

The InnoRenew CoE International Conference 2021

HEALTHY AND SUSTAINABLE
RENOVATION WITH
RENEWABLE MATERIALS

June 10-11 | Online



2021



**INNORENEW CoE INTERNATIONAL CONFERENCE
2021**

ONLINE | 10-11 JUNE 2021

BOOK OF ABSTRACTS



INNORENEW COE

Livade 6, 6310 Izola, Slovenia

IRIC2021 SCIENTIFIC COMMITTEE

Andreja Kutnar
Anna Sandak
David DeVallance
Iztok Šušteršič
Jakub Sandak
Michael Burnard
Miklós Krész

EDITORS/DESIGNERS

Amy Simmons
Elizabeth Dickinson

INNORENEW.EU

InnoRenew CoE is funded by the European Commission under Horizon 2020, the EU Framework Programme for Research and Innovation (H2020 WIDESPREAD-2-Teaming #739574), and by investment funding from the Republic of Slovenia and the European Regional Development Fund.



KEYNOTE ADDRESS



**LISANNE HAVINGA,
MSc. PHD**

Assistant Professor Building Performance and Principal Scientist System Integration, Technische Universiteit Eindhoven

Lisanne Havinga is Assistant Professor at the Building Performance group at Eindhoven University of Technology (TU/e) in the Netherlands. She is also Principal Scientist System Integration of the Eindhoven Institute for Renewable Energy Systems, and part of the management team of the institute. She received her Ph.D. in 2019 from TU/e, titled 'Advancing Post-War Housing: Integrating Heritage Impact, Environmental Impact, Hygrothermal Risk and Costs in Renovation Design Decisions'. Her research focuses on developing

modeling and simulation strategies to support decision-making in the energy transition of the built environment. Core topics include the optimization of renovation decisions using parametric exploration of housing variations, user behavior and renovation solutions. A holistic assessment of environmental impact, incorporating life cycle assessment and circularity, is a priority in her work. Lastly, she focuses on setting up interdisciplinary collaborations to develop multi-scale, multi-carrier, dynamic models that support system integration and decision-making across scale levels (technology-building-neighborhood-city-region-country) and sectors (mobility, industry, built environment). The evaluation of innovative technologies and their potential in addressing the key challenges of the energy transition is a priority.

In recent years, she's contributed to the development of the Climate Agreement of the Netherlands by developing 'the Renovation Accelerator', a subsidy program that was recently launched, aiming to accelerate the large-scale renovation of the housing stock. In this context, she's been an advisor and led research projects for multiple governmental organizations in the Netherlands. In addition to working for governmental organizations, she has built consortia with a wide variety of industry partners. Although she only recently was awarded her PhD thesis, she has already developed a substantial track record of publications and is already building teams of PDEngs, PhD's and postdocs on the topics 1) circularity/LCA, 2) sustainable renovation, 3) urban energy transition. She has been guest-editor for Renewable and Sustainable Energy Reviews and has authored publications for journals such as Building and Environment, Renewable and Sustainable Energy Reviews, Energy and Buildings and Journal of Cultural Heritage. She is a frequent reviewer for these and more academic journals and has been a member of several scientific committees of international conferences. She was chief editor (together with Emanuele Naboni) of the book publication 'Regenerative Design in Digital Practice'.



8:30 | **ZOOM OPEN**

9:00 | **OPENING**

Dr Michael Burnard, InnoRenew CoE
Deputy Director

9:05-9:35 | **KEYNOTE**

Lisanne Havinga, Assistant Professor,
Building Performance group,
Eindhoven University of Technology

9:35-11:05 | **ENGINEERING AND DESIGN**

9:35 Boris Azinović, Experimental investigations
of innovative seismic resistant CLT
connections

9:50 Igor Gavrić, Hybrid timber-steel shear wall
system for multi-story modular construction

10:05 Urban Kavka, Collecting Wood Waste
Generated During Construction of InnoRenew
CoE Building in Izola

10:20 Uroš Gantar, Near zero waste energy
window – wooden window for reuse and
cascading use

10:35 Mika Keskisalo, Form factor for efficient
low carbon construction

10:50 Laetitia Marrot, Developing electrically
conductive materials through thermal
conversions of hemp stalk wastes

11:05-11:30 | **COFFE BREAK**

11:30-12:30 | **CULTURAL HERITAGE**

11:30 Janez Kosel, Growth of xerophilic fungi on
model paint samples on glass and wooden
supports under low humidity conditions

11:45 Ana Slavec, Social mechanisms to engage
visitors in cultural heritage monuments
preservation

12:00 Tim Mavrič, Towards a common
framework for wood architectural heritage
conservation in Slovenia – a preparatory
overview

12:15 Veronika Kotradyova, Evaluation of
Residential Buildings Adaptation their
Interiors in a Rural Environment with a Deeper
Interdisciplinary Analysis of 3 Localities in
Slovakia

12:30-14:00 | **LUNCH**

14:00-15:15 | **HEALTH AND WELL-BEING**

14:00 Henrik Heräjärvi, Dependence of virgin
and recycled Scots pine heart- and sapwood
VOC emissions on indoor relative humidity
conditions

14:15 Mateja Erce, User needs and perspectives
on technologies or healthy ageing

14:30 Mark Dewsbury, Unhealthy advances in
Australian building regulations

14:45 Sabina Jordan, Temperature-based
approach for assessing buildings in terms of
providing thermal comfort for occupants

15:00 Nastja Podrekar Loredan, Development of
the School furniture suitability questionnaire
(SFS-Q)

15:15-15:30 | **COFFE BREAK**

15:30-16:15 | **MIXED TOPICS - FULL
PRESENTATIONS**

15:30 Lea Primožič, Three-pillar paradigm of
sustainability and its communication in the
wood industry – IKEA Group case study

15:45 Jan Vcelak, Prevention of mold formation
based on continuous condition monitoring of
timber constructions

16:00 Dennis Jones, The application of bicine or
tricine for limiting termite attack of thermally
modified wood

16:15 | **CLOSING**



11. 6. 2021

8:30 | ZOOM OPEN

9:00 | OPENING

Dr Michael Burnard, InnoRenew CoE
Deputy Director

9:05-10:20 | MIXED TOPICS - SHORT
PRESENTATIONS

9:05 Filip Majstorović, Strengthening of flax
textile-reinforced cement-based composite
materials by the addition of pozzolans

9:10 Viktor Bukovszki, Smart contract
affordances for energy communities

9:15 Petra Horvat, Relevant knowledge
management approaches in the civil
engineering research organizations and short
overview of current situation in selected
Slovenian public research organizations

9:20 Anja Jutraz, Renovation of outdoor school
environment to ensure healthy environment
for pupils

9:25 Lei Han, Creep Behaviour of Densified
Wood

9:30 Tamás Storc, ANN Supporting EDS
Building Optimisation

9:35 Kaja Kastelic, Assessing spinal posture
while back supported sitting: a review of
techniques used

9:40 Sidra Aslam, Mutable and Privacy-aware
Decentralized Ledger for Data Management in
Wood Supply Chain Environments

9:45 Esakkiammal Sudha Esakkimuthu,
Optimization of polyphenols extraction from
spruce bark

9:50 Ozlem Ozgenc, Increasing The Weathering
Durability of The Wood Surface with Tree Bark
Extractive Solution

9:55 Kelly Peeters, Extraction of phenolic
compounds to determine its concentration in
olive mill waste water

10:00 Vesna Starman, Education for a
Sustainable Future

10:05 Erwin M. Schau, Metrics for LCA and
carbon footprint of bio-based materials and
processes: New indicators and normalisation
factors for EN15804

10:10 Luca Versino, Perspectives of wood-based
products for acoustic purposes in building

10:15 Václav Sebera, Electric guitar neck from
densified poplar? Experimental and numerical
analysis

10:20-10:50 | COFFE BREAK

10:50-12:05 | INFORMATION AND
COMPUTING TECHNOLOGY

10:50 Richard Acquah, BIM Based Simulation Of
Fire And Smoke Spread In Timber Buildings

11:05 Zsolt Ercsey, Sensitivity Analysis
Supporting Building Optimisation

11:20 Kristóf Roland Horváth, Simulation
Database Development Supporting Building
Optimisation

11:35 Adam Katona, Evaluation and
optimization of different wind tower
geometries for passive air conduction systems
with CFD simulations

11:50 Sebastjan Meža, Circular Economy And
BIM In Civil Engineering

12:05 | CLOSING

AGENDA

MIXED TOPICS - SHORT PRESENTATIONS

- | 9:05-10:20
- 9:05 Filip Majstorović, Strengthening of flax textile-reinforced cement-based composite materials by the addition of pozzolans34
- 9:10 Viktor Bukovszki, Smart contract affordances for energy communities35
- 9:15 Petra Horvat, Relevant knowledge management approaches in the civil engineering research organizations and short overview of current situation in selected Slovenian public research organizations36
- 9:20 Anja Jutraz, Renovation of outdoor school environment to ensure healthy environment for pupils37
- 9:25 Lei Han, Creep Behaviour of Densified Wood38
- 9:30 Tamás Storz, ANN Supporting EDS Building Optimisation39
- 9:35 Kaja Kastelic, Assessing spinal posture while back supported sitting: a review of techniques used40
- 9:40 Sidra Aslam, Mutable and Privacy-aware Decentralized Ledger for Data Management in Wood Supply Chain Environments41
- 9:45 Esakkiammal Sudha Esakkimuthu, Optimization of polyphenols extraction from spruce bark42
- 9:50 Ozlem Ozgenc, Increasing The Weathering Durability of The Wood Surface with Tree Bark Extractive Solution43
- 9:55 Kelly Peeters, Extraction of phenolic compounds to determine its concentration in olive mill waste water44
- 10:00 Vesna Starman, Education for a Sustainable Future45
- 10:05 Erwin M. Schau, Metrics for LCA and carbon footprint of bio-based materials and processes: New indicators and normalisation factors for EN1580446
- 10:10 Luca Versino, Perspectives of wood-based products for acoustic purposes in building ...47
- 10:15 Václav Sebera, Electric guitar neck from densified poplar? Experimental and numerical analysis48



Mixed Topics - Short Presentations

Metrics for LCA and carbon footprint of bio-based materials and products: New indicators and normalisation factors for EN15804 and bio-based materials

Erwin M. Schau ¹

¹ *InnoRenew CoE, Livade 6, 6310 Izola, Slovenia, erwin.schau@innorenew.eu*

Life cycle assessment (LCA) and the EU-recommended Environmental Footprint (EF) are well known and accepted tools to measure a comprehensive set of environmental impacts throughout a product's life cycle. However, it is still a challenge to environmentally optimize and compare bio-based processes and products with similar fossil-based counterparts. More detailed lifecycle-based metrics and normalisation factors for climate change could help in this regard.

Based upon the recommendations for LCA impact assessment, the EU Environmental Footprint (Zampori & Pant, 2019) and EN15804+A2 (2019), together with data on greenhouse gas emissions from credible sources, sub-indicators for climate change (-fossil, -biogenic, and -land use change) and associated normalisation factors are developed. Also, new metrics for biobased products and processes are suggested. Results are applied on a case study with industry relevance in the transition to a climate-neutral society where heat from natural gas or wood chips in three different boilers are investigated.

The climate change metrics and normalisation factors are valuable in LCAs and carbon footprints where bio-based carbon emissions are involved and can be used by decision-makers to improve insight into the carbon footprint and environmental performance of wood, other bio-based products, and comparisons between these and their fossil counterparts. The proposed metrics improve communication and interpretation of the LCA and carbon footprint results for customers and other stakeholders. This presentation will show the method development and discuss the results of the case study with industry application.

Keywords: densified poplar, orthotropic material model, finite element analysis, electric guitar, acoustics

ACKNOWLEDGEMENT

The authors acknowledge the European Commission for funding the InnoRenew project (grant agreement 739574) under the Horizon2020 Widespread-2-Teaming program and the Republic of Slovenia (investment funding from the Republic of Slovenia and the European Regional Development Fund).