PROGRAM

# cisbat 2023

## INTERNATIONAL SCIENTIFIC CONFERENCE

### The Built Environment in Transition

13-15 SEPTEMBER 2023 EPFL
LAUSANNE SWITZERLAND

# CONFERENCE DAY 1 PROGRAM
## Wednesday 13 September

**09:00** **Welcome addresses**
Marilyne Andersen, Conference Chair
Andreas Eckmanns, Swiss Federal Office of Energy

**09:30** **Living well within limits: is it possible? And what will it take?**
Julia Steinberger, Professor of Ecological Economics at University of Lausanne, Lead author IPCC 6th Assessment Report, WG3

**Designing for circularity**
John Ochsendorf, Professor in architecture and civil and environmental engineering at MIT, founding director of MIT Morningside Academy for Design

2 / 3 ABC

**10:30** *Coffee break*

| | 2 / 3 ABC | 1 BC | 4 BC | 5 ABC |
|---|---|---|---|---|
| **11:00** | **Session A** Energy management systems & smart grid | **Session B** Air quality | **Session C1** Circular design, re-use & recycle Part I | |
| **12:30** | *Lunch* | | | |
| **14:00** | **Session D** Thermal systems<br>Poster sessions A & D | **Session E** Predictive Control / Health & productivity<br>Poster sessions B & E | **Session C2** Circular design, re-use & recycle Part II<br>Poster session C | **Workshop** Low-carbon building renovation. How and how much? |
| **16:00** | *Coffee break* | | | |
| **16:15** | **Session F** Energy performance modelling<br>Poster session F | **Session G** Thermal environment<br>Poster session G | **Session H** Renewable energy<br>Poster session H | **Workshop** Positive energy districts |
| **18:30** | *Aperitif* | | | |

# CONFERENCE DAY 2 PROGRAM
## Thursday 14 September

**09:00** **Opening of 2nd conference day**
Marilyne Andersen, Conference Chair

**09:15** **There is no such thing as a comfortable room - new paradigms for heating and cooling**
Forrest Meggers, professor of architecture at the Andlinger Center for Energy and the Environment at Princeton University

**Digital Twins: the hype and the hyper**
Ruchi Choudhary, Professor of architectural engineering, Cambridge University

2 / 3 ABC

**10:15** *Coffee break*

| | 2 / 3 ABC | 1 BC | 4 BC | 5 ABC |
|---|---|---|---|---|
| **10:45** | **Session I**<br>Positive energy districts & energy communities | **Session K**<br>Day and electric lighting | **Session L1**<br>Life cycle analysis Part I | **Workshop**<br>Digital twins: opportunities, challenges and lessons learnt |
| **12:30** | *Lunch* | | | |
| **14:00** | **Session M**<br>Digital optimization of buildings and districts | **Session N**<br>Control & behaviour | **Session L2**<br>Life cycle analysis Part II | **Workshop**<br>Storing for the seasons: progress and potential of building energy storage |
| | Poster session M | Poster sessions K & N | Poster session L | |

**16:00** *Coffee break*

2 / 3 ABC

**16:30** **Award ceremony**

**16:40** **Beyond technology: tackling societal challenges on the pathway to climate neutrality**
Panel discussion with Yamina Saheb, Sascha Nick & Arno Schlueter
*presentations ● roundtable ● discussion*

**18:00** *End of 2nd conference day - Individual transfer to Lausanne Ouchy Harbour*

**19:45** 

**EVENING NETWORKING EVENT**
Dinner cruise on Lake Geneva (registration required)

# VISITS
# Friday 15 September

## VISITS IN LAUSANNE | **EPFL CAMPUS**

**08h50** - Meeting at Swiss Tech Convention Center side entrance, luggage deposit
**09h00** - Start of visits
**12h30** - Light lunch at Swiss Tech Convention Center

### Lausanne Tour A - Thermal systems

**Digging deep: geothermal systems and CO2 sequestration**

Geothermal systems and CO2 sequestration in deep geological formations are the focus of this visit to the EPFL Laboratory of Soil Mechanics, which investigates energy geostructures that can serve as structural supports as well as heating and cooling elements for building and infrastructures, and explores the potential of CO2 capture and storage in depleted oil or gas reservoirs, saline formations and coal seams.

**100% renewable thermal power plant**

Thanks to thermal heat exchange with the nearby Lake Geneva and a thermal plant using the latest technology, heating and cooling of the whole EPFL campus is provided entirely without fossil fuels. A data center installed above the plant is cooled by the cold water discharges from the power plant and will in turn provide heat from the servers. The building is fully cladded with photovoltaic façade elements.

### Lausanne Tour B - Daylighting & Smart grid

**Multiple facets of Daylighting research**

The EPFL Laboratory of Integrated Performance in Design LIPID conducts research on visual comfort under daylight conditions, considering health, comfort, perception and energy. A visit of the test facility “Demona” will show insights of the experiments conducted for different glazing and shading including electrochromic glazing and fabrics.


**Smart grid monitoring and operation**

To ensure a sustainable, economic and secure electricity supply, the Distributed Electrical Systems Laboratory develops advanced smart grid monitoring and operation technologies. Prof. Paolone’s team will present a time-deterministic monitoring system of the EPFL campus used to control in real-time a utility-scale battery energy storage system to achieve multiple control functions.

## Tour C - Circularity

### The potential of robotic construction

The Lab for Creative Computation operates at the interface of design, digital technologies and construction. This visit will explore new construction modes that combine robotics with human interventions and digital media, in pursuit of more creative solutions to contemporary design and construction challenges. A particular focus will be given to sustainable construction approaches.

### Building elements resurrected – the *rebuiLT* pavilion

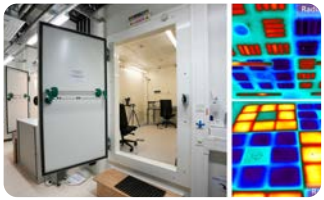
A second life is given to building elements in the rebuiLT pavilion near the EPFL campus. This student-led project applies the principles of zero waste by reusing the concrete structure and other components from a building in deconstruction. Innovative construction methods and low-tech solutions are explored with a view to defining a new low-carbon approach to construction.

## VISITS IN FRIBOURG | **SMART LIVING LAB**

**09h00** - Departure of bus shuttle at Conference Center side entrance.
**10h00** - Arrival in Fribourg - start of visits
**12h30** - Light lunch in Fribourg
**13h30** - Departure of bus shuttle from drop-off point direction Lausanne
**14h30** - Arrival and drop-off at Lausanne railway station

- Your luggage can be left in the bus if you intend to take the shuttle both ways. Otherwise, there will be a room to deposit it at Smart Living Lab.
- The shuttle bus will not be waiting for missing passengers.

### Environmental and climatic chambers - EPFL Fribourg campus lab tour



The key focus of this tour will be the visit to a twin environmental and climatic chambers facility, which is jointly operated by the Integrated Comfort Engineering Lab and the Human-Oriented Built Environment Lab situated on the Blue Factory site in Fribourg. These state-of-the-art chambers are designed for studying the combined impact of occupancy, HVAC systems and controls on indoor air quality, human exposure, thermal comfort and energy performance, and can be modified to simulate distinct indoor environments. Highlights will include the twin-chambers' control systems and an overview of experiments performed here. Additionally, participants will be able to discover a series of developments and projects coordinated by the Building2050 team in preparation for the exploitation of the new Smart Living Lab building as a purchased research infrastructure. The exhibition will give an overview of the project and its multiple scales, including a Radon protection project. The visit will also include a modular climate pavilion, as well as the solar house prototype winner of the 2017 edition of the international Solar Decathlon competition.

# KEYNOTE SPEAKERS
## 13 & 14 September

### Julia Steinberger

Julia Steinberger is a professor of Ecological Economics at the University of Lausanne in Switzerland. Her research examines the connections between resource use (energy and materials, greenhouse gas emissions) and societal performance (economic activity and human wellbeing). From 2017 to 2022, she was the recipient of a Leverhulme Research Leadership Award for her research project 'Living Well Within Limits', investigating how universal human well-being might be achieved within planetary boundaries. Since 2023, she co-leads the EU ERC Synergy grant "REAL- A Post-Growth Deal" on post-growth societies. She is Lead Author for the IPCC's 6th Assessment Report with Working Group 3.

***Topic | Living well within limits: is it possible? And what will it take?***

### John Ochsendorf

John Ochsendorf is an engineer, educator, and designer on the MIT faculty since 2002. He is the MIT Class of 1942 Professor with appointments in the departments of architecture and civil and environmental engineering. Trained at Cornell, Princeton, and the University of Cambridge, he is known for creative research at the intersection of structural engineering and architecture with a particular interest in historic structures. He served as the director of the American Academy in Rome from 2017–2020, and is the founding director of the MIT Morningside Academy for Design.

***Topic | Designing for circularity***

### Forrest Meggers

Forrest Meggers is an associate professor of architecture at Princeton University's Andlinger Center for Energy and the Environment. His expertise spans building systems design, radiant systems, geothermal energy, and more. Meggers founded and directs CHAOS (Cooling and Heating for Architecturally Optimized Systems) Lab, investigating alternative thermal paradigms to challenge the status quo in thermal system design for the built environment. With multiple patents, he also founded Aquaseek.tech and CHAOSense.com to bring sorption and sensor technology to market while working closely with industry and standards organizations to accelerate critical opportunities for innovation adoption.

***Topic | There is no such thing as a comfortable room – new paradigms for heating and cooling***

### Ruchi Choudhary

Ruchi Choudhary is a Professor of Architectural Engineering at the University of Cambridge, specializing in energy demand simulation for the built environment. She leads the Digital Twins of Built Environment group at the Alan Turing Institute (2018-2023) and heads the Energy Efficient Cities Initiative at Cambridge. Her projects cover underground heat modeling, city-scale geothermal systems, urban farming, and end-use energy demand modeling, with 70 papers in peer-reviewed journals. She's a fellow of the International Building Performance & Simulation Association (IBPSA) and serves on multiple journal editorial boards.

***Topic | Digital Twins: the hype and the hyper***

**16:30 - 18:00 Plenary session, Thursday 14 September**

## Beyond technology: tackling societal challenges on the pathway to climate neutrality

Presentations, round table & open discussion moderated by Marilyne Andersen.

In this era of accelerated Climate Change, technology holds the potential to address numerous challenges that face humanity. Nevertheless, unless we incorporate human factors, cultural dynamics, and societal complexities into the equation, the pace of change might prove insufficient for technology to yield the desired impact.
How can we narrow this gap? To shed light on this question, we've invited three panelists from diverse backgrounds who will share their unique perspectives with the CISBAT audience.

### Yamina Saheb

Lecturer and researcher at Sciences Po (Paris), a lead author of the IPCC report on climate change mitigation and a Senior fellow at OpenExp

Yamina is a senior energy policy analyst with a PhD in Energy Engineering and a strong background in research. In 2018, Yamina was the head of energy efficiency unit at the Energy Charter Secretariat.

Before that, she was a Policy and Scientific Officer at the Renewables and Energy Efficiency Unit at the Institute of Energy and Transport of the Joint Research Centre (JRC) of the European Commission (EC). She also worked as senior buildings energy efficiency policy analyst at the IEA.

### Sascha Nick

BSL Professor of Sustainability, Founder Academic Citizens' Assembly, EPFL Researcher

Sascha Nick is a researcher, teacher, serial entrepreneur, nature lover, and father of two. With a background in physics and economics, he researches action levers needed to transition society to a more inclusive and sustainable state, such as negative emissions, sufficiency, or deliberative democracy.

### Arno Schlueter

ETHZ Professor of Architecture & Building Systems, Principal investigator SEC Future Cities Lab

Arno Schlueter researches on systemic approaches for integrating questions of energy, emissions and human comfort for the design, production and operation of buildings.

In his research and teaching, he focuses on integrated building systems for low-emission buildings and cities from design to operation, utilizing computational and experimental approaches. Recent awards include the 2022 Arc Award and the 2023 Watt d'Or for Excellence in Energy Innovation awarded by the Swiss Federal Office of Energy.

# WORKSHOPS

## Wednesday 13 September

**Workshop 13 September**

**14:00 - 15:30**

### LOW-CARBON RENOVATION HOW AND HOW MUCH? — 5 ABC

The necessity of low-carbon building renovation is evident but it is difficult in practice. Two tools have been developed to assist planners in the process.

This hands-on workshop will be focused on low-carbon building renovation of Swiss residential buildings. During the workshop, the participants will review the theory of life cycle assessment (LCA) and directly apply the knowledge in practice by using two software applications, Bombyx and Hive, developed at ETHZ.

Bombyx and Hive are design-integrated parametric tools for the analysis of embodied emissions and operational energy consumption. The participants will have a possibility to create a 3d model of any house or use the building provided by the organizers.

During the workshop, several renovation solutions will be provided and the task will be to identify the optimal solutions in terms of operational and embodied emissions and define the most sensitive parameters.

For the practical part of this workshop, please bring your own laptop with Rhino installed.

Bombyx plugin - https://www.food4rhino.com/en/app/bombyx

Hive plugin - https://www.food4rhino.com/en/app/hive

Moderation

**Dr Alina Galimshina, Pedram Mirabian and Yasmine Priore, ETHZ**

**Workshop 13 September**

**16:15 - 18:00**

### POSITIVE ENERGY DISTRICTS PLANNING, DESIGN & INTERACTION WITH STAKEHOLDERS — 5 ABC

Positive Energy Districts (PED) are a key element in the EU planning for decarbonization of cities. Up to a hundred are being developed throughout the continent: a challenge both at the technical level and from an economic, environmental and social perspective.

The basic principle of Positive Energy Districts (PEDs) is to create an area within city boundaries not only capable of generating more energy than consumed but also agile/flexible enough to respond to the variation of the energy market. The aim of this workshop is to gain a better understanding of the technologies, planning tools and decision-making processes involved in the creation of PEDs and to share know-how with local stakeholders based on experience and data from demonstration cases.

Moderation

**IEA EBC Annex 83 «Energy Positive Districts», Prof. Matthias Haase, ZHAW**

Workshop
14 September

10:45 - 12:30

## DIGITAL TWINS CHALLENGES & OPPORTUNITIES — 5 ABC

The workshop on digital twins of buildings and cities will offer a unique opportunity for scientists and urbanists to explore the potential of digital twins in transforming the way we design, operate, and manage buildings and cities.

Digital twins are virtual replicas of physical assets, systems, or processes that simulate and predict their performance, behavior, and interactions in real-time. Participants will gain insights into the latest advancements in digital twin technology and their practical applications in areas such as energy efficiency, sustainability, and resilience.

The workshop will also examine the challenges and limits of digital twin technology, drawing on concrete examples to encourage participants to think creatively and collaboratively about potential solutions and strategies.

Moderation

**Jan Kerschgens, Executive Director, EPFL Center for Intelligent Systems (CIS)**

Workshop
14 September

14:00 - 15:45

## STORING FOR THE SEASONS PROGRESS AND POTENTIAL OF BUILDING ENERGY STORAGE — 5 ABC

If solutions to store thermal and electrical energy are easily implemented at a daily time scale, the storage capacity is limited and higher capacity storage or seasonal storage solutions must be developed. In this workshop we will explore the latest energy storage systems for buildings.

The workshop aims to delve into current and future storage solutions that cater to both thermal and electrical needs of buildings. We'll assess the storage solutions available for daily capacities, including hot water, ice-cold water with heat pumps, and PCM material, among others, while also considering potential upscaling for higher capacities. A particular focus will be on seasonal hydrogen storage. Throughout the workshop, we'll examine various factors such as the technology readiness level of the technologies, the energy storage capacities that can be achieved, constraints for the buildings, current regulatory status, and recommendations from authorities. We'll also consider whether seasonal storage should be contemplated as a local solution at building scale or rather at a district or even larger scale.

Moderation

**Dr Philippe Couty, Founder & Director TecPhy and Lecturer at School of Engineering and Architecture Fribourg**

# TOPICAL SESSIONS
# Wednesday 13 September

**A Sessions** — **ENERGY MANAGEMENT SYSTEMS & SMART GRID** — **2/3 ABC**

Chair: **Dr Jérôme Kämpf** Co-chair: **Dr Michael Papinutto**

**11:00-12:30** — **Technical session A. Energy management systems & smart grid**

**11:00** **Next generation of heat pumps for buildings based on thermoelectricity integrated with smart grids**
Sergio Diaz de Garayo, Raul Ciria, María Fernández

**11:15** **Value stacking flexibility services in neighborhoods participating in fast frequency reserve markets**
Peter Stai, Sigurd Bjarghov, Kasper E. Thorvaldsen, Stian Backe

**11:30** **Decarbonising energy supply: the potential impact on district heating networks of the integration of thermal energy storage and substitution of peak load with base load**
Stefan Mennel, Willy Villasmil, Ludger Fischer, Paul Tuohy

**11:45** **A semantic data framework to support data-driven demand forecasting**
James Allan, Francesa Mangili, Marco Derboni, Luis Gisler, Ali Hainoun, Andrea Rizzoli, Luca Ventriglia, Matthias Sulzer

**12:00** **Exploring thermostat override behavior during direct load control events**
Zeinab Khorasani Zadeh, Mohamed Ouf, Burak Gunay, Benoit Delcroix, Gilbert Larochelle Martin, Ahmed Daoud

**15:45-16:15** — **Poster session A. Energy management systems & smart grid**

**AP1** **Tool for evaluation of energy system options for municipalities**
Manuel Meyer, Esther Linder, Ueli Schilt, Sarah Schneeberger, Andreas Melillo, Ezgi Köker Gökgöl, Philipp Schuetz

**AP2** **Digitisation and analysis of energy data at municipal scale: an application to the municipality of Mendrisio**
Marco Belliardi, Nerio Cereghetti, Albedo Bettini, Katia Dalle Fusine, Francesco Vismara, Michela Sormani, Mario Briccola, Gabriele Martinenghi, Martin Mutaner, Paolo Camponovo, Filippo De Gottardi, Moreno Pusterla, Gabriele Gianolli

**AP3** **Dynamic open-source simulation engine for generic modeling of district-scale energy systems with focus on sector coupling and complex operational strategies**
Etienne Ott, Heiner Steinacker, Matthias Stickel, Christian Kley, Manfred Norbert Fisch

**AP4** **A benchmark for the simulation of meshed district heating networks based on anonymised monitoring data**
Roberto Boghetti, Jérôme H. Kämpf

Continued

## ENERGY MANAGEMENT SYSTEMS & SMART GRID 2/3 ABC

**AP5** **Energy assessment of a district by integrating solar thermal in district heating network: a dynamic analysis approach**
Matteo Bilardo, Jérôme H. Kämpf, Enrico Fabrizio

**AP6** **Exploring the potential of scaling up Smart Local Energy Systems to transform clusters of housing: Insights from a case study in Wales, UK**
Weronika Tadrak, Joanne Patterson, Aikaterini Chatzivasileiadi

**AP7** **Making an air-source heat pump smart-grid ready**
Simon Thorsteinsson, Hanmin Cai, Jan Dimon Bendtsen, Philipp Heer, Jacopo Vivian

**AP8** **Analysing energy use clusters of single-family houses using building and socio-economic characteristics**
Markus Schaffer, Anders Rhiger Hansen, J. Eduardo Vera-Valdés, Anna Marszal-Pomianowska

**AP9** **A comparative investigation between rule- and inverse model-based fault detection and diagnostics for HVAC control systems**
Darwish Darwazeh, Burak Gunay, Farzeen Rizvi, Dan Lowcay, Scott Shillinglaw

**AP10** **Inspiration from animals' collective behaviour for home energy demand management**
Lidia Badarnah, Merate Barakat, Sonja Oliveira

# TOPICAL SESSIONS
# Wednesday 13 September

**B Sessions** — **AIR QUALITY** — **1 BC**

Chair: **Prof. Dusan Licina** Co-chair: **Dr Sarah Crosby**

**11:00-12:30** **Technical session B. Air quality**

**11:00** **Rethinking building envelope design: Machine learning approaches to evaluate its impact on indoor ozone exposures**
Nan Ma, Qi Zhang, William W. Braham

**11:15** **Estimating perceived indoor air quality and environmental satisfaction using a camera**
Bowen Du, Dusan Licina

**11:30** **EvalCADair, tool for assessing air quality improvement after the deployment of a district heating network**
Stefan Schneider, Pierre Hollmuller

**11:45** **Exploring assumptions for air infiltration rate estimates using indoor radon in UK homes**
Phil Symonds, Zaid Chalabi, Giorgos Petrou, Yan Wang, Emma Hutchinson, James Milner, Shih-Che Hsu, Michael Davies

**12:00** **Evaluation of the impact of ventilation system daily operation on air quality, comfort and well-being in primary schools**
Joan Frederic Rey, Matias Cesari, Christophe Brunner, Yan Muller, Claude-Alain Roulet, Joelle Goyette Pernot

**15:30-16:00** **Poster session B. Air Quality**

**BP1** **Gravity ventilation for interior bathrooms**
Monika Hall, Vincent Gerber, Achim Geissler

**BP2** **Investigation of personal air pollution exposures and occupants' fresh air demands in two office buildings in Switzerland**
Seoyeon Yun, Dusan Licina

**BP3** **Hybrid Ventilation in residential and office buildings**
Caroline Hoffmann, Claudia Hauri, Alex Primas, Viktor Dorer, Heinrich Huber

**BP4** **Performance evaluation of radon passive and active sensors under different indoor aerosol conditions**
Joan Frédéric Rey, Nicolas Meisser, Dusan Licina, Joëlle Goyette Pernot

**BP5** **The benefit of kitchen exhaust fan uses after cooking - A CFD assessment**
Shou-Wang Chen, Chao-Yen Chang, Wan-Chen Lee, Ying-Chieh Chan

**BP6** **CO2 and thermal comfort analysis of schools in Lugano – a wide-scale monitoring**
Sebastiano Maltese, Giovanni Branca, Domenico Altieri, Mohamed Boutaleb, Luca Pampuri, Tiziano Teruzzi

**BP7** **Towards healthy and energy-efficient buildings in the context of Egypt: Modelling demand-controlled ventilation to improve the indoor air quality in a generic office space in Cairo**
Amr Auf Hamada, Sung Min Hong, Dejan Mumovic, Rokia Raslan

Continued

## AIR QUALITY 1 BC

**BP8** **Thermal comfort and indoor air quality in higher education: A case study in Houston, TX, during mid-season**
Mili Kyropoulou

**BP9** **Autodigit-RAD: Towards an automation of the radon's dataflow in a new and innovative building**
Joan Rey, Matias Cesari, Marion Schoenenweid, Frédéric Montet, Mauro Gandolla, Leewan Bonvin, Vincent Bourquin, Claude-Alain Jacot, Justine Roman, Sebastian Duque Mahecha, Sergi Aguacil Moreno, Jean Hennebert, Joëlle Goyette Pernot

**BP10** **Potential of physical barriers integrated with personal exhaust ventilation in decreasing airborne infection risk for people**
Seyedkeivan Nateghi, Jan Kaczmarczyk, Aleksandra Lipczyńska

**BP11** **Quantifying national household air pollution (HAP) exposure to PM2.5 in rural and urban areas**
Nahid Mohajeri, Shih-Che Hsu, James Milner, Jonathon Taylor, Gregor Kiesewetter, Agust Gudmundsson, Harry Kennard, Ian Hamilton, Mike Davies

**BP12** **A numerical study on urban-like block arrays' drag force and its correlation with ventilation efficiency**
Mingjie Zhang, Olga Palusci, Riccardo Buccolieri, Zhi Gao, Xin Guo, Jianshun Zhang

**BP13** **Detailed assessment of hybrid ventilation control system in a mixed-mode building in cold climate**
Mehrdad Rabani, Arnkell Jonas Petersen

**BP14** **Understanding the combined effect of built-up and green spaces upon air quality at multiple scales: A systematic literature review**
Chenling Wu, Ahmed Hazem Eldesoky, Eugenio Morello

**BP15** **Outdoor micro-climate: Air temperature measurements around an office building in Denmark during summer**
Hicham Johra, Mathilde Lenoël, Olena Kalyanova Larsen, Rasmus Lund Jensen

**BP16** **The potential of the height-to-width ratio as an indicator to characterize the ventilation performance of a canyon in the urban context**
Jiaying Li, Wei You, Wowo Ding

**BP17** **Low-cost carbon dioxide concentration sensors for assessing air quality in the built environment: an on-site evaluation of their measurement performance**
Francesco Salamone, Sergio Sibilio, Massimiliano Masullo

**BP18** **Low-cost sensor for particulate matter concentration: an evaluation of its measurement performance in the field by direct comparison with a calibrated reference system**
Francesco Salamone, Antonio Ciervo, Sergio Sibilio, Massimiliano Masullo

# TOPICAL SESSIONS
# Wednesday 13 September

**C Sessions** — **CIRCULAR DESIGN, RE-USE, RECYCLE** — **4 BC**

Chairs: **C1 Prof. Catherine de Wolf**, **C2 Dr Maléna Bastien-Masse** Co-chairs: **C1 Barbara Lambec**, **C2 Célia Küpfer**

**11:00-12:30** — **Technical session C1. Circular design, re-use, recycle Part I**

**11:00** — **Carbon and craft: Lessons from the deconstruction, relocation, and reuse of a traditional Japanese house's timber structure**
Demi Fang, Juliana Berglund-Brown, Dylan Iwakuni, Caitlin Mueller

**11:15** — **Case study K.118 - The reuse of building components in Winterthur, Switzerland**
Eva Stricker, Marc Angst, Guido Brandi, Barbara Buser, Andreas Sonderegger

**11:30** — **Low-tech methods for the reuse of reinforced concrete structural elements**
Julie Devènes, Malena Bastien-Masse, Nicole Widmer, Corentin Fivet

**11:45** — **PixelFrame: A reconfigurable, precast, post-tensioned concrete structural system for a circular building economy**
Inge Donovan, Jenna Schnitzler, Keith J Lee, Pitipat Wongsittikan, Yanjun Liu, Caitlin T Mueller

**12:00** — **Panorama of approaches to reuse concrete pieces: identification and critical comparison**
Célia Küpfer, Corentin Fivet

**14:00-15:30** — **Technical session C2. Circular design, re-use, recycle Part II**

**14:00** — **Carbon, economics, and labor: a case study of deconstruction's relative costs and benefits compared to demolition**
Felix Heisel, Joseph McGranahan, Alysson Lucas, Diane Cohen, Gideon Stone

**14:15** — **Integrating irregular inventories: accessible technologies to design and build with nonstandard materials in architecture**
Tim Cousin, Daniel Marshall, Natalie Pearl, Latifa Alkhayat, Caitlin Mueller

**14:30** — **A Danish model of building macro-components to promote circularity**
Nicolas Francart, Srinivasa Raghavendra Bhuvan Gummidi, Endrit Hoxha, Harpa Birgisdottir

**14:45** — **The Urban-Industrial metabolism: contribution of waste recycling to the circular economy objectives within the construction sector**
Anastasija Komkova, Guillaume Habert

**15:00** — **Veggies and PV: Optimization of Building-Integrated Agriculture in an Energy Hub**
Christoph Waibel, Zhongming Shi

**15:30-16:00** — **Poster session C.a Methods & case studies**

**CaP1** — **A framework for semi-automated creation of Building Information Models for existing buildings**
Georgios Triantafyllidis, Lizhen Huang

**CaP2** — **DeCO - Guidelines for the deconstruction of recent buildings**
Carlo Gambato, Leidy Guante Henriquez, Stefano Zerbi, Francesco Frontini

Continued

## CIRCULAR DESIGN, RE-USE, RECYCLE — 4 BC

**CaP3** **Circular economy meets building automation**
Hanmin Cai

**CaP4** **Digital information management to increase the reuse of building elements**
Oskar Fahlstedt, Thomas Berge Foyn, Rolf André Bohne

**CaP5** **New EPIQR-web application: Integration of smart building technologies and calculation of CO2 emissions within the building renovation process**
Nathalie Dumas, Flourentzos Flourentzou, Julien Boutillier, Bernard Paule, Tristan de Kerchove d'Exaerde

**CaP6** **Adaptability of buildings: to what extent do design-support models consider context-related factors? A literature review**
Giulia Scialpi, Joost Declercq, Karol Gawlik, Daniela Perrotti

**CaP7** **Circular practices in construction**
Georg Hubmann, Vera van Maaren

**CaP8** **From concrete waste to walls: An investigation of reclamation and digital technologies for new load-bearing structures**
Maxence Grangeot, Corentin Fivet, Stefana Parascho

**CaP9** **A shingled glass enclosure system constructed from reclaimed insulated glass**
Daniel Jonathan Meiklejon Marshall, Sheila Kennedy

**CaP10** **Human energy. An anthropological perspective on labour and skills in circular construction**
Madlen Kobi, Elena Sischarenco, Vanessa Feri

**CaP11** **Evaluation of the properties of a new circular building composite material to upcycle building wastes**
Mélanie Horvath, Sophie Trachte, Thomas Pardoen, Pierre Bollen

**CaP12** **Circular building design: a case study in Pakistan**
Bushra Danish Talpur, Chiara Rubino, Stefania Liuzzi, Francesco Martellotta

**CaP13** **Reuse of concrete for the construction of a retaining wall: a case study**
Agnes Collaud, Marco Mongillo, Elena-Lavinia Niederhäuser, Julien Pathé, Dario Redaelli, Hani Buri

Continued **CIRCULAR DESIGN, RE-USE, RECYCLE** **4 BC**

**15:30-16:00** **Poster session C.b Urban metabolism**

**CbP1** **Geospatial assessment of water footprints for hyperscale data centers in the United States**
Nuoa Lei, Jun Lu, Zhu Cheng, Zhi Cao, Arman Shehabi, Eric Masanet

**CbP2** **Multiscale patterns of building replacements in Zurich from 2000 to 2019**
Jingxian Ye, Corentin Fivet

**CbP3** **Mapping Urban Water Balance to support the integrated design of water cycles in the peri-urban areas**
Matteo Clementi, Valentina Dessì

**15:30-16:00** **Poster session C.c Construction & Manufacturing processes**

**CcP1** **«Rubber Band» – a practical support tool for integrated and resource-efficient early design in construction**
David Jenny, Konrad Graser, Luca Baldini

**CcP2** **Construction sites' sustainability enhancement through earthworks optimization using Building Information Modelling**
Sebastiano Maltese, Lorenzo Papa, Fulvio Re Cecconi

**CcP3** **Towards emission free construction sites in Northern Norway: results from a regional survey**
Randulf Høyli, Marianne Kjendseth Wiik, Shabnam Homaei, Selamawit Mamo Fufasì

D Sessions **THERMAL SYSTEMS** 2/3 ABC

Chair: **Prof. Matthias Sulzer** Co-chair: **Prof. Lidia Badarnah**

## 14:00-15:30 Technical session D. Thermal systems

**14:00** **Integration of heat sources for heat pumps of larger capacities**
Carsten Wemhoener, Christoph Meier

**14:15** **From certificate to physics - Paths to net-zero compatible buildings**
Joachim Bagemihl, Martin Jakob, Silvia Banfi Frost, Franz Sprecher

**14:30** **A new heat and cold storage system to enhance the thermal energy autonomy of residential buildings**
Jacques Robadey, Ruben Richard

**14:45** **Projected energy savings of a 3D printed selective heat transfer facade**
Bharath Seshadri, David Morroni, Illias Hischier, Kunal Masania, Arno Schlueter

**15:00** **Thermal performance of residential and non-residential sectors: describing differences and understanding underlying reasons**
Francesco Sasso, Martin K. Patel

## 15:30-16:00 Poster session D. Thermal systems

**DP1** **Decarbonising heating and cooling using temperature setback and geothermal energy**
Hui Ben, Sara Walker, Christopher Brown, Isa Kolo, Gioia Falcone

**DP2** **Estimating residential space heating and domestic hot water from truncated smart heat data**
Daniel Leiria, Markus Schaffer, Hicham Johra, Anna Marszal-Pomianowska, Michal Zbigniew Pomianowski

**DP3** **Multi-criteria comparison of various drinking water installations for low-temperature supply systems in apartments**
Peter Pärisch, Mark Distelhoff, Jonas Keuler, Carsten Lampe, Christopher Graf, Anna Cadenbach

**DP4** **Global transformer architecture for indoor room temperature forecasting**
Alfredo V. Clemente, Alessandro Nocente, Massimiliano Ruocco

**DP5** **Heat pumps on exhaust air for space heating and domestic hot water, in very high energy performance multifamily building (Geneva, Switzerland): feedback in actual condition of use**
Simon Callegari, Pierre Hollmuller

**DP6** **Applicability of a heat-pump-driven liquid-desiccant air-conditioning system in energy-efficient buildings**
Jae-Hee Lee, Beom-Jun Kim, Jae-Won Joung, Jae-Weon Jeong

**DP7** **Comparison of electrical load forecast methods validated on the hourly consumption profiles of 10 heat pumps located in Switzerland**
Andreas Melillo, Esther Linder, Manuel Meyer, Ueli Schilt, Philipp Schütz

Continued **THERMAL SYSTEMS** 2/3 ABC

**DP8** **Potential for district heating networks from waste heat: an assessment tool and its application to sewage treatment plants in the Canton of Zurich**
Giuseppe Peronato, Jérôme H. Kämpf

**DP9** **Potential-estimation of thermal micro-grids in urban areas based on heat load and building clustering**
Monika Hall, Pia Bereuter, Achim Geissler

**DP10** **Sensitivity analysis of fifth generation district heating and cooling coupled with borehole thermal energy storage with respect to cooling adoption**
Xiang Li, Jonathan Chamber, Selin Yilmaz, Martin K. Patel

**DP11** **BEM to BIM in early design phase: A comparison between static and dynamic heating energy predictions**
Marie-France Stendal, Thiago Ferreira, Marie-Claude Dubois

**DP12** **Development of design calculations for radiant ceiling panels incorporating phase change materials (PCMs)**
Eva Svarcova, Jun Shinoda, Dragos-Ioan Bogatu, Ongun Berk Kazanci, Dusan Petras, Bjarne W. Olesen

**DP13** **Experimental study of the performance of a novel solution with double skin façade and diffuse ceiling ventilation**
Chen Zhang, Yue Hu, Olena Kalyanova Larsen, Tine Steen Larsen

**DP14** **Energyplus model of double skin façade and diffuse ceiling ventilation**
Yue Hu, Olena Larsen, Chen Zhang, Tine Larsen

**DP15** **Transient exergy analysis of ejector cooling and thermoelectric generator systems using heat storage and parabolic trough collector for residential buildings**
Towhid Gholizadeh Baris, Hamed Ghiasirad, Karima Megdouli, Simin Anvari, Bartosz Stanek, Anna Skorek-Osikowska, Lukasz Bartela

**DP16** **Exergy analysis on the low flow rate of solution in the atomization-based liquid desiccant system**
Soo-Jin Lee, Jae-Weon Jeong

**DP17** **The lowest carbon HVAC system might be no system: the design and lifecycle comparison of two heating and cooling options for Canada's first hempcrete institutional building**
Kyle Gerrard, Juliette Mollard Thibault, Adam Rysanek

**DP18** **Field study of energy and environmental performance of ground source heat pumps retrofitted in a cluster of UK social housing dwellings**
Rajat Gupta, Sahar Zahiri

E Sessions **PREDICTIVE CONTROL | HEALTH & PRODUCTIVITY** 1 BC

Chair: **Prof. Clayton Miller** Co-chair: **Dr Stephen Wasilewski**

## 14:00-15:30 Technical session E. Predictive control / Health & Productivity

14:00 **Model predictive control of heating in a low energy single-family house**
Christian Mølgaard Nielsen, Kristian Helmer Kjaer Larsen, Simon Thorsteinsson, Jan Dimon Bendtsen

14:15 **Using machine learning to predict window opening position in a naturally ventilated building**
Jeremy Wong, Julian Donges, Andrea Gasparella, Adam Rysanek

14:30 **Performance analysis and optimization of a solar assisted heat pump concept**
Mathieu Frappe, Laurent Mora, Alain Sempey, Hugo Viot, Tessa Hubert

14:45 **Exploration of the relationships between perceived and observed parameters of IEQ using Bayesian analysis**
Sarah Crosby, Sanyogita Manu, Adam Rysanek

15:00 **Inequalities in exposure to indoor environmental hazards across England and Wales – can more energy efficient homes help?**
Lauren Ferguson, Anna Mavrogianni, Phil Symonds, Michael Davies, Paul Ruyssevelt

## 15:30-16:00 Poster session E.a Predictive control

EaP1 **Integration of occupant voting systems and smart home platforms for collecting thermal feedback in indoor environments**
Nicola Callegaro, Rossano Albatici

EaP2 **Comparison of two deep reinforcement learning algorithms towards an optimal policy for smart building thermal control**
Alberto Silvestri, Davide Coraci, Duan Wu, Esther Borkowski, Arno Schlueter

EaP4 **Towards a novel intelligent and fully interactive IoT framework for residential buildings**
Mohammad Amin Erfani Moghaddam, Iason Konstanzos

EaP5 **Comparison of different deep neural networks for system identification of thermal building behavior**
Simon Gölzhäuser, Lilli Frison

EaP6 **Degradation-aware data-enabled predictive control of energy hubs**
Varsha Naresh Behrunani, Marta Zagorowska, Mathias Hudoba de Badyn, Francesco Ricca, Philipp Heer, John Lygeros

EaP7 **Experimental validation for distributed control of energy hub networks**
Varsha Naresh Behrunani, Philipp Heer, John Lygeros

EaP8 **Cascaded reinforcement learning based supply temperature control**
Chenzi Huang, Stephan Seidel, Jan Bräunig

Continued **PREDICTIVE CONTROL | HEALTH & PRODUCTIVITY** 1 BC

**EaP9** **Flexibility assessment of power-hydrogen-power (P2H2P) system in multi-energy districts**
Binod Prasad Koirala, Hanmin Cai, Josien de Koning, Philipp Heer, Kristina Orehounig

**EaP10** **Physics-informed machine learning framework to model buildings from incomplete information**
Ting-Chun Kuo, Sreehari Manikkan, Ilias Bilionis, Xiaoqi Liu, Panagiota Karava

**15:30-16:00** **Poster session E.b Health & productivity**

**EbP1** **Cozie Apple: An iOS mobile and smartwatch application for environmental quality satisfaction and physiological data collection**
Federico Tartarini, Mario Frei, Stefano Schiavon, Yun Xuan Chua, Clayton Miller

**EbP2** **Utilizing wearable technology to characterize and facilitate occupant collaborations in flexible workspaces**
Kristi Maisha, Mario Frei, Matias Quintana, Yun Xuan Chua, Rishee Jain, Clayton Miller

**EbP3** **Is there an Optimum Balance between Indoor Environment, Energy Consumption and Health?**
Tine Steen Larsen, Lasse Rohde, Rasmus Lund Jensen, Olena Kalyanova Larsen

**EbP4** **Method to assess the integration of personalization, stimulus, and environmental design principles in school classrooms.**
Beatriz Piderit-Moreno, Javiera Leighton, Valentina Chandia, Alexis Perez-Fargallo

**EbP5** **Theoretical framework to develop an urban health index using built environment variables: the case of Ferrara, Italy**
Amruta Umakant Mahakalkar, Eugenio Morello, Farah Makki, Ahmed Hazem Eldesoky, Enrico Caiani

**EbP6** **Assessing the self-rated sleep quality in UK homes, based on an online survey**
Jaydeep Bhadra, Arash Beizaee, Kevin Lomas, Iuliana Hartescu

**EbP7** **Examining respiratory comfort in vernacular and conventional buildings**
Suchi Priyadarshani, Monto Mani, Daniel Maskell

**EbP8** **Impacts of energy saving measures on IEQ, task performance and COVID-19 contagion risk in public buildings: Analysis of a case-study in Bozen-Bolzano, Italy**
Riccardo Albertin, Angelica El Hokayem, Giovanni Pernigotto, Andrea Gasparella

**EbP9** **People flow management in a healthcare facility through crowd simulation and agent-based modeling methods**
Mirko Locatelli, Laura Pellegrini, Daniele Accardo, Emilio Sulis, Lavinia Chiara Tagliabue, Giuseppe Martino Di Giuda

**EbP10** **Students' Perceptions of acoustic comfort in traditional and flexible learning environments: a study in Chile**
Constanza Ipinza-Olatte, María Beatriz Piderit-Moreno, Philomena M Bluyssen, Maureen Trebilcock-Kelly

F Sessions

## ENERGY PERFORMANCE MODELLING 2/3 ABC

Chair: **Dr Sergi Aguacil** Co-chair: **Dr Julien Nembrini**

16:15-18:00 **Technical session F. Energy performance modelling**

16:15 **The Building Data Genome Directory -- An open, comprehensive data sharing platform for building performance research**
Xiaoyu Jin, Chun Fu, Hussain Kazmi, Attila Balint, Ada Canaydin, Matias Quintana, Filip Biljecki, Fu Xiao, Clayton Miller

16:30 **Modelling of multi-energy systems of residential buildings with Calliope and validation of results**
Ueli Schilt, Esther Linder, Manuel Meyer, Sarah Schneeberger, Andreas Melillo, Philipp Roos, Philipp Schuetz

16:45 **Identification of influential factors for combined energy consumption and indoor environmental quality in residential buildings**
Divyanshu Sood, Ibrahim Alhindawi, Usman Ali, Rune Korsholm Andersen, Donal Finn, James A. McGrath, Miriam A. Byrne, James O'Donnell

17:00 **National building stock model for evaluating the impact of different retrofit measures**
Natasa Vulic, Sven Eggimann, Matthias Sulzer, Kristina Orehounig

17:15 **Energetic performance of a smart neighborhood of existing multifamily buildings with heat pumps, PV and CHP focusing on energy balance and CO2 emissions**
Michael Kropp, Jakob Metz, Manuel Lämmle

17:30 **Gothenburg Digital Twin. Modelling and communicating the effect of temperature change scenarios on building demand**
Daniela Maiullari, Claudio Nageli, Andreas Rudena, Liane Thuvander

18:00-18:30 **Poster session F. Energy performance modelling**

FP1 **E-DYCE - Dynamic approach to the dynamic energy certification of buildings**
Olena Kalyanova Larsen, Michal Zbigniew Pomianowski, Giacomo Chiesa, Evangelos Belias, Tristan de Kerchove d'Exaerde, Flourentzos Flourentzou, Francesca Fasano, Paolo Grasso

FP2 **Energy performance certificate estimation at large scale based on open data**
Frederic Montet, Alessandro Pongelli, Stefanie Schwab, Mylène Devaux, Thomas Jusseleme, Jean Hennebert

FP3 **Model simplification of geometry and facilitiesc for energy and indoor environment towards more reliable energy labeling**
Michal Zbigniew Pomianowski, Yue Hu, Olena Kalyanova Larsen

FP4 **Data-driven modeling of heat pumps and thermal storage units for MPC**
Matthias Brandes, Hanmin Cai, Jacopo Vivian, Lorenzo Croci, Philipp Heer, Roy Smith

FP5 **Parametric integration of CFD-based wind pressure coefficients into building energy models: A novel workflow**
Naga Venkata Sai Kumar Manapragada, Jonathan Natanian

FP6 **Assessment of operational and embodied energy in passive residential retrofitting strategies for the Mediterranean climate**
Pamela Carrillo Arancibia, Anna Pages-Ramon

Continued **ENERGY PERFORMANCE MODELLING** 2/3 ABC

**FP7** **Determine the heat demand of existing buildings with machine-learning**
Joachim Werner Hofmann, Christian Amoser, Achim Geissler, Monika Hall

**FP8** **Performance gaps between energy system planning and operation: a study exploring the impacts of model fidelity and dispatch strategy**
Muriel Beaud, Hanmin Cai, Amarasinghage T.D. Perera, Philipp Heer

**FP9** **Development of an energy digital twin from a hotel supervision system using building energy modelling**
Michele Libralato, Paola D'Agaro, Giovanni Cortella

**FP10** **Comparison of building energy performance in three urban sites using field measurements and modelling in Kayseri, Turkiye**
Basak Toren, Tania Sharmin

**FP11** **Comparison of different coupling variants for building and HVAC simulation**
Chenzi Huang, Elisabeth Eckstädt

G Sessions **THERMAL ENVIRONMENT** 1 BC

Chair: **Prof. Dolaana Khovalyg** Co-chair: **Dr Steffen Hartmeyer**

## 16:15-18:00 Technical session G. Thermal environment

**16:15** **Experimental study to understand the thermal environment of an office cooled by radiant ceiling panels and dedicated outdoor air system**
Kian Wee Chen, Ippei Izuhara, Coleman Merchant, Forrest Meggers, Jovan Pantelic

**16:30** **Impact of room thermal conditions on thermal response and energy expenditure of people of different body compositions**
Aleksandra Lipczynska, Monika Blaszczok, Monika Dorobisz, Dominika Zoglowek

**16:45** **Personal comfort models in long-term monitoring using physiological data from wearable sensors**
Veronica Martins Gnecco, Ilaria Pigliautile, Anna Laura Pisello

**17:00** **Assessment of summer outdoor thermal comfort in an urban neighborhood with high-rise buildings**
Aytac Kubilay, Dominik Strebel, Andreas Rubin, Dominique Derome, Jan Carmeliet

**17:15** **Identifying and monitoring the Urban Heat Island in the compact Mediterranean city using satellite imagery and in-situ measurement data**
Olga Palusci, Vincenzo Laurino, Vincenzo Barbieri, Riccardo Buccolieri

**17:30** **Assessing outdoor comfort near graduation towers: An experimental calibration study in a public open space**
Fabian Görgen, Monica Rossi-Schwarzenbeck

## 18:00-18:30 Poster session G. Thermal environment

**GP1** **Influence of specific characteristics of subjects and environmental conditions on comfort level during showering**
Karina Albrecht, Jonas Keuler, Peter Pärisch

**GP2** **Exploratory analysis of the operation of a MHRV system in an overheating nZEB apartment in Spain**
Jorge Otaegi, Alexander Martin-Garin, Rufino J. Hernandez-Minguillon, Iñigo Rodriguez-Vidal

**GP3** **Fictitious cooling/heating: from free-floating thermal discomfort to energy needs, different approaches toward labelling free-running buildings**
Giacomo Chiesa

**GP4** **Occupant-centric metadata paradigms for comfort optimization in buildings**
Kipp Bradford, James Coleman, Forrest Meggers

**GP5** **Thermal perception and satisfaction of Italian students in distance (home) learning vs face-to-face learning environments during the heating season**
Ilaria Pittana, Federica Morandi, Francesca Cappelletti, Andrea Gasparella, Athanasios Tzempelikos

Continued

### THERMAL ENVIRONMENT — 1 BC

**GP6** **Towards sustainable energy consumption for occupants of buildings with collective heating systems**
Enzo Cabezas-Riviere, Thomas Recht, Aline Barlet, Maxime Robillart, Mathieu Bouville, Patrick Sebastian

**GP7** **Indoor environmental quality trade-offs due to summertime natural ventilation in London care homes**
Ioanna Tsoulou, Nishesh Jain, Eleni Oikonomou, Giorgos Petrou, Anna Mavrogianni, Rajat Gupta, Alastair Howard, Ai Milojevic, Michael Davies

**GP8** **Thermographic cameras for thermal comfort applications: simulated and experimental spectral response errors of various long-wave infrared detectors**
Coleman Merchant, Forrest Meggers

**GP9** **Unbalancing mean radiant temperature and air temperature**
Forrest Michael Meggers, Beyza Yazici, Jihun Kim, Kianwee Chen, Coleman Merchant, Ippei Izuhara

**GP10** **Sequentially coupling LBNL-method and Modelica to model and operate adaptive facades with inhomogeneous printing patterns**
Simon Oskar Weber, Yuan Fang, Sumee Park, Philip Leistner

**GP11** **Comparing different approaches to define shading control threshold via a new automatic building simulation platform**
Giacomo Chiesa, Paolo Grasso, Francesca Fasano

**GP12** **Impact of different thermal zone data simplification for model calibration on monitored-simulated performance gaps**
Giacomo Chiesa, Francesca Fasano, Paolo Grasso

**GP13** **Automated workflow for simulating the effect of green façades on indoor thermal comfort**
David Marx, Roland Reitberger, Markus Kleeberger, Werner Lang

**GP14** **Green roof energy performance in different climate zones: a simulation study**
Nursat Kulumkanov, Abid Nadeem, Serik Tokbolat

**GP15** **Optimization of the thermal-optical performance of a PCM-integrated thermochromic glazing system**
Xiangyu Long, Qian Jin, Qiuting Sun

**GP16** **Energy performance of ventilated façades; the influence of the colour and the air channel dimension**
Oriol Roig, Cristina Pardal, Antonio Isalgue, Ignacio Paricio

**GP17** **The resilience of buildings to climate change: the role of mobile passive systems**
Marc Roca-Musach, Carlos Alonso-Montolio, Isabel Crespo Cabillo, Helena Coch Roura

Continued

## THERMAL ENVIRONMENT 1 BC

**GP18** **Integration of aquaponics system with water reuse for housing in hot arid climate: BaityKool(BK), a bio-inspired dwelling prototype in Dubai-UAE**
Vidya Puliparambil Mohanan, Denis Bruneau, Ferran Garcia, Philippe Lagiere, Ryad Bouzouidja, Jasmina Locke, Jacinta Dsilva, Axel Rochaud, Bertrand Canigani

**GP19** **Examining the climate responsiveness of End-of-life Photovoltaic (EoL-PV) integrated buildings**
Roshan R Rao, Monto Mani

**GP20** **Quantification of the impact of global warming on summer overheating risk in a residential building in urban areas in Belgium**
Mohsen Sharifi, Mohammad Haris Shamsi, Yixiao Ma, Dirk Lauwaet

**GP21** **Sensitivity analysis on hygrothermal properties and thickness of green roof layers, including recycled and artificial materials**
Mostafa Kazemi, Luc Courard, Shady Attia

**GP22** **From near real-time urban data to an Explainable city-scale model to help reduce the Urban Heat Island (UHI) effect**
Nasim Eslamirad, Francesco De Luca, Sadok Ben Yahia, Kimmo Lylykangas

**GP23** **Development of a composite model for predicting urban surface temperature distribution in the context of GIS**
Ziang Cui, Thomas Leduc, Auline Rodler, Marjorie Musy

**GP24** **A multi-criteria review of mean radiant temperature evaluations models for urban thermal comfort**
Alexandre Merville, Auline Rodler, Marjorie Musy, Simon Rouchier, Emmanuel Dufrasnes

**GP25** **Investigating the Impact of Heat Stress and Green Space Accessibility for At-Risk Communities**
Doruntina Zendeli, Nicola Colaninno, Eugenio Morello

**GP26** **Impact of shade on outdoor thermal comfort, in the case of a Mediterranean promenade**
Ani Tola (Panariti), Juljan Veleshnja, Paul Louis Meunier, Geri Bisha

# TOPICAL SESSIONS
# Wednesday 13 September

**H Sessions** | **RENEWABLE ENERGY** | **4 BC**

Chair: **Prof. Martin Patel** Co-chair: **Prof. Raphaël Compagnon**

**16:15-18:00** **Technical session H. Renewable energy**

**16:15** **Do we need a saw? Carbon-based analysis of facade BIPV performance under partial shading from nearby trees**
Justin McCarty, Christoph Waibel, Alina Galimshina, Alexander Hollberg, Arno Schlueter

**16:30** **Estimating surface utilization factors for BIPV applications using pix2pix on street captured façade images**
Ayca Duran, Christoph Waibel, Arno Schlueter

**16:45** **Modeling reflection by structured building-integrated photovoltaics**
Lars Oliver Grobe, Stephen Wasilewski, Daniel Plörer, Christian Roeske

**17:00** **Predictive model of solar potential on building facades with the sky view factor as shading indicator**
Domenico Altieri, Erika Saretta, Tõnu Mauring, Mohamed Boutaleb, Giovanni Branca

**17:15** **Solar potential on facades in urban areas: an integrated approach combining solar and digital built facade modelling**
Gilles Desthieux, Adrien Gressin, Raybaud Blaise, Ingensand Jens

**17:30** **Thermochemical storage networks for integration of renewables through seasonal load shifting**
Luca Baldini, Juan Mahecha Zambrano

**18:00-18:30** **Poster session H. Renewable energy**

**HP1** **A review and analysis of energy systems planning models and tools for renewable energy integration in cities**
Mashael Yazdanie, Kristina Orehounig

**HP2** **Experimental energy performance investigation of electrified renewable energy-sharing community**
Min-Hwi Kim, Haneol Kim, Jong-Kyu Kim, Yong-Sub Ahn

**HP3** **Upscaling potential of BIPV for public housing typologies in Singapore**
Maximilian Gester, Christoph Waibel, Argyrios Grammatas, Tien Foo Sing, Arno Schlüter

**HP4** **Optimization of Building integrated photovoltaic and thermoelectric hybrid energy harvesting system for different climatic regions**
Yong-Kwon Kang, Su-Young Jo, Hyo-Lim Park, Jae-Weon Jeong

**HP5** **Scalable façade-integrated PVT-systems for upward extensions in the urban context**
Pius Weidner, Andreas Gerber

**HP6** **Performance measurements on WISC collectors under artificial environmental conditions**
Stefano Pauletta, Alexis Duret, Gabriel Dupont, Xavier Jobard

Continued

## RENEWABLE ENERGY — 4 BC

**HP7** **What is the net PV energy production in Switzerland and how can we maximize it?**
Pablo Martinez-Alcaraz, Gloria Serra-Coch, Carlos Alonso-Montolio, Helena Coch

**HP8** **NTNU-SINTEF SolarNet: A solar irradiation monitoring network at high latitudes**
Mattia Manni, Alessandro Nocente, Martin Bellmann, Steve Völler, Marisa Di Sabatino, Gabriele Lobaccaro

**HP9** **Increasing pv solar collection using the upper edges in balconies**
Richard H. Valdivia-Sisniegas

**HP10** **A mapping of electric construction machinery and electric construction sites in Norway**
Marianne Kjendseth Wiik, Shabnam Homaei, Randulf Høyli

**HP11** **Parametric design of a residential building system through solar energy potential: the case of Guelma, Algeria**
Zineb Medjeldi, Amal Kirati, Assoule Dechaicha, Djamel Alkama

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# ENVIRONMENTAL RESEARCH 2023

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# TOPICAL SESSIONS
# Thursday 14 September

**I Sessions** — **POSITIVE ENERGY DISTRICTS & ENERGY COMMUNITIES** — **2/3 ABC**

Chair: **Prof. Francesco Guarino** Co-chair: **Dr Hassam Rehman**

**10:45-12:30** — **Technical session I. Positive energy districts & energy communities**

**10:45** **Exploring tools and indicators to support collaborative planning, design, implementation, operation, and evaluation of Positive Energy Districts**
Maria-Beatrice Andreucci, Marco Delli Paoli, Matthias Haase

**11:00** **Modeling uncertainty in positive energy districts through a non-probabilistic approach**
Mohammad Haris Shamsi, Amin Kouti, Yixiao Ma, Lukas Engelen, Mohsen Sharifi

**11:15** **Optimizing positive energy districts**
Matthias Haase

**11:30** **Assessing pathways to carbon neutrality in a neighbourhood study in Germany**
Miaomiao He, Isabell Nemeth, Astrid von Blumenthal, Thomas Haupt, Jochen Stopper, Johannes Jungwirth

**11:45** **Economic and environmental benefits of decentralized multi-energy systems for energy communities**
Xavier Jobard, Massimiliano Capezzalli, Neha Dimri, Alexis Duret, Marten Fesefeldt, Mija Frossard, Vincent Jacquot, Sebastien Lasvaux

**12:00** **The more the better? Archetype segmentation in urban building energy modeling**
Zoe Le Hong, Zachary Berzolla, Christoph Reinhart

**15:45-16:15** — **Poster session I. Positive energy districts**

**IP1** **Towards the implementation of Positive Energy Districts in industrial districts: an Italian case study**
Elisa Marrasso, Chiara Martone, Giovanna Pallotta, Carlo Roselli, Maurizio Sasso

**IP2** **Towards positive energy islands - a Danish case study**
Muhyiddine Jradi

**IP3** **A database for positive energy districts (PED)**
Beril Alpagut, Silvia Bossi, Paolo Civiero, Sergio Diaz de Garayo, Christoph Gollner, Matthias Haase, Michal Kuzmic, Nuria Sanchez, Oscar Secco, Silvia Soutullo Castro, Giulia Turci, Shokufeh Zamini

**IP4** **Development of an early design tool for the sustainability assessment of positive energy districts: methodology, implementation and case-studies**
Alberto Brunetti, Salvatore Cellura, Francesco Guarino, Sonia Longo, Marina Mistretta, Francesco Reda, Roberta Rincione

**IP5** **Review of natural language processing techniques for characterizing positive energy districts**
Mengjie Han, Juveria Shah, Xingxing Zhang

**IP6** **“oPEN Lab” project as an underpin innovation for Positive Energy District solutions in Pamplona**
Alicia Kalms, Iñaki Cornago Santos, Mikel Ezquer Mayo, Sergio Diaz de Garayo Balsategui, Alba Juncal Arias Royo, Luis Torres Cardona, Daniel San Emeterio Carciandia, M. Olatz Irulegui Garmendia, Faisal Bouchotrouch, Maarten De Groote

K Sessions **DAY AND ELECTRIC LIGHTING** 1 BC

Chair: **Dr Jan Wienold** Co-chair: **Dr Sneha Jain**

## 10:45-12:30 Technical session K. Day and electric lighting

**10:45** **Exploring spatiotemporal dynamics in light-dosimetry**
Steffen Lutz Hartmeyer, Frederic Roman Rudawski, Martine Knoop, Marilyne Andersen

**11:00** **A framework to generate local spectral skies for spectral daylight simulations**
Priji Balakrishnan, Martine Knoop, Lionel Doppler

**11:15** **Integrated assessment of buildings visual and thermal performance with translucent bricks**
Lina Hassoun, Fazel Khayatian, Michal Ganobjak, Jannis Wernery, Jacopo Vivian

**11:30** **A VR-based workflow to assess perception of daylit views out with a focus on dynamism and immersion**
Yunni Cho, Caroline Karmann, Marilyne Andersen

**11:45** **Selecting roller shade optical properties for glare protection**
Sichen Lu, Thanos Tzempelikos

**12:00** **Daylighting performance of an innovative Prismatic Vertical Louvers (PVLs) shading system incorporating Prismatic Materials (PMs)**
Masoome Haghani, Wayne Place

## 15:45-16:15 Poster session K. Day and electric lighting

**KP1** **Vertical Sky Component (VSC) and daylight regulation compliance by the EN 17037 and BFS 2011:6 standards**
Agnieszka Czachura, Niko Gentile, Jouri Kanters, Maria Wall

**KP2** **Impact of model detail on daylighting metrics in residential buildings**
Lars Oliver Grobe, J Alstan Jakubiec

**KP3** **Investigating of Annual Sunlight Exposure (ASE) as an indicator for overheating in a free-running building: a case of thermal comfort improvement in a child development center in Thailand**
Apiparn Borisuit, Phanchalath Suriyothin

**KP4** **Field study challenges: Customisation and personalisation during lighting control research in residences**
Myriam Aries, Alyaá Tabbah, Géza Fischl

**KP5** **Development and evaluation of highly thermally insulating aerogel glass bricks**
Michal Ganobjak, Wim J. Malfait, Janis Just, Marcel Käppeli, Francisco Mancebo, Samuel Brunner, Jannis Wernery

**KP6** **Simulation workflows in multi-objective lighting design optimisation for human well-being and building performance metrics: a scoping review**
Alyaa Tabbah, Myriam Aries, Annika Moscati, Peter Johansson

Continued

### DAY AND ELECTRIC LIGHTING — 1 BC

**KP7** **Green view factor and satisfaction with window views in urban offices**
Yasuko Koga, Taisei Okamoto, Rintaro Majima, Fabian Estuardo Jarrin Mancero, Yoshikane Kojima, Chikako Ohki, Akiko Kawano, Nozomi Takagi

**KP8** **Assessing views from office buildings in virtual reality**
Yoshikane Kojima, Chikako Ohki, Akiko Kawano, Nozomi Takagi, Yasuko Koga, Taisei Okamoto, Rintaro Majima, Fabian Estuardo Jarrin Mancero

**KP9** **Use of digital 3D urban models for view evaluation in building envelope design**
Rintaro Majima, Yasuko Koga, Taisei Okamoto, Fabian Estuardo Jarrin Mancero, Yoshikane Kojima, Chikako Ohki, Akiko Kawano, Nozomi Takagi

**KP10** **Indoor thermal and visual well-being of people with autism: preliminary results from a field study in Denmark**
Luca Zaniboni, Mandana Sarey Khanie, Jørn Toftum

L Sessions

## LIFE CYCLE ANALYSIS — 4 BC

Chairs: **L1 Prof. Daia Zwicky** Co-chair: **L1 & L2 Dr Maléna Bastien-Masse**
**L2 Prof. Thomas Jusselme**

### 10:45-12:30 Technical session L1. Life cycle analysis Part I

**10:45** **A design stage, multi-objective assessment: material selection with environmental life-cycle analysis, labour and health considerations for building structure**
Zherui Wang, Xiaowen Yu, Kayleigh Houde, Dorit Aviv

**11:00** **The GHG emission timeline - Integrating sustainability assessment into the early building design stage**
Illias Hischier, Linus Walker, Valeria Piccioni, Esther Borkowski, Alina Galimshina, Arno Schlueter

**11:15** **Office to housing conversion: estimating life cycle and financial performance**
Dorothee Stiernon, Anders Böhlke, André Stephan, Morgane Bos, Giulia Marino

**11:30** **Application of sensitivity analysis on building dynamic lifecycle assessment of GHG emissions: a French case study**
Lucas Hajiro Neves Mosquini, Benoit Delinchant, Thomas Jusselme

**11:45** **Life Cycle Assessment of the new Solar Power Plant SolarCAD II connected to a District Heating Network in Geneva, Switzerland**
José Solano, Mija Frossard, Sebastien Lasvaux, Alexis Duret

**12:00** **Quantification and spefication of agricultural by-products as local resources for mycelium-bound composites**
Jae Geun Yoo, Kate Heath, Marta H. Wisniewska, Felix Heisel

### 14:00-15:45 Technical session L2. Life cycle analysis Part II

**14:00** **Stepwise renovation of buildings: what to refurbish first to minimize life-cycle carbon emissions?**
Yasmine Dominique Priore, Lucile Schulthess, Stefanie Schwab, David Rollo, Thomas Jusselme

**14:15** **Carbon budget for national building stock life-cycle emissions: a novel approach**
Nicolas Alaux, Teresa Lackner, Stefan Nabernegg, Barbara Truger, Martin Röck, Karl W Steininger, Alexander Passer

**14:30** **Influence of building geometry on the environmental impact of building structures**
Pierre Navaro Auburtin, Myriam Saadé, Manuel Manthey, Mathilde Louërat, Jean-Luc Martin, Olivier Baverel

**14:45** **Reuse practices in building construction: proposition of a life cycle assessment methodology and application to a case study in Switzerland**
Mija Frossard, Sébastien Lasvaux, Florence Petetin, Lucie Gross

**15:00** **Decarbonisation roadmap for the building activity : LCA modelling of the renovation lever**
Marin Pellan, Mathilde Louërat, Denise Almeida, Felix Dubois, Guillaume Habert

**15:15** **Regulation on carbon emissions for buildings with special conditions: analysis, calculation model and stakeholder perspectives**
Buket Tozan, Lea Hasselsteen Nielsen, Endrit Hoxha, Harpa Birgisdóttir

Continued **LIFE CYCLE ANALYSIS** **4 BC**

**15:45-16:15** **Poster session L.a Life cycle analysis**

**LaP1** **Public buildings: Life-cycle GHG emission scenarios and reduction trajectories by 2050**
Nicolas Alaux, Barbara Truger, Teresa Lackner, Stefan Nabernegg, Martin Röck, Karl W Steininger, Alexander Passer

**LaP2** **Eco-effective sustainability assessment in buildings: Status and future directions for life cycle studies**
Manish Kumar, Monto Mani

**LaP3** **Mitigating carbon emissions of single-family houses: Assessing the need for a limit value**
Buket Tozan, Lea Hasselsteen Nielsen, Endrit Hoxha, Harpa Birgisdóttir

**LaP4** **Readjusting the climate change hyperfocus: how expanding the scope of impact categories will affect the evaluation of wood buildings**
Rasmus Noddegaard Hansen, Endrit Hoxha, Camilla Ernst Andersen, Freja Nygaard Rasmussen, Morten Walbech Ryberg, Harpa Birgisdóttir

**LaP5** **Turning dynamic LCA principles into practice**
Camilla Ernst Andersen, Christian Grau Sørensen, Ole Michael Jensen, Endrit Hoxha, Freja Nygaard Rasmussen, Harpa Birgisdottir

**LaP6** **LCA models in building industry practice – how do practitioners' assumptions affect LCA results?**
Camilla Ernst Andersen, Endrit Hoxha, Freja Nygaard Rasmussen, Harpa Birgisdóttir

**LaP7** **Embodied net-zero compatible buildings? They already exist!**
Yasmine Dominique Priore, Thomas Jusselme, Guillaume Habert

**LaP8** **Building within planetary boundaries: setting and assessing absolute sustainability targets at the building level**
Nicolas Francart, Caroline Amalie Clausen, Anders Bjørn, Harpa Birgisdottir

**LaP9** **Carbon budgets at component scale and their impacts on design choices: the façade as a case study**
Nazanin Rezaei Oghazi, Thomas Jusselme, Marilyne Andersen

**LaP10** **How to build green substations? An LCA comparison of different sustainable design strategies for substations**
Negar Mohtashami, Rahul Karuvingal, Kai Droste, Thomas Schreiber, Rita Streblow, Dirk Müller

**LaP11** **Generic materializations for heightening of buildings and their effects on embodied carbon and costs**
Daia Zwicky

**LaP12** **A community-based Whole Lifecycle Carbon Assessment: case study of a London estate community plan**
Sahar Nava, Zaid Chalabi, Sarah Bell, Esfandiar Burman

Continued **LIFE CYCLE ANALYSIS** 4 BC

**LaP13** **The role of LCA in the renovation's early decision-making for the design of a multifunctional, modular building envelope system.**
Thaleia Konstantinou, Tatiana Armijos Moya, Muge Yuksle Cetin, Marios Tsikos, Olaia Eguiarte, Beñat Arregi

**LaP14** **To renovate or to reconstruct – A comparative life-cycle assessment study over an existing building in Fribourg, Switzerland**
Emilie Nault, Edouard Cattin

**LaP15** **Environmental assessment of several scenarios of active and passive radon control measures**
Licia Felicioni, Martin Jiránek, Antonín Lupíšek

## 15:45-16:15 Poster session L.b Low carbon materials

**LbP1** **The potential of agricultural residual waste as building material in South Sweden**
Jouri Kanters, Montanun Kulsomboon, Paulien Strandberg-de Bruijn

**LbP2** **Development of climatic damage predictive tool for timber façade moisture related damage**
Katarzyna Ostapska, Guilherme Barreto Arez Coelho, Johannes Brozovsky, Dimitrios Kraniotis, Arian Loli

**LbP3** **The carbon dioxide storage potential of building materials: a systematic literature review**
Dominik Maierhofer, Iris Zögl, Marcella Ruschi Mendes Saade, Alexander Passer

**LbP4** **Energy-efficient residential building in Uzbekistan using local renewable raw materials based on the historical layout of housing**
Bonu Azizova

## 15:45-16:15 Poster session L.c Regenerative planning

**LcP1** **Closing the gap to sufficiency-based absolute climate targets for wood buildings**
Rasmus Noddegaard Hansen, Endrit Hoxha, Camilla Ernst Andersen, Freja Nygaard Rasmussen, Morten Walbech Ryberg, Harpa Birgisdóttir

**LcP2** **Blockchain for regenerative built environment governance**
Hongyang Wang, Jens Juri Hunhevicz, Daniel Hall, Gregor Meier, Catherine De Wolf

# TOPICAL SESSIONS
# Thursday 14 September

**M Sessions** — **DIGITAL OPTIMIZATION OF BUILDINGS & DISTRICTS** — **2/3 ABC**

Chair: **Dr Christoph Waibel** Co-chair: **Dr Shen Yang**

**14:00-15:45** — **Technical session M. Digital optimization buildings & districts**

**14:00** **Assessing the impact of morphed CMIP6 climate model outputs on building energy performance simulations**
Justin McCarty, Arno Schlueter, Adam Rysanek

**14:15** **Final report of the GENEAP project: digitalising and automating planning of district heating and cooling**
Jonathan David Chambers, Stefano Cozza, Martin Patel

**14:30** **Flexibility implications of optimal PV design: building vs. community scale**
Qiuxian Li, Natasa Vulic, Hanmin Cai, Philipp Heer

**14:45** **The use of synthesised data for the development of Digital Twin: Chalmers student house case study**
Alex Arnoldo Gonzalez Caceres, Elena Malakhatka, Holger Hellebro

**15:00** **Urban airflow prediction by pix2pix trained on FFD**
Rebekah Vecchiarelli, Michael Kraus, Danielle Griego, Christoph Waibel

**15:15** **How good is the advice from ChatGPT for building science? Comparison of four scenarios**
Adam Rysanek, Zoltan Nagy, Clayton Miller, Aisgul Demir

**15:45-16:15** — **Poster session M. Digital optimization of buildings & districts**

**MP1** **Effect of climate on the optimal sizing and operation of seasonal ice storage systems**
Jacopo Vivian, Philipp Heer, Massimo Fiorentini

**MP2** **Cluster analysis-based energy performance assessment for office building stock**
Ji Hyun Oh, Hye Gi Kim, Sun Sook Kim

**MP3** **Optimization of a ventilation system integrated into a window frame using CFD simulations**
Joel Philippe Karolin, Mohammad Rahiminejad

**MP4** **Transfer learning methodology for machine learning based fault detection and diagnostics applied to building services**
Kunal Chavan, Tim Rist, Nicolas Rehault

**MP5** **Comparison of supervised algorithms for automated data analysis in existing buildings**
Florian Stinner, Alexander Kümpel, Dirk Müller

**MP6** **Automatic detection and evaluation of control loops in existing buildings**
Florian Stinner, David Gorgis, Alexander Kümpel, Dirk Müller

**MP7** **Towards deep learning methods to improve photovoltaic prediction and building decarbonization in benchmarking study**
Mame Cheikh Sow, Youssef Jouane, Ilyass Abouelaziz, Mourad Zghal

**MP8** **Method combining expert and analytical approaches towards economical energy renovation roadmaps and improved indoor comfort**
Michal Zbigniew Pomianowski, Kim Wittchen, Markus Schaffer, Yue Hu, Giacomo Chiesa, Francesca Fasano, Paolo Grasso

Continued

## DIGITAL OPTIMIZATION OF BUILDINGS & DISTRICTS 2/3 ABC

**MP9** **Taking a step back from glass towers facades to make them compatible with the 2050 targets**
Bernard Paule, Sergi Aguacil Moreno, Benoit Beckers

**MP10** **Smart digital campus UniTO: data gathering and visualisation to support sustainability and indoor comfort**
Daniele Accardo, Silvia Meschini, Paola Gasbarri, Lavinia Chiara Tagliabue, Giuseppe Martino Di Giuda

**MP11** **Comparison between ENVI-met and Ansys-fluent when used for microclimate simulation**
Anh Vu Le, Ying Chieh Chan

**MP12** **Heat vulnerability digital mapping at neighbourhood level in the compact city**
Michele Morganti, Carlos Fernando López Ordóñez, Adriana Ciardiello

**MP13** **Effect of built form on local wind characteristics, a case of tropical savanna climate in India**
Govind Dev, Aysha Saifudeen, Anurup K, Bijoy Chacko

**MP14** **Optihood – a multi-objective analysis and optimization framework for building energy systems at neighborhood scale**
Neha Dimri, Daniel Zenhäusern, Daniel Carbonell, Xavier Jobard, Vincent Jacquot, Agnès François, Massimiliano Capezzali, Marten Fesefeld

**MP15** **Planning the design and operation of urban energy systems with limited data availability: a holistic open-source tool chain**
Thomas Schreiber, Tobias Beckhölter, Kai Derzsi, Kai Droste, Rahul Karuvingal, Yi Nie, David Wackerbauer, Marco Wirtz, Sarah Welter, Yizhuo Zhang, Dirk Müller

**MP16** **Developing Tools for Municipalities to meet Carbon Targets**
Khosro Lari, Kevin Cant, Ralph Evins

**MP17** **Temperature flexible operation of district heating with booster heat pumps – Improving efficiency of existing networks**
Stefan Adldinger, Lothar Behringer, Thomas Lickleder, Daniel Zinsmeister, Thomas Hamacher

**MP18** **Study on the ancestral rules of bioclimatic urban fabric in southern Algeria**
Djamel Mestoul

**MP19** **A building archetype characterization for mass-housing energy efficiency through a UBEM approach**
Andrea Vallati, Michele Morganti, Francesco Causone, Simona Mannucci, Costanza Vittoria Fiorini, Miriam di Matteo, Francesco Muzi

**MP20** **Supporting urban decision-making processes through supply-side technologies characterisation**
Carla Rodriguez Alonso, Ana Quijano, Estefanía Vallejo Ortega, Aapo Huovila, Tania Molteni, Edoardo Croci, Irantzu Urcola

**MP21** **Evaluating the capabilities of a simplification algorithm for Urban Building Energy Modeling in performing building-level Multi-Objective Optimizations at district scale**
Federico Battini, Giovanni Pernigotto, Andrea Gasparella

# TOPICAL SESSIONS
# Thursday 14 September

**N Sessions** — **CONTROL & BEHAVIOUR** — **1 BC**

Chair: **Prof. Myriam Aries** Co-chair: **Dr Julien Nembrini**

**14:00-15:45** — **Technical session N. Control & behaviour**

**14:00** **Glare analysis of an integral daylighting and lighting control strategy for offices**
Daniel Plörer, Stephen Wasilewski, Lars Oliver Grobe

**14:15** **Enhancing user acceptance in automated systems with human-centric lighting: the role of visual comfort, personality, and preference**
Michael Papinutto, Moreno Colombo, Roberto Boghetti, Chantal Basurto, Kornelius Reutter, Denis Lalanne, Jérôme Henri Kämpf, Julien Nembrini

**14:30** **Enhancing personalised thermal comfort models with Active Learning for improved HVAC controls**
Zeynep Duygu Tekler, Yue Lei, Xilei Dai, Adrian Chong

**14:45** **Do the customers remember? The fade-out effect from the demand response applied in the district heating system in Denmark**
Anna Marszal-Pomianowska, Ole Michael Jensen, Kim Bjarne Wittchen, Benas Jokubauskisa, Simon Pommerencke Melgaard

**15:00** **Are the next-generation households ready for the energy transition? A survey on their positioning and practice with energy management tools**
Ernesto Antonini, Lia Marchi, Jacopo Gaspari

**15:15** **Quantifying the impact of Covid-19 on the energy consumption in the low-income housing in Greater London**
Nahid Mohajeri, Kavan Javanroodi, Lauren Fergouson, Jingfeng Zhou, Vahid Nik, Agust Gudmundsson, Ehsan Anvari, Jonathon Taylor, Phil Symonds, Mike Davies

**15:45-16:15** — **Poster session N.P Control & behaviour**

**NP1** **Leveraging campus-scale WiFi data for activity-based occupant modeling in urban energy applications**
Martin Alejandro Mosteiro Romero, Clayton Miller, Matías Quintana, Adrian Chong, Rudi Stouffs

**NP2** **Inter- and intra-individual variability in CO2 production and metabolic rate**
Dolaana Khovalyg, Mohamad Rida

**NP3** **Human sitting behavior at office work and its effect on metabolic rate under varying thermal exposure**
Ryan Liao, Dolaana Khovalyg

**NP4** **Towards multi-domain user archetypes for user-centred façade design**
Alessandra Luna Navarro, Pranay Khanchandani, Eleonora Brembilla, Pedro de la Barra, Charalampos Andriotis

**NP5** **Indoor monitoring and long-term survey to identify the risks of Energy Poverty: the case of social housing in Northern Italy**
Ilaria Pittana, Andrea Mercusa, Andrea Gasparella, Piercarlo Romagnoni, Francesca Cappelletti

Continued

## CONTROL & BEHAVIOUR — 1 BC

**NP6** **Scalable decarbonisation using automated operation optimisation**
Marc Baranski, Gerrit Bode, Felix Nienaber, Bruno Bruhn, Philip Grant, Henrik Ziegeldorf

**NP7** **Development of personalized predicted mean vote based on a real-time clothing insulation recognition system**
Kuan Chun Shih, Ying-Chieh Chan

**NP8** **Greenery, sun exposure and ventilation of public spaces in residential units in Tirana**
Parashqevi Tashi, Ani Tola, Ani Tashi

**NP9** **Potentials of radar sensor detecting the presence of an imitated user for optimising short-range presence-sensing lighting in homes**
RatnaKala Sithravel, Jerome Landré, Anita Hurtig-Wennlöf, Myriam Aries

**NP10** **Automated data labeling of building automation systems using time series data and conditional probabilities**
Marwa Maghnie, Florian Stinner, Alexander Kümpel, Dirk Müller

**NP11** **Management tool of highly efficient social housing to provide healthy indoor conditions and fight energy poverty**
Raul Ciria, Sergio Diaz de Garayo, María Fernández

**NP12** **Influence of temporal- and spatial resolutions on building performance simulation models: A Danish residential building case study**
Kamilla Heimar Andersen, Anna Marszal-Pomianowska, Benas Jokubauskis, Per Kvols Heiselberg

**NP13** **The potential of switchable glazing in cooling dominated climates**
Etienne Magri, Vincent Buhagiar, Mauro Overend

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smart living lab

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EPFL

Our scientific partners from Cambridge University, and the Massachusetts Institute of Technology as well as the members of the CISBAT 2023 scientific and programming committee and all workshops organisers enthusiastically supported the conference and ensured its quality. We would like to express our sincere thanks for the time and effort they have spent to make it a success.

Our thanks also go to the authors and presenters for sharing their research, and to the numerous scientists who have kindly contributed to the review process. We address particular thanks to the Associate Editors, for the many hours invested in curating more than 300 papers.

Behind the scenes, we have received much competent support from the EPFL administration, the Swiss Tech Convention Center staff as well as from our diverse suppliers. We herewith express our sincere thanks for their efficient and friendly collaboration.

To make a hybrid conference work also for remote participants is always a challenge, met thanks to the expertise of the filming company and the and immense commitment of the team of the EPFL Platform Measurement and Information Technology PL-MTI, whose professional support has been essential at every stage of preparation and during the conference.

Finally, we cordially thank all our speakers, authors and participants who are bringing CISBAT to life.

*In partnership with myclimate, CISBAT 2023 will fully offset all CO2 emissions generated by the event, including participants' travel and lodging, infrastructure, meals etc. by contributing to meticulously monitored climate protection projects.*

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## CONFERENCE HOSTS

The Smart Living Lab works at the forefront of research and technological development in renewable energy, building science, urban physics, human-building interaction and circularity.

A joint venture of EPFL, Fribourg University and University of Applied Sciences and Architecture Fribourg it evolves since 2016 under the academic leadership of Prof. Marilyne Andersen of the School of Architecture, Civil and Environmental Engineering (ENAC) of the Ecole Polytechnique Federale de Lausanne (EPFL) in Switzerland, with Dr Martin Gonzenbach as Head of Operations. The lab has its seat in Fribourg where it is currently constructing a large experimental building to test and implement the most recent technology destined to bring along the energy transition.

EPFL coordinates and financially supports the Conference, which takes place in the Swiss Tech Convention Center located on its Lausanne campus.

## CISBAT CONFERENCE CYCLE

To meet the needs of a fast growing world population and mitigate human induced climate change, the global scientific community more than ever needs to find creative solutions - fast. The built environment -- as one of the main energy consumers -- poses a particular challenge in this context, as human requirements of comfort and health as well as behavioural aspects need to be taken into account to render the sector truly sustainable. This makes the building scientists' task infinitely more complex but also very fascinating.

Since the Solar Energy and Building Physics Lab (LESO-PB) of the Swiss Federal Institute of Technology in Lausanne (EPFL) organised the first CISBAT Conference in 1991, much progress has been achieved in this sector.

However, much more needs to be done to render the building sector truly sustainable for generations to come. Fully committed to be catalysts of change in this field, Smart Living Lab and EPFL are pleased to host the CISBAT Conferences from 2023.

## CONFERENCE CHAIR

Marilyne Andersen is Full Professor of Sustainable Construction Technologies and Head of the EPFL Laboratory of Integrated Performance in Design (LIPID) as well as Academic Director of the Smart Living Lab, co-leader of the Student Kreativity and Innovation Laboratory (SKIL) and former Dean of the EPFL School of Architecture, Civil and Environmental Engineering (ENAC).

Earlier in her career, she was at MIT as a Professor in Building Technology, establishing the MIT Daylighting Lab in 2004. Her work focuses on the impact of daylight on occupants' comfort, perception, and health.

She has authored 200+ papers, winning multiple awards, and co-founded the startup OCULIGHT dynamics. Andersen also led the Swiss Team's victory in the U.S. Solar Decathlon 2017 with the NeighborHub project and curated the EPFL Pavilions' Lighten Up! exhibition.

She is Vice-Chair of the Foundation Culture du Bâti and of the ArtTech Foundation, Board member of Holcim Foundation for Sustainable Construction, and an expert in InnoSuisse's Innovation Council. She plays an active role in numerous editorial and committee positions.

# EVENING EVENT
# Thursday 14 September

## DINNER CRUISE ON LAKE GENEVA

Thursday, 14 September, 19:45 – 23:00 – separate registration needed


### Boarding at 19:45 – Departure at 20:00 precisely - Return at 23:00

The cruise will take us along the UNESCO world heritage vineyards of Lavaux past Montreux to the famous castle «Château de Chillon» and back to Lausanne. While enjoying a meal against the beautiful backdrop of Swiss Alpine peaks, you will have time to discuss the day's rich conference programme and network with other participants.

### Individual transfer from EPFL to Lausanne Ouchy

Metro M1 from EPFL to Lausanne Centre "Flon"
Metro M2 from Lausanne "Flon" to "Ouchy"
5' walk to harbour, where we will board the "Lausanne" at Dock 4
(please allow 50' for the whole trip)

# IMPRESSUM

## Conference Organisation

Conference Chair: Prof. Marilyne Andersen
Conference Manager: Barbara Smith
MC: Dr Martin Gonzenbach
EPFL | Smart Living Lab
Fribourg / Switzerland
cisbat@epfl.ch / http://cisbat.org

## Scientific partners

Massachusetts Institute of Technology, USA
Cambridge University, UK

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# CISBAT 2023

# EPFL - Lausanne - Switzerland

## 13-15 September 2023


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