings. Unexpectedly, buildings that were supposed to offer protection were located in flooded areas. Many people lost their lives.

As a society, such events painfully demonstrate to us the possible impact of climate change. Therefore, climate change adaptation is necessarily a key topic for the planning of our future living environment and infrastructure. The construction sector is of particular relevance, as it contributes significantly to carbon emissions (and thus offers potential for savings), but also promises to provide opportunities for adaptation and solutions to gain resilience. Both aspects are closely interwoven with social, economic, and cultural issues. Due to this complexity, the topic demands us to bring together knowledge from different disciplines to stimulate new scientific interactions.

The threat of natural disasters, the resilience of the built infrastructure, the weighing up of security requirements and life risks in the areas of society, economy and culture should therefore also be included for future planning processes and receive more awareness amongst decision makers.

In two sessions, we invite to discuss significant questions in the context of climate change adaption. At the end of the second session, further individual exchange is enabled by round table exchange to prepare the session findings for the final plenary presentation.

Session 1: Technical adaptions to climate change
Enhancement of safety, constructions, and infrastructures to protect the living environment

- How can we predict and guarantee structural and infrastructural safety in the future?
- How do we need to adapt our built environment to climate change tendencies?
- How can reliable infrastructure consider reduced carbon emission goals?

Moderation: Prof. Dr.-Ing. Holger Schüttrumpf & Prof. Dr.-Ing. F. Kemper

Session 2: Implementation and transformation
Collaborative and interdisciplinary approach to implement needed change processes

- How do we need to modify planning processes?
- How can we moderate transformation processes and gain support of politics and society?
- How do we need to develop higher education to raise the right experts?

Moderation: Prof. Dr.-Ing. Thomas Wintgens & Dr.-Ing. Andreas Witte

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Agile Infrastructure Solutions

Re-thinking infrastructure against the background of transformational change

The flood disaster in North Rhine-Westphalia in the summer of 2021 clearly showed how dramatic the need for adaptation to climate change is, even in Central Europe. At the same time, it has highlighted the particular sensitivity of critical infrastructures (water and wastewater, transport, rescue and telecommunications, power supply, telecommunications). The reconstruction of these infrastructures is of great urgency. However, it cannot be a matter of reconstruction alone. The real task is to make infrastructures adaptable to future development demands at the time of their (re-)construction.

This is also evident, albeit in a different way, regarding transformation processes such as the one in the Rhenish mining area. Old infrastructures must be ex-novated, new ones built, and at the same time future development options must be considered now, i.e., materially anchored in the infrastructure. To put it succinctly, infrastructures are needed that are agile, participative, and capable of being updated. An intimidating task. How can this be achieved? How do we have to think and design infrastructures so that they can meet such demands? It is clear that this task can only be tackled in an interdisciplinary way. Even more, it requires a tailored form of interdisciplinarity.

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