



# **FIRENWOOD**

## **Improved Fire Design of Engineered Wood Systems**

ForestValue Final Conference, Madrid, Sept. 29, 2022

Project name/website: Improved Fire Design of Engineered Wood Systems  
Project acronym: FIRENWOOD

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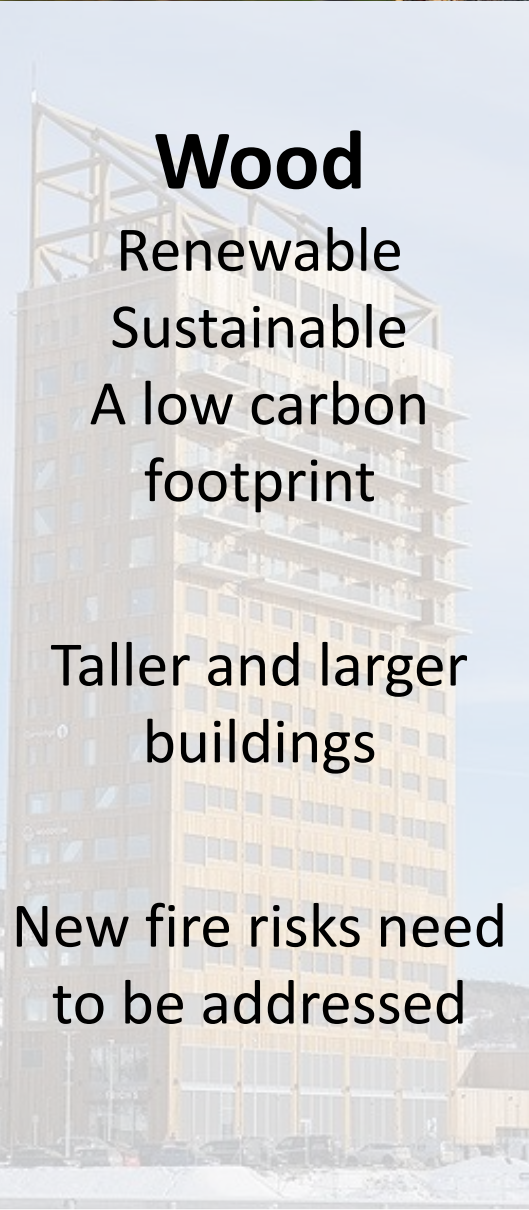
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 773324



## Project partners



Total budget 1,360,398 €  
Project duration (2019.03.01-2022.10.01)



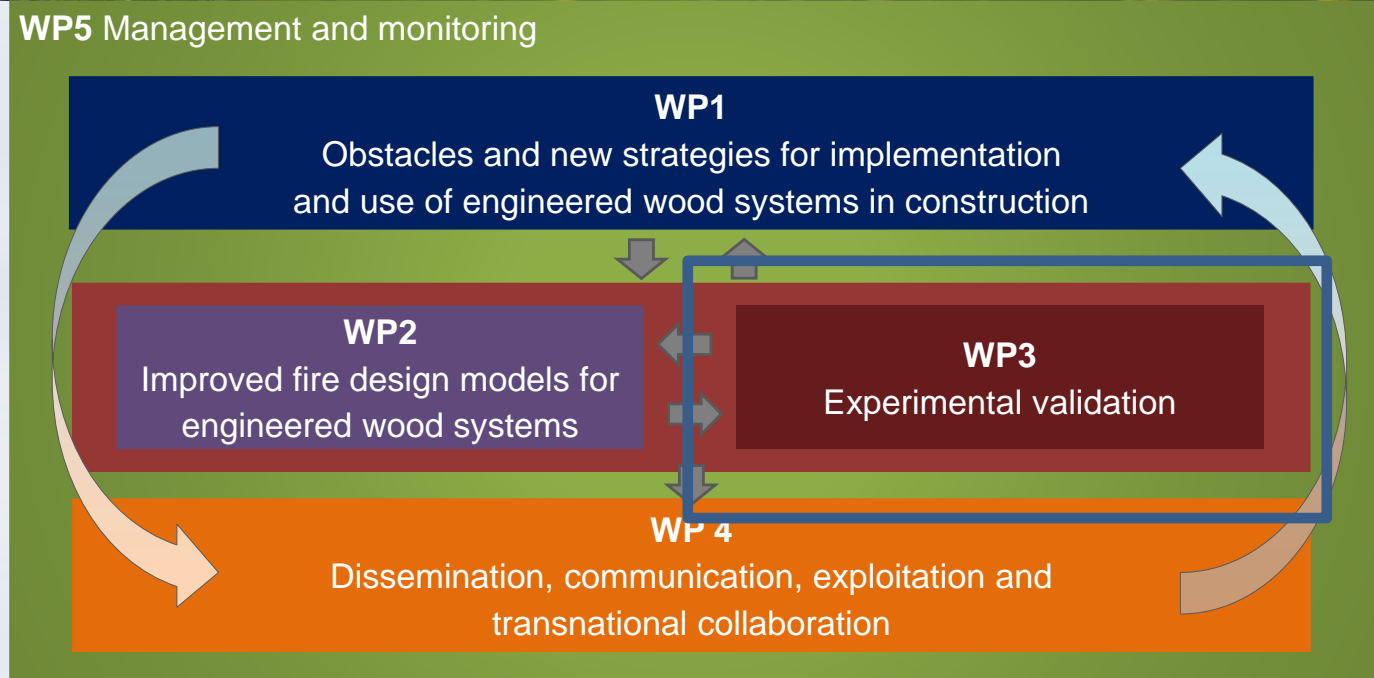
## Wood

Renewable  
Sustainable  
A low carbon footprint

Taller and larger buildings

New fire risks need to be addressed

Photo: Nina Rundsveen



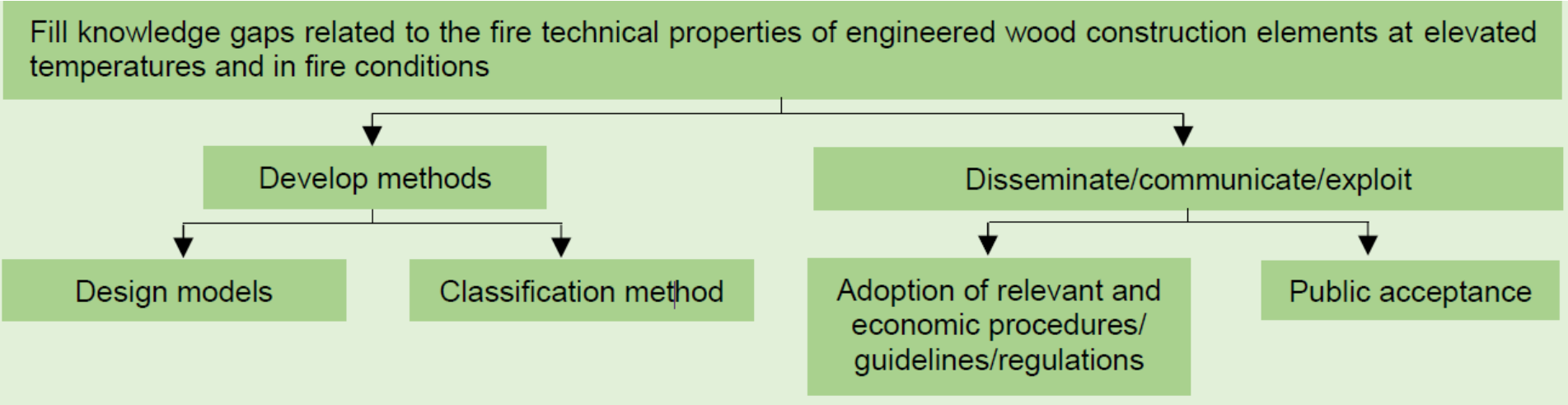




# Results — Steps

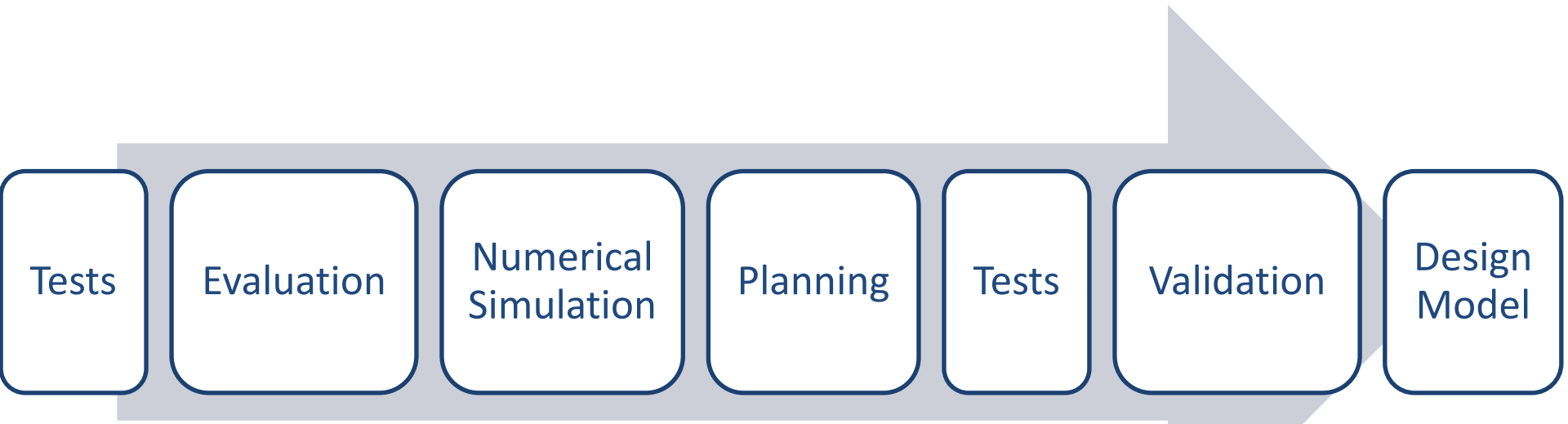
**Gaps regarding fire-safe use of engineered wood systems (structural joints and adhesives)**

- Outdated design models
- Lacking small-scale test methods for the classification of temperature and fire behaviour of wood adhesives for bonds
- Pessimistic societal perception of the fire safety of timber buildings





# Results — Design model for glued-in rods



## Four different testing series

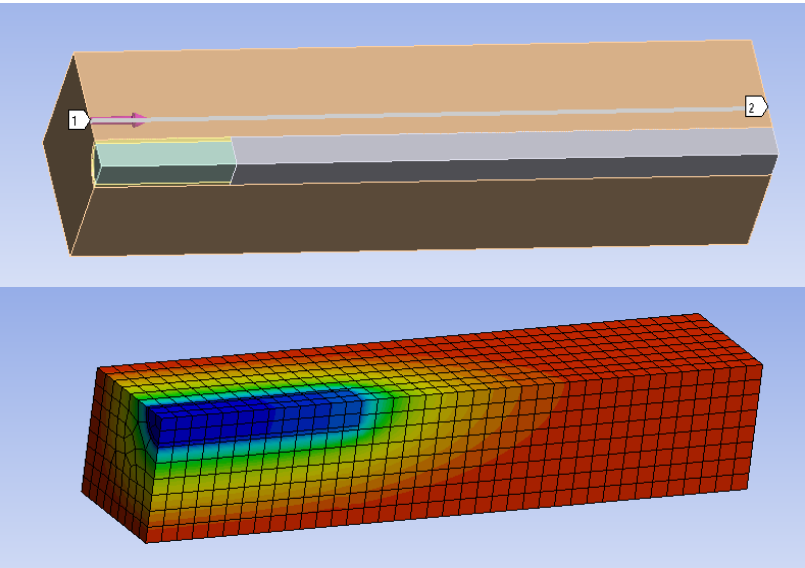
- Mechanical load level
- Fire load
- Temperature distribution
- Adhesive behaviour
- Load-bearing capacity
- ...



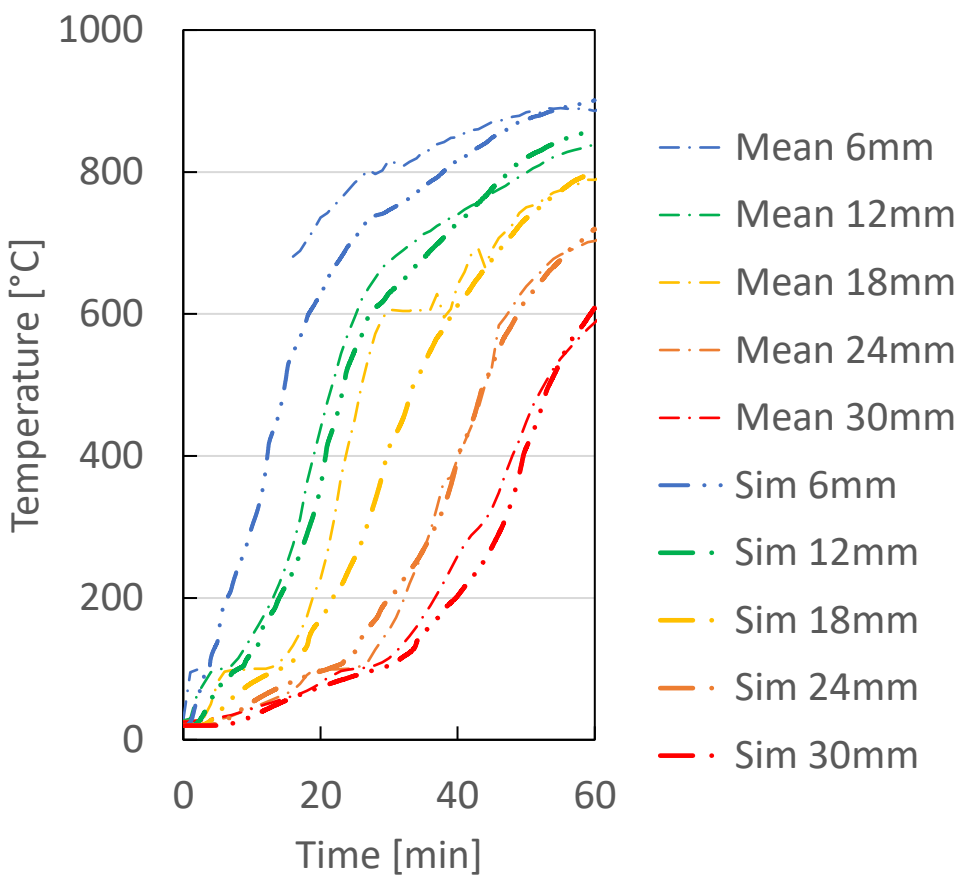


# Results — Design model for glued-in rods

## Numerical simulation



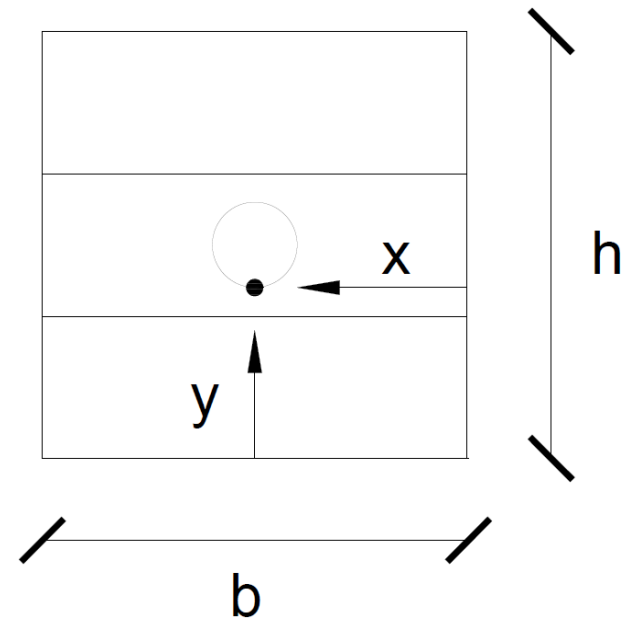
Temperature profile of a 3-dimensional model with a glued-in rod



Comparison between experimental (mean values) and simulation results at five measurement depths

## Results — Design model for glued-in rods

Design model to determine the necessary borehole cover/side length

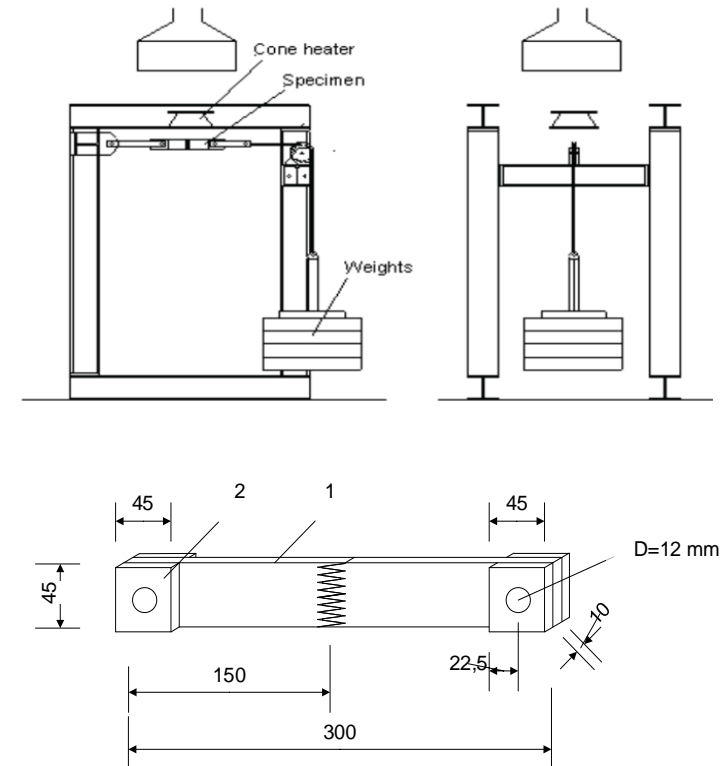
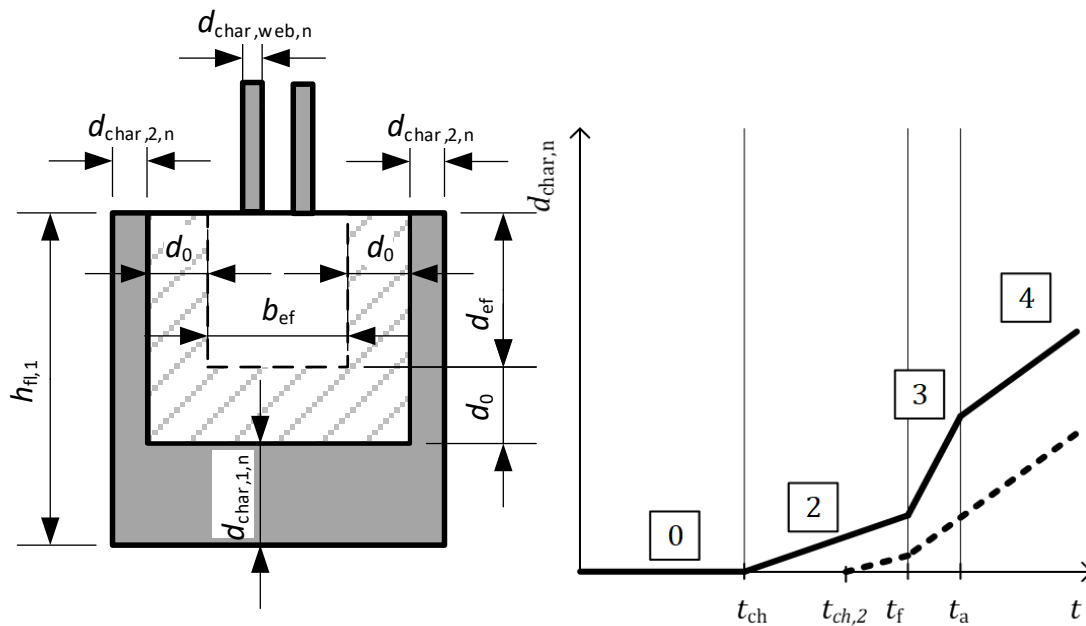


$$\Phi(x) = 20 + (280 \cdot (\beta \cdot t)^\alpha) \cdot \left\{ \left( \frac{1}{x} \right)^\alpha + \left( \frac{1}{(b-x)} \right)^\alpha + \left( \frac{1}{y} \right)^\alpha + \left( \frac{1}{(h-y)} \right)^\alpha \right\}$$





# Results (more examples)



Improved fire design model for the I-joists

Small-scale method for finger joints





## Impacts



### Communications

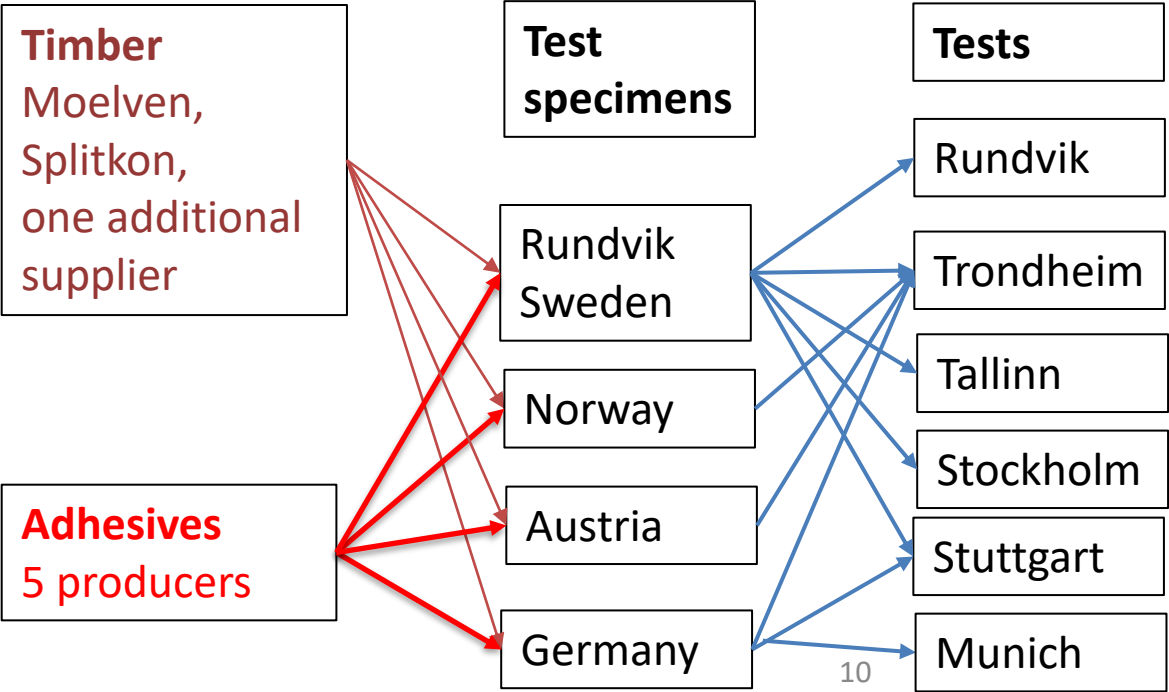
- Conferences and workshops for representatives from academia, designers, industry, rescue offices and authorities
- Standardization groups
- Courses for students and practising engineers

- Possibility of the classification of adhesives
- Small-scale test method for the classification
- Improved and validated models for the standard fire design
- Possibility of further classification rules and models
  - CEN TC193 SC1 Adhesives for wood and derived timber products, WG13 - Fire behaviour
  - CEN TC250 SC5 Structural Eurocodes – Eurocode 5: Design of Timber Structures, WG4 – Fire



# The value of scientific cooperation

- Transnational collaboration in the field of fire safety of innovative engineered wood systems
- Sharing of knowledge
- Each partner provides its unique testing capacity and competence





# Unexpected peculiarities/barriers

## Covid-19

- Shutdown (lab, factory, country border, etc.)
- “Hybrid experiment”
- Monthly online meetings
- Additional contributions from industries outside the consortium



📅 2019-04-24	✓	📅 2019-08-07 Project meeting in Muni...	✓	📄 Minutes of meeting 2019-05-13.pdf	✓
📄 Minutes of meeting 2019-09-30.pdf	✓	📄 Minutes of meeting 2019-11-07.pdf	✓	📄 Minutes of meeting 2019-12-02.pdf	✓
📄 Minutes of meeting 2020-01-09.pdf	✓	📄 Minutes of meeting 2020-02-06.pdf	✓	📄 Minutes of meeting 2020-03-09.pdf	✓
📄 Minutes of meeting 2020-04-02.pdf	✓	📄 Minutes of meeting 2020-05-07.pdf	✓	📄 Minutes of meeting 2020-06-10.pdf	✓
📄 Minutes of meeting 2020-07-03.pdf	✓	📄 Minutes of meeting 2020-09-03.pdf	✓	📄 Minutes of meeting 2020-10-08.pdf	✓
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## **Thank you!**

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# ForestValue

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