EASI ZERo

Envelope mAterial System with low Impact for Energy Renovation and construction

LEITAT managing technologies

Environmental and social performance assessment of innovative products from material to component scale

Sara Dimovska

Innovation Business Development Manager

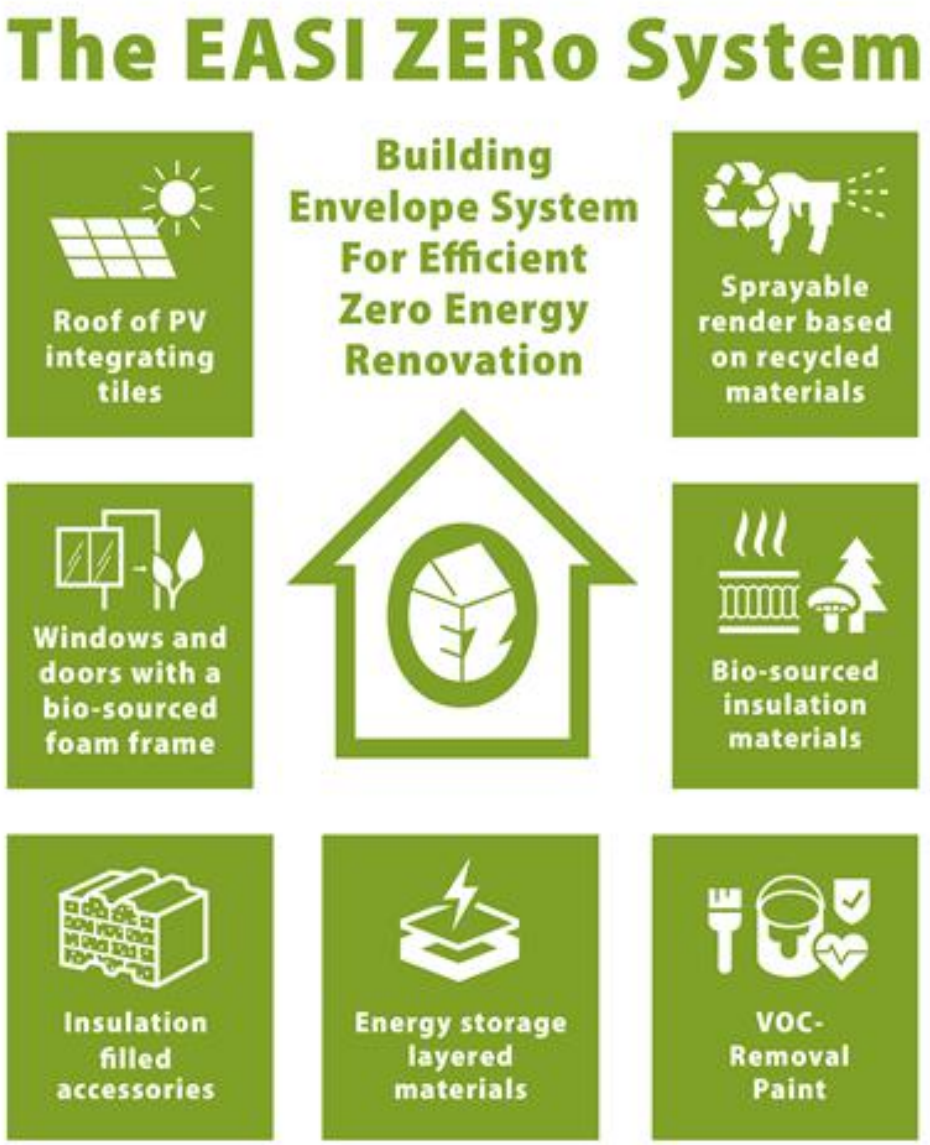
sdimovska@leitat.org

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

OUTLINE

- Eco-design and circular strategies for innovative products
- Enhanced sustainability of EASI ZERo's products
- Social impact assessment and experts feedback
- Sustainability from products to building scale



LEITAT managing technologies

cea

INDRESMAT INDUSTRIAL RESINS & MATERIALS

Elithis

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

ABOUT LEITAT

FOUNDED IN **1906**, LEITAT IS A NON-PROFIT **RESEARCH ORGANISATION** PROVIDING DISRUPTIVE **TECHNOLOGICAL SOLUTIONS**

SOME FIGURES

€47M
Income in 2024

+300
European projects

+700
National projects

+3.400
Industrial R&D projects

+400
experts

10
sites

AREAS OF KNOWLEDGE

- **CIRCULAR ECONOMY & DECARBONIZATION**
- **APPLIED CHEMISTRY & MATERIALS**
- **DIGITAL INDUSTRY**
- **HEALTH & BIOMEDICINE**
- **ADVANCED TECHNOLOGICAL SERVICES**

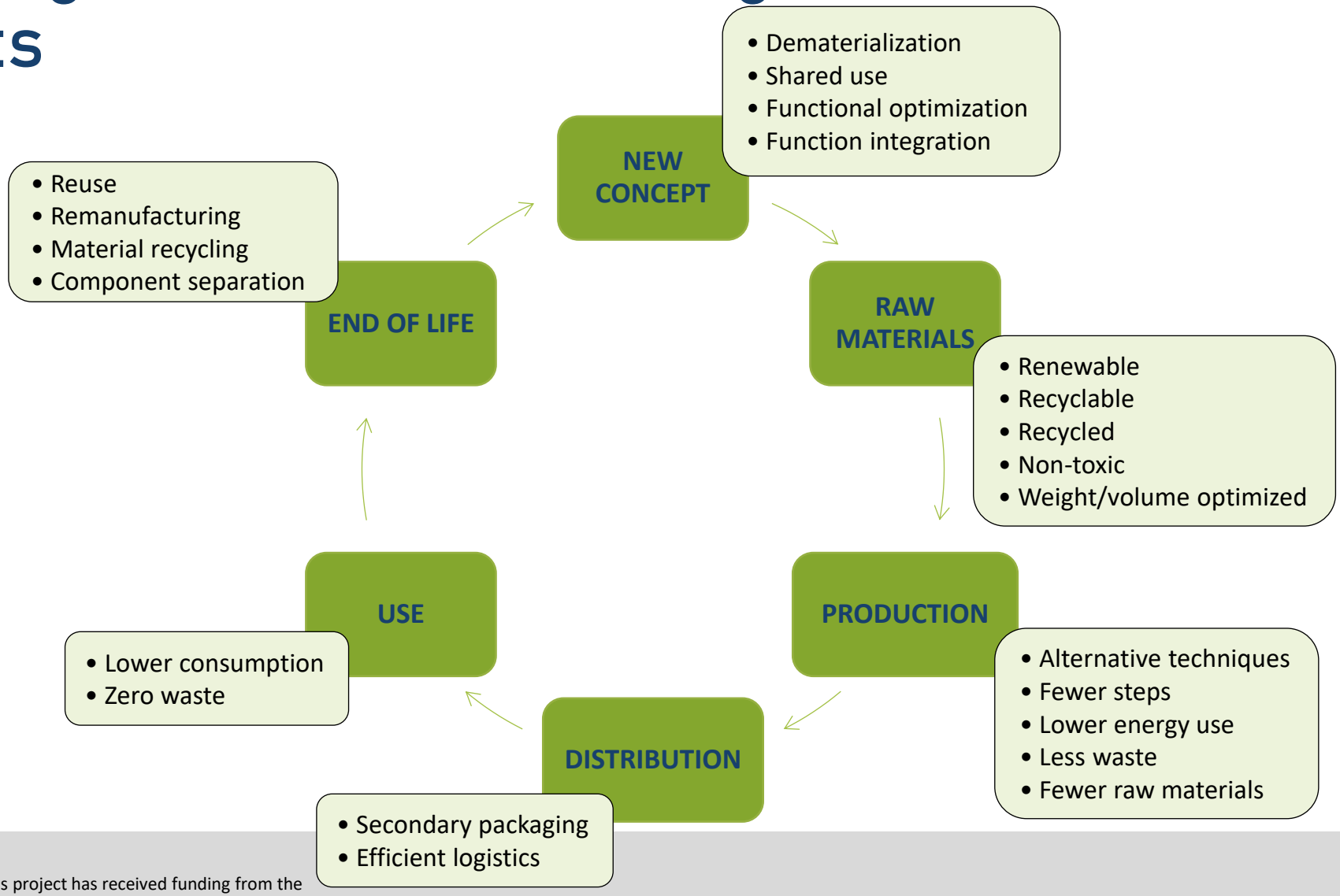
ROLE IN EASI ZERo

- Bio-PUR & VOC removal paints development
- Sustainability assessments
- Environmental Product Declarations
- Material passports development
- BIM and energy modelling

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

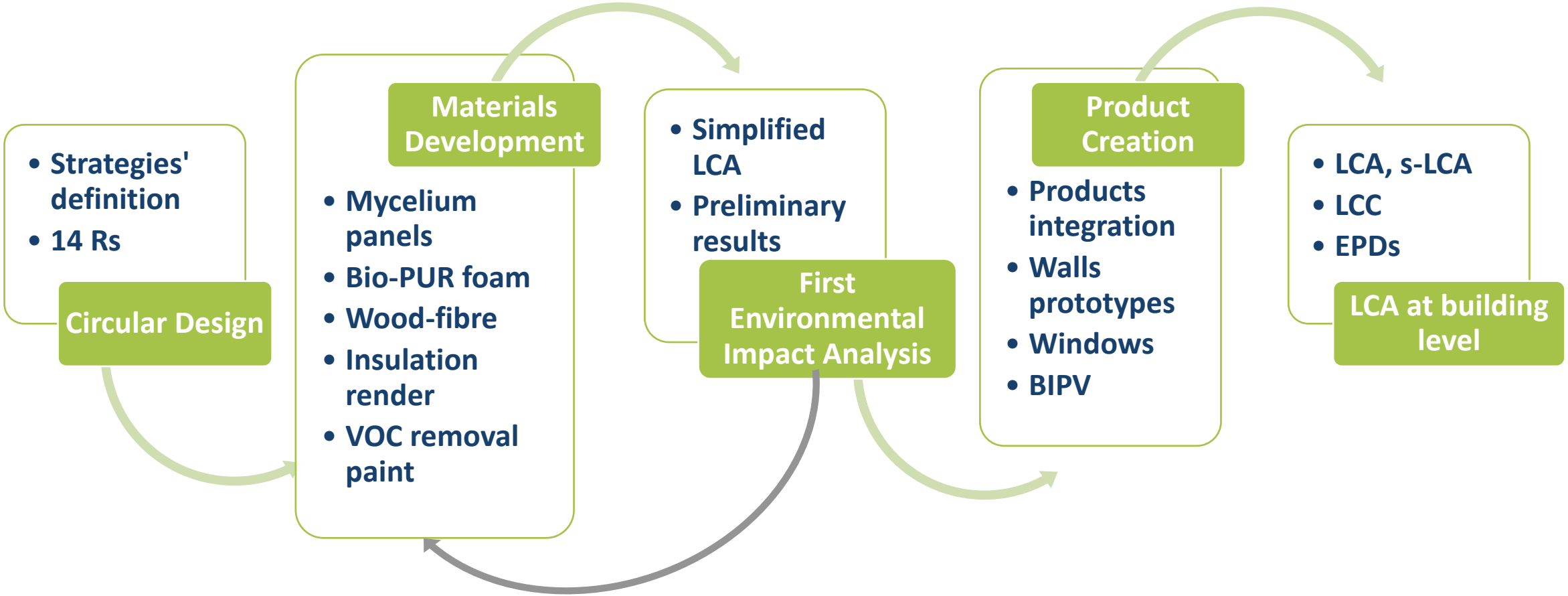
SUSTAINABLE PLACES 2025

Eco-design and circular strategies for innovative products



This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Eco-design and circular strategies for innovative products

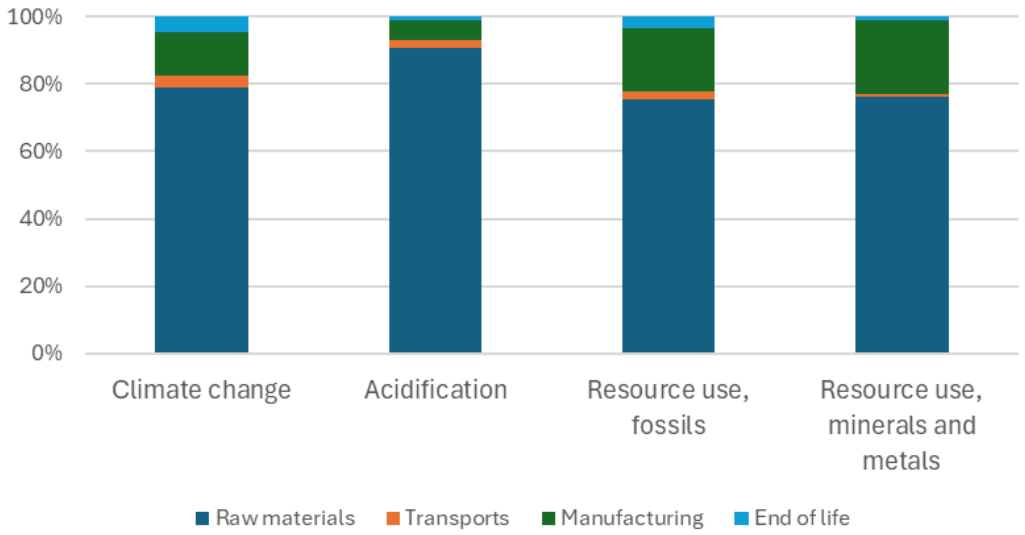


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

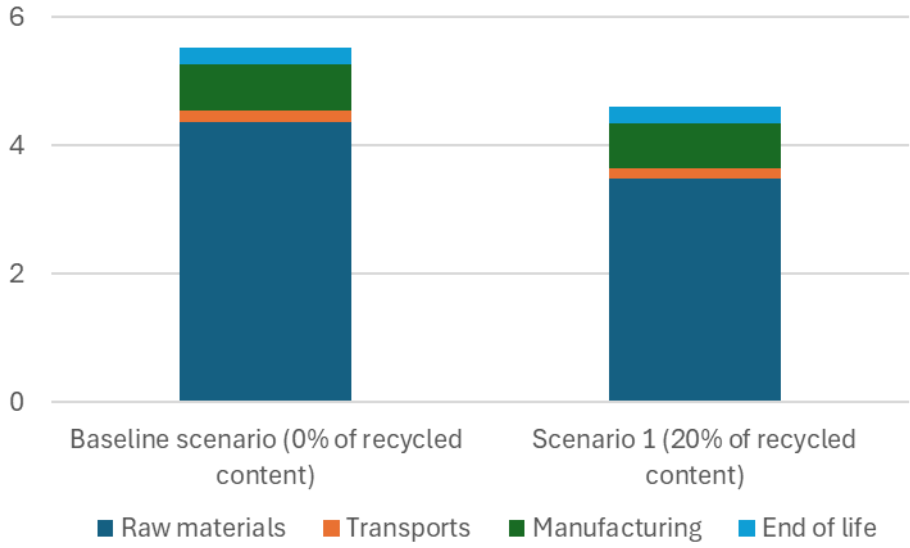
Enhanced sustainability of EASI ZERo's products

- Detailed results remain confidential
- Simplified LCA enabled impact quantification and scenario comparison
- Partners gained insights for informed and data-driven decisions

Example: Define the most impactful life stage



Example: Compare Alternative Scenarios

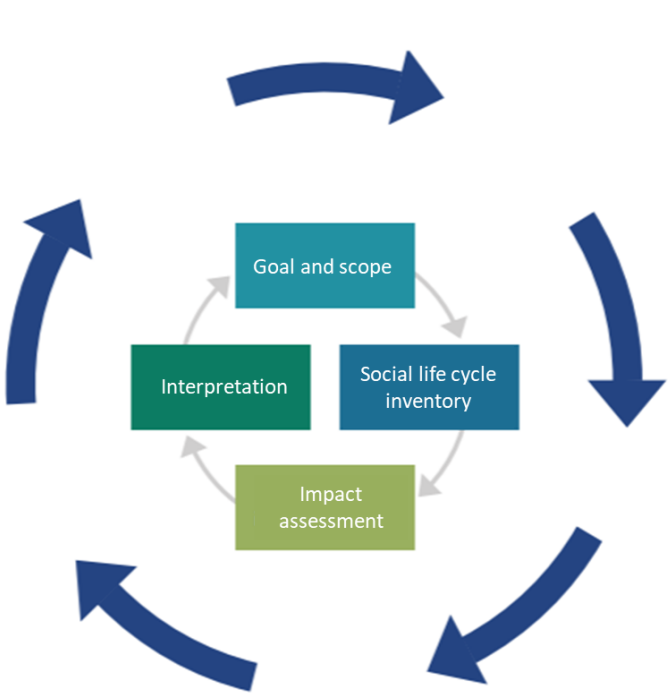


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Social impact assessment

S-LCA methodology

to assess the potential social impacts of EASI ZERo products



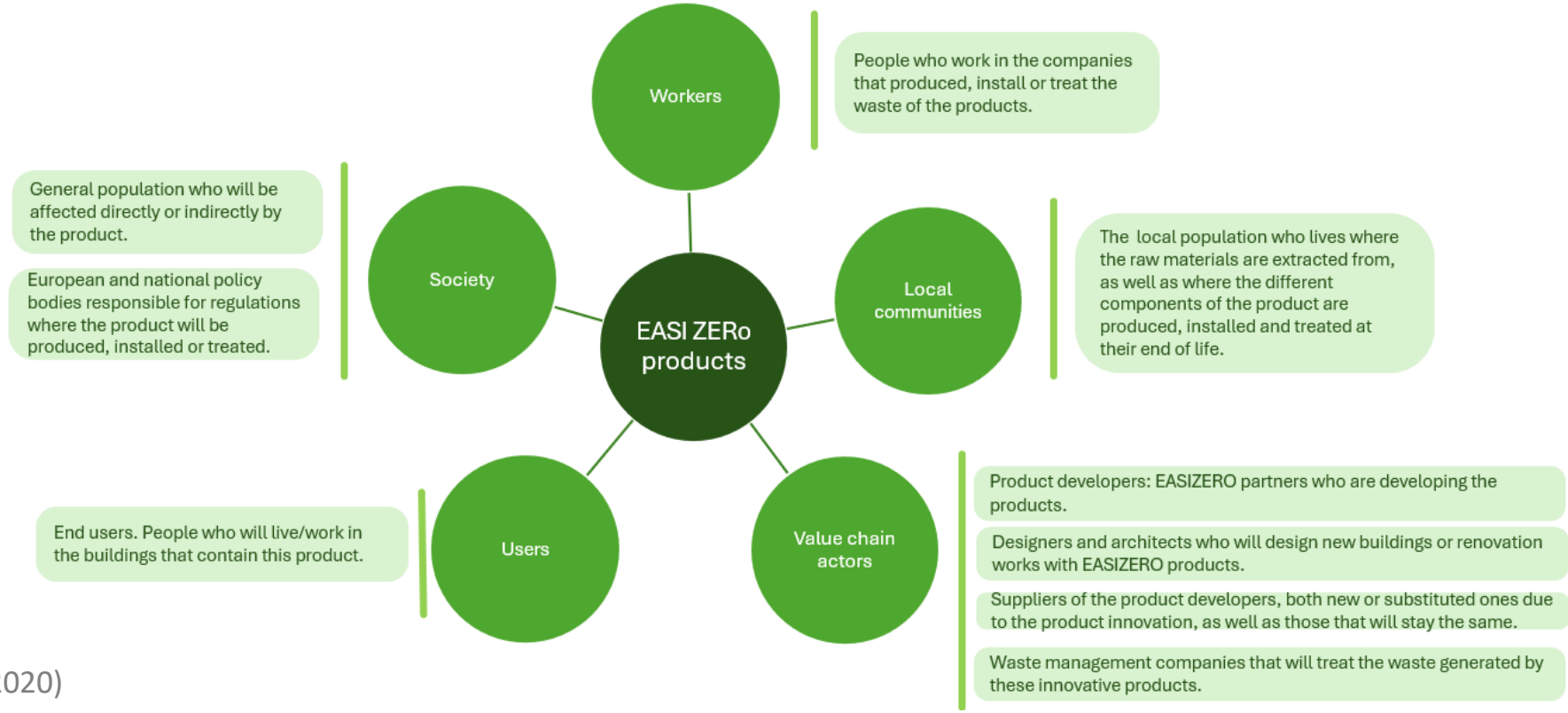


Figure: The four iterative phases of S-LCA (UNEP, 2020)

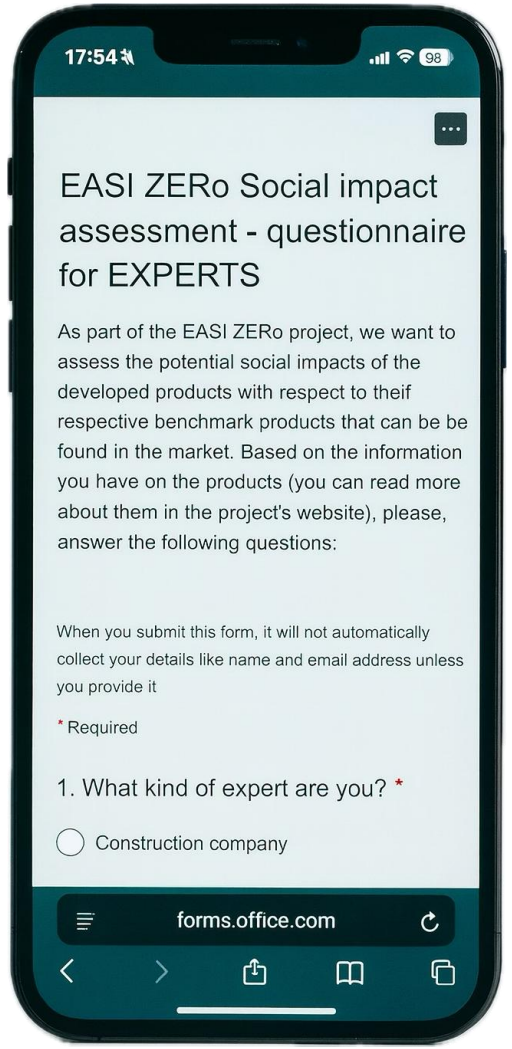
This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Social impact assessment

Do you want to contribute to the project?

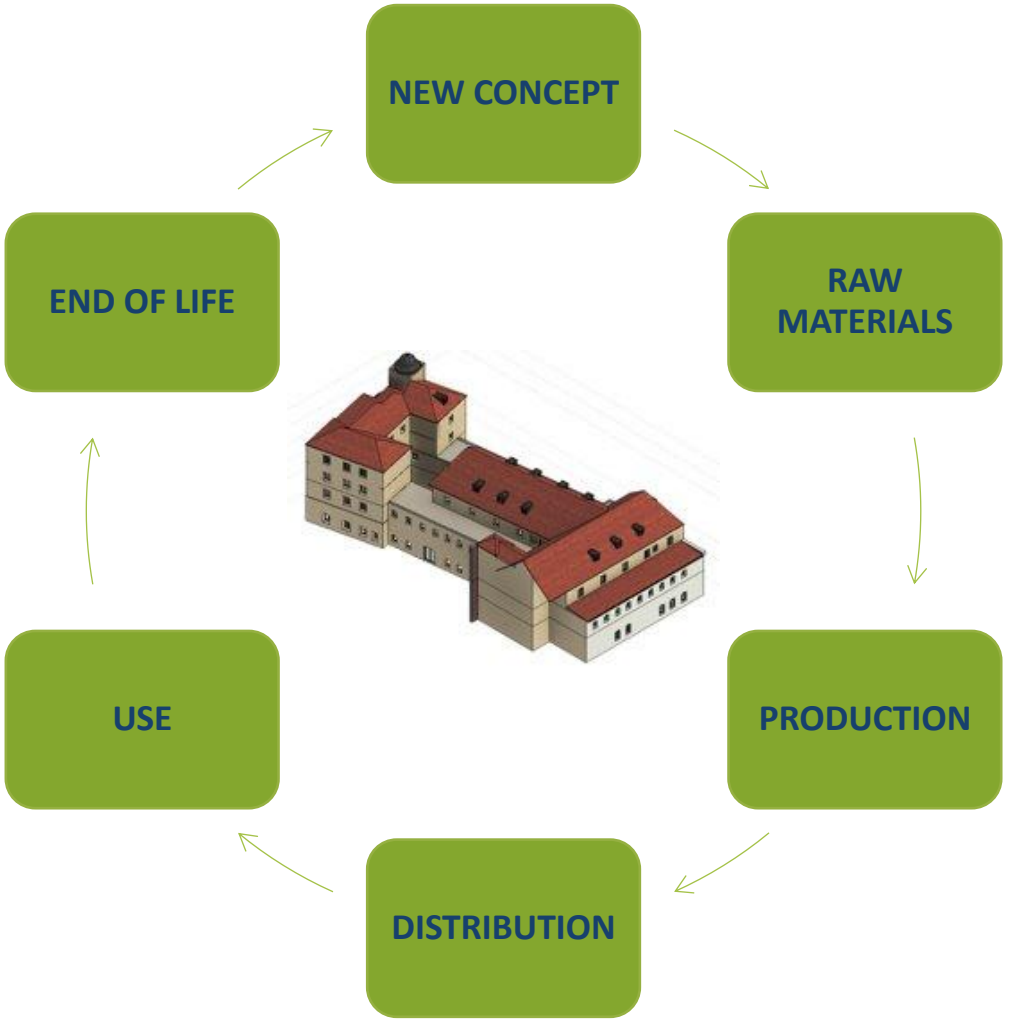
Please, answer this questionnaire for the Social Life Cycle Assessment we are carrying out!

EASI ZERo Social impact assessm
ent - questionnaire for EXPERTS



This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Sustainability from products to building scale

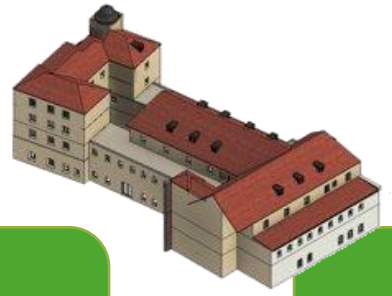


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Sustainability from products to building scale

Environmental impacts

Based on ISO 14040, EN 16978 and Level(s)
- Including Use stage (Refurbishment) and End of life
- KPI: GWP



User Wellbeing assessment

Based on Level(s)
- KPI: % of occupied time outside comfort range

Circularity

Based on Houseful Methodology and Level(s)
- **KPI:**
  - Energy Circularity Indicator (ECI)
  - Materials Circularity Indicator (MCI)
  - Environmental Impact Reduction (EIR)
  - Life Cycle Cost Reduction (LCCR)

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

THANK YOU!

Marco Mori
mmori@leitat.org

Davide Cerra
dcerra@leitat.org

Sara Dimovska
sdimovska@leitat.org

LEITAT
Acondicionamiento Tarrasense
TEL. +34 93 788 23 00
WWW.LEITAT.ORG

EASI ZERo : Envelope mAterial System with low Impact for Energy Renovation and cOnstruction

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

EASI ZERo

Envelope mAterial System with low Impact for Energy Renovation and construction

Energy Performance of Sustainable Building Renovation Products

From Lab Environment To Real Buildings

SUSTAINABLE PLACES 2025

LEITAT
managing technologies

Davide Cerra
Researcher
Energy Efficiency
Circular Economy & Decarbonization

V-Card:

M. (+34) 610 91 20 88
dcerra@leitat.org

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Lab Environments Energy Models

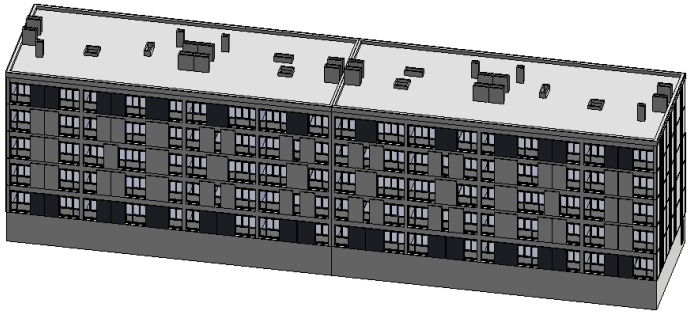
Simulation and validation of building renovation components: A case study using IDA ICE and EnergyPlus

Roberta Moschetti, Alessia Losini, Amandine Piot, Mirco Riganti and Alessandro Nocente.

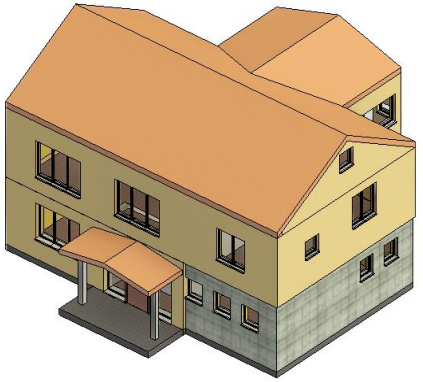
	NRMSE(-)		
	IDA ICE vs EnergyPlus	**IDA ICE vs Measures**	**EnergyPlus vs Measures**
Operative Temperature	0.205	0.323	**0.252**
Interior Surface Temperature of Glazing	0.088	0.080	**0.063**
Interior Surface Tamperature of Test Wall	0.139	**0.116**	0.119
Heat Flux Through Test Wall	0.172	0.181	**0.159**

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

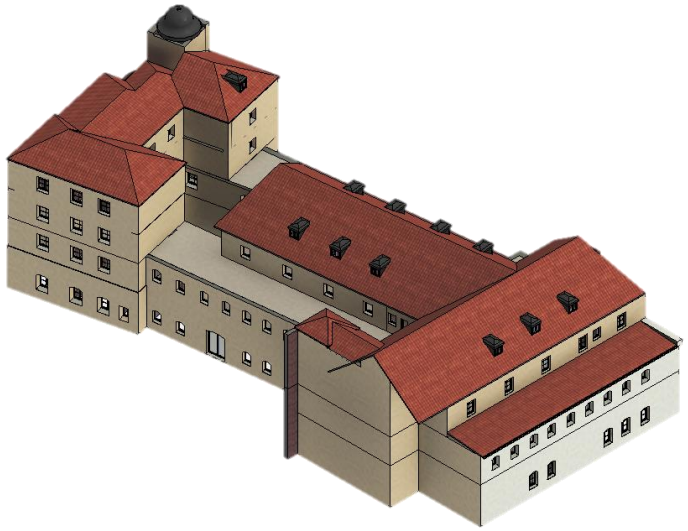
BIM to BEM and LCA



Condominium
Saint-Gratien, France



Detached House
Trondheim, Norway

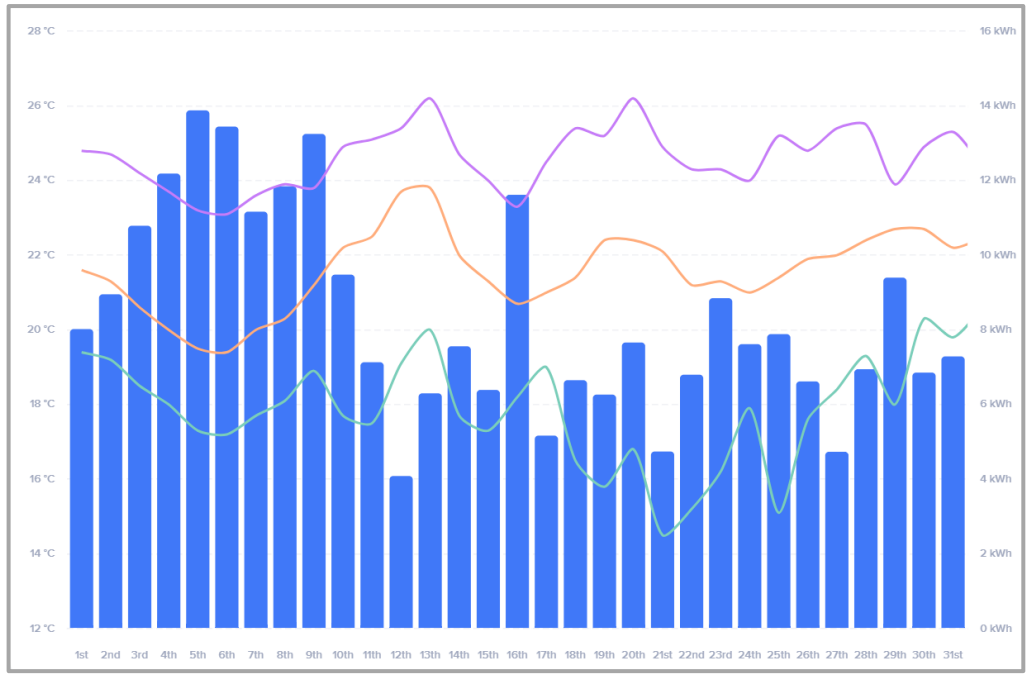


Office Building
Würzburg, Germany

SimaPro ← R RVT → IES VE

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Monitoring



Netatmo legrand®

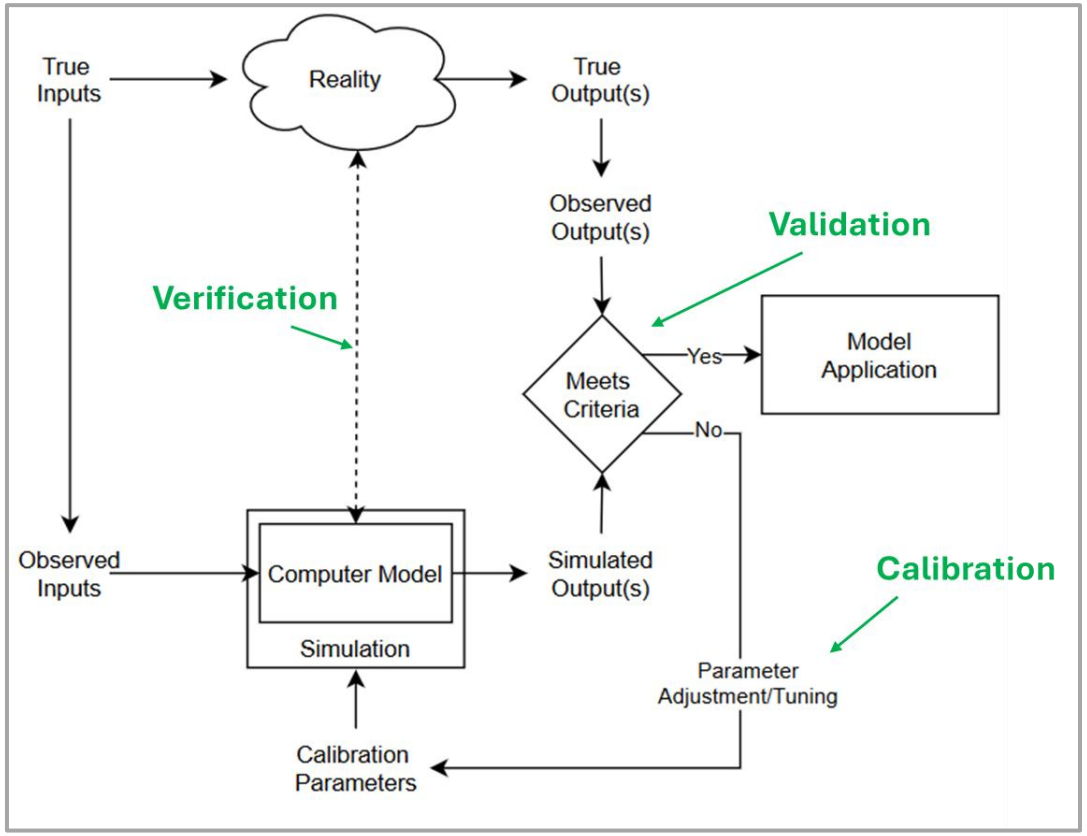
- Temperature
- Humidity
- CO2
- Pressure
- Noise

- Electricity Consumption

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

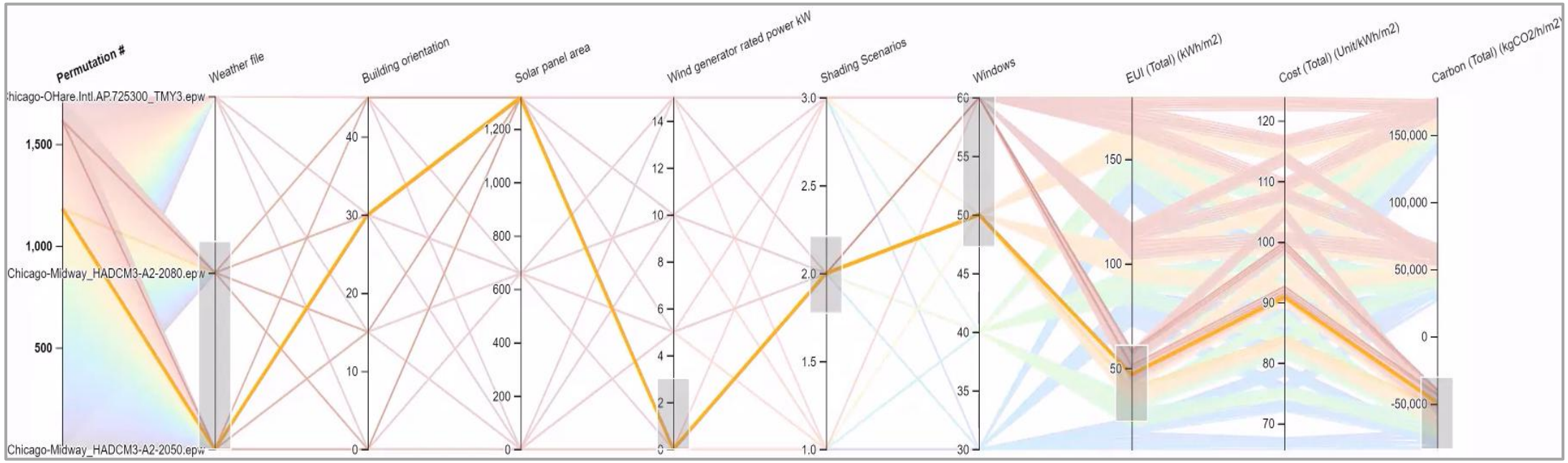
Model Calibration



	Condominim	Detached house	Office Building
Measured Data	Monthly energy bills U-values Air tightness	Weather Indoor temp/RH Electricity	Annual energy bills
Model Type	Deterministic model with uncertainty quantification	High-confidence deterministic model	Probabilistic modeling via uncertainty simulation
Uncertain Inputs	Internal loads occupancy Appliances usage	DHW, plug loads, equipment operation	Infiltration internal gains occupancy setpoints HVAC
Methods	Morris Screening LHS	Morris Screening Sobol Indices	Monte Carlo LHS
Outputs	Calibrated model + uncertainty bands	Fully validated model, optional uncertainty check for unmonitored loads	Statistical distribution
Strength of Validation	Medium reliability (limited temporal and spatial resolution)	High reliability (granular temporal and spatial resolution)	Medium
Tool Used	IES VE	IES VE	IES VE

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Parametric Analysis



This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

LEITAT
managing technologies

Davide Cerra
Researcher
Energy Efficiency
Circular Economy & Decarbonization

V-Card:

M. (+34) 610 91 20 88
dcerra@leitat.org

EASI ZERo : Envelope mAterial System with low Impact for Energy Renovation and cOnstruction

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

EASI ZERo

Envelope mAterial System with low Impact for Energy Renovation and construction

Wall test prototype

Alessia Losini

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

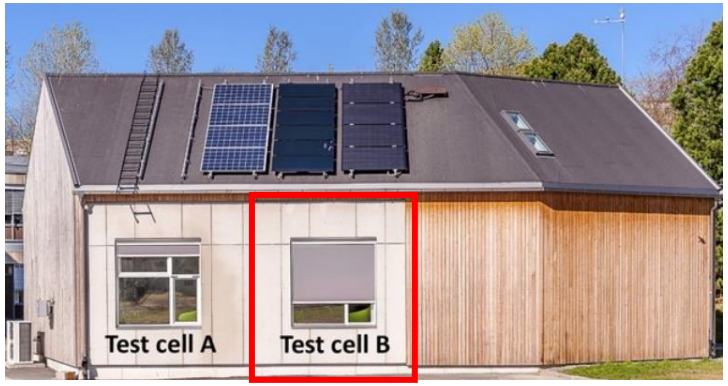
SUSTAINABLE PLACES 2025

Project objectives and methodology

Materials **prototyping** and lab testing

-30% CO_2 emissions
-30% in the embodied energy

Numerical modeling and experimental testing at **wall scale**



+20% thermal resistance
-30% installation worktime

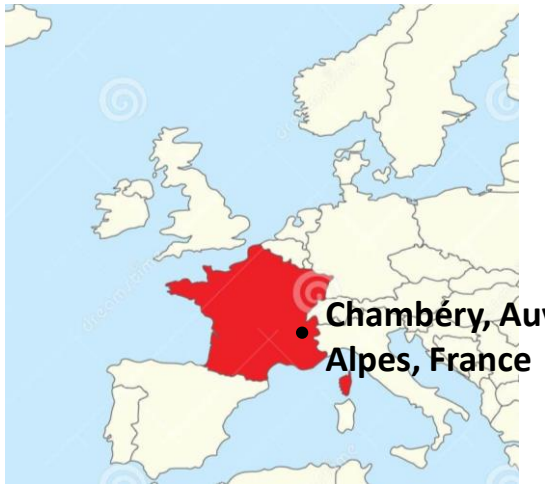
Real **case study**

Energy consumption < 50 kWH/m²/yr
Carbon emission < 4 $kgCO_2/m^2/yr$

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Test facilities in CEA: passys cells

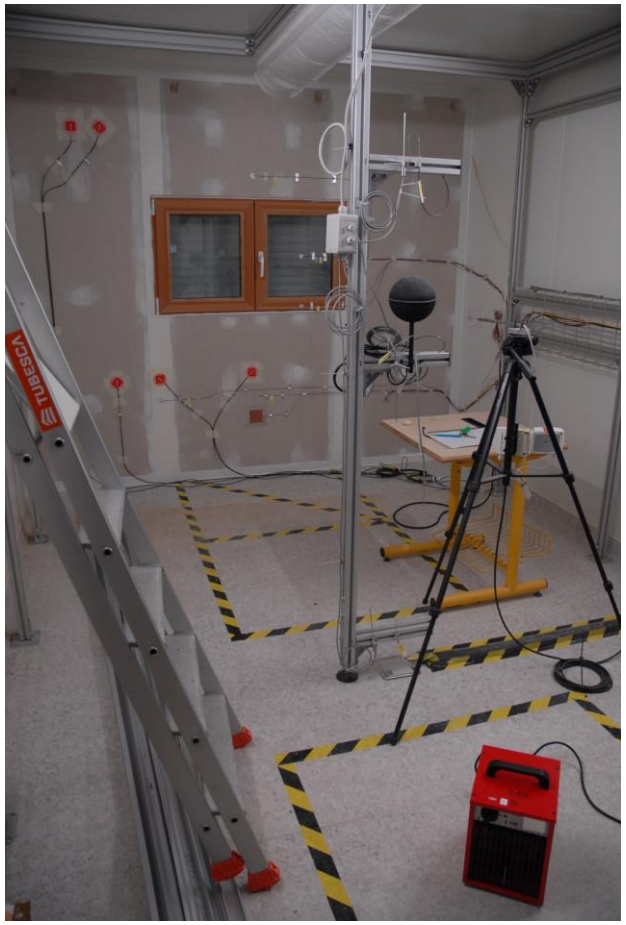


- Full-scale outdoor facility in France
- Twin-cell configuration
- Flexible setup
- Controlled indoor environment
- Measurement versatility

This proj
European
and innov
agreement No 101091531

SUSTAINABLE PLACES 2025

Test facilities



- Fully Instrumented
- Insulated and airtight

Easizero products:
BioPur Sprayable foam
Bio-pur windows frame
VOC removal paint

Not retrofitted façade

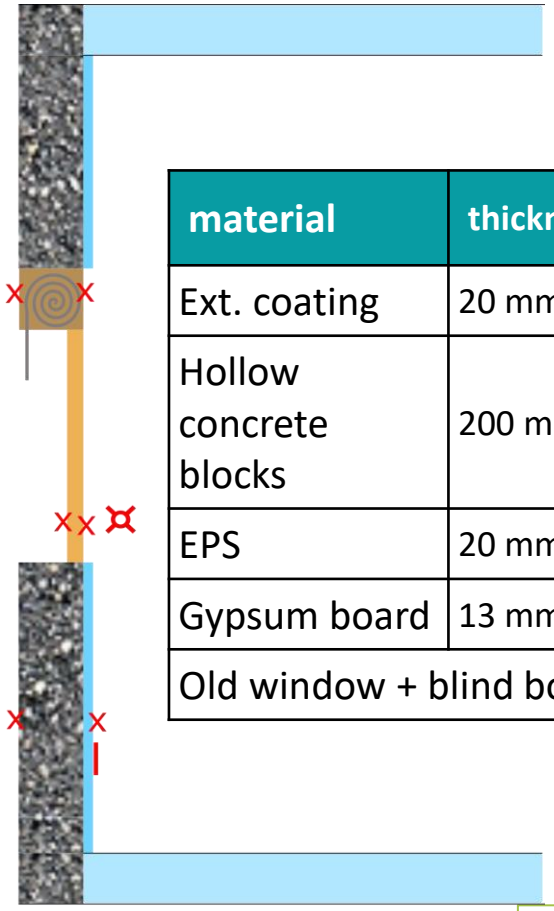
Retrofitted façade

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Test facilities

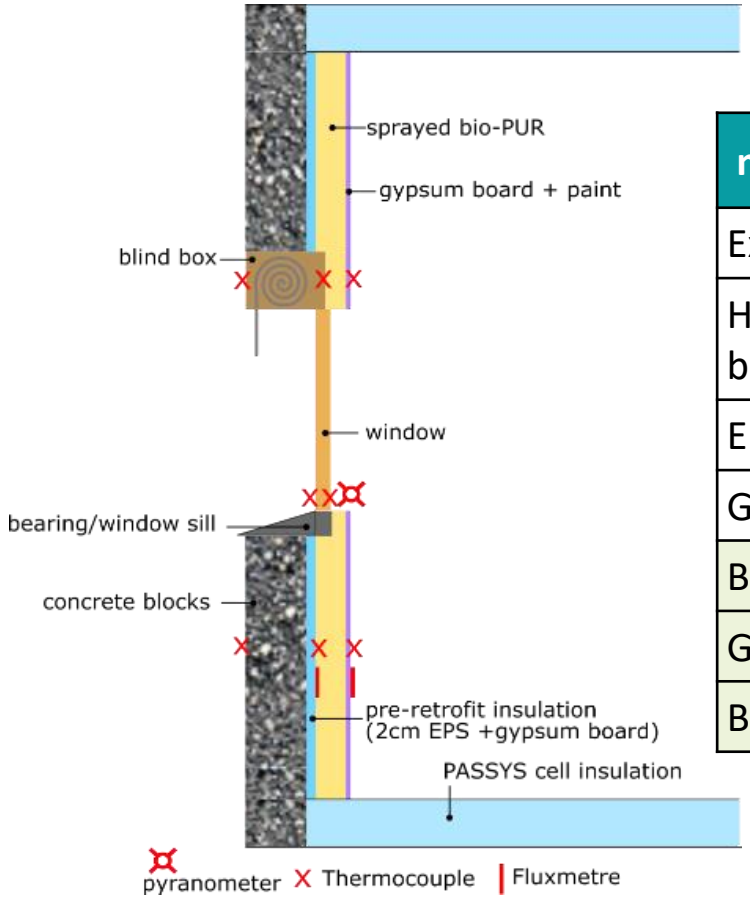
Easizero products:
BioPur Sprayable foam
Bio-pur windows frame
VOC removal paint



material	thickness
Ext. coating	20 mm
Hollow concrete blocks	200 mm
EPS	20 mm
Gypsum board	13 mm
Old window + blind box	

pyranometer X Thermocouple | Fluxmetre

Not retrofitted façade



pyranometer X Thermocouple | Fluxmetre

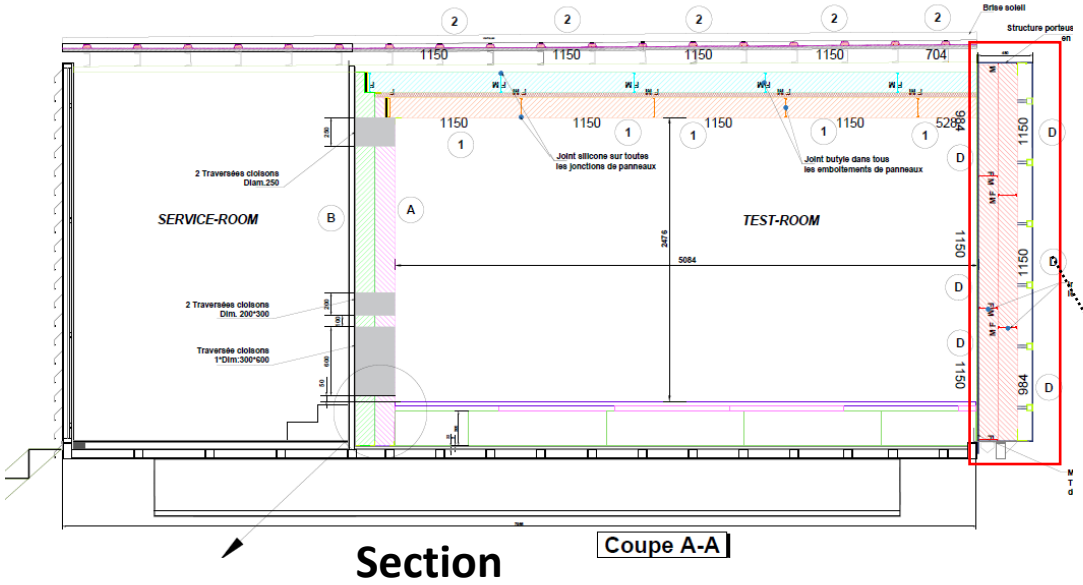
material	thickness
Ext. coating	20 mm
Hollow concrete blocks	200 mm
EPS	20 mm
Gypsum board	13 mm
Bio-PUR foam	100 mm
Gypsum board	13 mm
Bio-PUR window + wooden blind box	

Retrofitted façade

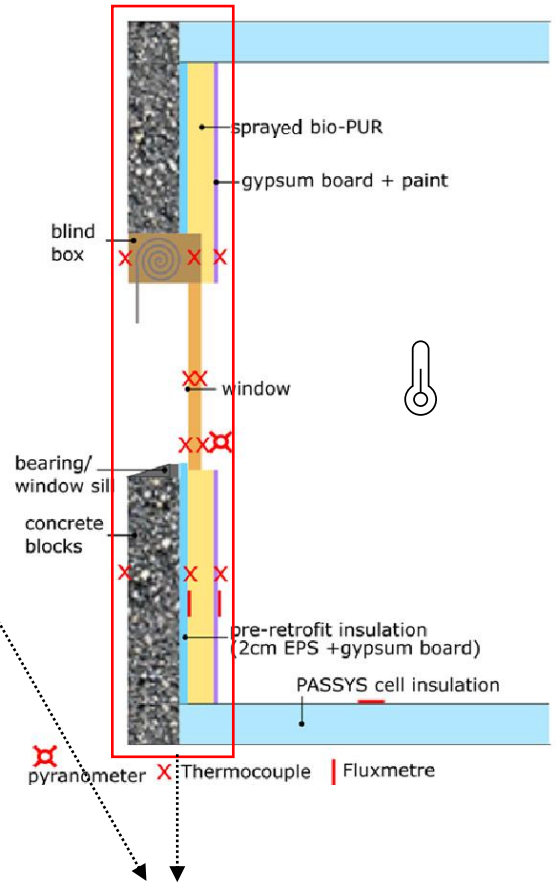
This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Test facilities



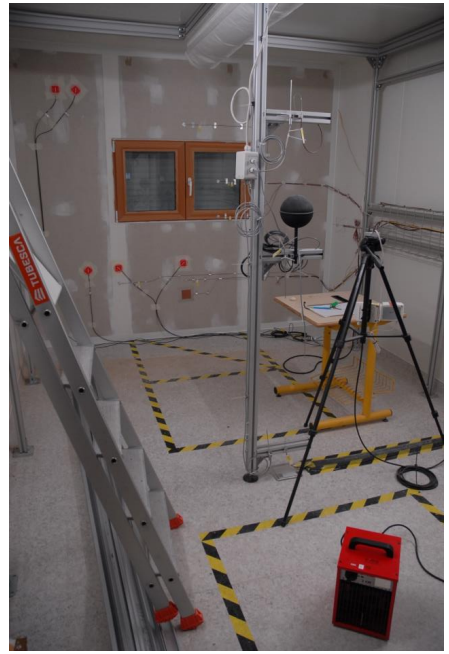
Section



Test wall

Measured variables:

- Surface temperatures
- Heat fluxes
- Indoor air temperature
- Operative temperature

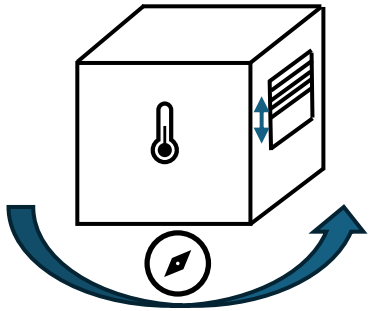


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Measurement plan towards modelling

North



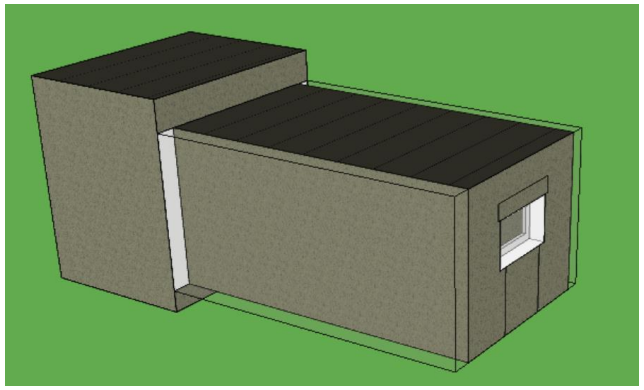
South

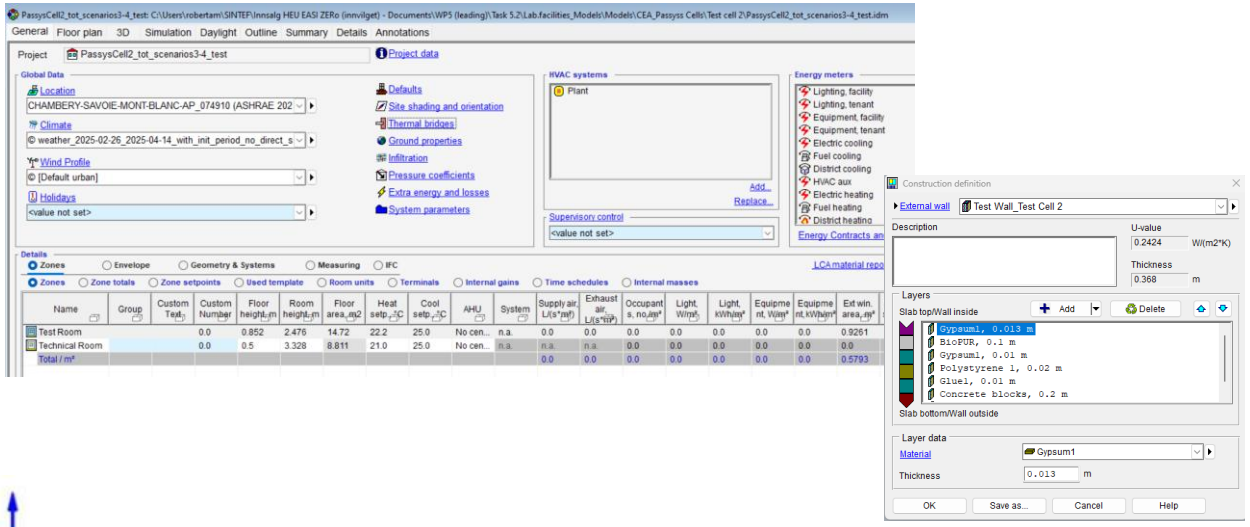
Case	Measurement period		Blinds	Temperature set-point	Orientation
1	13-Feb	25-Feb	drawn	20	North
2	01-Mar	16-Mar	open	20	North
3	17-Mar	30-Mar	drawn	22	South
4	31-Mar	13-Apr	open	free floating	South

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Numerical model software

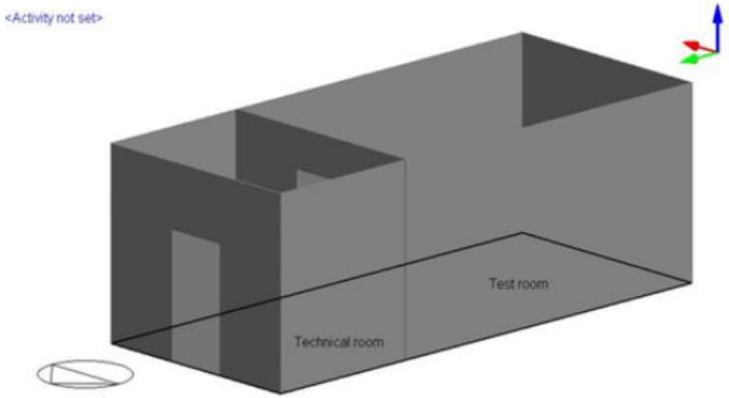
IDA ICE

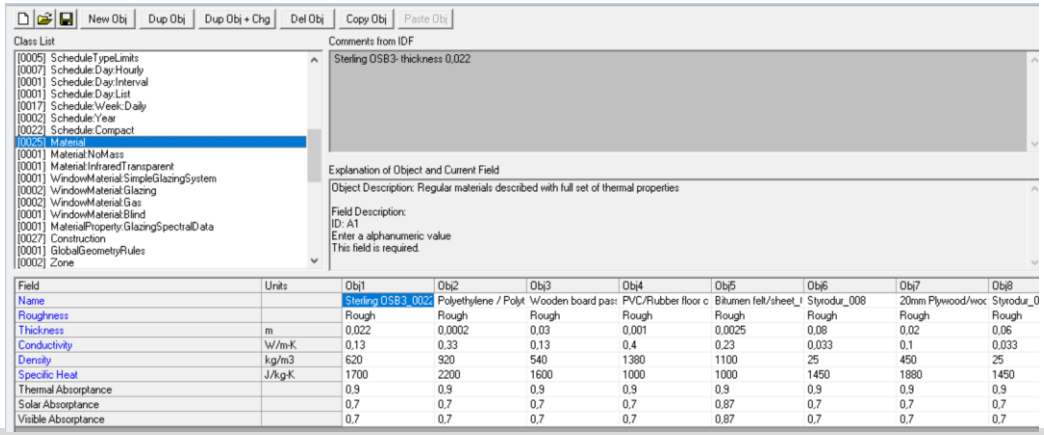




EnergyPlus

DesignBuilder

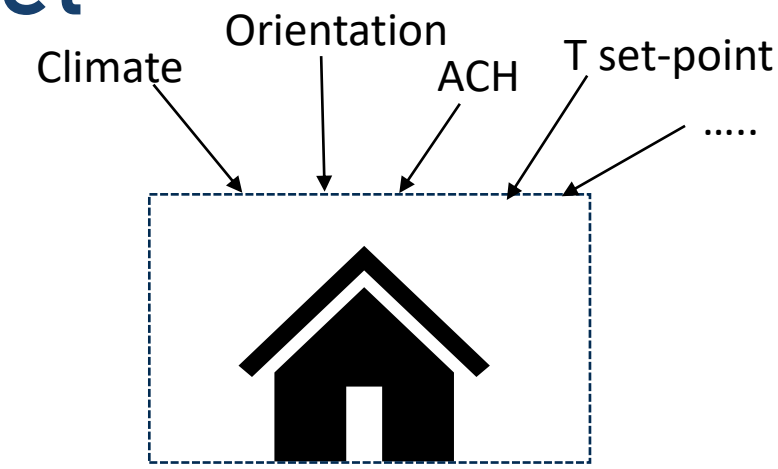


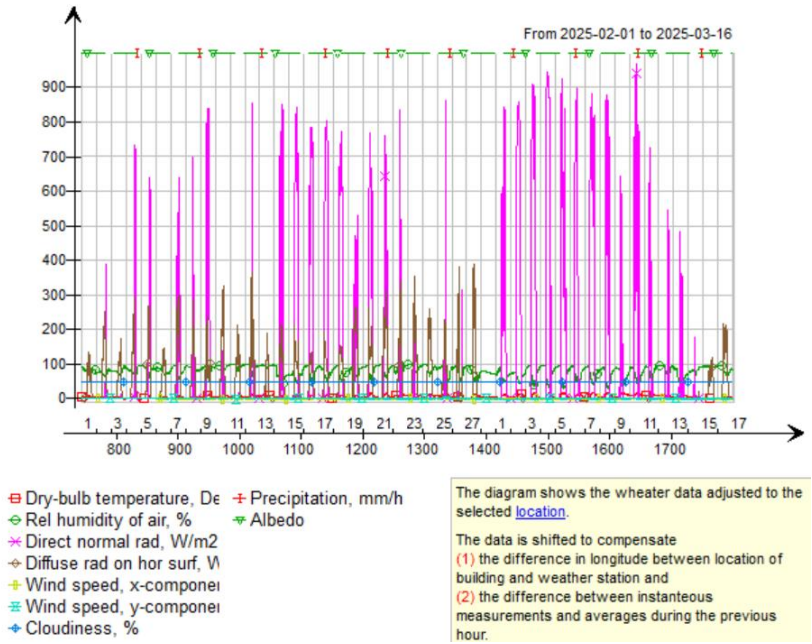


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Numerical model Input-output





Aligned inputs for:

- Climate file
- Geometry
- Envelope (opaque and transparent)
  - U-values, solar transmittance, etc.
  - Emissivity/Reflectance coefficients
  - ACH at 50 Pa = 2.76
- Thermal Zones
  - Heating setpoints: 20°C in test room
  - Internal gains: none
  - No cooling, nor ventilation

Simulation period: March 1–17, 2025

Output time-step: 10-minutes

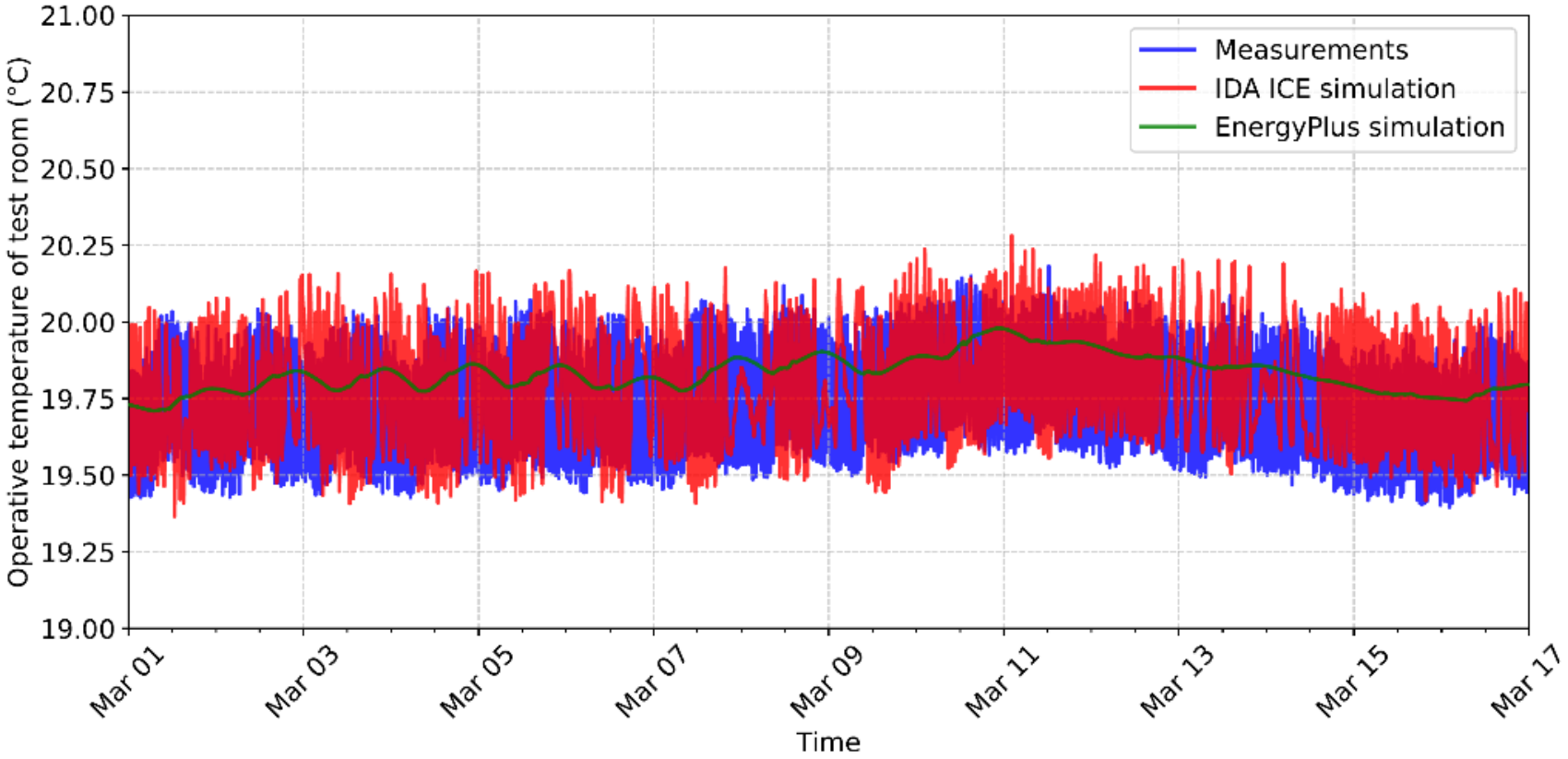
Analysed outputs:

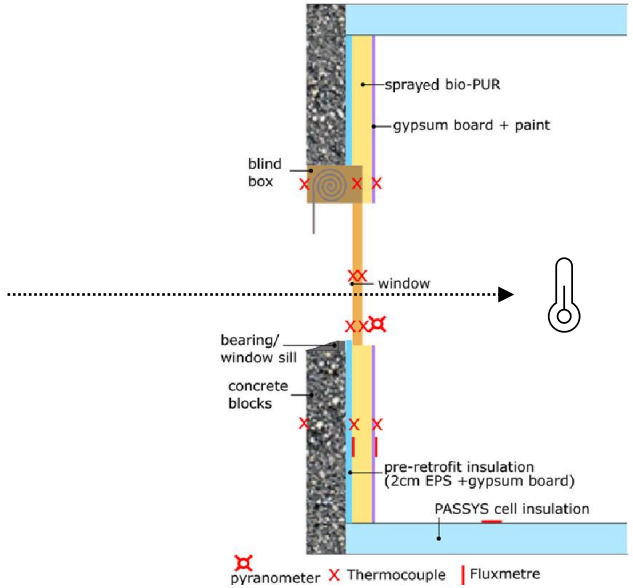
- Test wall interior surface temperature
- Test wall heat flux
- Operative temperature
- Window interior surface temperature

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Simulation results

Operative temperature in test room



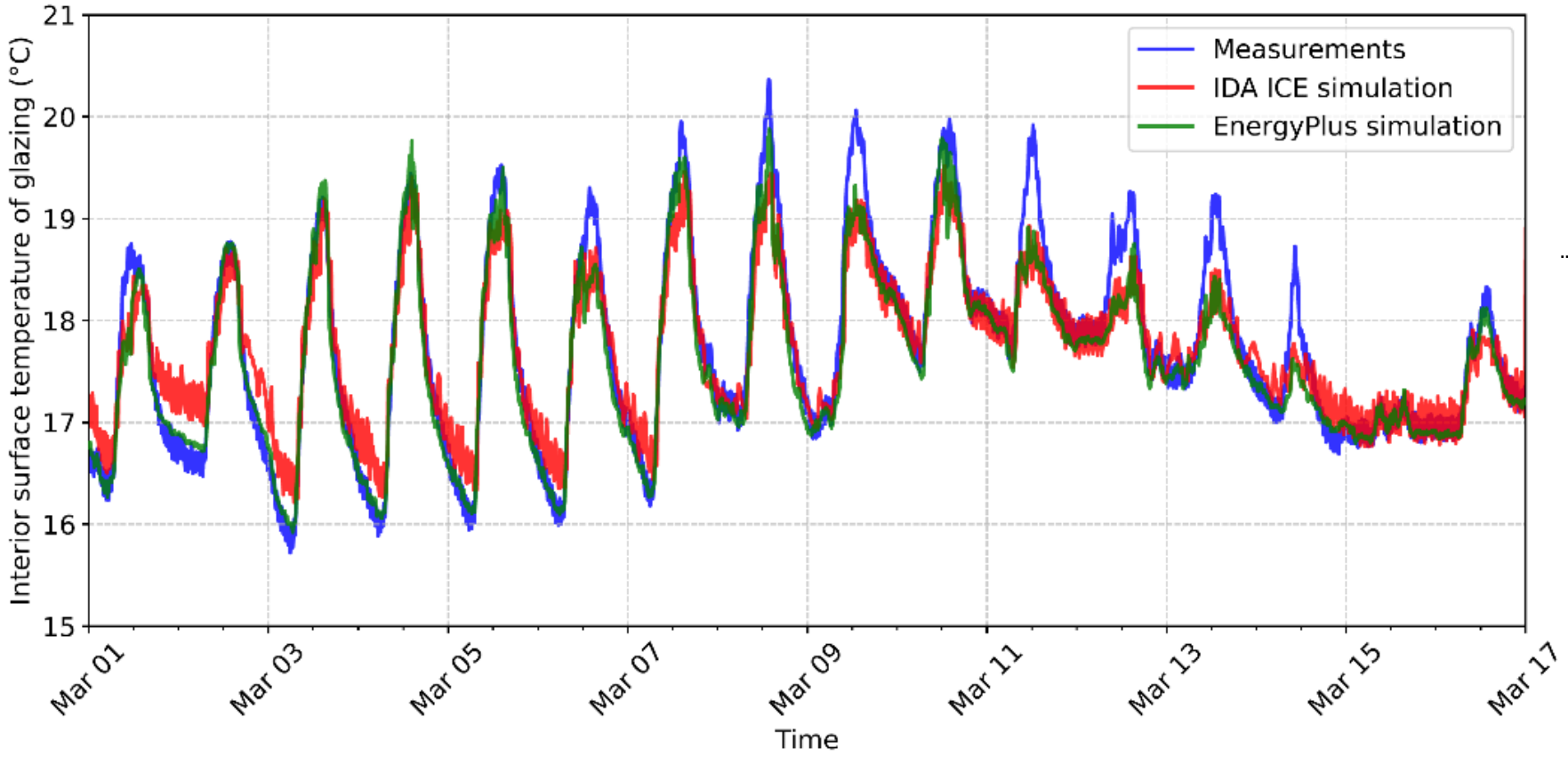


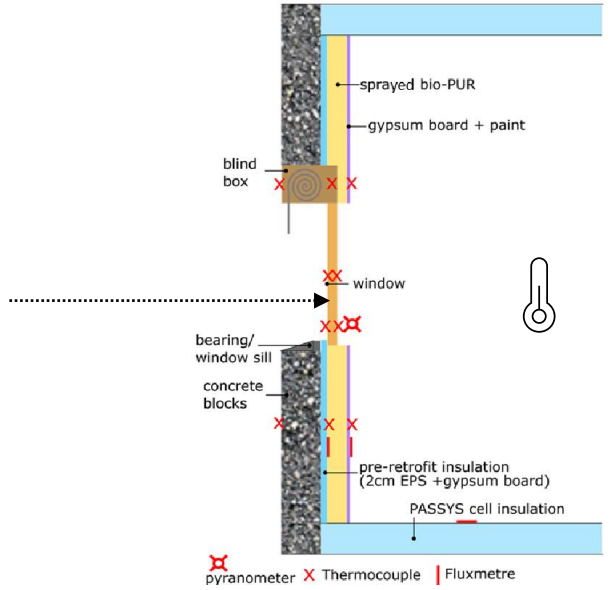
This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Simulation results

Glazing interior surface temperature

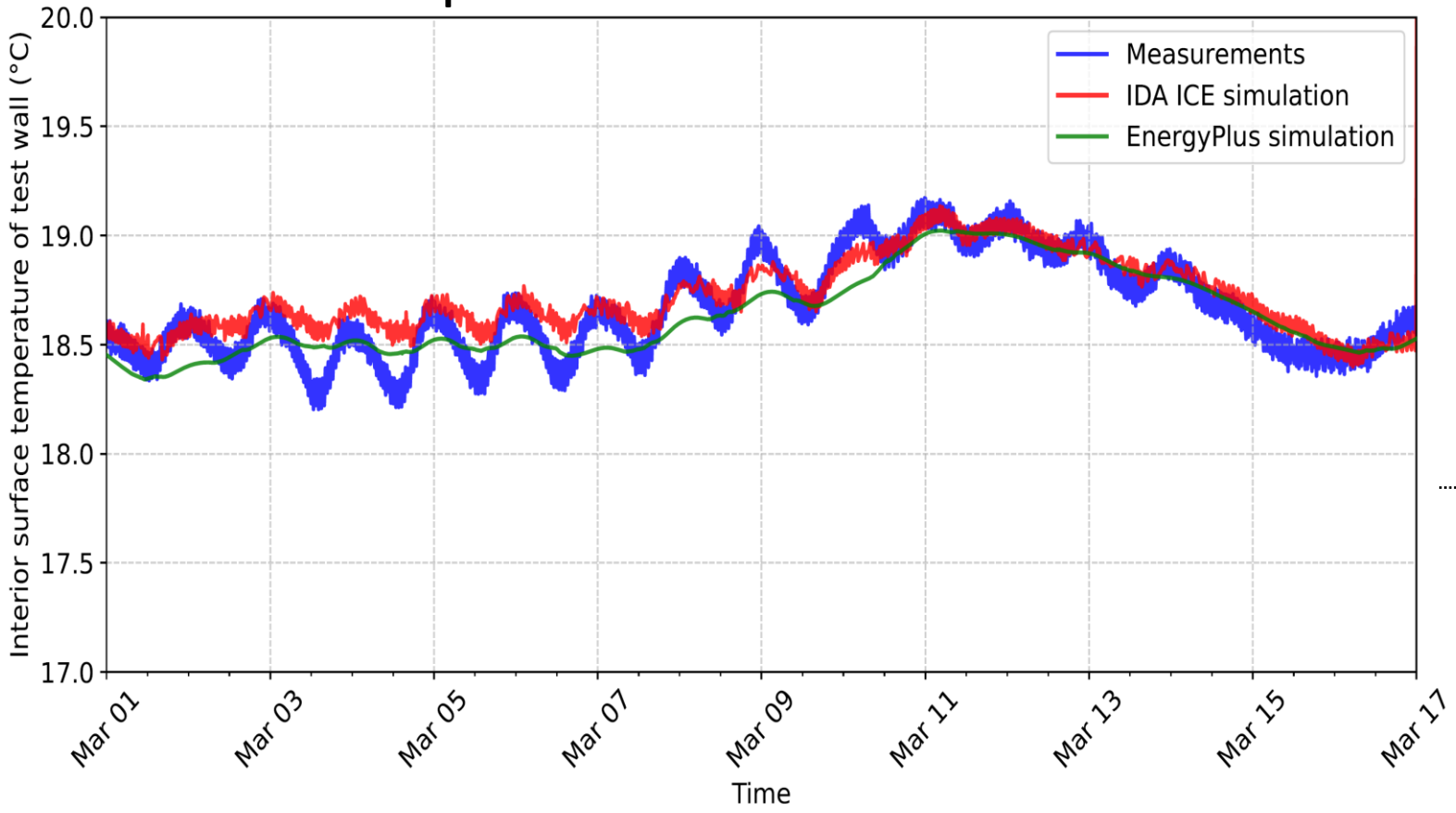


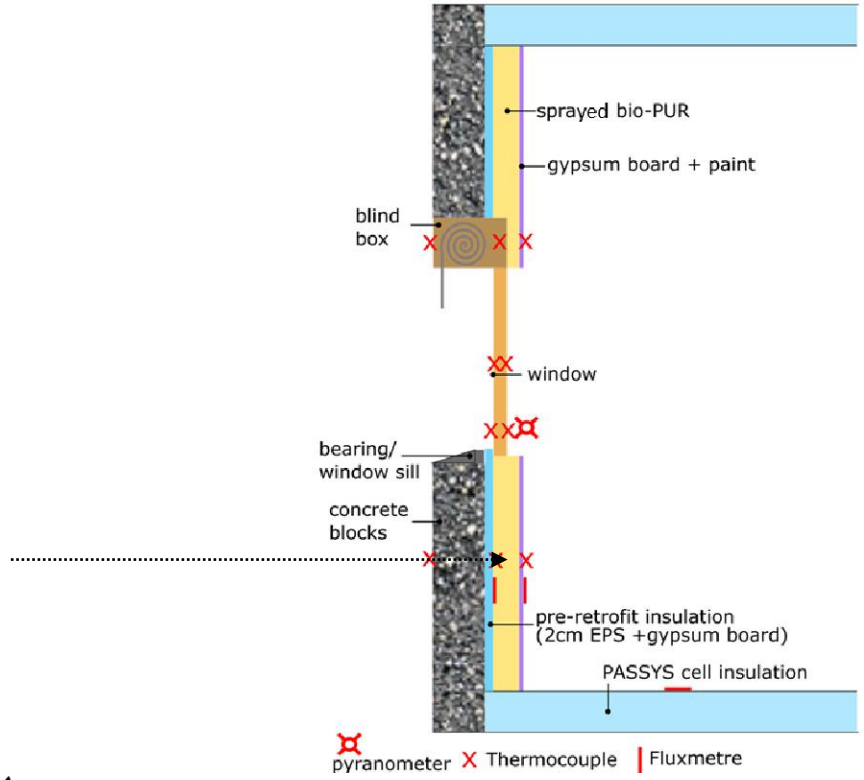


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Interior surface temperature of test wall

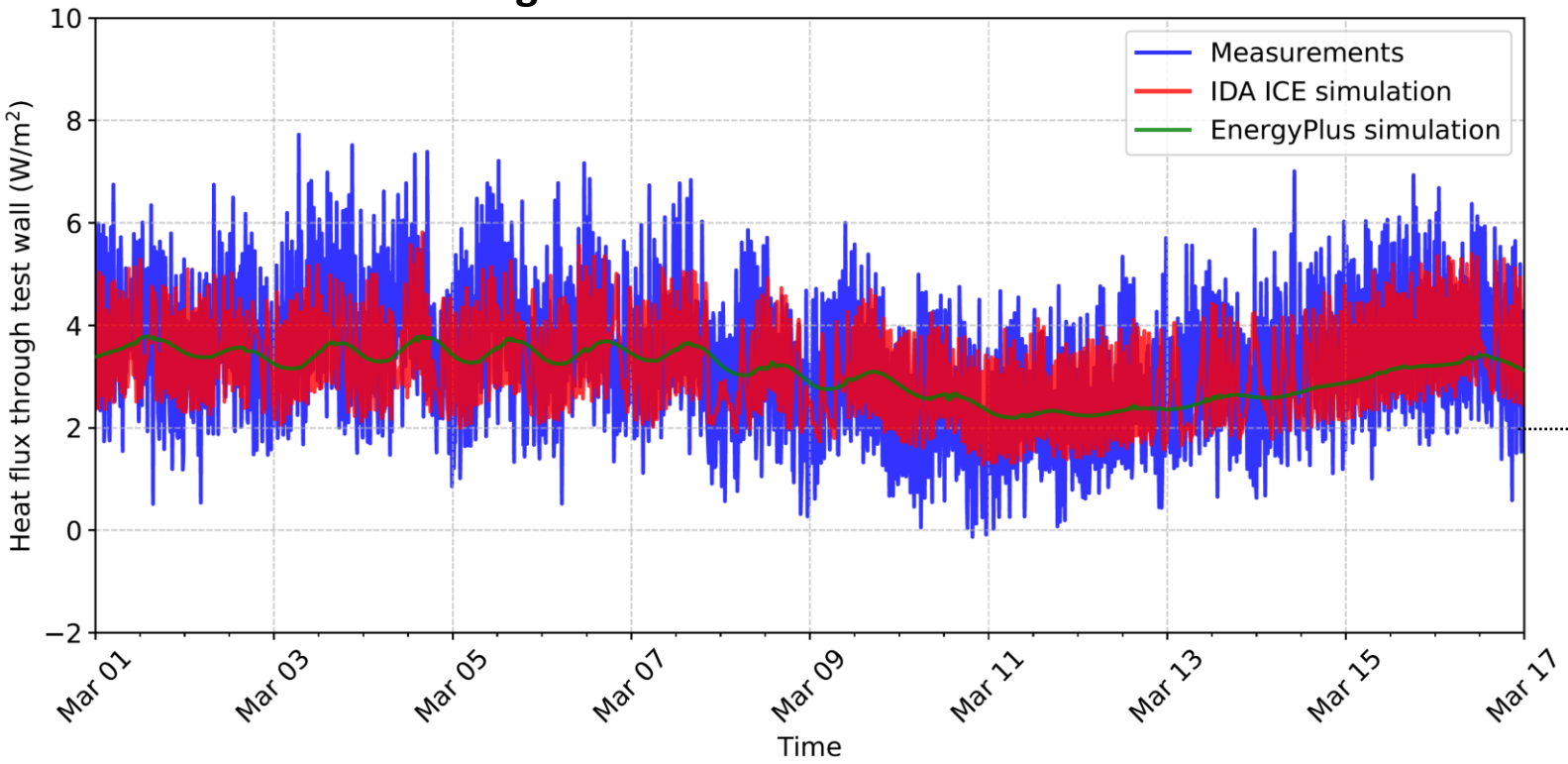


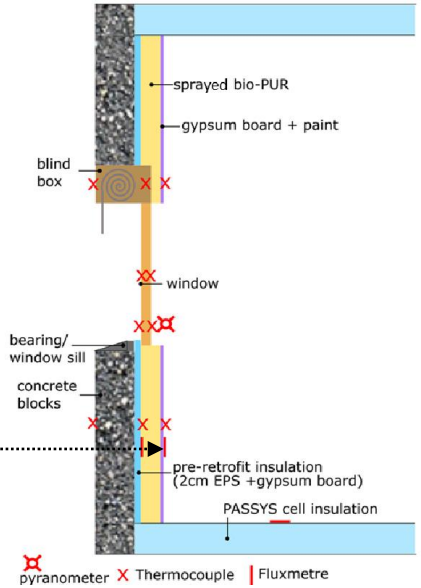


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Heat flux through test wall





This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Results comparison

$$RMSE=\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - x_i)^2}$$

$$NRMSE=\frac{\sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - x_i)^2}}{y_{max}-y_{min}}$$

Variable	RMSE (°C for temperatures and W/m² for heat flux)		
	IDA ICE vs EnergyPlus	IDA ICE vs Measures	EnergyPlus vs Measures
• Operative temperature	0.187	0.253	**0.198**
• Interior surface temperature of glazing	0.356	0.373	**0.293**
• Interior surface temperature of test wall	0.109	**0.113**	0.115
• Heat flux through test wall	0.768	1.419	**1.251**

Variable	NRMSE (-)		
	IDA ICE vs EnergyPlus	IDA ICE vs Measures	EnergyPlus vs Measures
• Operative temperature	0.205	0.323	**0.252**
• Interior surface temperature of glazing	0.088	0.080	**0.063**
• Interior surface temperature of test wall	0.139	**0.116**	0.119
• Heat flux through test wall	0.172	0.181	**0.159**

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Conclusions

- Energy and thermal performance of EASI ZERo wall, assessed with IDA ICE & EnergyPlus vs. measurements.
- EnergyPlus generally slightly more accurate than IDA ICE, although both show some discrepancies.
- Observed discrepancies: differences in the tools' heat transfer algorithms, model assumptions, measurement uncertainties.
- Future work: refine models, extend validation period, and include cross-climate comparisons.

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Thank you for your attention!

Roberta Moschetti, Alessandro Nocente,
SINTEF AS, Department of Architecture, Materials and Structures, 7034, Trondheim, Norway
Alessia Losini, Amandine Piot,
Université Grenoble Alpes, CEA, LITEN, INES, 73375 Le Bourget du Lac, France
Mirco Riganti, LEITAT Technological Center, Carrer de la Innovacio' 2, 08025 Terrassa, Spain and
Escola Técnica Superior D'Arquitectura de Barcelona, Universitat Politécnica de Catalunya,

alessia.losini@cea.fr

EASI ZERo : Envelope mAterial System with low Impact for Energy Renovation and cOnstruction

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

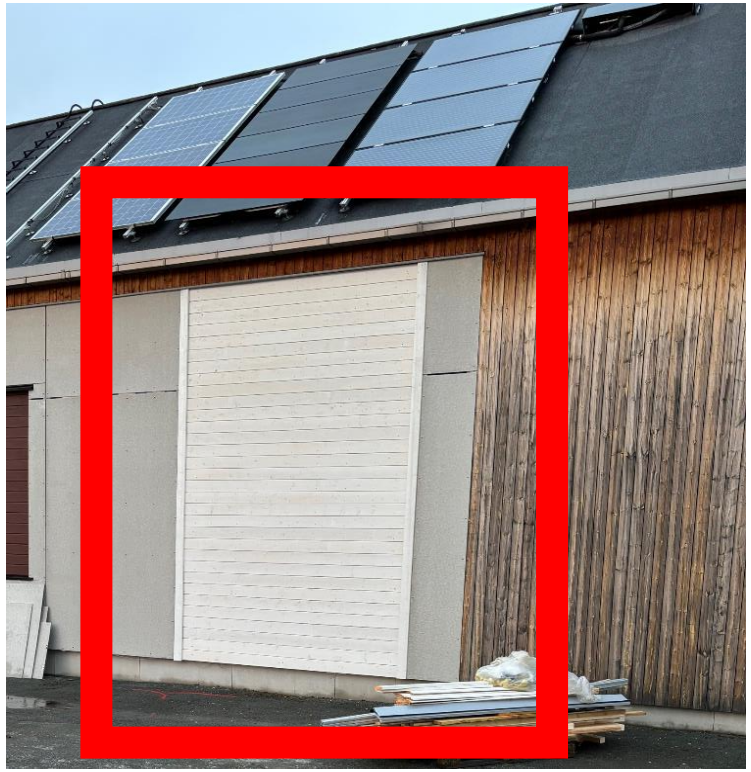
SUSTAINABLE PLACES 2025

Test facilities

- SINTEF

Material	Thickness
Ventilated cladding + wind barrier	
Hunton wood fiber (classic)	100 mm
Vapour barrier	
Gypsum board	13 mm

Material	Thickness
Ventilated cladding + wind barrier	
Hunton wood fiber (classic)	100 mm
Vapour barrier	
Hunton wood fiber (EZ0 new)	50 mm
Gypsum board	13 mm



Case	Test cell	Simulation/measurement period		Temperature set-point in test room	Temperature set-point in adjacent room	Ventilation	Occupancy	Orientation
		Starts	Ends					
1	B	23-Dec 2024	31-Mar 2025	20	20	Off	None	S
2	B	03-Apr 2025	18-May 2025	20	20	Off	None	S

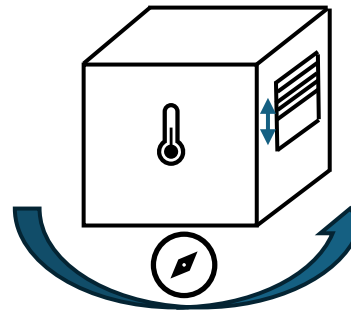
This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Measurement plan

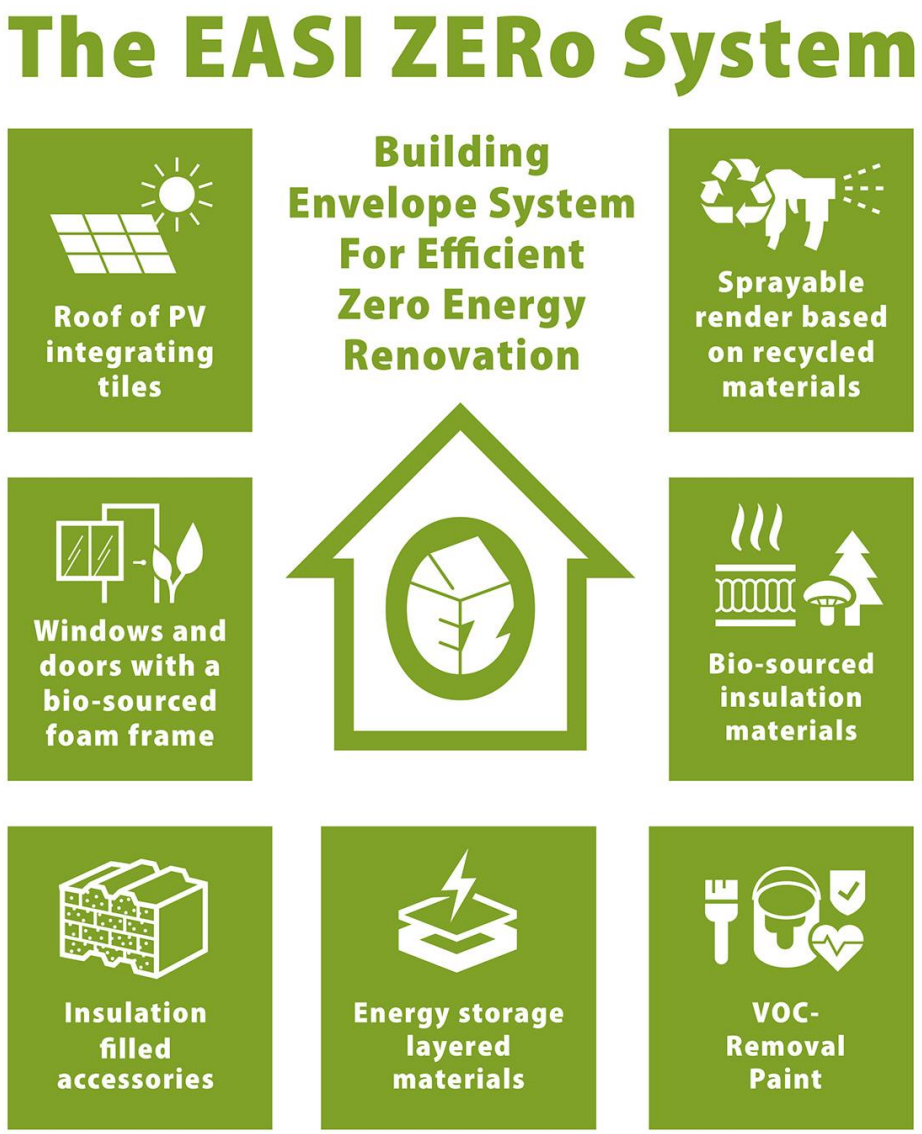
Measurement	Device	Accuracy
Air temperature	Thermohygrometer	0.4°C
Operative temperature	Pt100	0.1°C
Surface wall temperature	Type T thermocouples	0.23°C
Heat flux	Captec 10cmx10cm	5%
Solar radiation	Pyranometer	10 W/m²
Wind speed and direction	Ultrasonic anemometer	2% wind speed, 2° direction

Case	Measurement period		Blinds	Temperature set-point	Orientation
1	13-Feb	25-Feb	drawn	20	North
2	01-Mar	16-Mar	open	20	North
3	17-Mar	30-Mar	drawn	22	South
4	31-Mar	13-Apr	open	free floating	South



This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025



EASI ZERo

Envelope mAterial System with low Impact for Energy Renovation and construction

Zero energy and low carbon buildings renovation EASI ZERo project overview

Arnaud JAY – Alessia LOSINI

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

EASI ZERo project overview

EASI ZERo Key figures

- Call : HORIZON-CL4-2022-RESILIENCE-01
- Dates : 01/12/2022 – 31/05/2026
- Duration : 42 months / Status : M34
- 16 partners parterfrom 7 countries

- EASI ZERo website : https://easizero.eu/

Linkedin →

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

Financed by Horizon Europe research program

Low carbon materials for the total envelope

Easy to install and apply

Reusable components

Low-carbon plasters and renders

Healthy finishing

Integrated PV tiles

High performance thermal insulation

Recycled materials

Bio-sourced insulation

Start : December 2022

End : May 2026

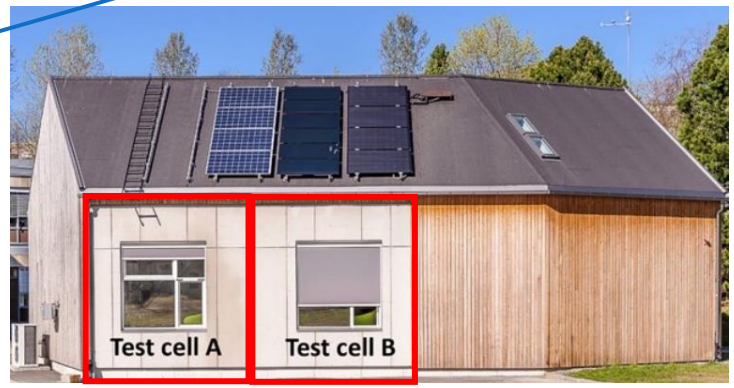
This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Project objectives and methodology

Materials **prototyping** and lab testing

Numerical modeling and experimental testing at **wall** and **building scales**



Design retrofitting strategies on real **case study**

-30% CO_2 emissions

+20% thermal resistance

Energy consumption < 50 kWH/m²/yr

Carbon emission < 4 $kgCO_2/m^2/yr$

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

EASI ZERo partners and activities

MATERIALS → COMPONENTS → INTEGRATION → VALIDATION (virtual demo)

MARKET & REQUIREMENTS → STANDARDIZATION & CERTIFICATION

SUSTAINABILITY: ECO-DESIGN, CIRCULAR APPROACH, LCA/LCC/S-LCA

DISSEMINATION, EXPLOITATION & COMMUNICATION

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

EASI ZERo material portfolio

- **Insulation materials**
  - Mycelium Panels
  - Wood fiber board
  - Insulation render
  - Sprayable Bio-PUR foam
- **Finishing :**
  - VOC removal paint
  - & with recycled polymer
- **Enveloppe components**
  - Bio-PUR windows frame
  - Filled Bricks with PCM and insulation
  - Insulated Blind box
  - PV module integration

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

EASI ZERo insulation products (1/2)

- Mycelium based board

Mycelium + paint «Pluma»

Mycelium + recycled wool «Kiwi»

Mycelium + wood «Veneer»

Mycelium + recycled textile «Felted»

- Wood fiber board

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

EASI ZERo insulation products (2/2)

- Bio-PUR sprayable foam

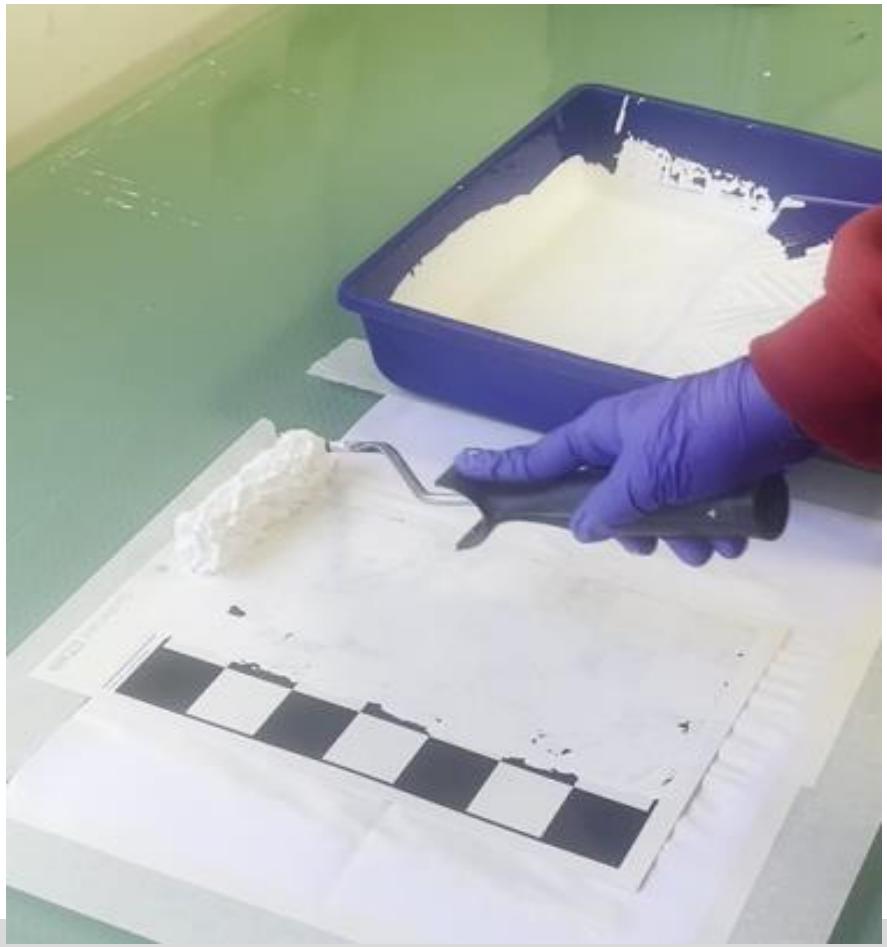
- Insulated render

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

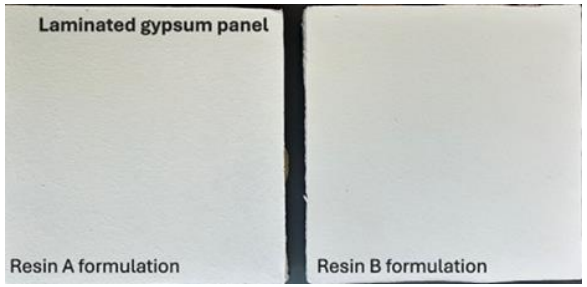
SUSTAINABLE PLACES 2025

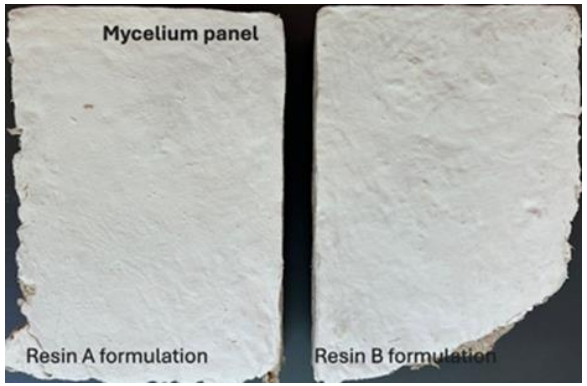
EASI ZERo paints

- VOC removal paint



- Recycled polymer based paint



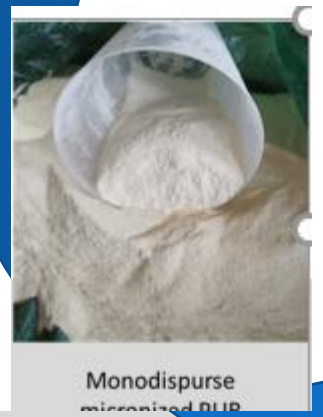


This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

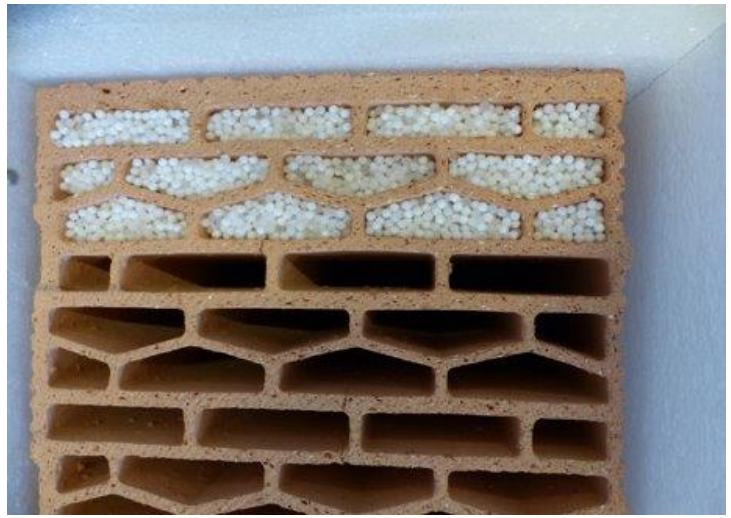
SUSTAINABLE PLACES 2025

EASI ZERo envelope components (1/2)

- Bio-PUR windows frame



- Filled Bricks with PCM and insulation

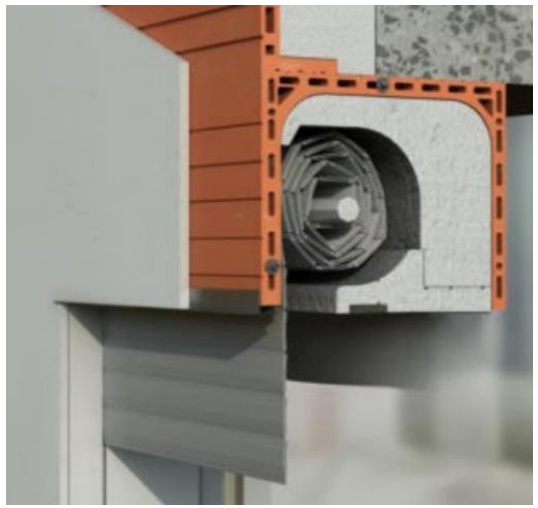


This
Euro
and i...
agreement No 101091531

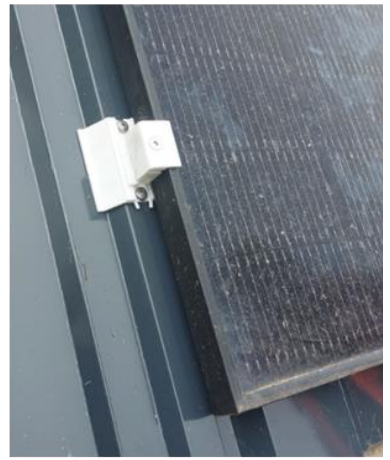
SUSTAINABLE PLACES 2025

EASI ZERo envelope components (2/2)

- Insulated Blind box



- PV integration



This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Session Content

- EASI ZERo project overview — Arnaud Jay / CEA
- Challenges about certification of innovative products — Marina Stipetic / Univ. of Stuttgart
- Environmental and social performance assessment of innovative products from material to component scale — Sara Dimovska, Marco Mori / Leitat
- Wall scale prototype — Alessia Losini / CEA
- Energy performance assessment of innovative products from lab environment to real building — Davide Cerra / Leitat

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025

Thank you for your attention!

arnaud.jay@cea.fr

EASI ZERo : Envelope mAterial System with low Impact for Energy Renovation and cOnstruction

This project has received funding from the European Unions's Horizon Europe research and innovation program under grant agreement No 101091531

SUSTAINABLE PLACES 2025