

CISBAT 2021

Journal of Physics: Conference Series Volume 2042

Lausanne, Switzerland and Online
8 – 10 September 2021

Part 1 of 2

ISBN: 978-1-7138-5013-7
ISSN: 1742-6588

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

This work is licensed under a Creative Commons Attribution 3.0 International Licence.
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2023)

For permission requests, please contact the Institute of Physics
at the address below.

Institute of Physics
Dirac House, Temple Back
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481
Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

PART 1

CISBAT 2021 International Hybrid Conference Carbon Neutral Cities – Energy Efficiency & Renewables in the Digital Era

Prof. Dr Jean-Louis Scartezzini, Barbara Smith

Peer Review Declaration

Targeting Building Energy Efficiency Using Thermal Infrared Earth Observation Telescopes	1
<i>Hui Ben, Erik Mackie, Ian Parry, Emily Shuckburgh, George Hawker, Marco Gomez Jenkins</i>	
Quantification of the Suitable Rooftop Area for Solar Panel Installation from Overhead Imagery Using Convolutional Neural Networks	7
<i>Roberto Castello, Alina Walch, Raphaël Attias, Riccardo Cadei, Shasha Jiang, Jean-Louis Scartezzini</i>	
Presentation of New Geospatial Datasets for Renewable Thermal Energy Systems Modelling in Switzerland.....	13
<i>Jonathan Chambers, Mercedes Rittman-Frank, Martin Patel</i>	
Deep Reinforcement Learning for Room Temperature Control: A Black-Box Pipeline from Data to Policies	19
<i>L Di Natale, B Svetozarevic, P Heer, C N Jones</i>	
Evaluating Superblock Design to Enhance Urban Greening.....	25
<i>Sven Eggimann, Philipp Lischer, Janine Bolliger</i>	
An Adaptive Control Framework Based on Reinforcement Learning to Balance Energy, Comfort and Hygiene in Heat Pump Water Heating Systems.....	31
<i>Amirreza Heidari, Francois Marechal, Dolaana Khovalyg</i>	
Use of Machine-Learning for Monitoring Solar Thermal Plants.....	38
<i>Joachim Werner Hofmann, Bernd Sitzmann, John Dickinson, Dominique Kunz, Ralph Eismann</i>	
Artificial Intelligence for Detecting Indoor Visual Discomfort from Facial Analysis of Building Occupants	44
<i>Hicham Johra, Rikke Gade, Mathias Østergaard Poulsen, Albert Daugbjerg Christensen, Mandana Sarey Khanie, Thomas Moeslund, Rasmus Lund Jensen</i>	
Statistical Analysis of 200 Digital Twins for Thermal Load of Swiss Buildings Created from Smart Grid Monitoring Data.....	50
<i>Andreas Melillo, Esther Linder, Braulio Barahona, Philipp Schuetz</i>	
Using Machine Learning to Estimate the Technical Potential of Shallow Ground-Source Heat Pumps with Thermal Interference	56
<i>Alina Walch, Roberto Castello, Nahid Mohajeri, Agust Gudmundsson, Jean-Louis Scartezzini</i>	

Quantification of Existing Rooftop PV Hourly Generation Capacity and Validation Against Measurement Data.....	62
<i>Alina Walch, Martin Rüdüsüli, Roberto Castello, Jean-Louis Scartezzini</i>	
Buildingenergy.ninja: A Web-Based Surrogate Model for Instant Building Energy Time Series for Any Climate.	68
<i>Paul Westermann, Guillaume Rousseau, Ralph Evins</i>	
Detection of Thermal Anomalies on Building Façades Using Infrared Thermography and Supervised Learning.....	74
<i>Braulio Barahona, Roger Buck, Oskar Okaya, Philipp Schuetz</i>	
Satellite Imagery to Select a Sample of Rooftops for a PV Installation Project in Jeddah, Saudi Arabia.....	80
<i>Luke S. Blunden, Mostafa Y.M. Mahdy, Abdulsalam S. Alghamdi, AbuBakr S Bahaj</i>	
Data Analytics for Smart Buildings: A Classification Method for Anomaly Detection for Measured Data	86
<i>Enguerrand de Rautlin de la Roy, Thomas Recht, Akka Zemhari, Pierre Bourreau, Laurent Mora</i>	
Big Building Data 2.0 - A Big Data Platform for Smart Buildings	92
<i>Lucy Linder, Frédéric Montet, Jean Hennebert, Jean-Philippe Bacher</i>	
Residential Density Classification for Sustainable Housing Development Using a Machine Learning Approach.....	98
<i>N Mohajeri, A Walch, D Assouline, A Gudmundsson, A Smith, T Russel, J Hall</i>	
Neuro-Symbolic A.I. for the Smart City.....	104
<i>Gilles Morel</i>	
A Machine-Learning Model for the Prediction of Aggregated Building Heating Demand from pan-European Land-Use Maps	110
<i>G Peronato, R Boghetti, J H Kämpf</i>	
Data Mining in the Context of Urban Metabolism: A Case Study of Geneva and Lausanne, Switzerland.....	116
<i>N S Wiedmann, A Athanassiadis, C R Binder</i>	
A Comparative Analysis of Patterns of Electricity Use and Flexibility Potential of Domestic and Non-Domestic Building Archetypes Through Data Mining Techniques	122
<i>Selin Yilmaz, Jonathan Chambers, Xiang Li, Martin K. Patel</i>	
Classification of the Energy Production Potential of Water Lens Solar Concentrators Using Machine Learning.....	128
<i>Hamidreza Zarrinkafsh, Nasim Eslamirad, Francesco De Luca</i>	
Empirical Evaluation of Energy Profiles of Thermally-Efficient Homes with Smart Energy Systems and Controls	134
<i>Rajat Gupta, Johanna Morey</i>	
Benchmarking of Data Predictive Control in a Real-Life Apartment During Heating Season.....	140
<i>Benjamin Huber, Felix Bünning, Antoon Decoussemaeker, Philipp Heer, Ahmed Aboudonia, John Lygeros</i>	
Cloud-Based Hardware-In-The-Loop Testing of Building Automation Controllers	146
<i>M Maghnie, F Stegemerten, A Niewöhner, M Baranski, A Kümpel, D Müller</i>	

Prediction of Domestic Hot Water Temperature in a District Heating Network.....	152
<i>Frédéric Montet, Lorenz Rychener, Alessandro Pongelli, Jean Hennebert, Jean-Philippe Bacher</i>	
Dimensionality Reduction and Clustering of Time Series for Anomaly Detection in a Supermarket Heating System.....	158
<i>Lorenzo Salmina, Roberto Castello, Justine Stoll, Jean-Louis Scartezzini</i>	
Towards an Intelligent HVAC System Automation Using Reinforcement Learning.....	164
<i>T Schreiber, A Schwartz, D Muller</i>	
Temperature Level Optimization for Low-Grade Thermal Networks Using the Exergy Method	170
<i>Yolaine Adihou, Malick Kane, Julien Ramousse, Bernard Souyri</i>	
Experiment Strategy for Evaluating Advanced Building Energy Management System.....	176
<i>Hanmin Cai, Fazel Khayatian, Philipp Heer</i>	
ProsNet – a Modelica Library for Prosumer-Based Heat Networks: Description and Validation	182
<i>I Elizarov, T Lickleder</i>	
Evaluation of Linear and Nonlinear System Models in Hierarchical Model Predictive Control of HVAC Systems.....	188
<i>Steffen Eser, Phillip Stoffel, Alexander Kumpel, Dirk Muller</i>	
An Assessment of Operational Economic Benefits of Renewable Energy Communities in Belgium.....	194
<i>Alex Felice, Lucija Rakocevic, Leen Peeters, Maarten Messagie, Thierry Coosemans, Luis Ramirez Camargo</i>	
Multi-Objective Optimization of a Power-To-Hydrogen System for Mobility Via Two-Stage Stochastic Programming.....	200
<i>Marta Fochesato, Philipp Heer, John Lygeros</i>	
Short-Term Load Forecasting in a Microgrid Environment: Investigating the Series-Specific and Cross-Learning Forecasting Methods.....	206
<i>Evgenii Genov, Stefanos Petridis, Petros Iliadis, Nikos Nikopoulos, Thierry Coosemans, Maarten Messagie, Luis Ramirez Camargo</i>	
Comparison of Flexibility Factors for a Residential Building.....	212
<i>Monika Hall, Achim Geissler</i>	
Self-Adjusting Model Predictive Control for Modular Subsystems in HVAC Systems.....	218
<i>Alexander Kümpel, Phillip Stoffel, Dirk Müller</i>	
An Optimisation Approach for Spatial Allocation of Energy Sources to District Heating Networks	224
<i>Xiang Li, Jonathan Chambers, Selin Yilmaz, Martin K. Patel</i>	
Characteristics and Challenges in Prosumer-Dominated Thermal Networks.....	230
<i>Thomas Lickleder, Daniel Zinsmeister, Ilya Elizarov, Vedran Perić, Peter Tzscheutschler</i>	
Industrial Waste Heat District-Heating Design Based on Geographic Information System: Case Study in Vitoria-Gasteiz (Spain).....	237
<i>Mikel Lumbreras, Gonzalo Diarce, Koldobika Martin-Escudero, Alvaro Campos-Celador, Pello Larrinaga</i>	

The Internet-Of-Buildings (IoB) — Digital Twin Convergence of Wearable and IoT Data with GIS/BIM.....	243
<i>Clayton Miller, Mahmoud Abdelrahman, Adrian Chong, Filip Biljecki, Matias Quintana, Mario Frei, Michael Chew, Daniel Wong</i>	
Do-It-Yourself, Low-Cost Building Monitoring System.....	249
<i>Olivier Steiger, Reto Marek</i>	
Comparative Study of Neural Network Based and White Box Model Predictive Control for a Room Temperature Control Application	255
<i>Phillip Stoffel, Max Berkthold, Arman Gall, Alexander Kiimpel, Dirk Muller</i>	
Key Features of Climate-Neutral Energy Systems for Municipalities in Different Climate Zones.....	261
<i>Gerhard Stryi-Hipp, Annette Steingrube, Marc-André Triebel, Vicky Albert-Seifried</i>	
High-Resolution Air Temperature Mapping in a Data-Scarce, Arid Area by Means of Low-Cost Mobile Measurements and Machine Learning	268
<i>Ahmed H M Eldesoky, Nicola Colaninno, Eugenio Morello</i>	
An Investigation on the Radiant Heat Balance for Different Urban Tissues in Mediterranean Climate: A Case Study.....	274
<i>G Evola, V Costanzo, L Marletta, F Nocera, M. Detommaso, A. Urso</i>	
The Influence of Perceived Environmental Quality on Thermal Comfort in an Outdoor Urban Environment During Hot Summer	280
<i>Kevin Ka-Lun Lau, Chun Yin Choi</i>	
Carbon Neutral Urban Block in Athens - 2050.....	286
<i>Eleni-Marina Maragkaki, Kartikeya Rajput</i>	
The Solar Block Generator: An Additive Parametric Method for Solar Driven Urban Block Design	292
<i>Jonathan Natanian, Francesco De Luca, Thomas Wortmann, Guedi Capeluto</i>	
Informing the Design of Courtyard Street Blocks Using Solar Energy Models: A Case Study of a University Campus in Singapore.....	298
<i>Ekaterina Vitineva, Zhongming Shi, Pieter Herthogs, Reinhard König, Aurel von Richthofen, Sven Schneider</i>	
Development and Initial Tests of an Urban Comfort Monitoring System	304
<i>Giacomo Chiesa, Luo Yingjun, Sheng Yuxuan, Wang Guoxin, Zhang Bolun</i>	
Impact of Multiple Reflections on Urban Acoustics	310
<i>Inès de Bort, Benoit Beckers</i>	
The Role of Building Morphology on Pedestrian Level Comfort in Northern Climate	316
<i>Nasim Eslamirad, Francesco De Luca, Kimmo Sakari Lylykangas</i>	
Linking Urban Scenarios with Energy Simulations for Dense Urban Planning Under Climate Change.....	322
<i>J Felkner, B Marshall, S Richter, E Mbata, S Zigmund, Z Nagy</i>	
Energy Analysis of Texas Metropolitan Areas for Climate Change Mitigation Using LiDar.....	328
<i>J Felkner, E Mbata</i>	
Evaporative Cooling Strategies in Urban Areas: The Potential of Vertical Greening Systems to Reduce Nocturnal Heat Stress	334
<i>Fabian Görgen, Monica Rossi-Schwarzenbeck</i>	

Building Materials for Cities and Climate Change – a Material Catalogue with Recommendations	340
<i>C Hoffmann, A Geissler, M Mutti, A Wicki, F Schwager</i>	
Quantifying the Impacts of Urban Morphology on Modifying Microclimate Conditions in Extreme Weather Conditions	346
<i>K. Javanroodi, V.M. Nik, J.L. Scartezzini</i>	
Integrated Analysis of Regional Energetic Demand and Renewable Energy Potentials at the Example of Ludwigsburg County, Germany	352
<i>Chris Kesnar, Verena Weiler, Julia Neuhäuser, Bastian Schröter</i>	
Climate Change and Indoor Temperature Variation in Venetian Buildings: The Role of Density and Urban Form	358
<i>D Maiullari, B Gherri, C Finizza, M Mareto, E Naboni</i>	
The Assessment of Outdoor Thermal Comfort Inside Oasis Settlements in North Africa - Algeria.....	364
<i>Mohamed Elhadi Matallah, Djamel Alkama, Waqas Ahmed Mahar, Shady Attia</i>	
Retrofitting Solutions for a Campus Building to Mitigate Urban Heat Island in a Hot Humid Climate	370
<i>Vajreshwari Patil, Maite Bizcarguenaga, Katherine Lieberknecht, Juliana Felkner</i>	
A Simplified Procedure to Improve the Usability of Hydrodynamic Modelling Software in Regenerative Urban Design.....	376
<i>M. Pereira Guimarães, A. Moredia Valek, V. Dessi, M. Clementi</i>	
Impact of Volume Distribution on Pedestrian Wind Environment in High-Rise Urban Districts: A CFD Study.....	383
<i>Milad Sadeghfar, Sadra Sahebzadeh</i>	
Characterization of the Urban Microclimate by the Modelling of Urban Planning Policies in France	389
<i>Magalie Técher, Hassan Ait Haddou, Rahim Aguejdad</i>	
Optimizing Solar Access and Density in Tel Aviv: Benchmarking Multi-Objective Optimization Algorithms.....	395
<i>Thomas Wortmann, Jonathan Natanian</i>	
Automated Modelling of Building Energy Systems with Mode-Based Control Algorithms in Modelica.....	401
<i>Xiaoye Cai, Junyi Xue, Alexander Kümpel, Dirk Müller</i>	
Experimental Implementation of a Context-Aware Prosumer	407
<i>Hanmin Cai, Philipp Heer</i>	
Development of a Freely Distributable CFD Tool for Approximate and Detailed Simulations of the Flow Around a Complex of Buildings.....	413
<i>J Decaix, P Jaboyedoff, G. Duthé, E. El Sergany, L. Aiulfi</i>	
A Machine Learning Approach to Enhance Indoor Thermal Comfort in a Changing Climate.....	419
<i>Tobias Kramer, Veronica Garcia-Hansen, Sara Omrani Vahid M. Nik, Dong Chen</i>	
A Tool for Automated Detection of Hidden Operation Modes in Building Energy Systems	425
<i>Thomas Storek, Jonathan Kriwet, Alexander Kümpel, Dirk Müller</i>	
Time Enhanced Architectural Modelling (T.E.A.M.): Virtual Reality Project for the Planning and Visualization of Kinetic Architecture and Dynamic Design.....	431
<i>V. Temporin, J. Volpato, P.L. Cocco, A. D'Angelo, M. Tieghi</i>	

Modelling Climate Related Performances of Building Wall Coatings and Understanding the Portability of the “Künzel” Rule in Different Climates.....	437
<i>Andrea Augello, Joy Alexis Peren, Heiko Fechner, Enrico De Angelis</i>	
Procedural Modeling Buildings for Finite Element Method Simulation.....	443
<i>G Besuievsky, E García-Nevado, G Patow, B Beckers</i>	
Implementing Air-Based Thermally Activated Building Systems in Retrofitted Tertiary Buildings – Towards the Proof of Concept.....	449
<i>M Cézard, M Labat, S Lorente</i>	
CFD Model to Assess Parameters Influencing Piston Wind in a Subway Tunnel and Station	455
<i>Loreline Faugier, Benoît G. Marinus, Walter Bosschaerts, Delphine Laboureur, Karim Limam</i>	
Simulation-Based Optimization of Energy Performance with Focus on Sustainable Building Services Engineering.....	461
<i>Daniel Kierdorf, Farzan Banihashemi, Hannes Harter, Michael Vollmer, Werner Lang</i>	
Development of a Modelica-Based Simplified Building Model for District Energy Simulations.....	467
<i>Alessandro Maccarini, Enrico Pratavia, Angelo Zarrella, Alireza Afshari</i>	
How Daylight Representation in Architectural Competitions Images Can Lead to an Erroneous Interpretation of Projects	473
<i>Bernard Paule, Joshua Pereira</i>	
Transient Thermal Response of Opaque Building Envelope Elements: EPFL Campus Case Study.....	479
<i>Mohammad Rahiminejad, Cécile Berquand, Dolaana Khovalyg</i>	
Assessment of Thermal and Electrical Performance of BIPV Façades Using Simplified Simulations	485
<i>Romain Schindelholz, Mohammad Rahiminejad, Arnab Chatterjee, Dolaana Khovalyg</i>	
Information Model Development for the Quality Assurance of Technical Equipment in Small Buildings	491
<i>M Stobbe, A Gerber, S Herkel, N Réhault, C Nytsch-Geusen</i>	
Fault Detection and Diagnosis in Building Energy Systems: A Tool Chain for the Automated Generation of Training Data.....	497
<i>Christine van Siphoudt, Florian Stinner, Gerrit Bode, Alexander Kümpel, Dirk Müller</i>	
BIM in Early Design Phase: Workflow for Preliminary Assessment with SBToolCZ	503
<i>J Veselka, J Hájek, M Volf, J Růžička, V Žd’ára</i>	
Heat Flow Metering in Building Practice - A Critical Field Study for a Large Industrial Building Complex	509
<i>Karl Walther, Karsten Voss</i>	
Sustainable Energy Supply for Self-Sufficient Buildings with Seasonal Energy Storages – Parametric Study	515
<i>Andrii Zakovorotnyi</i>	
SEAMS: An Alternative Techno-Economic System to Foster the Sustainable Development of Renewable Energy Use in Urban Areas.....	521
<i>D Bourguignon, P Crépeaux, F Adam</i>	
Monitoring of Photovoltaic Systems and Evaluation of Building Energy Self-Consumption.....	527
<i>Giacomo Cillari, Fabio Fantozzi, Alessandro Franco</i>	

District Heating Network Modelling for Future Integration of Solar Thermal Energy	533
<i>Clement Dromart, Loïc Puthod, Jérôme H. Kämpf, Diane von Gunten</i>	
Modeling of Photovoltaic-Thermal District Heating with Dual Thermal Modes	539
<i>Anneka Kang, Ivan Korolija, Dimitrios Rovas</i>	
An Integrated Decision-Making Framework for Sustainable Data Center Operation Through Intelligent Load Scheduling	545
<i>Nuo Lei, Zhu Cheng, Zhi Cao, Eric Masanet</i>	
Hydrogen-Based Electricity Storage Optimization on Buildings by Coupling Thermal and Photovoltaic Electricity Production Towards Carbon Neutrality.....	551
<i>Y Morier, S Aguacil Moreno, P Couty</i>	

PART 2

CFD-Based Surrogate Modelling of Urban Wind Farms Using Artificial Neural Networks: Double Rotor Arrangements.....	557
<i>Sadra Sahebzadeh, Abdolrahim Rezaeiha, Hamid Montazeri</i>	
Solar Thermal Regeneration of Borehole Heat Exchangers in Urban and Suburban Districts.....	563
<i>David Sauter, Manuel Hunziker, Joachim Poppei, Fabien Cochand, Markus Hubbuch, Jiirg Rohrer</i>	
An Energy-Economic Analysis of Real-World Hybrid Building Energy Systems	569
<i>Parantapa Sawant, Christian Braasch, Manuel Koch, Adrian Bürger, Sonja Kallio</i>	
Impact of Demand Response on BIPV and District Multi-Energy Systems Design in Singapore and Switzerland.....	575
<i>Christoph Waibel, Shanshan Hsieh, Arno Schlüter</i>	
Residential Rooftop PV Power Generation to Support Cooling Loads and National Targets in Saudi Arabia.....	581
<i>M Alam, A S Alghamdi, A S Bahaj, P A B James, L S Blunden</i>	
Application of Indirect Evaporative Cooling Strategies for a Warm-Humid Climate	587
<i>José Roberto García Chávez, Anaís Carrillo Salas, Karina A García Pardo</i>	
Reducing Emissions in London Schools with Photovoltaics.....	593
<i>Daniel Godoy-Shimizu, Stephen Evans, Ivan Korolija, Dominic Humphrey, Sung-Min Hong, Gareth Simons, Yair Schwartz, Paul Ruysssevelt, Philip Steadman, Dejan Mumovic, Anna Mavrogianni</i>	
Solar Thermal Component Activation	599
<i>Helmut Hachul, Daniela Ridder, Yesim Tekinbas, Federico Giovannetti, Finn Weiland, Maik Kirchner</i>	
The Impact of Roof Morphology on Solar Potential: Making Toronto Suburbs Solar Ready	605
<i>Javeriya Hasan, Miljana Horvat, Charles Riddell, Rita Wang</i>	
Experimental Analysis of Heat Prosumers Under Low Temperature Thermal Network	611
<i>Min-Hwi Kim, Dong-Won Lee, Duek-Won Kim, Jaehyeok Heo</i>	
Applying Life Cycle Sustainability Assessment to Maximise the Innovation Potential of New Technologies for Critical Components in Wind Turbines.....	617
<i>Wai Chung Lam, Sofie De Regel, Karolien Peeters, Carolin Spirinckx</i>	

Solar Energy Potential at the Great St Bernard Pass	623
<i>David Notzon, Pietro Florio, Andreas Schüler</i>	
Dynamic LCA of a Single-Family House, Equipped with a Micro-Cogeneration Unit, Using a Variable Share of Biomethane	629
<i>Pierrryves Padey, Marten Fesefeldt, Kyriaki Goulouti, Sébastien Lasvaux, Massimiliano Capezzali</i>	
Impact of Roof Geometry on Cross-Ventilation in Vaulted Buildings: A CFD Study	635
<i>Milad Sadeghfar, Sadra Sahebzadeh</i>	
Impact of Wind Direction on Wind Energy Potential for Building- Integrated Ducted Wind Turbines: A Numerical Analysis	641
<i>Sadra Sahebzadeh, Hamid Montazeri, Abdolrahim Rezaeiha</i>	
Impact of Shared Battery Energy Storage System on Total System Costs and Power Peak Reduction in Commercial Buildings.....	647
<i>Ida E. U. Skoglund, Mette Rostad, Kasper E. Thorvaldsen</i>	
Sustainable Long-Term Energy Planning for a District in Suzhou City, China.....	653
<i>Mashaël Yazdanie, Chenyu Zhou</i>	
Concentrated Solar Power (CSP) for Sustainable Architecture to Supply Domestic Hot Water and Heating Loads of Buildings.....	659
<i>Hamidreza Zarrinkafsh, Nasim Eslamirad, Francesco De Luca</i>	
Exploring Light Exposure of Hospital Nurses Working Rapidly Rotating Shifts in Relation to Sleepiness and Sleep.....	665
<i>Mariëlle P.J. Aarts, Steffen L. Hartmeyer, Kars Morsink, Helianthe S.M. Kort</i>	
Implementation of Machine Learning Techniques for the Quasi Real-Time Blind and Electric Lighting Optimization in a Controlled Experimental Facility	671
<i>Chantal Basurto, Roberto Boghetti, Moreno Colombo, Michael Papinutto, Julien Nembrini, Jérôme H Kämpf</i>	
Non-Intrusive Luminance Mapping Via High Dynamic Range Imaging and 3-D Reconstruction	677
<i>Michael Kim, Athanasios Tzempelikos</i>	
Utilization of Programmable Cameras for Web-Based Sensing and Control of Daylight in Buildings	683
<i>Dongjun Mah, Michael Kim, Athanasios Tzempelikos</i>	
Towards the Integration of Personal Task-Lighting in an Optimised Balance Between Electric Lighting and Daylighting: A User-Centred Study of Emotion, Visual Comfort, Interaction and Form-Factor of Task Lights	689
<i>M. Papinutto, M. Colombo, M. Golsouzidou, K. Reutter, D. Lalanne, J. Nembrini</i>	
A Conceptual Simulation Workflow to Guide Design Decisions Regarding the Effects of Daylight on Occupants' Alertness	696
<i>Pierson Clotilde, Soto Magán Victoria Eugenia, Aarts Mariëlle, Andersen Marilyne</i>	
Laboratory Testing of a High Efficiency Light Redirection System	702
<i>A Thanachareonkit, L L Fernandes, J Mouledoux, E S Lee</i>	
The Impact of Daylight Presence on Cooling Strategies: Energy Simulations of a Test Room in Austin, Texas, and Geneva, Switzerland	709
<i>I T Uckok, M Addington, J Felkner</i>	

Exploring the Relationship Between Light and Subjective Alertness Using Personal Lighting Conditions	715
<i>J. van Duijnhoven, M.P.J. Aarts, E.R. van den Heuvel, H.S.M. Kort</i>	
Towards a Wearable Sensor for Spectrally-Resolved Personal Light Monitoring.....	721
<i>Forrest Simon Webler, Giorgia Chinazzo, Marilyne Andersen</i>	
Influence of Scale on the Daylighting System Evaluation in Physical Models: Experimental Method Based on Objective and Subjective Measurements.....	727
<i>Safa Daich, Mohamed Yacine Saadi, Barbara E.A Piga, Ahmed Motie Daiche</i>	
Review of Spectral Lighting Simulation Tools for Non-Image- Forming Effects of Light	733
<i>M Gkaintatzi-Masouti, J van Duijnhoven, M P J Aarts</i>	
Evaluation of a New User-Centric Sensor-Based Lighting Control Approach for Circulation Areas	739
<i>Ö Karaman Madan, MK Pekerçli</i>	
Large Lightwells to Revitalize a Deep Office Building in Lausanne	745
<i>Bernard Paule, Anne Tardin, Ly Som</i>	
Immersive Virtual Reality as a Tool for Lighting Design: Applications and Opportunities	751
<i>Michelangelo Scorpio, Roberta Laffi, Ainoor Teimoorzadeh, Sergio Sibilio</i>	
Data-Driven Occupant-Centric Rules of Automated Shade Adjustments: Luxembourg Case Study	757
<i>Ghadeer Derbas, Karsten Voss</i>	
Data Mining for Evaluating the Rebounds-Associated Emissions Due to Energy-Related Consumer Behavioural Shifts in Switzerland	763
<i>Rhythima Shinde, Sidi Peng, Saloni Vijay, Stefanie Hellweg, Andreas Froemelt</i>	
Urban Cooling Strategies as Interaction Opportunities in the Public Space: A Methodological Proposal.....	769
<i>X. Stavropoulos-Laffaille, I. Requena-Ruiz, C. Drozd, T. Leduc, M. Servières, D. Siret</i>	
Impact of COVID-19 Countermeasures on the Energy and Water Consumption and CO2 Concentration of Municipal Buildings	775
<i>Florian Stinner, Alexander Kümpel, Dirk Müller</i>	
A Review of Common Human Errors in Design, Installation, and Operation of Multiple-Zone VAV AHU Systems.....	781
<i>Narges Torabi, H. Burak Gunay, William O'Brien</i>	
Environmental Preferences of Occupants: A Multi-Domain Approach in the Swiss Open Office Case Study.....	788
<i>Verena M. Barthelmes, Caroline Karmann, S. Viviana González, Arnab Chatterjee, Jan Wienold, Marilyne Andersen, Dusan Licina, Dolaana Khovalyg</i>	
Parameters and Indicators Used in Indoor Environmental Quality (IEQ) Studies: A Review	794
<i>Muriel Diaz, Maria Beatriz Piderit, Shady Attia</i>	
Nature Based Solution for Indoor Air Quality Treatment.....	800
<i>Heinz Gattringer, Nektaria Efthymiou-Charalampopoulou, Egmont Lines, Maria Kolokotroni</i>	
Daylighting Provision and Visual Comfort in Unilaterally and Bilaterally Illuminated Classrooms	806
<i>Martina Liberska, Lenka Maierová</i>	

User's Behaviours in Non-Residential Mixed-Mode Buildings: A Case Study in a Tropical Climate	812
<i>M Payet, M David, P Lauret, F Garde</i>	
Environmental Thermal Influence Over Soundscape Perception: A Test Room Experimental Campaign Involving the Psychological and Physiological Description of the Indoor Environment.....	818
<i>Ilaria Pigliautile, Gioia Fusaro, Jian Kang, Wen-Shao Chang, Anna Laura Pisello</i>	
Thermal Comfort Analysis: Comparison Between Model and Experimental Data in Tropical Climate	824
<i>T. Rakotoarivelo, F. Miranville, C. Gronfier, B. Malet-Damoui</i>	
Influence of Some Specific Meteorological Events on Indoor Radon Dynamic in Western Switzerland.....	830
<i>J Rey, S Goyette, M Palacios, F Barazza, M Gandolla, J Goyette Pernot</i>	
A Survey-Based Approach Used to Analyse the Indoor Satisfaction and Productivity Level of User in Smart Working During Lock-Down Due to the COVID-19 Pandemic	836
<i>Francesco Salamone, Lorenzo Belussi, Ludovico Danza, Italo Meroni</i>	
Environmental Assessment Platform for Cities Racing to Net Zero	842
<i>A S Bahaj, P Turner, M Mahdy, S Leggett, N Wise, A Alghamdi</i>	
Performance Gap Analysis of a New Minergie A/P District.....	848
<i>Pauline Brischoux, Stefan Schneider, Pierre Hollmuller</i>	
Preliminary Investigation on the Transient Hygrothermal Analysis of a CLT-Based Retrofit Solution for Exterior Walls	854
<i>V Costanzo, G Evola, L Marletta, G Roccella</i>	
The Energy Performance Gap in Swiss Residential Buildings: A Roadmap for Improvement	860
<i>Stefano Cozza, Jonathan Chambers, Martin K. Patel</i>	
Domestic Hot Water Optimizing Potential in Existing Or Renovated Multifamily Residential Buildings	867
<i>Flourentzos Flourentzou, Joshua Pereira</i>	
Actual Energy Savings of More than 1000 Renovated Buildings in Geneva	873
<i>Basile Grandjean, Stefan Schneider, Pierre Hollmuller</i>	
Towards Climate Resilient Residential Buildings: Learning from Traditional Typologies	879
<i>D Mohaibesh, S Monna, H Qadi, R Sokkar</i>	
Thermal Energy Autonomy Study for a Reference House Equipped with PV Panels, a Heat Pump and PCM Storage Elements.....	885
<i>J. Robadey, S. Vuilleumier, E.-L. Niederhäuser</i>	
Sensitivity Analysis of Heating a Typical UK Dwelling and Implications for Retrofit Design.....	891
<i>Kate Simpson, Peter Childs, Jennifer Whyte</i>	
Electricity Demand Flexibility Potential of Optimal Building Retrofit Solutions.....	897
<i>Emmanouil Thrampoulidis, Kristina Orehounig, Gabriela Hug</i>	
Comparing Metrics for Scenario-Based Robustness Assessment of Building Performance	903
<i>Linus Walker, Alexandra Kuhn, Ilias Hischier, Arno Schlueter</i>	

Effectiveness of Passive Climate Change Adaptation Measures in Switzerland: A Climate-Based Analysis on Natural Ventilation and Overheating Risks Reduction in Dwellings.....	909
<i>Daniel ZepedaRivas, Sergi Aguacil Moreno, Jorge Rodríguez Álvarez</i>	
Synchronized Coupling of Thermal Mass and Buoyancy Ventilation: Wood Versus Concrete.....	915
<i>L Barrett, J Jeong, R Price, C Subasic, S Asselin, R Fortin, A Freear, D Kennedy, K Moe, S Craig</i>	
Non-Domestic Building Stock Energy and Carbon Modelling for Policy Advice – a User Requirements Survey.....	921
<i>Julian Bischof, Aidan Duffy</i>	
The Retrofit of ‘70s Office Buildings Curtain Walls in London.....	927
<i>A Cirillo, A Scofone</i>	
Stay Cool Without Fossil Fuel. a Passive Eco-Cooler for Low-Income Population in Informal Settlements	933
<i>Marwa Dabaieh, Monica Michel Zakaria, Medhat Kazem</i>	
Geometrically Activated Thermal Mass: Wood Vs. Concrete	939
<i>Remy Fortin, Salmaan Craig</i>	
The Influence of Envelopes in the Thermal Performance of Residential Buildings, from the Perspective of Bioclimatic Architecture	945
<i>Emeli Lalesca Aparecida da Guarda, Veronica Martins Gnecco, Artur Martins Kamimura, Martin Ordenes Mizgier, Michele Fossati</i>	
Fighting Energy Poverty in a Typical Peruvian Rural House	951
<i>Gino Gutierrez, Enrico De Angelis</i>	
Effect of Thermal Mass of Insulated and Non-Insulated Walls on Building Thermal Performance and Potential Energy Saving.....	957
<i>M Haj Hussein, S Monna, A Juaidi, A Barlet, M Baba, D Bruneau</i>	
Cost Optimal Energy Retrofit Strategies for Public Administrative Buildings: A Cairo Case Study	963
<i>A Hamada, R Raslan, D Mumovic</i>	
Development of Strategy for Combined Smart Ventilated Window and PCM Energy Storage Control for Residential Building Energy Saving	969
<i>Yue Hu, Per Kvols Heiselberg</i>	
Thermal Performance of a Non–segmented and Segmented Tall Atrium in Hot and Humid Climate	975
<i>Priya Pawar, Deying Zhang, Xiaoying Wu, Werner Lang</i>	
Green and Transportable Modular Building: A Prefabricated Prototype of Resilient and Efficient House.....	981
<i>Simona Roggeri, Paolo Olivari, Lavinia Chiara Tagliabue</i>	
A Tool for Optimal Refurbishment Design of Low-Energy Buildings.....	987
<i>I Salerno, M F Anjos, K McKinnon, E S Mazzucchelli</i>	
Embodied Greenhouse Gas Emissions Reduction for Structural Elements in Office Buildings	993
<i>Nicolas Alaux, Endrit Hoxha, Marcella Ruschi Mendes Saade, Alexander Passer</i>	
LCA Evaluation and Energy Performance of a Housing Building in Different Technological Scenarios	999
<i>Luigi Costardi, Lavinia Chiara Tagliabue, Mohamed Hamdy, Giovanni Dotelli</i>	

New Circular Building Composite Material to Upcycle Building Wastes.....	1005
<i>Mélanie Horvath, Sophie Trachte, Thomas Pardoën</i>	
Should Biogenic Carbon Be Analysed Separately in the Calculation of the GWP Indicator?.....	1011
<i>Endrit Hoxha, Alexander Passer</i>	
A Comparative Analysis of Quantification and Validation Methods for Prospecting the Anthropogenic Mine as Material Reserve for Circular Construction	1017
<i>Damun Jawanrudi, Joseph McGranahan, Felix Heisel</i>	
Adapting Residential Envelope Assemblies for Full Circularity	1023
<i>Matan Mayer</i>	
Comparative Life Cycle Assessment on City Quarter Level – a Case Study of Redensification	1029
<i>Christina Meier-Dotzler, Hannes Harter, Farzan Banihashemi, Werner Lang</i>	
Deriving Global Carbon Budgets for the Swiss Built Environment.....	1035
<i>Y D Priore, T Jusselme, G Habert</i>	
Implementation of Strategies for the Realization of Ecologically and Economically Optimized Serial Type House Buildings for Social Housing	1041
<i>M Vollmer, H Harter, K Theilig, D Kierdorf, W Lang</i>	
CARES Research: Product and Process Digitalization for Design and Manufacturing of Prefabricated Cardboard Panels.....	1047
<i>Paola Gallo, Rosa Romano, Elisa Belardi</i>	
Gap Between Simplified and Detailed Calculation of the Environmental Impacts of Road Mixtures	1053
<i>Endrit Hoxha, Rolf André Bohne, Alexander Passer</i>	
Design for Disassembly (DfD) in Construction Industry: A Literature Mapping and Analysis of the Existing Designs	1059
<i>Katarzyna Ostapska, Klodian Gradeci, Petra Ruther</i>	
Identification and Life Cycle Based Allocation of Building Emissions Based on a Systematic Literature Review	1065
<i>K Theilig, M Vollmer, W Lang</i>	
Optimization of Photoluminescent Materials for Lighting Energy Saving in the Built Environment	1071
<i>C Chiatti, C Fabiani, A L Pisello</i>	
Subjective Assessment of Visual Comfort in a Daylit Workplace with an Electrochromic Glazed Façade.....	1077
<i>S Jain, C Karmann, J Wienold</i>	
Parametric Design of an Additively Manufactured Building Facade for Bespoke Response to Solar Radiation	1083
<i>Bharath Seshadri, Ina Cheibas, Matthias Leschok, Valeria Piccioni, Ilias Hischier, Arno Schlüter</i>	
Combining Thermal Insulation and Mobile Communication in Buildings: Influence of Laser- Treated Glazing on Microwave Propagation	1090
<i>Jeremy Fleury, Luc Burnier, Héloïse Delaporte, Andreas Schüler</i>	
Analysis of Supplemental Dehumidification for Increased Energy Efficiency of Shoulder Seasons Based on Climate Change Predictions in Austin Texas	1096
<i>B Marshall, J Felkner, Z Nagy</i>	

Phase Change Materials for Building Envelopes in Reunion Island, France	1102
<i>L. Trovalet, L. Liu, D. Bigot, B. Malet-Damour</i>	
Mechanical Characterization of a Concrete Masonry Block Enhanced with Micro-Encapsulated Phase Changing Materials	1108
<i>Talal Salem, Mohamad Kazma, Judy Bitar, Joseph Moussa, Dalia Falah</i>	
Optimal Design of Mass Timber Panels as Dynamic Insulation: Simulations of Steady and Transient Heat Exchange	1114
<i>Anna Halepaska, Salmaan Craig</i>	

Author Index