



Smart Sustainable Technologies

Sustainable Design and Manufacturing (SDM-24)

Sustainability in Energy and Buildings (SEB-24)

Conference Programme



18-20 September 2024

Santa Cruz, Madeira, Portugal

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Chairs' Welcome

11th International Conference on Sustainable Design and Manufacturing SDM-24

On behalf of the organizers of SDM-24 and the esteemed KES community, it is our distinct privilege to extend a heartfelt welcome to you all for the 11th International Conference on Sustainable Design and Manufacturing (SDM-24). This prestigious event will take place in Santa Cruz, Madeira, Portugal, from September 18th to 20th, 2024, and it will also be accessible online via the well-established KES Online platform, offered by KES International.

Throughout the past decade, the SDM community has consistently demonstrated its commitment to advancing research and practice in a wide spectrum of sustainable design and manufacturing domains. These endeavours have yielded a tremendous impact across diverse sectors of society. The technical program of SDM-24 is exceptionally comprehensive, featuring a line-up of keynote presentations, oral sessions, and constructive invited discussions. Encompassing both the theoretical foundations and practical applications of sustainable design and manufacturing, this conference offers a superb forum for the dissemination and deliberation of novel insights and concepts. It serves as a fertile ground for the exchange of knowledge and the incubation of ground-breaking ideas.

We are honoured to have two distinguished keynote speakers: Professor I.S. "Jawa" Jawahir, Professor and James F. Hardyman Chair in Manufacturing Systems; Director of Institute for Sustainable Manufacturing from University of Kentucky, USA and Dr Annela Anger Kraavi Climate Change Policy Group, Centre for Atmospheric Science in the Yusuf Hamied Department of Chemistry at the University of Cambridge, UK. Their talks "Product Circularity Principles for Advancing Sustainable Manufacturing" and "Climate Change: Policy and Politics" respectively will give visions of the challenges of Circular Economy and the Policy implementation to help us address Climate Change challenges. We deeply appreciate their thought leadership contributions and willingness to share their insights with our conference attendees.

The meticulous selection of conference submissions involved a rigorous blind peer-review process, drawing upon the expertise of esteemed reviewers within the manufacturing and design community. Only the most outstanding submissions have been chosen for presentation at the conference and inclusion in the proceedings, which will be published as a distinguished volume in the KES-Springer series 'Smart Innovation, Systems and Technologies.'

Our heartfelt gratitude goes out to our admired authors, diligent reviewers, and the rigorous efforts of our general track and invited session chairs, as well as all others who

have played an integral role in shaping this esteemed event. Your contributions have been instrumental in ensuring the excellence of SDM-24.

We extend a warm welcome to the KES SDM community and sincerely hope that your participation in this conference proves to be both enriching and enjoyable.

Professor Mark Jolly, Professor of Sustainable Materials and Manufacturing, Cranfield University, UK

Prof. Robert Howlett, 'Aurel Vlaicu' University of Arad, Romania and Cardiff Metropolitan University, Wales, UK

Prof. Rossi Setchi, Cardiff University, UK
SDM-24 Conference Chairs

16th International Conference on Sustainability in Energy and Buildings SEB-24

The 16th International Conference on Sustainability and Energy in Buildings 2024 (SEB-24) is a significant international conference organised by a partnership between KES International, and The Sustainable and Resilient Built Environment research group, Cardiff Metropolitan University.

SEB-24 invited contributions on a range of topics related to sustainable and resilient buildings and sustainable energy technologies, renewable energy and explored innovative themes regarding climate-resilient neighbourhoods and other local, national and global challenges.

The aim of the conference was to bring together University researchers, Government and Scientific experts and Industry professionals to discuss the minimisation of energy use and associated carbon emissions in buildings, neighbourhoods, cities in the urban context and rurally; from a theoretical, practical, implementation, modelling, simulation and validation perspectives.

The conference formed an exciting chance to present, interact, and learn about the latest research, practical developments and knowledge transfer on the subjects and themes with real world impact.

SEB-24 will be held in a hybrid form with mainly physical and also virtual attendance, in response to agile work patterns and an environmental sustainable ethos.

The conference featured two General Tracks chaired by experts in the fields:

- G01 Sustainable & Resilient Buildings
- G02 Sustainable Energy Technologies

In addition, there were four Invited Sessions proposed, organised by prominent researchers with papers presented.

- IS01: Big Data Analytics in Sustainable and Smart City
- IS02: Technology for support social, health, wellbeing and sustainability
- IS04: Climate-Resilient Buildings and Neighbourhoods
- IS05: Intelligent and data-driven decision making in green urban mobility

It is important that a conference provides high quality presentations from world leading impactful researchers and practitioners. SEB-24 featured two keynote speakers: Professor Antonio Gagliano from University of Catania, Italy; and Professor Robert Howlett from KES International Research, UK, 'Aurel Vlaicu' University of Arad, Romania, and Cardiff Metropolitan University, Wales, UK.

The conference attracted submissions from around the world. Submissions for the Full-Paper Tracks were subjected to a two-stage blind peer-review process. With the objective of producing a high-quality impactful conference, only the best of these papers were selected for presentation at the conference and publication as book chapters in a volume of Springer's book series: The Smart Innovation, Systems and Technologies.

Thanks are due to the very many people who have given their time and goodwill freely to make SEB-24 a success. We would like to thank one of the local SEB-23 conference chairs from the Polytechnic University of Bari, Italy who co-chaired one of the general tracks with the SEB-24 conference general chair. Furthermore, we are grateful to the time of members of the International Programme Committee who were essential in providing their reviews of the conference papers, to ensure appropriate high quality of papers was maintained. We thank the high-profile keynote speakers for providing interesting talks to inform delegates and provoke discussion. Important contributors to the conference were made by the authors, presenters, and delegates without whom the conference could not have taken place, so we offer them our thanks. Finally, we would like to thank the administrative staff of KES International.

It is hoped that delegates find the SEB-24 conference an interesting, informative, and useful experience; and remain connected through the KES International Virtual Conference Experience.

Prof John Littlewood, Cardiff Metropolitan University, Wales, UK

Prof Robert J. Howlett, 'Aurel Vlaicu' University of Arad, Romania and Cardiff Metropolitan University, Wales, UK

Prof Lakhmi Jain, University of Piraeus, Athens, Greece

SEB-24 Conference Chairs

SDM-24

Organisation

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Steffen G Scholz, Karlsruhe Institute of Technology KIT, Germany

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SEB-24

Organisation

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Prof John Littlewood	Cardiff Metropolitan University, Wales, UK
Veronica Madonna	Athabasca University, Canada
Dr Samantha Organ	University of the West of England, UK
Dr Marco Savino Piscitelli	Polytecnico di Torino, Italy
Dr Kirsten Stevens-Wood	Cardiff Metropolitan University, Wales, UK
Dr Francesco Zaccaro	Cardiff Metropolitan University, Wales, UK

Keynote Talks

Dr. Annela Anger-Kraavi

University of Cambridge, UK and World Meteorological Organization (WMO)

Climate Change: Policy and Politics

Abstract: Our best knowledge about climate change is deeply grounded in science. This science gives (or at least should give) a solid basis for policy making. Climate change policies span from national and European to international levels. But it's the politics that often intervenes with policy making as well as with the implementation of the decisions taken. This talk will briefly cover all of the above. It reminds us of history and looks forward into the future.



Professor I.S. Jawahir

University of Kentucky, USA

Product Circularity Principles for Advancing Sustainable Manufacturing

Abstract: During the last three decades, Circular Economy (CE) concepts and principles have emerged as a promising new opportunity for implementing and advancing Sustainable Manufacturing (SM). SM enables multiple closed-loop material and information flows with 6Rs (Reduce, Reuse, Recycle, Recover, Redesign and Remanufacture). The 6Rs serve as the technological elements of CE with total Life cycle (TLC) considerations for products covering all four life cycle stages (Pre-manufacturing, Manufacturing, Use and Post-use). Effective implementation of CE concepts and principles continues to serve as the basis for sustainability transformation in manufacturing for greater economic, environmental and societal benefits. Designing and manufacturing circular products with 6Rs have thus become essential for advancing SM with digitally integrated systems connecting products, processes, and systems across the entire value chain.

This presentation will focus on circular product design principles driven by the CE targets in manufacturing. Current SM practices will be summarized with an emphasis on achieving product circularity as the first necessary step towards process and system innovation for advancing SM. Product circularity will be presented as a quantifiable activity involving a metrics-based evaluation method. Recent progress in product circularity studies and development of standards and industry practice guidelines will also be presented.



Biography: Dr. I.S. Jawahir is a Professor of Mechanical Engineering, James F. Hardymon Chair in Manufacturing Systems, and Founding Director of Institute for Sustainable Manufacturing (ISM) at the University of Kentucky. His current research focuses on predictive modeling and optimization of sustainable manufacturing processes and product design for circularity.

He has published extensively with over 450 research publications, including 170+ journal papers; awarded with 5 U.S. patents; and delivered 82 keynote/plenary presentations in major international conferences and over 160 invited presentations in 40 countries. He has received significant research funding (over \$70M) from US federal agencies and from numerous industry groups. He has also directed/supervised the research of 26 postdoctoral researchers, 45 PhD graduates and over 70 MS (thesis) graduates. He is a Fellow of CIRP (International Academy for Production Engineering), ASME (American Society of Mechanical Engineers) and SME (Society of Manufacturing Engineers); Editor-in-Chief of International Journal of Sustainable Manufacturing; and

Technical Editor of Journal of Machining Science and Technology. In 2005, he established the ASME's Research Committee on Sustainable Products and Processes and served as the Founding Chairman for six years (2005-11). He has been active in international collaborative research through CIRP since 1990. He led five CIRP research groups: Chip control in machining (1990-93); Modeling of machining operations (1995-2001); Surface integrity in manufacturing processes (2007-11); Cryogenic manufacturing processes (2012-16); and Integrated Machining Performance for the Assessment of Cutting Tools (IMPACT) (2021-24). He founded the CIRP Conference Series on Modeling of Machining Operations in 1998; co-founded the CIRP Conference Series on Surface Integrity in 2012; and continues to play a major role in the Global Conference on Sustainable Manufacturing (GCSM) series since its founding in 2004. During the last three decades, Professor Jawahir has also established active international collaboration with 28 universities from 20 countries.

Professor Jawahir received numerous awards and honors, including the 2013 ASME Milton C. Shaw Manufacturing Research Medal, 2015 William Johnson International Gold Medal, 2022 SME Frederick W. Taylor Research Medal and the 2023 ASME Kos Ishii - Toshiba Award.

Prof. Antonio Gagliano

University of Catania, Italy

Solar systems for decarbonised and energy efficient buildings

Abstract: The EU has recently agreed on reaching a 42.5% renewables share in final energy consumption, for fighting the climate change.

The climate neutrality can't be reached without a faster and just decarbonisation of the building sector. Around 80% of the EU population live in urban areas, making them the main actors to accelerate the energy transition, becoming the centre of solar deployment.

Considering that the building energy needs are constituted by heat and power, Photovoltaic-Thermal (PVT) plants, which integrates photovoltaic (PV) panels for electricity generation with thermal collectors for heat generation, is a technology able to provide renewable, affordable and secure heat and power not producing any on-site emissions.

Moreover, PVT plants occupy less space compared to separate PV and solar thermal systems, making them ideal for areas with limited land availability. Solar energy systems can be integrated into residential and commercial buildings providing energy for heating, cooling, and electricity needs. This lecture will present the state of the art of PVT plants, how the synergy between the two forms of energy generation, power and heat, boosts the overall efficiency and energy output. It will analyse different PV or PVT plants configurations for generating the building's energy supply, both for heating and cooling.

As one of the main challenges of the renewable energy generation is the mismatching between supply and demand, the role of the energy storage will be also discussed. Finally, it will present some innovative experimental installations that foresee the use of ventilated bifacial PV façade and how its performance can be evaluated and monitored.



Biography: Antonio Gagliano, was graduated in Engineering in 1991 from the University of Catania, he obtained the title of PhD in Environmental Technical Physics in 1998 from the University of Palermo.

Since 2001 he has been a professor at the University of Catania and has taught Technical Physics and Environmental Control Techniques.

He has been editor of the book Proceedings of the 3rd International Conference on Electronic Engineering and Renewable Energy Systems, Springer 2023. Currently he is member of the Editorial board of several International (10) e National journal (1); Editor of book (1), and Guest Editor of journal's special issues (4). He has

been Principal Investigator or participated in several International, National and Regional Research project.

He is component of several international and national scientific association. Engagement at the IEA task 60 "Application of PVT collectors and new solutions in HVAC systems" of the IEA Solar Heating and Cooling Programme. Engagement at the IEA task 15 "Enabling Framework for the Development of BIPV" of the IEA Solar Heating and Cooling Programme. Author of more than 180 articles published in international journal (97), conference proceedings (77), book chapter (6) and patent (1)

The main area of SCIENTIFIC interest are: Buildings Energy Efficiency, Building Acoustic, Environmental Acoustic, Environmental Air Quality (EAQ), Air Pollution, Renewables Energy (solar thermal, photovoltaic, wind, biomasses), Energy Policy, HVAC plants , Fluid dynamic analysis of ventilated structure, Heat transfer and thermal comfort.

Prof. Robert J Howlett

KES International, UK, Cardiff Metropolitan University, Wales, UK & 'Aurel Vlaicu' University of Arad, Romania

Innovation in food production ... Towards sustainably feeding the world

Abstract: Civilisation faces huge challenges in the 21st century in feeding a growing population a healthy diet while avoiding excessive consumption of natural resources and damage to the environment. Innovative approaches are required to food production technology that increase yields and decrease waste, at the same time minimising harm to the ecosystem. Recent challenges such as the Covid global pandemic and armed conflicts in various parts of the world have demonstrated the importance of resilience throughout the 'Farm to Fork' food chain through local production. New technologies are increasingly being incorporated into various aspects of the food production process. Artificial intelligence and machine learning (AI/ML) are being used to optimise growing regimes. The Internet of Things (IoT), robotics, geolocation, are being used e.g. for precision agriculture. Plant factories can repurpose redundant buildings and bring food production close to consumers, eliminating transport costs and emissions. Sustainable energy technologies are being used to reduce energy costs in greenhouses and other examples of controlled environment horticulture. This talk will provide an overview of the subject and identify future trends.



Biography: Robert Howlett is the Academic Chair of KES International, a non-profit organisation which facilitates knowledge transfer and the dissemination of research results in areas that include Intelligent Systems, Sustainability, and Knowledge Transfer. He is a Visiting Professor in Sustainable Innovation at Cardiff Metropolitan University, Wales, UK, and Visiting Professor at 'Aurel Vlaicu' University of Arad, Romania. He has previously been Visiting Professor in Enterprise at Bournemouth University, UK, and was a Reader at the University

of Brighton. His technical expertise is in the use of artificial intelligence paradigms for the solution of industrial problems. His current interests centre on the application of smart systems to sustainability, particularly renewable energy and applications in housing and controlled environment horticulture. He previously developed a national profile in knowledge and technology transfer, and the commercialisation of research. He works with a number of universities and international research groups on the supervision teams of PhD students, and provides technical support for research projects.

Timetable – Wednesday 18 September

	Plenary Room / Room 1	Room 2	Room 3	Room 4
12:45 - 13:45 CEST	Lunch			
13:45 - 14:00 CEST	Opening Ceremony Prof. Robert J Howlett, KES International, UK & Cardiff Metropolitan University, UK Prof. John Littlewood, Cardiff Metropolitan University, UK Prof. Mark Jolly, Cranfield University, UK			
14:00 - 15:00 CEST	Keynote Speaker 1 Prof. Antonio Gagliano Talk Title: Solar systems for decarbonised and energy efficient buildings			
15:00 - 15:30 CEST	Networking Break			
15:30-18:00 CEST	GO1-A Sustainable and Resilient Buildings Chair: Prof. John Littlewood	IS02 Eco-design and eco-assessment for Additive Manufacturing Chair: Prof. Christian Spreafico	GO2 Sustainable Energy Technologies Chair: Dr. Simon Walters	IS03 Sustainable and Circular Economy transformations in Business and Society Chair: Dr. Minna Lammi

Timetable – Thursday 19 September

	Plenary Room / Room 1	Room 2	Room 3	Room 4
09:30 - 10:30 CEST	<p>Keynote Speaker 2 Prof. I.S Jawahir Talk Title: Product circularity principles for advancing sustainable manufacturing</p>			
10:30 - 11:00 CEST	Networking Break			
11:00-13:00 CEST	GO1-B Sustainable and Resilient Buildings Chair: Prof. John Littlewood	IS03 & IS05 Sustainable and Circular Economy transformations in Business and Society & Moving from Industry 4.0 to Industry 5.0: opportunities, trends and reference models in the modern disruptive scenario Chair: Dr. Minna Lammi & Marco Bortolini	G01 & G04 Sustainable Design & Digitalisation for sustainability Chair: Prof. Mélanie Despeisse & Prof Maria Holgado	GO2 Sustainable manufacturing and systems Chair: Prof. Emanuele Pagone
13:00 - 14:00 CEST	Lunch Break			

	Plenary Room / Room 1	Room 2	Room 3	Room 4
14:00 - 15:00 CEST	<p>Keynote Speaker 3 Prof. Robert Howlett Talk Title: Innovation in food production towards sustainably feeding the world</p>			
15:00 - 15:30 CEST	Networking Break			
15:30 - 17:45 CEST	GO1-C Sustainable and Resilient Buildings Chair: Prof. John Littlewood	IS04-A Climate-Resilient Buildings and Neighbourhoods Chair: Prof. Michele Morganti	IS06 Sustainability-oriented Industrial Technologies in the domain of Industry 4.0 Chair: Prof. Steffen Scholz	Workshop Boosting the exploitation of Circular Economy standards in research projects Prof. Mélanie Despeisse
19:00 CEST	Gala Dinner			

Timetable – Friday 20 September

	Plenary Room / Room 1	Room 2	Room 3	Room 4
09:00 - 10:00 CEST	<p>Keynote Speaker 4 Annela Anger Kraavi Talk Title: Climate Change: Policy and Politics</p>			
10:00 - 10:30 CEST	Networking Break			
10:30 - 12:30 CEST	<p>GO1-D Sustainable and Resilient Buildings Chair: Prof. John Littlewood</p>	<p>IS04 Climate-Resilient Buildings and Neighbourhoods Chair: Prof. Michele Morganti</p>	<p>IS01 & IS05 Big Data Analytics in Sustainable and Smart City & Intelligent and data-driven decision making in green urban mobility Chair: Prof. Abdellah Chehri & Prof. Chiara Bordin</p>	
12:30 - 12:45 CEST	Closing Ceremony			
12:45 - 13:45 CEST	Lunch Break			

SDM Paper Presentations

SDM- G01 & G04: Sustainable Design & Digitalisation for sustainability

Chairs: Mélanie Despeisse & Maria Holgado

Thursday 19th 11:00-13:00

Room 3

Paper No	Paper Title / Authors
18	A Circular Economy based technology assessment tool for R&D projects Giácómo Parolin, Clare Farrukh, Jacob Arnbjerg, Tim C. McAlóone and Daniela C. A. Pigosso
22	A Design Method for Locally Oriented Transportation Services Targeting Rural Areas Daiki Kaiga, Hidenori Murata and Hideki Kobayashi
5	How can foundation industries improve their contribution to Sustainable Development: A System View Juan Ramon Candia and Peter Ball
17	Life cycle cost framework for enhancing sustainable manufacturing and energy efficiency of production assets Minna Räikkönen, Saara Hänninen and Teuvo Uusitalo

SDM- G02: Sustainable manufacturing and systems

Chair: Emanuele Pagone

Thursday 19th 11:00-13:00

Room 4

Paper No	Paper Title / Authors
6	Comparison of pellet-based and filament-based processes in additive manufacturing Stefan Junk and Matthias Herr
15	Balancing of three pillars of sustainability with application of advanced manufacturing technologies. Iwona Zwierzak
16	EcoPLM - implementation of the concept of green product life cycle management Mariusz Cholewa and Sylwester Oleszek
19	Environmental Impact Assessment of Titanium Swarf Cleaning Methods Georgios Karadimas, Emanuele Pagone, Konstantinos Salonitis, Mark Jolly and Stewart Williams
33	The Challenges and Potential for Increasing the Recycling of Post-Consumer Aluminium Scrap in the UK Milan Liu, Kilian Schneider, Lampros Litos and Konstantinos Salonitis

SDM-02: IS02: Eco-design and eco-assessment for Additive Manufacturing

Chair: Christian Spreafico

Wednesday 18th 15:15-17:35

Room 2

Paper No	Paper Title / Authors
1	Patent-based prospective life cycle inventory of titanium powder for additive manufacturing Christian Spreafico and Nils Thonemann
2	Eco-design for metal additive manufacturing: a parametric model for combining mass reduction with recycled and reused powder Christian Spreafico, Francesca Campana, Paolo Cicconi and Daniele Landi
11	Combining Design for Compliant and multi material AM for conceiving more sustainable products. Matteo Cattaneo, Davide Gotti and Davide Russo
21	The use of AI to classify sustainability patents about AM metal powders according to EU environmental objectives Simone Avogadri and Davide Russo
32	Design for Additive Manufacturing of a High-Performance Cryogenic Silicon Wafer Holder Abas Ahmad, Michele Bici, Daniele Cortis, Giorgio Del Castello, Daniele Delicato, Valerio Pettinacci, Marco Vignati, Donato Orlandi and Francesca Campana
36	Preliminary comparison of the additive manufacturing sustainability in case of topologically optimized components through a piston case-study Hemant Kollipara, Luca Belluomo, Daniele Cortis, Michele Bici, Francesca Campana and Donato Orlandi

*Online

SDM-04: IS03: Sustainable and Circular Economy transformations in Business and Society

Chair: Minna Lammi

Wednesday 18th 15:15-17:35

Room 4

Paper No	Paper Title / Authors
3	Designing market-shaping customer value propositions in the circular economy: a case study of reusable packaging Päivi Petänen and Henna Sundqvist
4	How sustainability virtual influencers and their followers utilize hashtags. Katie Leggett and William Davies
9	Barriers for circular business models in the textile sector Minna Salo and Päivi Petänen
10	Tatiana Nevzorova and Raul Carlsson Traceability options for products containing ABS plastic: a systematic literature review
13	Orhan Sahin, Jelena Milisavljevic Syed, Mohamed Afy-Shararah and Konstantinos Salonitis Critical Success Factors in Twin Transition of SMEs Toward Digitalization and Sustainability
20	Linking value chain Scope 3 data in decision-making and circularity Tuija Rantala, Ella Hatara, Laura Kojo and Mikko Heiskanen
23	"I would need more information..." Communicating restaurants' environmental operations to consumers effectively Minna Lammi, Jukka Ojasalo, Ruusa Ligthart and Jasmina Elo

*Online

SDM-05: IS03 & IS05: Sustainable and Circular Economy transformations in Business and Society & Moving from Industry 4.0 to Industry 5.0: opportunities, trends and reference models in the modern disruptive scenario

Chairs: Minna Lammi & Marco Bortolini

Thursday 19th 11:00-13:00

Room 2

Paper No Paper Title / Authors

29	Importance of end-of-life value chains: evidence from UK to Europe trade flows in the e-waste management Gamze Saglam and Manoj Dora
34	Against the Odds: Innovation System Dynamics for Circular Economy Transformation in Himalaya Curie Park, Padmakshi Rana and Steve Evans
24	Evaluating companies' Industrial Symbiosis potential: Development and application of an Assessment Tool in Northern Italy Valentina Ventura, Beatrice Colombo, Marco Bortolini, Paolo Gaiardelli and Marco La Monica
25	Lean, Agile, Resilient & Green paradigms: literature review and research steps towards full integration Valentina Ventura, Alice Caporale, Cristian Cafarella, Cristina Mora and Emilio Ferrari
26	A multi-objective optimization model to balance costs and land use in power system expansion planning Cristian Cafarella, Mauro Gamberi, Marco Bortolini, Francesco Gabriele Galizia and Erik Delarue
27	The shift from Industry 4.0 to Industry 5.0: A Mauritian Case Study Devkumar Sing Callychurn
35	Early defect prediction in manufacturing: a cross-sectorial review to enhance quality and sustainability targets Michele Ronchi, Alberto Regattieri, Mauro Gamberi, Marco Bortolini and Cristian Cafarella

SDM-06: IS06: Sustainability-oriented Industrial Technologies in the domain of Industry 4.0

Chair: Steffen Scholz

Thursday 19th 15:30-17:45

Room 3

Paper No	Paper Title / Authors
8	SME Ready for the Future: fostering transformation and sustainable business models for manufacturing SMEs in Industry 4.0 Joanna Helman, Maria Rosienkiewicz, Mariusz Cholewa, Mateusz Molasy, Steffen Scholz, Tobias Müller, Giovanni Berselli, Federico Manara, Ana Ćosić Pilepić, Sara Tikel and Andrea Enyingi-Kurucz
14	Infrastructure sharing model implementation as a pathway towards sustainability in advanced technologies Maria Rosienkiewicz, Joanna Helman, Mariusz Cholewa, Mateusz Molasy, Dan Kohen-Vacs, Michael Winokur, Sofia Amador Nelke, Avraham Levi, José-Francisco Gómez-González and Arriel Benis
28	3D model design rules for precise microfeature representation in 3D inkjet printing data Karin J. Chen, Ahmed Elkaseer, Steffen G. Scholz and Veit Hagenmeyer
30	Exploring the printability and marine degradation of biodegradable, starch-based polymers in additive manufacturing Tobias Müller, Ahmed Elkaseer, Sophie von Staerk and Steffen Scholz
31	Integrating multiscale manufacturing data for digital twin-enhanced sustainable performance: a case demonstration Yujia Luo, Juan Ramón Candia and Peter Ball

SEB Paper Presentations

SEB-1: G01-A: Sustainable and Resilient Buildings

Chair: John Littlewood

Wednesday 18th 15:30-18:00

Plenary Room

Paper No	Paper Title / Authors
1	Dynamic Operational Life Cycle Assessment of Industrial Building Retrofit: Exploring Electricity Mix and Climate Change Effects - A German Case Study Sonja Herzogenrath, Johannes Linus Cuypers, Veronika Richter, Maximilian Schildt, Jérôme Frisch and Christoph van Treeck
2	Visualizing the Origin of Data in Building Life Cycle Assessment Johannes Linus Cuypers, Maximilian Schildt, Christoph van Treeck and Jérôme Frisch
3	Impact of insulation and natural ventilation on the thermal performances of a west-facing bioclimatic building Draou Mohcine and Brakez Abderrahim
4	Enhancing Indoor Air Quality in Naturally Ventilated Classrooms in Ireland: A Systematic Review Protocol and Future Research Agenda David Honan, John Littlewood and John Garvey
5	Assessing the Value of Residential Occupant Behavior Data in Heating and Ventilation for Enhanced Energy Simulation Accuracy: a Case Study in the Netherlands Bei Wang, Dujuan Yang and Qi Han
58	Optimising University Space Usage for Energy and Carbon Management, a UK Case Study Graham Lewis, John Littlewood and Shrikant Sharma
6	Development and evaluation of a training activity in a CAVE to improve building occupants' energy-related behaviour Ludovica Marcelli, Arianna Latini, Elisa Di Giuseppe and Marco D'Orazio

*Online

SEB-2: G01-B: Sustainable and Resilient Buildings

Chair: John Littlewood

Thursday 19th 11:00-13:00

Plenary Room

Paper No	Paper Title / Authors
7	Exploring the applicable circular business models in Dutch temporary social housing Qi Han and Pei-Hsuan Lee
8	Resilient Sustainability Measurement and Evaluation (RESUME) Jeremy Gibberd
9	Applying the Refined Kano Model to Enhance Youth Housing Towards User-Centered Sustainability: Insights from Three Cases in Taipei Pei-Hsuan Lee and Qi Han
10	Industrial energy forecasting algorithm to extract product-related energy use: A case study in a food factory José L. Hernández and Francisco Morentin
11	Occupant Behaviour and Daily Indoor Environmental profiles in residential buildings: Evaluation through Clustering and Decision Tree approaches Elisa Di Giuseppe, Arianna Latini, Gabriele Bernardini, Andrea Gianangeli and Marco D'Orazio
51	Evaluating agricultural crop waste for fabricating biomaterial insulation board prototypes John Littlewood, Richard Hawkins, Nick Evans, Jon Pigott, Martin Lane, Peter Pickford and Charlotte Hale
14	A preliminary investigation on the thermal performance of a Hydroponic Roof System in Mediterranean climate Francesco Nocera, Vincenzo Costanzo, Maurizio Detommaso, Gianpiero Evola, Marina Mistretta and Sonia Longo

SEB-3: GO1-C: Sustainable and Resilient Buildings

Chair: John Littlewood

Thursday 19th 15:30-17:45

Plenary Room

Paper No	Paper Title / Authors
17	A Comparative Study of Airtightness in Modern Buildings Using Blower Door Tests: A Semi-Arid Climate Houda Er-Retby, Niima Es-Sakali, Adeline Mélois, Mohamed Oualid Mghazli, Mohamed El Mankibi and Mostafa Benzaazoua
18	Sustainable effect of using recycled aggregates for road concrete production Artem Chystiakov, Sergii Kroviakov, Anton Bershadskyi, Igor Medved and Michal Slany
25	Modular cladding system design for active radiative cooling in buildings Amaia Zuazua-Ros, Pablo Arias-Salazar, José Antonio Sacristán-Fernández, Claudio Fernández Acevedo, Cristina Salazar, Marina Vidaurre-Arbizu and César Martín-Gómez
26	Testing architectural quality Key Performance Indicators for Climate Positive Circular Communities in a new highly efficient residential building Iuliia Maskova, Joana Ortiz, Óscar Negre Moreno and Jaume Salom
27	Automated carbon footprint assessment from the early design stage of building: a proposal for a new approach based on modeling constructive processes Catherine Bouillon, Benjamin Cohen Boulakia, Karim Beddiar, Yves Jaboin and Fabrice Duval
50	A Comprehensive Review of Life Cycle Assessment (LCA) in Construction: Tools, BIM Integration, and Applications in Morocco Oumaima Zga, Hassane Radoine, Abdelghani El Asli and Noussaiba Rharbi
30	Materials' inventory for Life cycle assessment in the African context: Moroccan case Noussaiba Rharbi, Hassan Radoine, El Asli Abdelghani, Oumaima Zaga and Antonio Garcia Martinez

SEB-4: GO1-D: Sustainable and Resilient Buildings

Chair: John Littlewood

Friday 20th 10:30-12:30

Plenary Room

Paper No	Paper Title / Authors
40	Comparing the environmental impact of a CLT and concrete building Harry Seuntjens and Matthias Buyle
41	Enhancing Energy Disaggregation with Attention-Based Neural Network Nidhal Balti, Baptiste Vrigneau and Pascal Scalart
42	A tool for energy benchmarking of public buildings applied to a real case study in Milan, Italy Martina Ferrando, Alessia Banfi and Francesco Causone
45	A New Method for Assessing the Vulnerability of Eastern Caribbean Buildings To Natural Disasters Using Remote Sensing Evan Owen-Powell, John Littlewood and Fausto Sanna
47	The Effect of Ventilation Control on Thermal Comfort in PCM-integrated Dwellings Rafael Alvarez Gutiérrez, Stijn Verbeke and Amaryllis Audenaert
49	Assessing the impact of urban morphology on residential building energy efficiency and daylight autonomy Safae Oulmouden, Hassan Radoine and Brahim Benhamou
48	Assessing Thermal and Energy Performance of a Modular Positive Energy Residential Building in a Semi-Arid Climate Region Karim Boumlik, Hassan Radoine, Mustapha Mahdaoui, Mustapha Ouardouz and Mohammed Ahachad

SEB-5: GO2: Sustainable Energy Technologies

Chair: Simon Walters

Wednesday 18th 15:15-17:35

Room 3

Paper No	Paper Title / Authors
13	A Practical Design Methodology for a Robust Integral State-Feedback Controller With a Full-order Observer, Applied to a Laboratory Scale Islanded Hybrid Microgrid Omaima Smouni, Meriem Nachidi Labourel and Abdelhamid Rabhi
16	Comparisons of Energy-saving Strategies for Parking Garages Based on Smart Lighting Systems Jiali Bao, Lu Yin, Jinqi Li, Xinyu Zhao, Yuanjie Gao and Jichuan Yi
24	Investigation of a building-integrated solar collector for dual applications Sunita Mahavar, Pradeep Kasana, Atul Sagade and Ashmore Mawire
32	Seasonal Thermochemical Heat Storage (S-TCHS): experimental results in a medium-scale Test Facility and implementation of an innovative separate reactor configuration. Enrico Patrucco and Paola Castellazzi
46	Experimental performance evaluation of cost-sensitive Bayesian Networks for Fault Detection and Diagnosis in HVAC systems Marco Paolini, Marco Savino Piscitelli, Armin Hooman, Antonio Rosato and Alfonso Capozzoli
54	Reduction of Carbon Emissions in the Built Environment: Utilizing Geopolymer Concrete from Industrial Byproducts Ametha Varghese, Martin Anda and David Goodfield

SEB-6: IS01 & IS05: Big Data Analytics in Sustainable and Smart City & Intelligent and data-driven decision making in green urban mobility

Chairs: Abdellah Chehri & Chiara Bordin

Friday 20th 10:30-12:30

Room 2

Paper No	Paper Title / Authors
29	Using Smart Technologies and Hydrometeorological Data for Enhanced Malfunction Detection and Sustainability in Urban Water Distribution Systems Ján Bábel, Michal Munk and Dasa Munkova
39	Artificial Intelligence and Big Data Analytics - a tool for management of Energy Services in Buildings Radmilo Savic
59	Topological Data Analysis for Sustainable and Smart City Education Systems I. de Zarzà and J. de Curtò
31	Vulture: Planning EV Charging Stations Fergus Hathorn, Iker Olarra and Gabriela Servidone
56	Artificial Intelligence for Resilient and Intelligent Microgrid Control in Smart Cities: A Comprehensive Review of Techniques and Applications Abd Alelah Derbas, Chiara Bordin and Sambeet Mishra
57	Optimal route management for mobile energy storage considering construction sites Shamim Al Mamun, Sambeet Mishra, Thomas Øyvang, Chiara Bordin and Praveen Prakash Singh

*Online

SEB-7: IS04: Climate-Resilient Buildings and Neighbourhoods

Chair: Michele Morganti

Thursday 19th 15:30-17:45

Room 2

Paper No	Paper Title / Authors
12	Geospatial Analysis of Socio-Urban Vulnerability to Heat in the Context of Cardiovascular Health Julia Nawaro, Lorenzo Gianquintieri, Andrea Pagliosa, Maurizio Migliari and Enrico Caiani
19	One-Stop-Shops and Energy Rehabilitation Offices. Management to boost Energy retrofit in Spanish residential buildings stock Rolando Biere Arenas, Carlos Marmolejo-Duarte, Silvia Spairani-Berrio and Paúl Espinoza-Zambrano
20	Exploring new financial based solutions for fostering energy efficient homes: an analysis for Barcelona Carlos Marmolejo-Duarte, Paúl Espinoza-Zambrano, Carlos Marmolejo-Vega, Arkaitz Fullaondo-Elordui-Zapaterietxe, Anna Garcia-Masiá and Rolando Biere-Arenas
28	Thermochromic coating's Impact on Building Energy Efficiency via a Ladybug Tools Radiative Heat Modeller Emanuela Giancola, Naga Venkata Sai Kumar Manapragada, Shoab Amin, Marcello Turrini, Jonathan Natanian and Emanuele Naboni
33	Integrating Mean Radiant Temperature into Urban Heat Vulnerability Assessment: A Case Study in the City of Rome, Italy Alice Vicini and Michele Morganti
34	Exploring the influence of wind patterns on SUHII: a case study on Italian cities Antonio Esposito, Gianluca Pappaccogli, Giuseppe Maffei and Riccardo Buccolieri

SEB-8: IS04: Climate-Resilient Buildings and Neighbourhoods

Chair: Michele Morganti

Friday 20th 10:30-12:30

Room 2

Paper No	Paper Title / Authors
35	Four issues on the Goal and Scope definition of a BIM-based LCA study for existing buildings Giorgia Cipriani, Michele Morganti, Teresa Villani and Carlos Alonso Montolio
36	Evaluating the Impact of Natural Ventilation on Indoor Air Quality and Thermal Comfort in a Primary School During Winter in Barcelona. A Methodological Approach Eva Crespo Sanchez, Fabian Lopez Plazas and Nicolas Lietti
37	Comparative Study of Nature-based Intervention Strategies for Urban Climate Control Using the ENVI-met Climate Simulation Software Pamela Muñoz Ossandón and Massimo Palme
38	Impact of the window ratio on the energy demand of twelve buildings in Barcelona Juan Diego Garcia Honores, Carlos Alonso Montolio, Helena Coch and Michele Morganti
43	Integrated and Sustainable Urban Regeneration Milan – Rio – REMIRIO: Urban Diagnosis based on Integrated Modification Methodology (IMM) Carlo Andrea Biraghi, Massimo Tadi, Mohammad Hadi Mohammad Zadeh, Felipe Cerbella Mandarino, Gabriele Masera, Leandro Gomes Souza and João Paulo R. Fraga
44	Implementation of Ventilated Permeable Roof solutions in urban microclimate models: a preliminary study Elisa Di Giuseppe, Gianluca Maracchini and Marco D'Orazio
55	Light structural systems and enclosures in pine wood and natural cork from southwestern Europe: triple balance in both new construction and rehabilitation; the IMIP project Salvador Gilabert Sanz, José Vicente Oliver Villanueva, Emilio Luengo-Cuadrado and Eva Hermoso-Prieto

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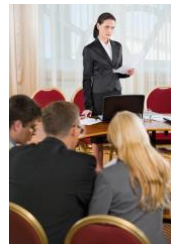
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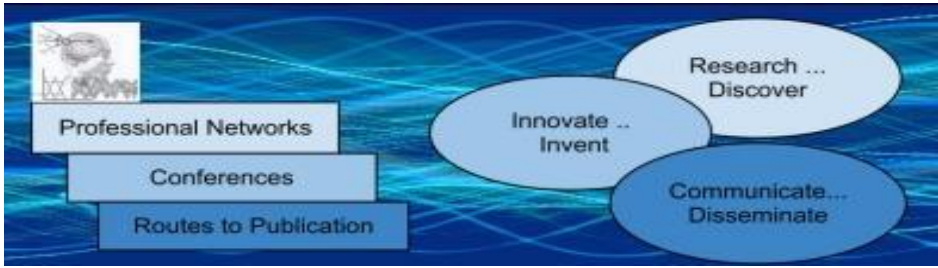
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