

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

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KEYNOTE ADDRESS



LISANNE HAVINGA, MSc. PHD

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

Lianne 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 Storcz, 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

INFORMATION AND COMPUTING TECHNOLOGY |

10:50-12:05

- 10:50 Richard Acquah, BIM Based Simulation Of Fire And Smoke Spread In Timber Buildings51
- 11:05 Zsolt Ercsey, Sensitivity Analysis Supporting Building Optimisation52
- 11:20 Kristóf Roland Horváth, Simulation Database Development Supporting Building Optimisation53
- 11:35 Adam Katona, Evaluation and optimization of different wind tower geometries for passive air conduction systems with CFD simulations54
- 11:50 Sebastjan Meža, Circular Economy And BIM In Civil Engineering55



*Information and Computing
Technology*

BIM-based simulation of fire and smoke spread in timber buildings

Richard Acquah ¹, Eva Prelovšek Niemelä ², Jakub Sandak ²

¹ *University of Primorska, Faculty of Mathematics, Natural Sciences, and Information Technologies, Glagoljaška 8, 6000 Koper, Slovenia*

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Wood can perform exceptionally towards fire resistance when used properly in building design even though wood itself is combustible. Because of the combustibility of wood, there are still uncertainties and misconceptions associated with its use as a construction material. One of the ways to clear uncertainties and increase stakeholders' confidence in the use of timber and wood-based composite building elements in construction is through experimental research. Advanced computer technology has made available several computational techniques in the field of building design. Two of these techniques which are gaining popularity are Building Information Modelling (BIM) and Computational Fluid Dynamics (CFD). Though these techniques have proved to be efficient, fast and have long term cost efficiency, its integration needs further exploration.

The purpose of this study is to simulate the spread of fire/smoke based on information stored in a BIM model. The underlying goal is to validate the information stored in a BIM model and demonstrate how this information can be used in building physics simulations.

This study has a three-step approach. The first step was to extract a section of an already developed BIM model of the InnoRenew CoE building complex in Izola, Slovenia. The next step was to export the extracted model and its thermal properties to a CFD software for the simulation. Pyrosim, a Graphic User Interface for Fire Dynamic Simulator (FDS) and Smokeview is used. The third step was to perform the simulation and analyze the results.

The limitation was the inability of Pyrosim to read the thermal properties from the BIM model. This limitation was overcome by developing a Dynamo script that extracts the thermal properties from the BIM model and exports it into Pyrosim. For better integration, further work is needed to enable Pyrosim to read the thermal properties from Revit. Also, a plugin can be developed for Revit to streamline the integration workflow of Revit-FDS/Smokeview and Pyrosim.

Keywords: wood, fire and smoke simulation, Building Information Modelling, computational fluid dynamics, Pyrosim, Revit

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REFERENCES

Sun, Q. and Turkan, Y., 2020. A BIM-based simulation framework for fire safety management and investigation of the critical factors affecting human evacuation performance. *Advanced Engineering Informatics*, 44, p.101093.