

Bridging Physical and Virtual Testing: A Semi-Virtual Bench for Assessing Dynamic Façade Performance

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metabuilding labs



EU wide network of Testing facilities & Innovation services for new
building envelope technologies & products

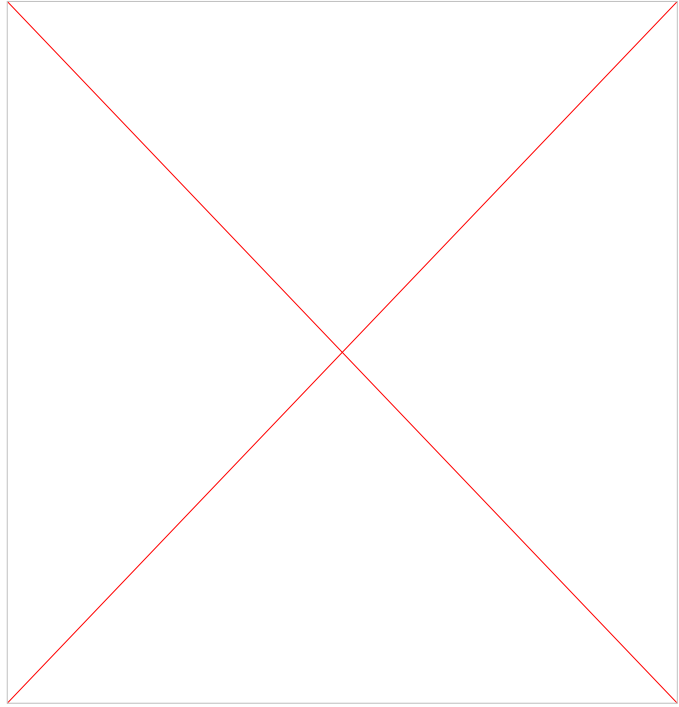
Bridging Physical and Virtual Testing: A Semi-Virtual Bench for Assessing Dynamic Façade Performance



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European Construction sector

Innovation vs regulation



VS



European Construction sector

Innovation vs regulation



VS

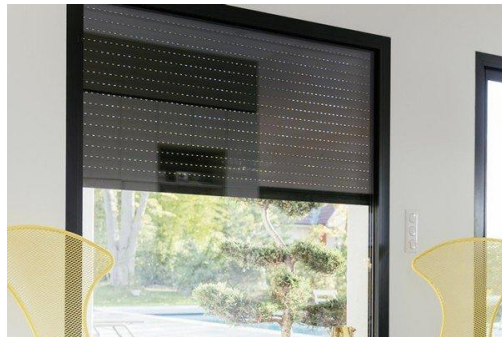


Race for innovation or for regulation ?

European Construction sector

Innovation vs regulation

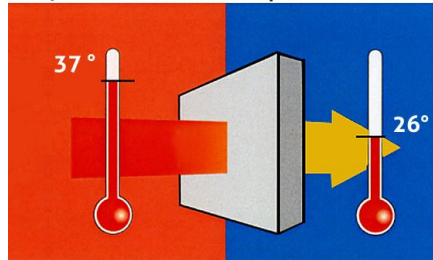
Unproven claims



- 4°C !

- 25%
heating°C !

Température extérieure Température intérieure



Intérêt d'un isolant dense et à fort déphasage

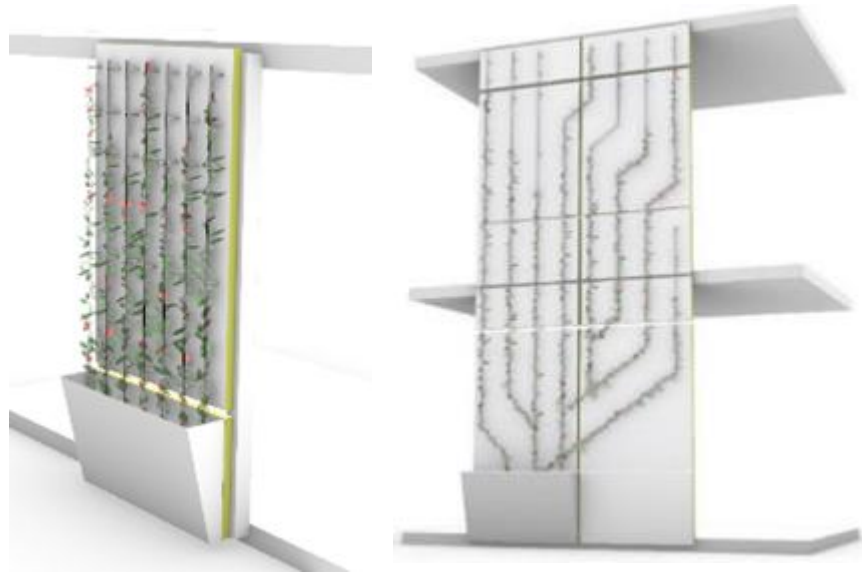


Ecodesign for Sustainable
Products Regulation



Real case example – manufactures needs

A green wall for renovation



Initial discussion



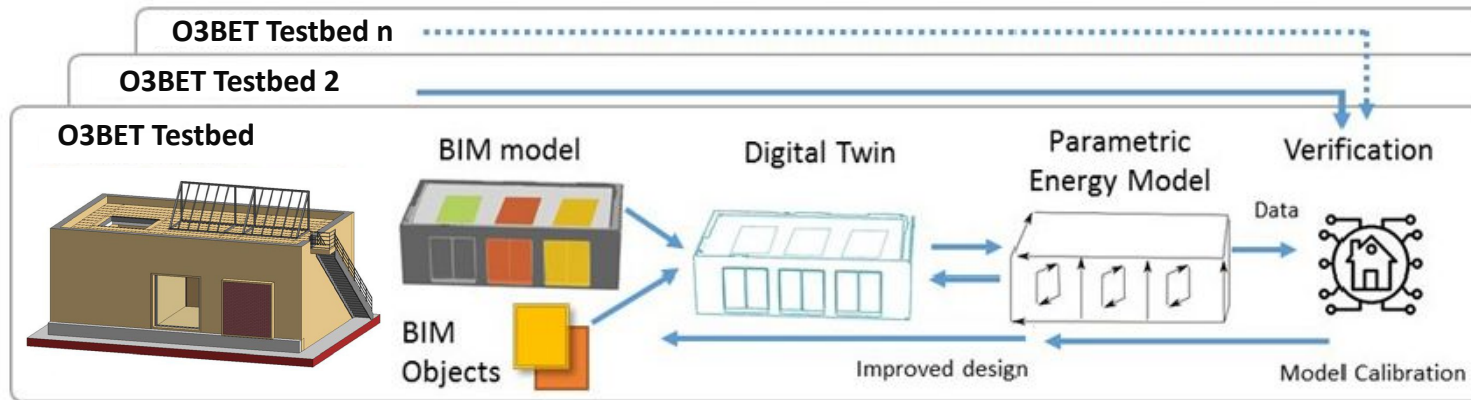
- System for renovation
- Product not finalized: still improving
- It impacts comfort, cooling loads
- Most often not modeled
- No standards to describe

Market objectives

- What is the impact on cooling loads or summer comfort for residential & office buildings?
- On what walls should it be installed? All orientations ?
- Can it be modeled in business as usual modeling & simulation platforms ?

Our solution

O3BET | Open Source Open Data Open Access | Building Envelope Testbench



O3BET Benefits

- A 1:1 scale
- Standardised and fully replicable
- Cost-effective
- Timber based and industrialised
- Mountable/dismountable low environmental impact kit
- Digital twin enabled
- Including all necessary sensors/hardware for virtual testing

First O3BET in CARTIF, Valladolid, Spain



Our technical services

- **Testing facilities (>100)**
 - Standardised laboratory testing
 - Development testing
 - Regulation compliance reporting
- **Strategy & Management**
 - Coaching services
 - DPP based management



RISE
Borås
SWEDEN



BAM
Berlin
GERMANY



ITB
Warsaw
POLAND



EMI
Szentendre
HUNGARY



BUILDWISE
Limette
BELGIUM



LIST / NEOBUILD
Bettermbourg
LUXEMBOURG



U. of GALWAY
Galway
IRELAND



NOBATEK / INEF4
Anglet
FRANCE



IDONIAL
Gijón
SPAIN



CARTIF
Boecillo
SPAIN



AIT
Vienna
AUSTRIA



TEKNIKER
Eibar
SPAIN



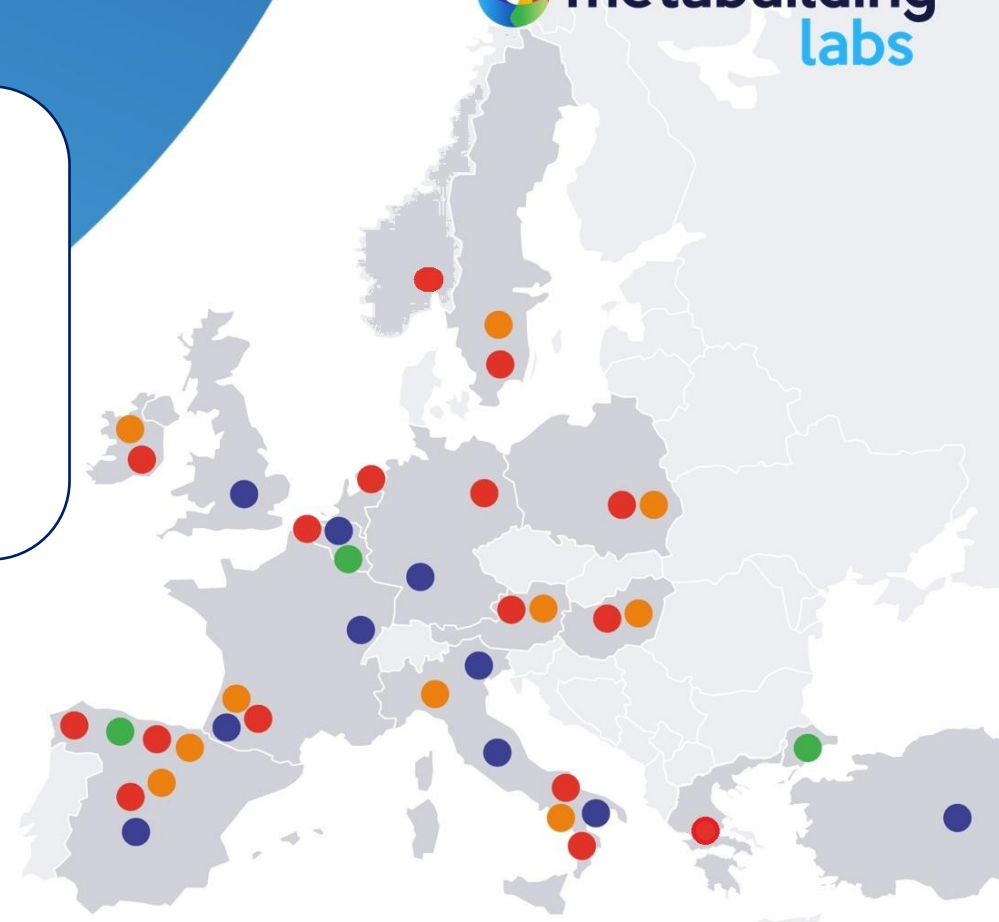
UNIRC
Reggio Calabria
ITALY



STRESS
Benevento
ITALY



UPV / EHU
Vitoria
SPAIN



- O3BET replication
- Living Labs
- Clusters & dissemination point
- Testing Infrastructure



O3BET testing as a service

Service



Initial
analysis

experimental
protocol

Energy model

Targeted Building
stock

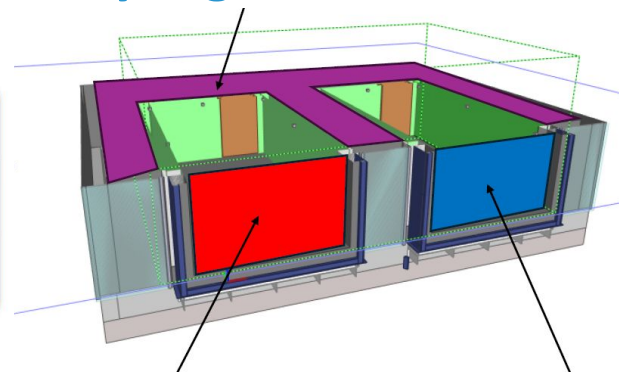
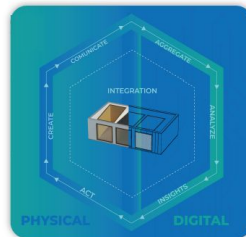
Installation
on a O3BET
6-12 weeks

Exploita
tion

□ 4 months
□ 15-25 k€

Empowered by Digital tools

O3BET BEM Server



O3BET Digital Twin

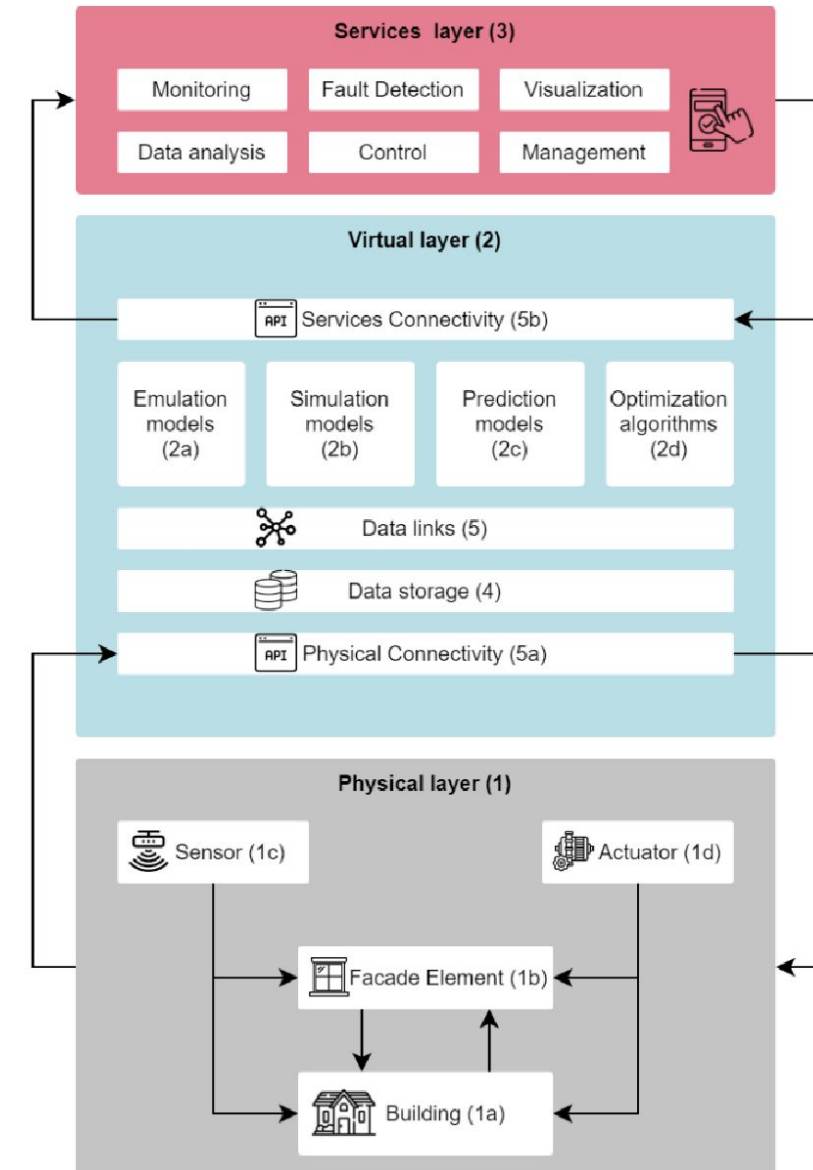
Why do we need an O3BET-DTw?

- 1) **Digitalise and streamline** the modular testing process.
- 2) **Monitor** the testing environment in different contexts.
- 3) **Simulate** different scenarios for novel technologies.
- 4) **Explore** design options, models and different applications.

In Metabuilding Labs, we developed the **architecture**, **semantic models** and **use cases** specific to our façade element testing use cases, documented here:

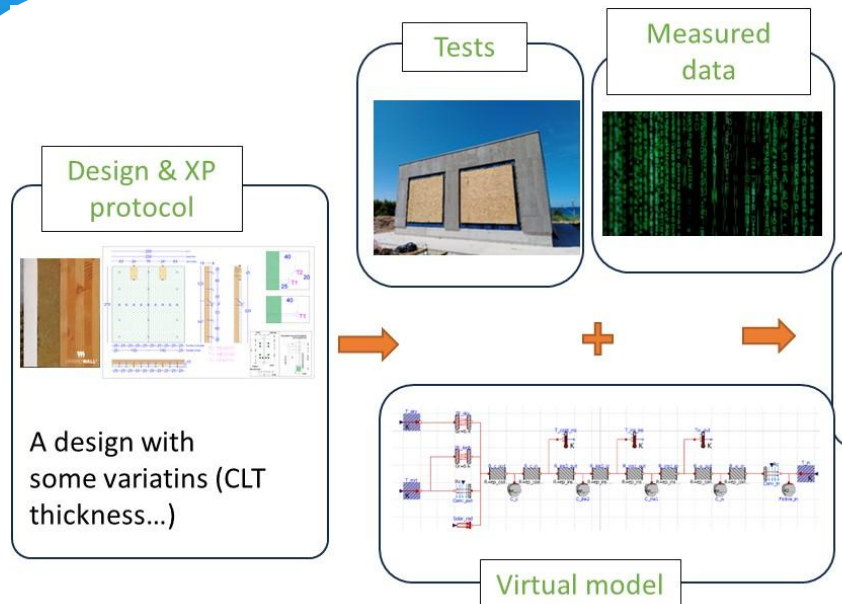
(PDF) Digital Twin systems for building façade elements testing

(PDF) Defining semantics for digital twins of façade component testing facilities

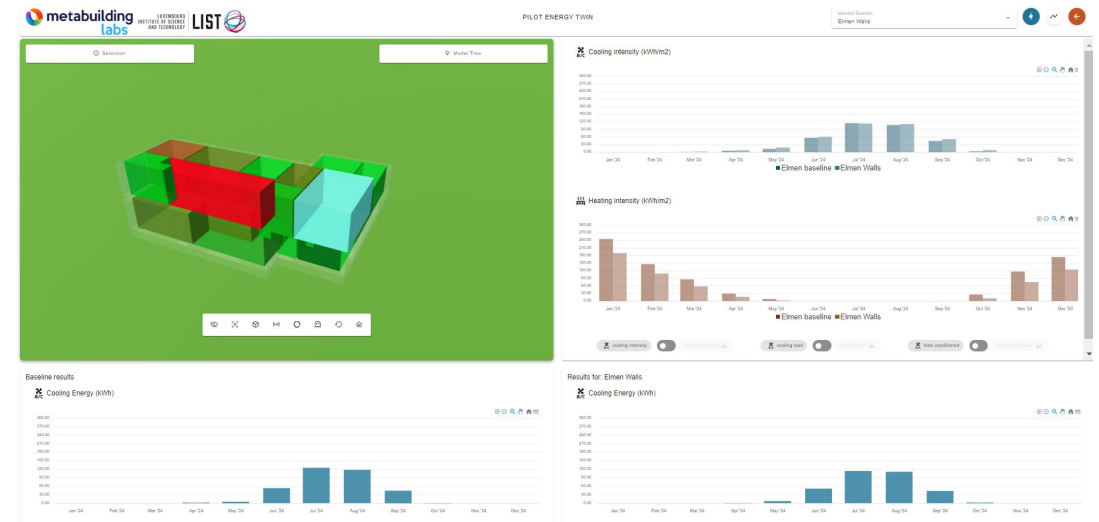
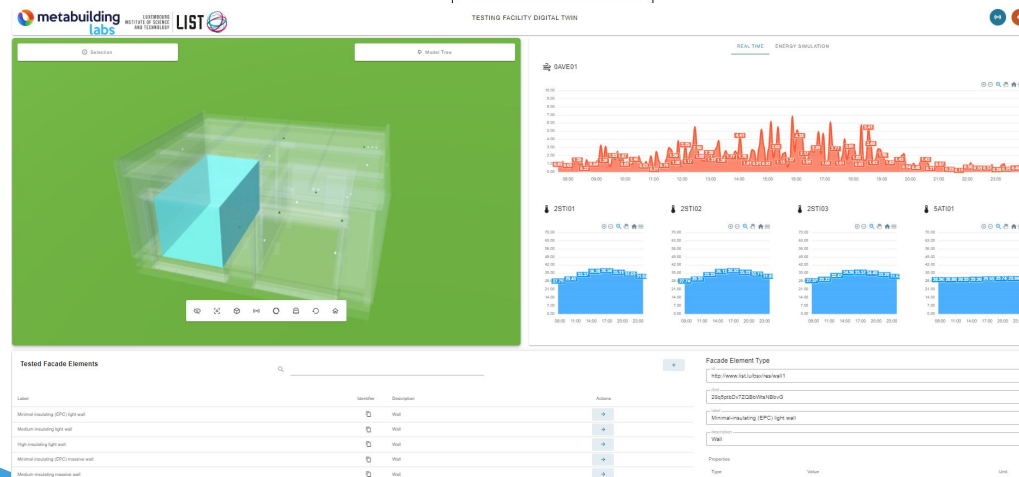


Source: (Boje et al., 2023)

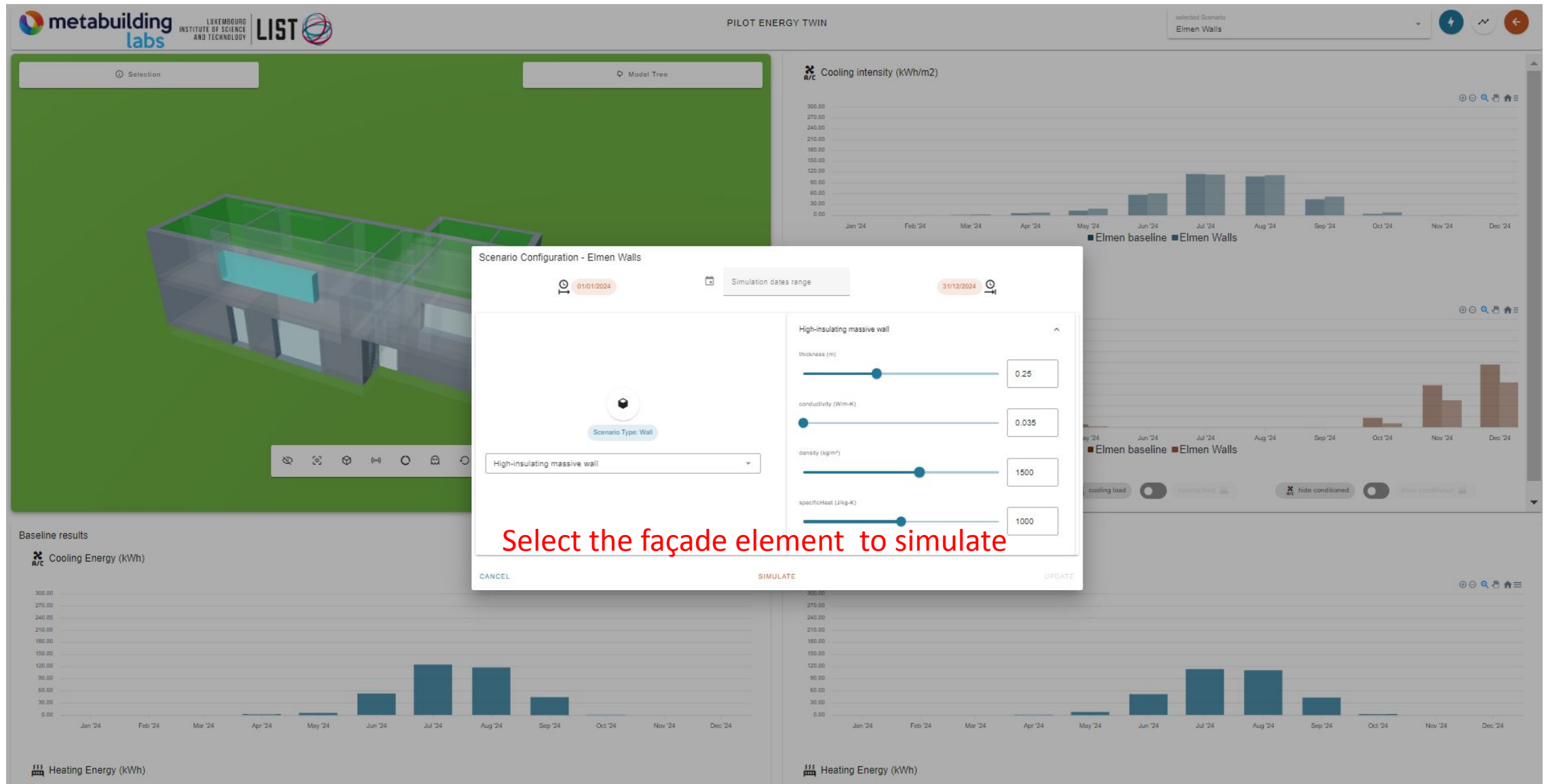
O3BET – a semi virtual test bench



1. An energy model that characterises the new facade component
2. The monitoring of test protocol
3. Testing the potential of novel façades on typical buildings and climate conditions

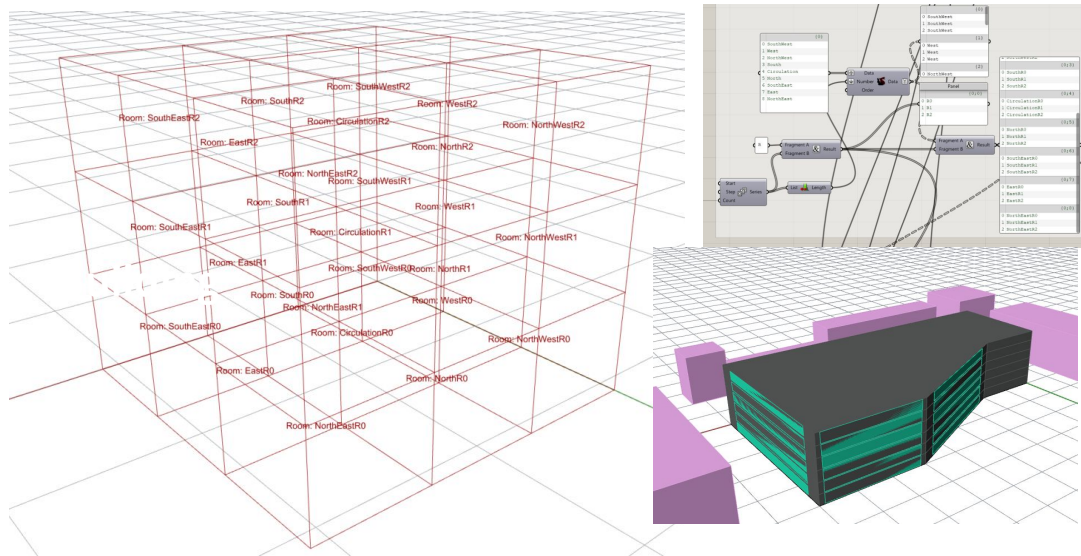


End user dashboard **virtual test bed for façade element** performances on typical building archetypes



Towards a catalogue of building archetypes

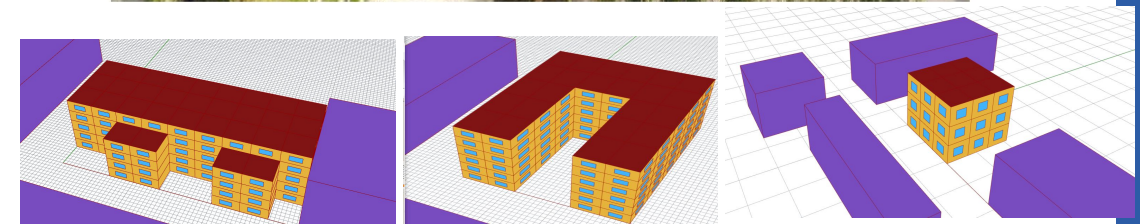
Generation of buildings with Grasshopper



Endgame:

-> Show test bed clients the potential of their innovations in different contexts (reports)

Archetypes database from real buildings



Easily adaptable

```
PenetrationSurface:Detailed,  
Facade_glazing_N_3_d5680034,  
Window,  
Building_N_glazing,  
R2_cc10357E.Face3,  
Name  
Condition Object  
Ground  
Name  
Name  
Name
```

!- Name	!- Surface Type
!- Construction Name	!- Building Surface
!- Outside Boundary	!- View Factor to
!- Frame and Divider	!- Multiplier
!- Number of	

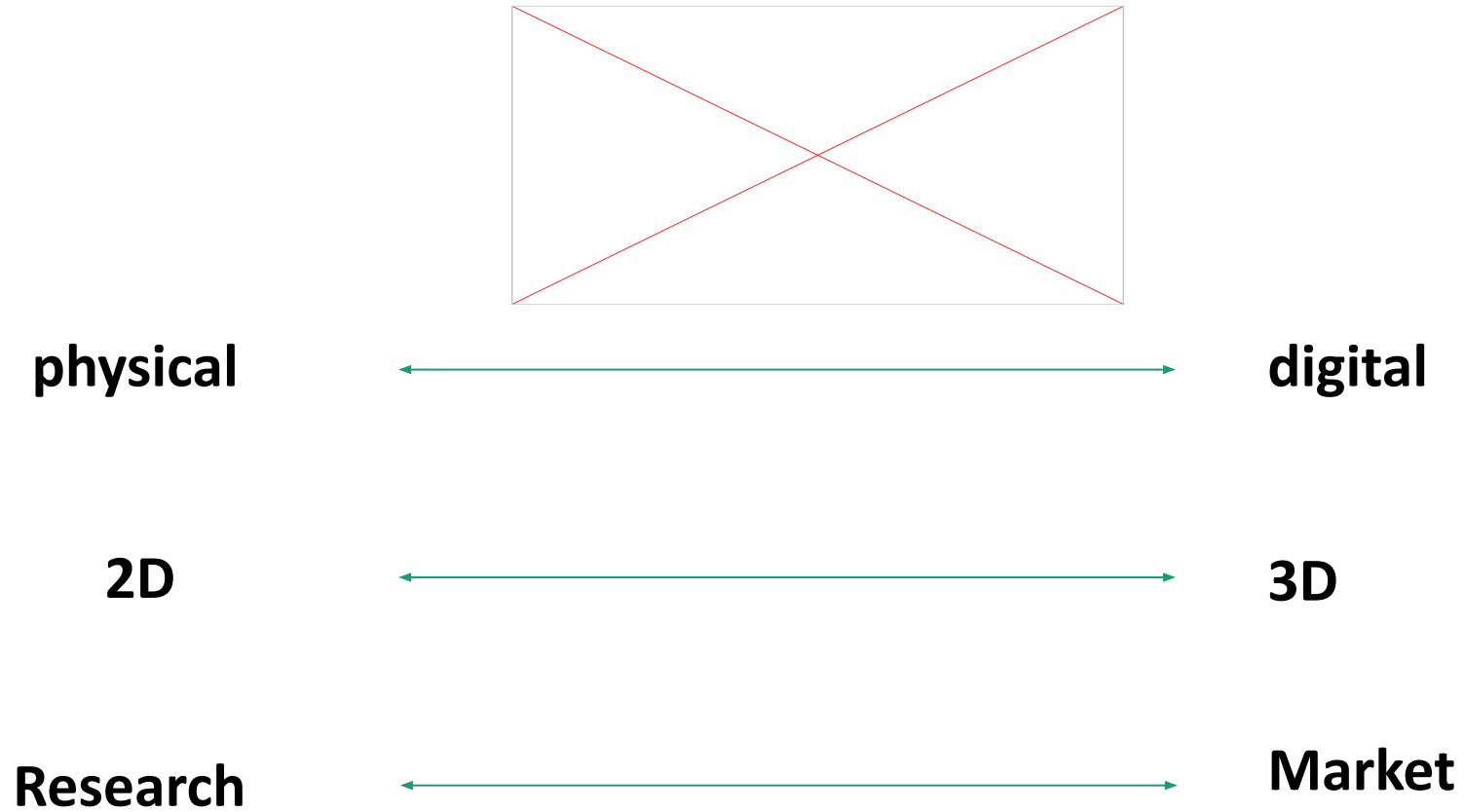
Weather

Location

Composition

Use

Conclusions



Thank you for your kind attention



The Project
www.metabuilding-labs.eu



The Platform
www.metabuilding.com



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