SUSTAINABLE PLACES 2025

8-10 October 2025

Milano

Comune di Milano

R2M RESEARCH TO MARKET SOLUTION

ENERGY EFFICIENCY AND SMART READINESS OF BUILDINGS

WORKSHOP

Smart Readiness in Action: Unlocking Energy Efficiency and Comfort in Buildings

Day 2 – Thursday 9th October, 14:00-15:30 – Room 7

SMARTeeSTORY

MULTICARE

INBUILT

REHOU

BuildON

CHRONICLE

Moderator

Valerie Bahr
Head of Department
Climate, Energy, Mobility
Steinbeis Europa Zentrum

Speakers

Matteo Porta
Senior Project Engineer
RINA Consulting

Giannis Papias
Researcher & Energy Specialist
NTUA

Konstantinos Mamis
Project Manager, Researcher
Que Technologies

Keovathana Run
Postdoctoral researcher
Côte d'Azur University

Łukasz Wilczyński
Project Manager
ASM Research Solutions Strategy

Agenda

How is the Smart Readiness Indicator (SRI) making buildings more resilient, sustainable, and smart?

- **Focus 1: SRI in the Operative – Tools and Methodologies**
  - How are digital tools and methodologies making the SRI measurable and actionable in real-world settings?
- **Focus 2: Demonstrations in Practice**
  - What does SRI implementation look like on the ground and what are we learning from it?
- **Focus 3: Beyond Energy**
  - How does the SRI framework support broader goals like resilience and occupant comfort?
- **Panel Discussion**

After each focus segment, participants and speakers engage in shared reflections and cross-project discussions to capture insights, spark questions, and encourage inter-project learning.

Detailed Agenda (internal slide)

Time	Topics & Speakers
15’	**Opening and welcome by moderator Valerie Bahr**
20’	**Focus 1: SRI in the Operative - Tools and Methodologies**
5’	• Matteo Porta (RINA): how the SRI digital calculation tool supports the implementation of the SRI in historic buildings (SMARTeeSTORY)
5’	• Giannis Papias (NTUA): how the SRI calculator and SMURF Assessment Tool enables the operational implementation of the SRI (BuildON)
5’	• Konstantinos Mamis (Que Technologies): how the BIM-to-BEP and BIM-to-SRI transformation engines can streamline SRI and energy assessments form a unified model (CHRONICLE)
5’	• Echoes & Insights
15’	**Focus 2: Demonstrations in Practice**
5’	• Matteo Porta (RINA): how hands-on experience in renovation demos can help shape and refine the SRI (REHOUSE)
5’	• Keovathana Run (University of Cote d’Azur). how innovative building materials and envelope can enable buildings to operate in a smart, energy-efficient, and resilient way, thus supporting the SRI (INBUILT)
5’	• Echoes & Insights
20’	**Focus 3: Beyond Energy**
5’	• Łukasz Wilczyński (ASM Research): comprehensive approach through incorporation of resilience-based support tools within energy efficiency and indoor environmental quality directly aligns with promoting the SRI (MULTICARE)
5’	• Konstantinos Mamis (Que Technologies): CHRONICLE approach advances building monitoring and occupant comfort (CHRONICLE)
5’	• Matteo Porta (RINA): SMARTeeSTORY approach advances building monitoring and occupant comfort
5’	• Echoes & Insights
20’	**Panel discussion & wrap up**

Let’s get to know each other

Head over to menti.com

Access code: 6277 0592

Focus 1

SRI in the Operative – Tools and Methodologies

How are digital tools and methodologies making the SRI measurable and actionable in real-world settings?

***Matteo Porta**, Senior Project Engineer, RINA-C*

***Giannis Papias**, Researcher & Energy Specialist, NTUA*

***Konstantinos Mamis,** Project Manager, Researcher, Que Technologies*

SMARTeeSTORY SRI web app - Functionalities

***Matteo Porta**, Senior Project Engineer, RINA-C*
***Noelia Vicente Gomez**, Researcher, TECNALIA*

User side

- Fill wizard
- Visualize results
- Related operations:

Server side

- Wizard configuration
- SRI calculation (based on official excel file)
- Advanced optimization logics

Multilanguage

WebApp ready for any language with live reload.

Validation

Verify the data through the wizard,

Information persists

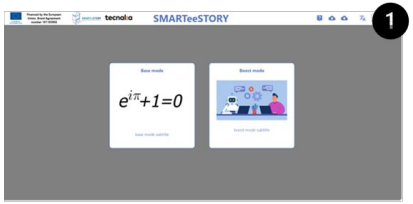
Store information in files.

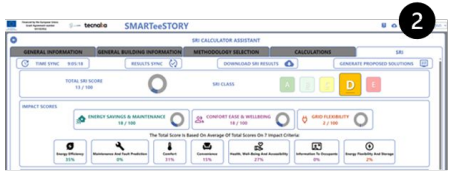
Export calculations as PDF.

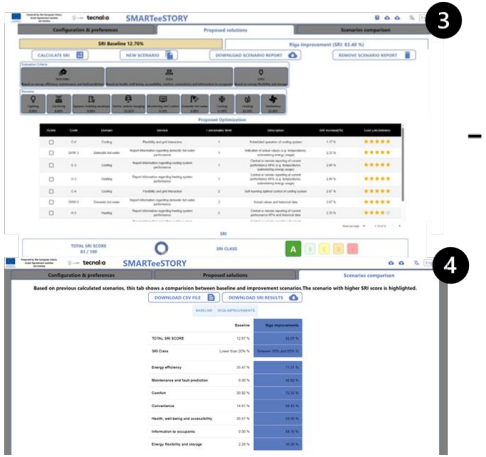
Built-in reference

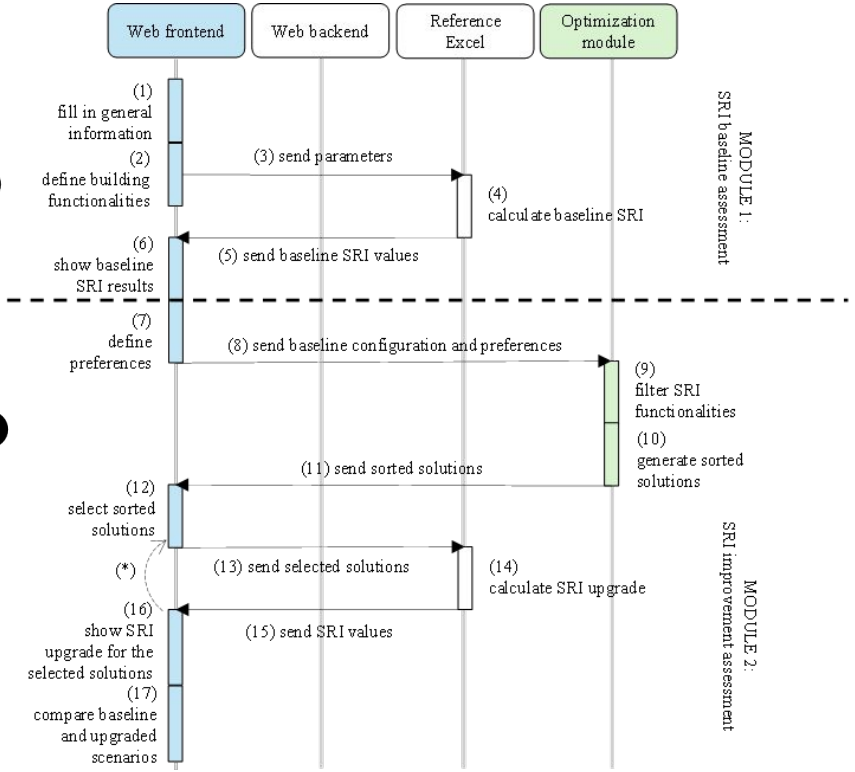
Check for reference without losing the work flow,

SMARTeeSTORY SRI web app - Workflow

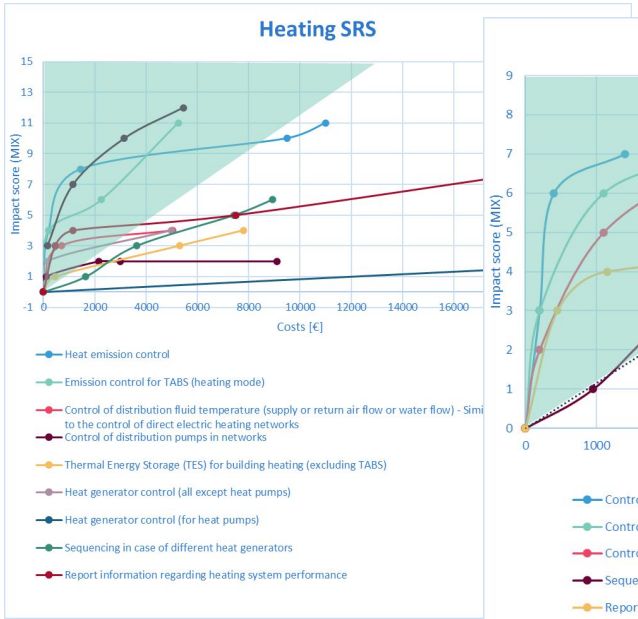


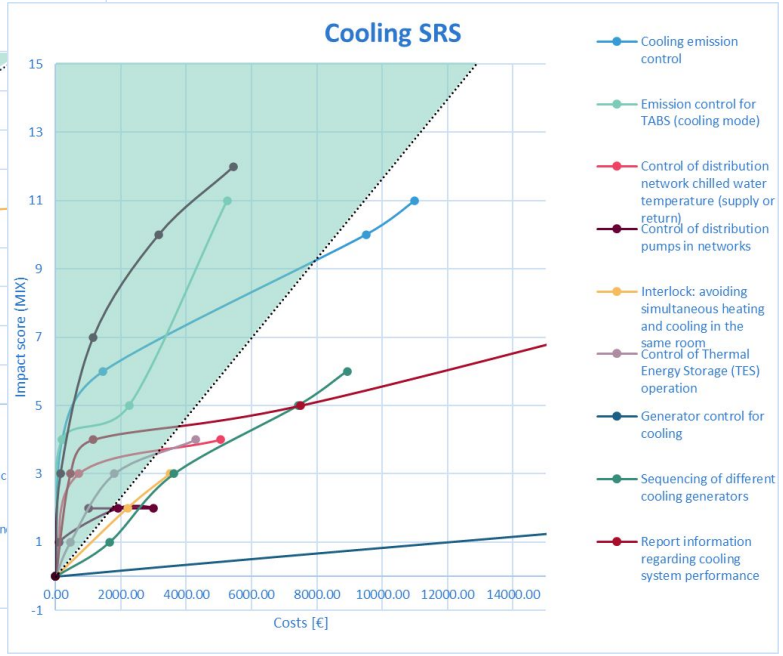






SMARTeeSTORY SRI web app – SRS cost analysis





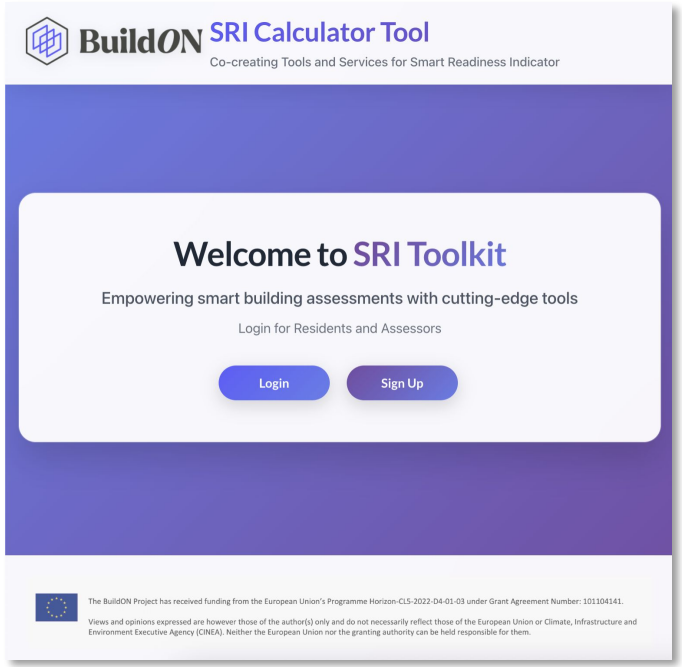
SMURF Decision Support Tool

From SRI assessment to cost-effective smart upgrade scenarios

***Giannis Papias**, Researcher & Energy Specialist, NTUA*

Purpose of the tool:

- Define specific Smart Readiness Indicator (SRI) targets
- Explore tailored upgrade paths to achieve goals
- Optimized, cost-effective scenarios with minimal intervention
- Integrates **real market technologies, costs & emissions**
- Builds upon **SRI Calculator** for continuity



SMURF Decision Support Tool

From SRI assessment to cost-effective smart upgrade scenarios

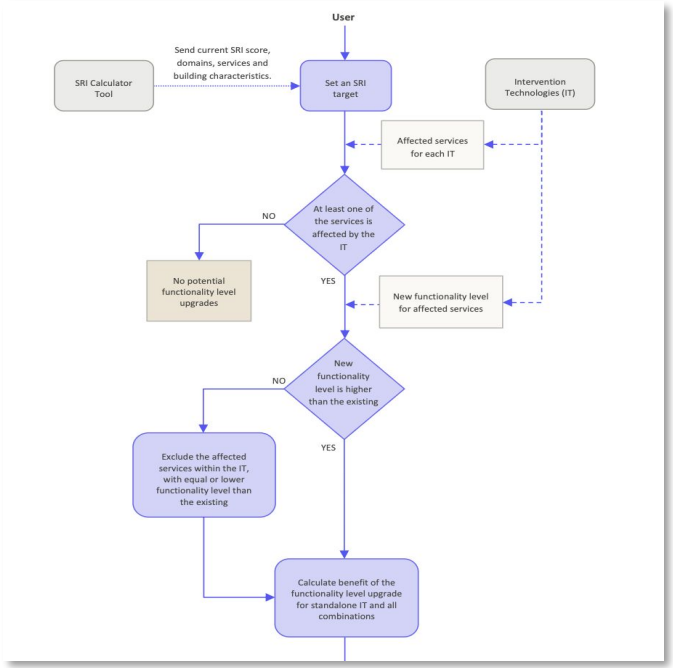
Methodology (Overview):

Two modules:

1. **SRI Assessment** – data collection & baseline calculation
2. **Decision Support** – target setting & upgrade scenarios

Scenarios ranked by:

Total cost | SRI gain | Cost-effectiveness

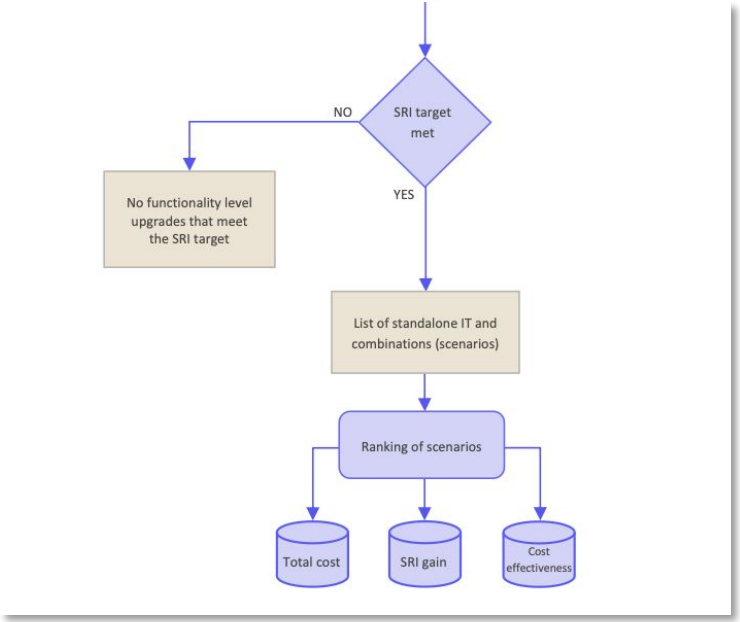


SMURF Decision Support Tool

From SRI assessment to cost-effective smart upgrade scenarios

Methodology (Process Flow):

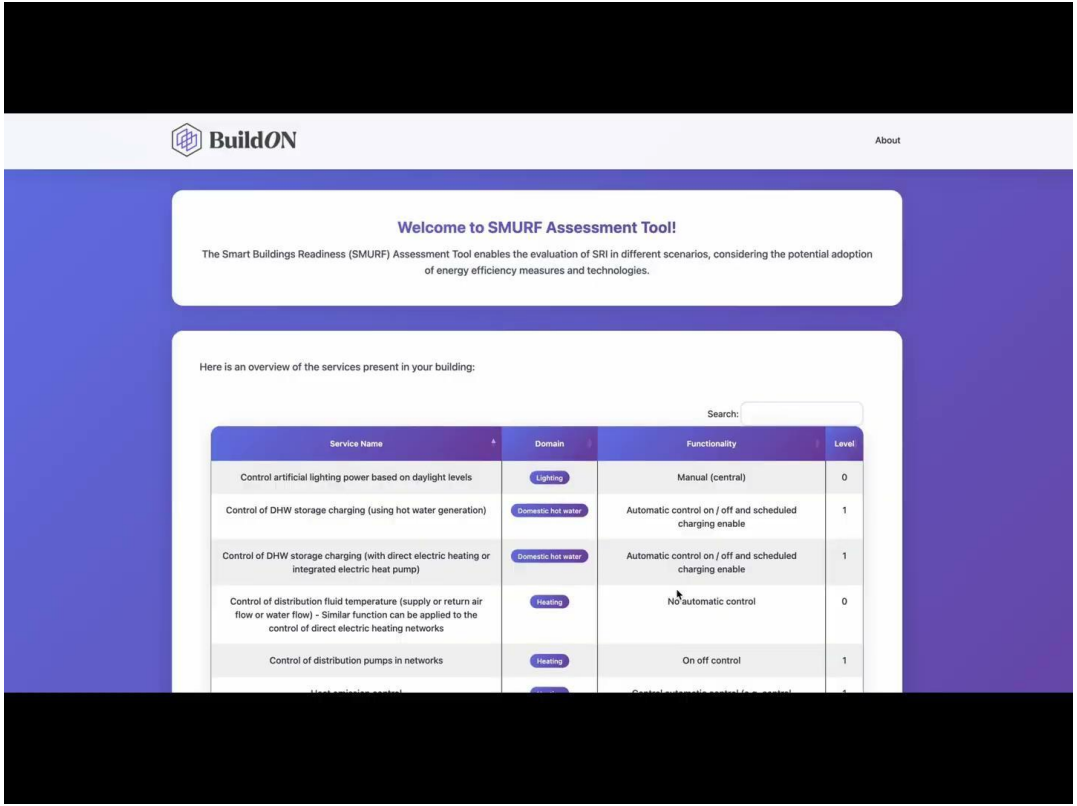
1. User defines **target SRI**
2. Catalogue of **Intervention Technologies (ITs)** evaluated
3. ITs mapped to services → functionality improvements
4. Tool checks for feasibility & calculates benefits
5. Generates **valid upgrade scenarios** or closest match



SMURF Decision Support Tool

From SRI assessment to cost-effective smart upgrade scenarios

Demonstration



SMURF Decision Support Tool

From SRI assessment to cost-effective smart upgrade scenarios

Finalization

- **Fully functional tool** integrated with SRI Calculator
- Scenario-based approach: practical & market-ready
- Features:
  - ✔ Real product integration
  - ✔ Carbon emissions insights
  - ✔ Exportable results
- Validated with **5 pilot buildings including residential and commercial buildings**
- Supports informed & sustainable decision-making

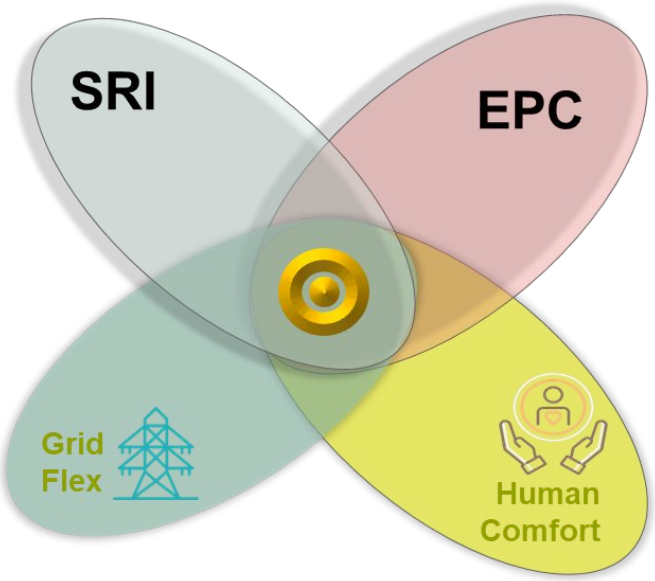
Join us!

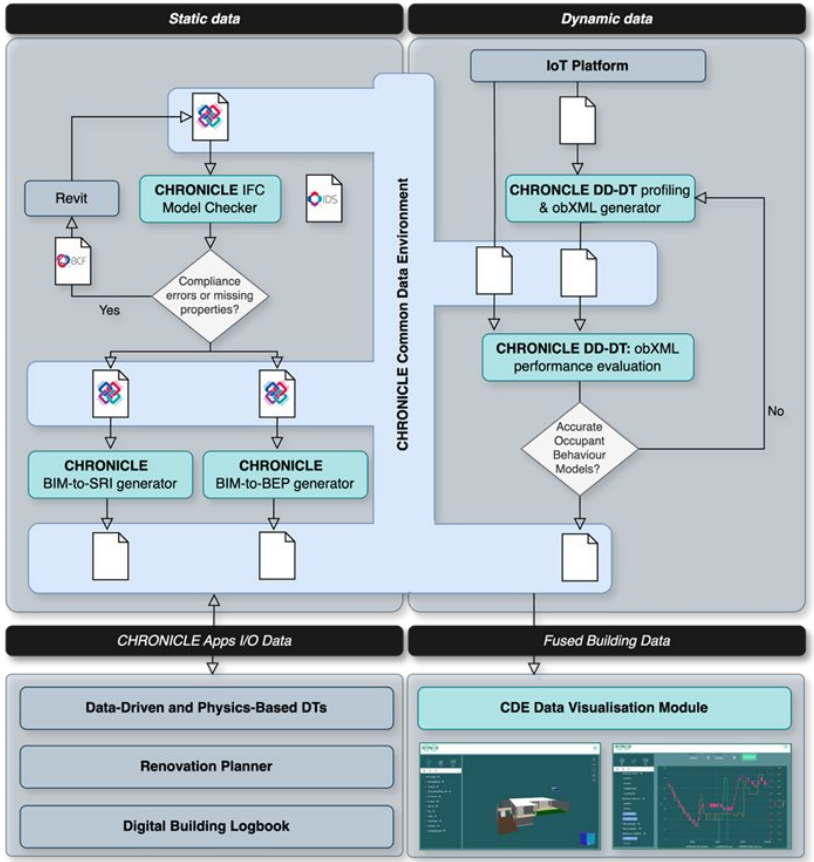
Main Challenges & Barriers:

Offering data-driven and performance-based SRI calculation

Konstantinos Mamis, *Project Manager, Researcher, Que Technologies*

- Lack of Common Inspection and Data collection protocols for SRI and EPC
- High level of subjectivity in the selection and evaluation of services and functionalities leading to inconsistent results
- Human-centric performance aspects (comfort, convenience, well being) would be better represented through outcome-based assessment practices
- ”Hidden” interdependencies between the various performance factors included in the SRI impact criteria (e.g. comfort vs flexibility driven by human preferences) are not accounted for





The CHRONICLE Solution: One Source, Many Uses

Achievements: *SRI+*

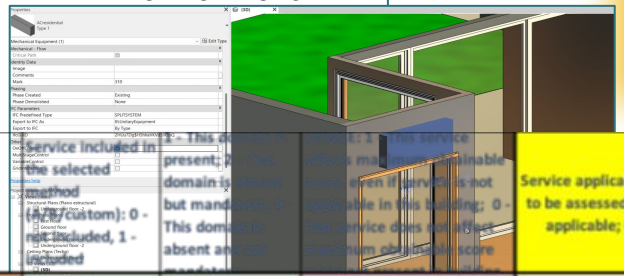
(PSets) definition

CHRONICLE_SRI_PSets.txt

```
# User Defined PropertySet Definition File
#
# Format:
#    PropertySet:      <Pset Name>      I[nstance]/T[ype]      <element list separated by ',']>
#       <Property Name 1>       <Data type>       <[opt] Revit parameter name, if different from IFC>
#       <Property Name 2>       <Data type>       <[opt] Revit parameter name, if different from IFC>
#       ...
#
# Data types supported: Area, Boolean, ClassificationReference, ColorTemperature, Count, Currency,
#       ElectricalCurrent, ElectricalEfficacy, ElectricalVoltage, Force, Frequency, Identifier,
#       Illuminance, Integer, Label, Length, Logical, LuminousFlux, LuminousIntensity,
#       NormalisedRatio, PlaneAngle, PositiveLength, PositivePlaneAngle, PositiveRatio, Power,
#       Pressure, Ratio, Real, Text, ThermalTransmittance, ThermodynamicTemperature, Volume,
#       VolumetricFlowRate

# CHRONICLE

#HEATING DOMAIN
PropertySet:    Pset_HeatEmissionControl        I       IfcUnitaryControlElement
                HeatingBMSAvailability  Boolean
                HeatingBMSControlAvailability   Boolean
                HeatingBMSPresenceControl       Boolean
                HeatingSystemReport     Boolean
                HeatingHistoricalSystemReport   Boolean
                HeatingSystemForecasting        Boolean
                HeatingSystemManagementAndFaultDetection        Boolean

PropertySet:    Pset_UnitaryHeatGeneratorControl        I       IfcUnitaryEquipment
                HeatingConstantTempControl      Boolean
                HeatingVariableTempControlOutdoorTemp   Boolean
                HeatingVariableTempControlLoad  Boolean

PropertySet:    Pset_SHeaterHeatGeneratorControl        I       IfcSpaceHeater
                HeatingConstantTempControl      Boolean
                HeatingVariableTempControlOutdoorTemp   Boolean
                HeatingVariableTempControlLoad  Boolean

PropertySet:    Pset_HeatPumpControl    I       IfcUnitaryEquipment
                HeatingOnOffControl     Boolean
                HeatingMultiStageControl        Boolean
                HeatingVariableTempControlLoad  Boolean
                HeatingGridInteraction  Boolean

PropertySet:    Pset_HeatingStorage     I       IfcTank
                HSAvailability  Boolean
                HWSRemoteConnection     Boolean
                UsageOptimisation       Boolean
                EnergyReturn            Boolean
```

BIM-enabled SRI

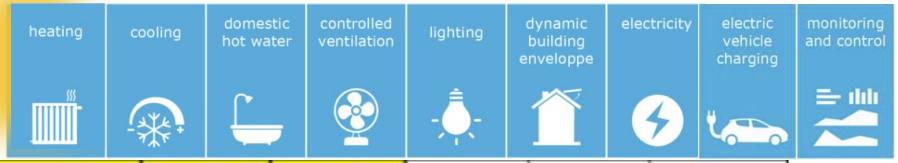
BIM-enrichment



					Service applicable in your building? - to be assessed by the assessor: 1 - applicable; 0 - not applicable	Main functionality level as inspected by SRI assessor	share (default = 100% means applicable throughout the building)	Optional: additional functionality level in part of the building	Share of additional functionality level	Warnings
ol - demand side	Heat emission control	1	1	0	1	-	100%		0%	please enter a valid functionality level
ol - demand side	Emission control for TABS (heating mode)	0	1	0					0%	
t production	Storage and shifting of thermal energy	1	1	0	1	2	80%	-	20%	please enter a valid functionality level

weights

Future Advancement



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Echoes & Insights

What moment or insight sparked your interest the most?

What questions or connections does this raise for your own work?

Focus 2

Demonstrations in Practice

What does SRI implementation look like on the ground and what are we learning from it?

Keovathana Run, *Postdoctoral researcher, Côte d'Azur University*

Matteo Porta, *Senior Project Engineer, RINA Consulting*

Hands-on experience in renovation demos |

Matteo Porta, *Senior Project Engineer, RINA Consulting*

REHOUSE
ACCELERATING THE EUROPEAN RENOVATION RATE

Co-funded by the European Union

Project funded by

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

The SRI:

- Provides the ground truth of the building status, before and after renovation,
- Assists with the technical assessment and feasibility of renovation works,
- Validates and quantifies actual performance, and
- Improves the usability and interpretation of data from the stakeholders.

The project
Horizon Europe / IA
10/2022-09/2026

REHOUSE
ACCELERATING THE EUROPEAN RENOVATION RATE

Hands-on experience in renovation demos |

Student Residences
Xanthi, Kimmeria, Greece

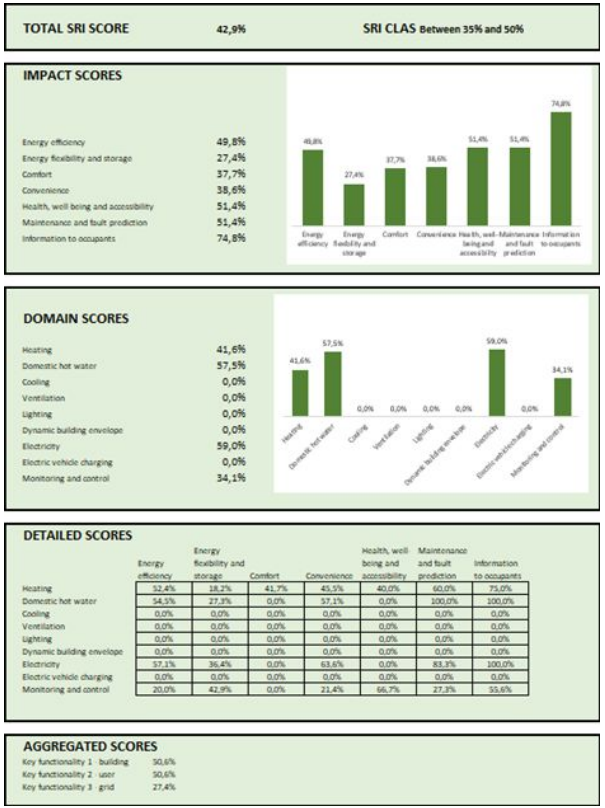
Student Residences
Budapest, Hungary

Residential Building
Margherita di Savoia, Italy

Residential Building
Saint-Dié-des-Vosges, France

REHOUSE
ACCELERATING THE EUROPEAN RENOVATION RATE

Hands-on experience in renovation demos |



TOTAL SRI SCORE 42,9% **SRI CLAS** Between 35% and 50%

IMPACT SCORES

Energy efficiency	49,8%
Energy flexibility and storage	27,4%
Comfort	37,7%
Convenience	38,6%
Health, well being and accessibility	51,4%
Maintenance and fault prediction	51,4%
Information to occupants	74,8%

DOMAIN SCORES

Heating	41,6%
Domestic hot water	57,5%
Cooling	0,0%
Ventilation	0,0%
Lighting	0,0%
Dynamic building envelope	0,0%
Electricity	59,0%
Electric vehicle charging	0,0%
Monitoring and control	34,1%

DETAILED SCORES

	Energy efficiency	Energy flexibility and storage	Comfort	Convenience	Health, well being and accessibility	Maintenance and fault prediction	Information to occupants
Heating	52,4%	18,2%	41,7%	45,5%	40,0%	60,0%	75,0%
Domestic hot water	54,5%	27,3%	0,0%	57,1%	0,0%	100,0%	100,0%
Cooling	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Ventilation	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Lighting	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Dynamic building envelope	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Electricity	57,1%	36,4%	0,0%	63,6%	0,0%	83,3%	100,0%
Electric vehicle charging	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Monitoring and control	20,0%	42,9%	0,0%	21,4%	66,7%	27,3%	55,6%

AGGREGATED SCORES

Key functionality 1 building	50,6%
Key functionality 2 user	50,6%
Key functionality 3 grid	27,4%

The Greek demonstration site conducted the following baseline SRI assessment, before the renovation works:

REHOUSE
ACCELERATING THE EUROPEAN RENOVATION RATE

Hands-on experience in renovation demos |

This overview provides important insights concerning the main building systems, and the possibilities for improvement.

It further visualizes these results, assisting stakeholders in understanding their buildings' strengths, weaknesses and adequately form a renovation plan.

Innovative Building Materials

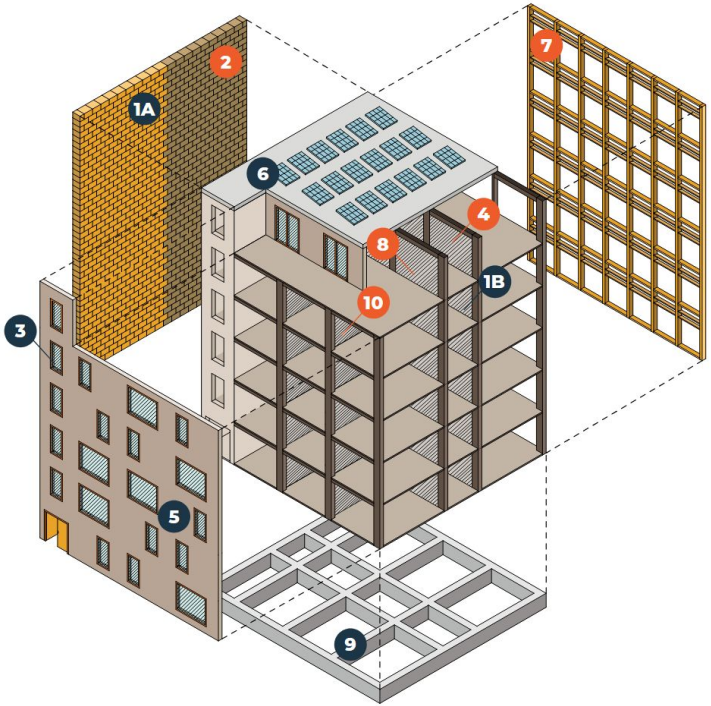
Keovathana Run, *Postdoctoral researcher, Côte d'Azur University*

REUSED AND RECYCLED MATERIALS

- 1A Recycled Fired Bricks
- 1B Recycled non-fired Bricks
- 3 BioPUR-framed Smart Plasmochromic Windows
- 5 Reclaimed Wood Wall Panels
- 6 Second-Life Photovoltaic Panels
- 9 Recycled Concrete Blocks and in-situ Recycled Concrete

LOW CARBON BUILDING PRODUCTS

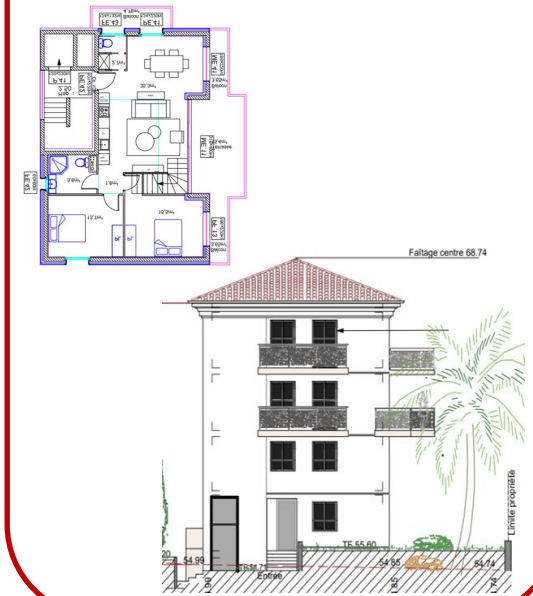
- 2 Compressed Earth Blocks
- 4 Bio-based Insulations Panels
- 7 Bio-based Curtain Walls
- 8 Hybrid Straw-clay Boards
- 10 Recycled Paper and Textile Fiber Insulation Mats



Demonstration Sites

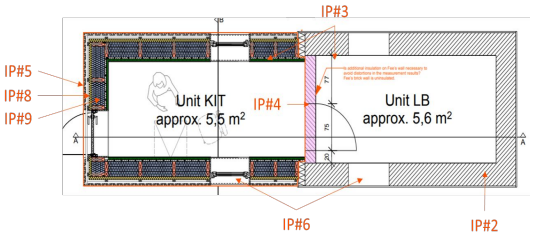
New-Build

Nice, France



Tiny house

Pfeffenhausen, Germany



Retrofit

Birmingham, UK

SRI Implementation on Demo Sites

Electricity

- *On-site renewable electricity (second life PV)*

Monitoring & Control

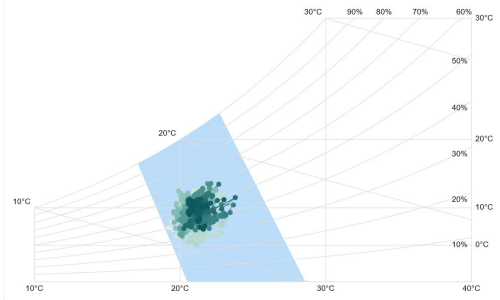
- *Real-time monitoring of indoor climate, electricity loads and energy consumption*

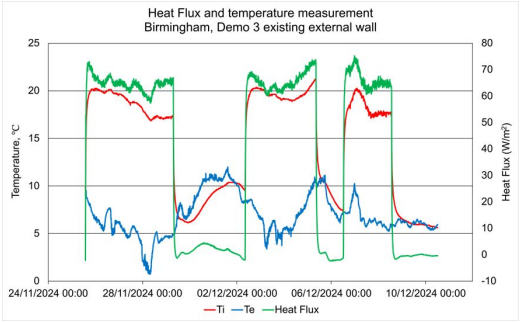
Energy Efficiency

- *Innovative building materials and envelopes*
- *Energy performance evaluation through simulation and calibrated with real data*

Occupant Comfort

- *Thermal comfort assessment*





SRI Implementation on Demo Sites: Granada

***Matteo Porta**, Senior Project Engineer, RINA-C*

HEATING
- Heat emission control;
- Flexibility and grid interaction;
- Report information regarding heating system performance

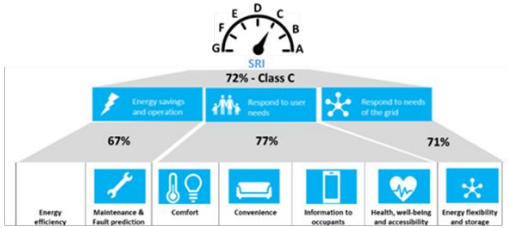
COOLING
- Cooling emission control;
- Control of distribution network chilled water temperature
- Flexibility and grid interaction
- Report information regarding cooling system performance

LIGHTING
- Occupancy control for indoor lighting

ELECTRICITY
- Reporting information regarding electricity consumption

MONITORING AND CONTROL
- Detecting faults of technical building systems and providing support to the diagnosis of these faults;
- Occupancy detection: connected services
- Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals

Facilities of the High Court of Justice in Granada



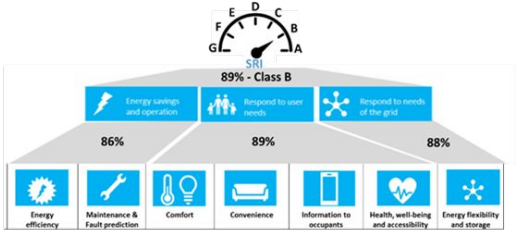
	Baseline scenario	Future scenario
Method B SRI assessment	12%, class G	72%, class C

Detailed impact scores view for foreseen future scenario, method B assessment and Granada demo.

SRI Implementation on Demo Sites: Riga

HEATING	•Heat emission control; •Flexibility and grid interaction
DHW	•Report information regarding domestic hot water performance
COOLING	•Cooling emission control; •Report information regarding cooling system performance
VENTILATION	•Supply air flow control at the room level; Supply air temperature control at the air handling unit level; Reporting information regarding IAQ
LIGHTING	•Occupancy control for indoor lighting •Control artificial lighting power based on daylight levels
DYNAMIC BUILDING ENVELOPE	•Window solar shading control; •Window open/closed control, combined with HVAC system
ELECTRICITY	•Reporting information regarding local electricity generation; Storage of electricity
ELECTRICAL VEHICLE CHARGING	•EV Charging Capacity; EV Charging Grid balancing; EV charging information and connectivity.
MONITORING AND CONTROL	•Run time management of HVAC systems; Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals

Riga City Hall



Detailed impact scores view for foreseen future scenario, method B assessment and Riga demo.

	Baseline scenario	Future scenario
Method B SRI assessment	12%, class G	89%, class B

SRI Implementation on Demo Sites: Delft

HEATING
- Heat Emission Control;
- Control of distribution fluid temperature
- Flexibility and grid interaction

VENTILATION
- Supply air flow control at the room level
- Air flow or pressure control at the air handler level
- Reporting information regarding IAQ

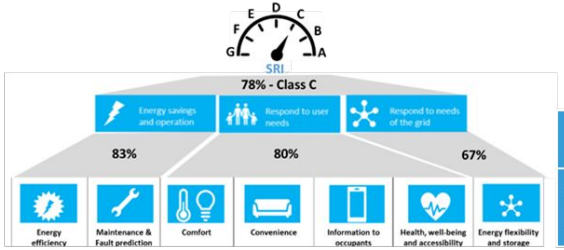
LIGHTING
- Occupancy control for indoor lighting
- Control artificial lighting power based on daylight levels

DYNAMIC BUILDING ENVELOPE
- Window solar shading control
- Window open/closed control, combined with HVAC system
- Reporting information regarding performance of dynamic building envelope systems

ELECTRICITY
- Reporting information regarding electricity consumption

MONITORING AND CONTROL
- Detecting faults of technical building systems and providing support to the diagnosis of these faults
- Single platform that allows automated control & coordination between TBS + optimization of energy flow based on occupancy, weather and grid signals

University building hosting the Faculty of Architecture and the Built Environment of TUD



	Baseline scenario	Future scenario
Method B SRI assessment	21%, class F	78%, class C

Detailed impact scores view for foreseen future scenario, method B assessment and Delft demo

After each focus segment, participants and speakers engage in shared reflections and cross-project discussions to capture insights, spark questions, and encourage inter-project learning.

Echoes & Insights

What moment or insight sparked your interest the most?

What questions or connections does this raise for your own work?

Focus 3

SUSTAINABLE PLACES 2025

Beyond Energy

How does the SRI framework support broader goals like resilience, comfort, and user engagement?

MULTICARE

CHRONICLE

SMARTeeSTORY

Łukasz Wilczyński, *Project Manager, ASM Research Solutions Strategy*

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Smart-readiness through resilience, energy & comfort (MULTICARE → SRI)

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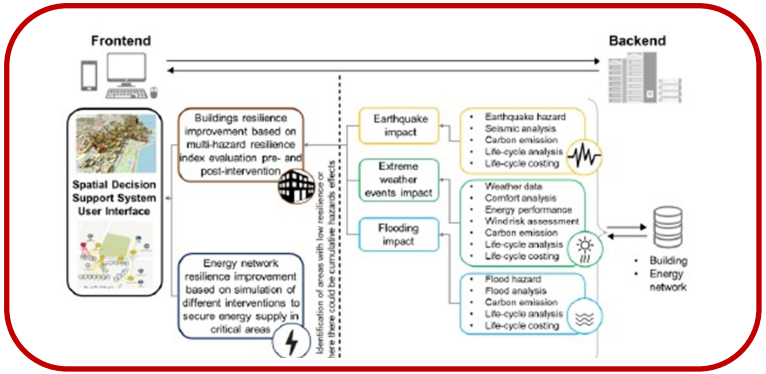
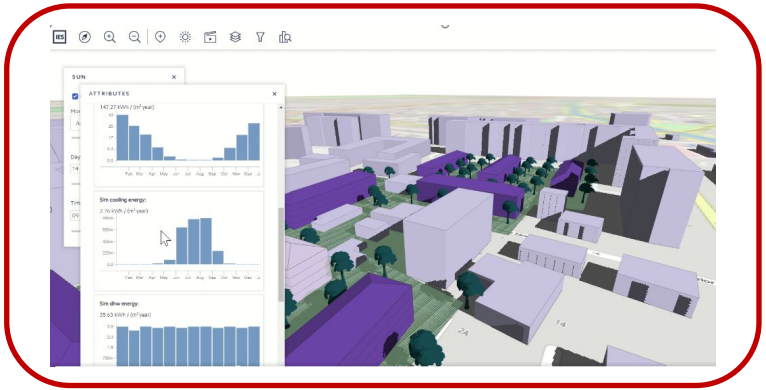
- MULTICARE links resilience-based decision support with Energy Efficiency (EE) and Indoor Environmental Quality (IEQ) to uplift the Smart Readiness Indicator (SRI).
- Digital twin (DT) — calibrated models, early warnings and “what-if” scenarios — to optimize EE while maintaining IEQ
- Real-time monitoring & alerts integrate forecasts for smarter operation and safety (earthquakes, floods, heatwaves).
- Pilots verify performance against SRI and IPMVP (International Performance Measurement and Verification Protocol).
- User-centric interfaces & feedback loops enable comfort-driven operation and higher SRI service levels.

The resilience-based toolchain that powers SRI outcomes

- Resilience Readiness Levels (RRLs) + multi-hazard indicators (heat, seismic, wind, flood) quantify capacity to withstand & recover and guide design/renovation choices.
- Multi-Attribute Decision-Making (MADM) using AHP (Analytic Hierarchy Process) + TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) balances EE, IEQ, carbon, cost & resilience
- Embedded in BIM (Building Information Modelling) / CDE (Common Data Environment) and SDSS (Spatial Decision Support System) to coordinate from component → building → district.
- Outcome: data-driven prioritisation of measures that improve comfort, cut energy and increase adaptive capacity — directly improving SRI.



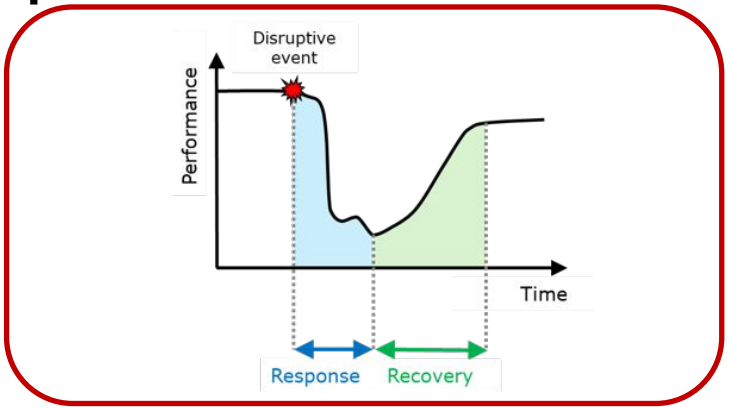


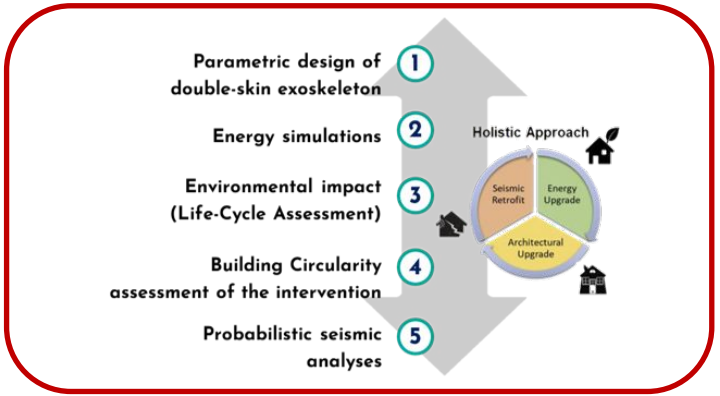
Evidence from pilots & labs: SRI-relevant impacts

- Energy & carbon: operational energy reduced in scenarios 175 ⟶ 87.5 kWh/m²·y), operational CO_2 down; digital services active post-retrofit.
- IEQ: 30–50% improvement targets via predictive heat-risk services and occupant-centric control.
- Risk & continuity: reduced Expected Annual Loss (EAL) and downtime through resilient façade/exoskeleton modules + monitoring/alerts

–Example: EAL 2.5% ⟶ 1.2%

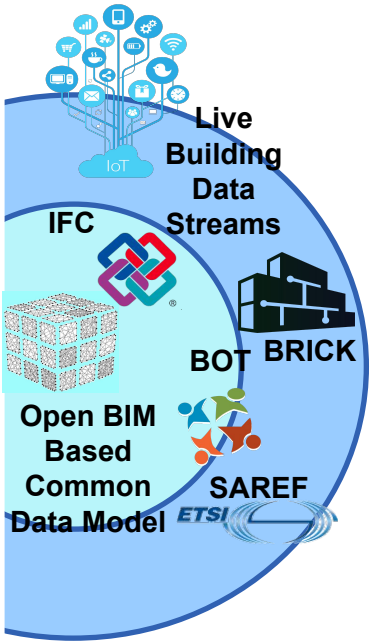
- Alignment: monitoring and impact verification benchmarked to SRI (Smart Readiness Indicator) and IPMVP; supports smart operation & maintenance outcomes.



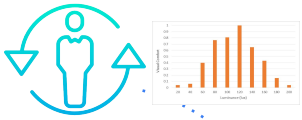


Data Driven Building Performance Framework

Konstantinos Mamis, *Project Manager, Researcher, Que Technologies*

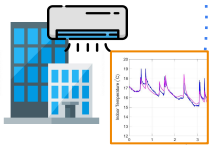


Common Data Model



EN 16798-1 Human centric Performance Modelling

- Occupancy
- Comfort
- IEQ



Data Driven Buildings/Asset Modelling

Humans, Buildings, Asset Modelling

Energy Performance

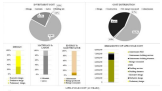
“EU Kernel” ISO 52000 Energy Performance Engine

Flexibility

- Dynamic Flex Profiles
- Human centric & Multi-purpose Flex Profiles

Level(s) Sustainability

LCC - LCA

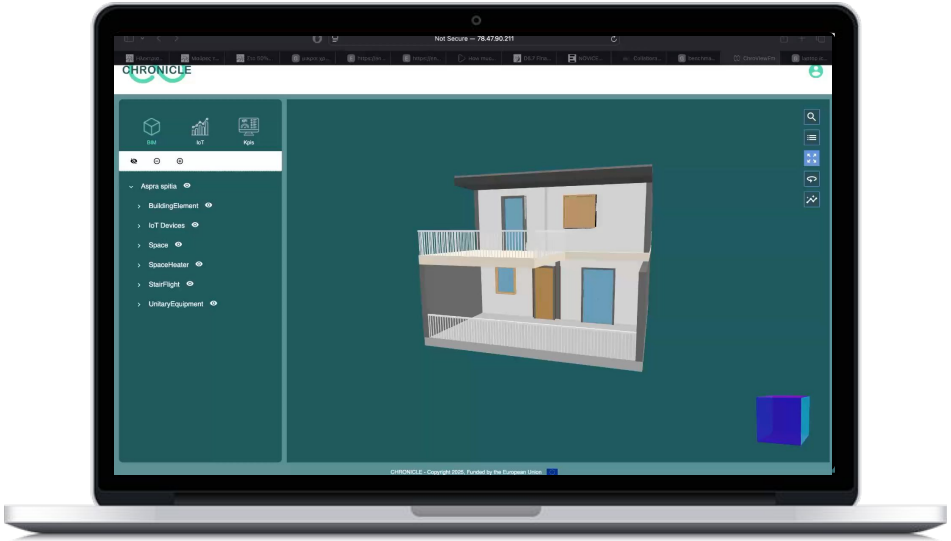


Integrated Performance Calculation Engine

ChroViewFM
View for Facility managers

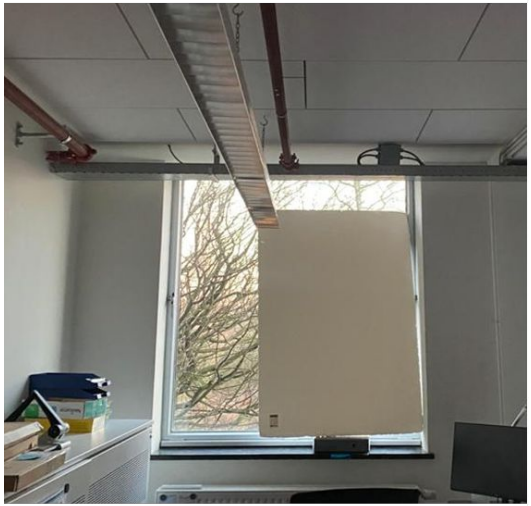
ChroViewOcc
View for Occupants

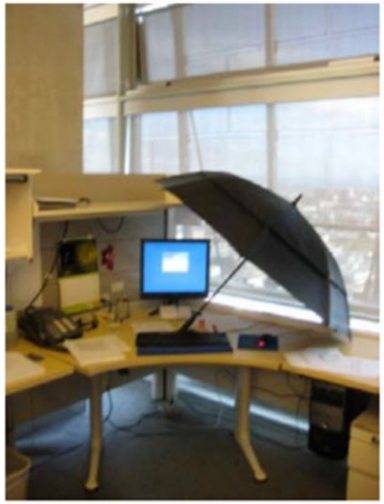
Focus 3: Beyond Energy



User centred approach

***Matteo Porta**, Senior project engineer, RINA-C*
***Pablo Martinez Alcaraz**, PhD candidate, TU Delft*

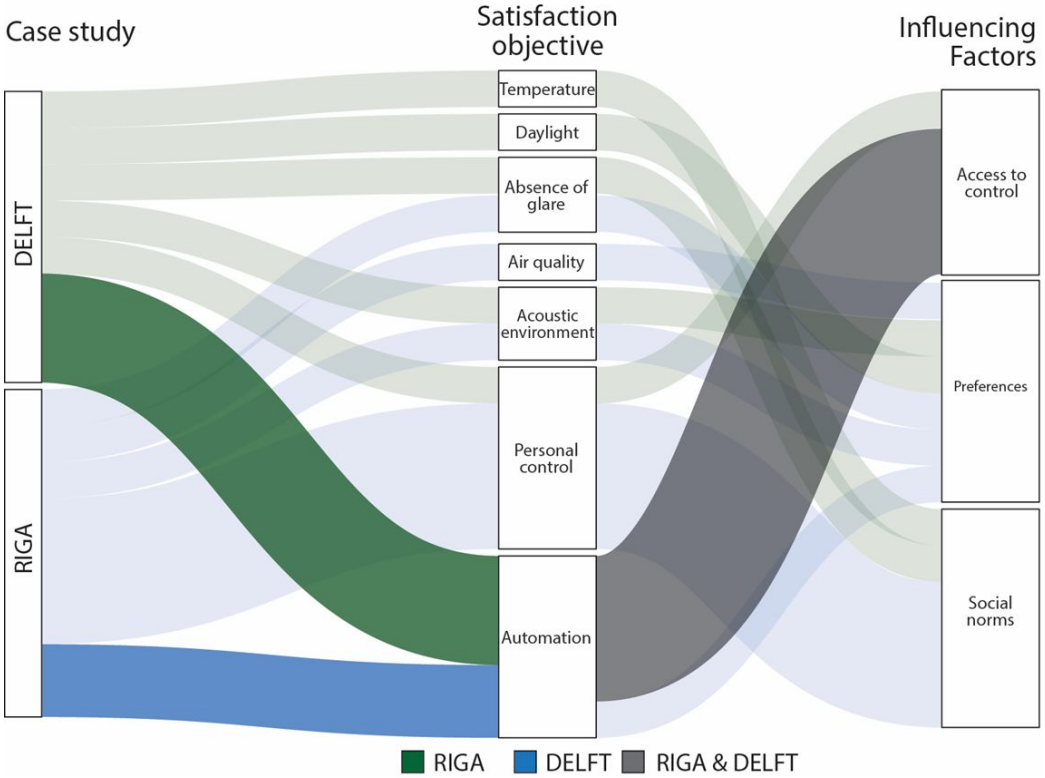




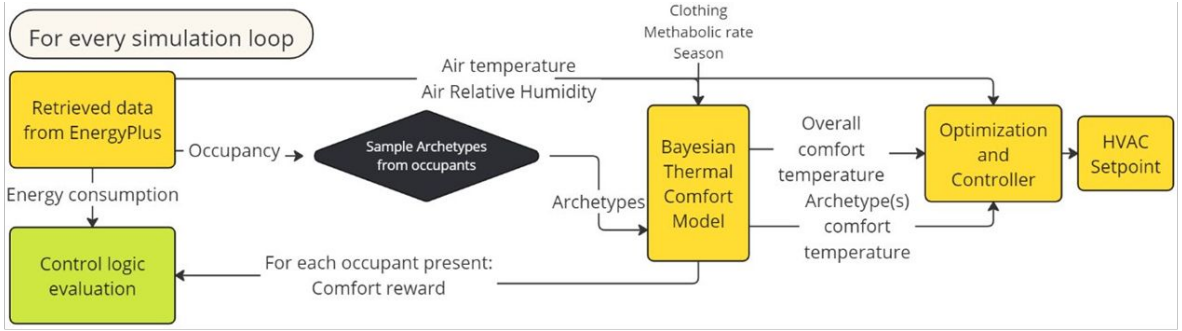
Buildings are 'humane' only when they promote **peaceful human co-existence.**

Frei Otto

User centered approach



User centred approach



Summer

Dynamic response **VS** Unified response

~ +7% thermal comfort

~ +5% energy consumption

Dynamic response **VS** Energy efficient (24°C)

~ +4% thermal comfort

~ +13% energy consumption

Winter

Dynamic response **VS** Unified response

~ +6% thermal comfort

~ -3% energy consumption

Dynamic response **VS** Energy efficient (19°C)

~ +45% thermal comfort

~ +34% energy consumption

After each focus segment, participants and speakers engage in shared reflections and cross-project discussions to capture insights, spark questions, and encourage inter-project learning.

Echoes & Insights

What moment or insight sparked your interest the most?

What questions or connections does this raise for your own work?

Panel Discussion

Open points to discuss

Panel discussion (internal slide)

- What topics need to be adressed that have not been adressed yet in the workshop?
- What is your dream question you would like someone ask about your project?

e.g. question asked by Valerie to ….

Keovathana (INBUILT) and Giannis (BuildON) What regulatory or market challenges hinder the adoption of innovative materials and smart technologies, and how can SRI assessments better recognize their impact on building performance?

Mateo (SMARTeeSTORY): How can the SRI assessment be adapted to address the unique constraints and preservation requirements of historic buildings, especially when traditional retrofitting is not feasible?

Lukas (MULTICARE): What's the fastest path from lab pilots to mass retrofit? Which bottlenecks matter most—standards/interoperability, supply chains, skills/upskilling, or permitting/heritage rules—and how could SRI recognition help unlock scale?

Mateo REHOUSE: Can you share any lessons learned from stakeholder involvement or cross-project collaborations that influenced the outcome of your demonstration?

For Focus 3: Translating the new performance aspects: resilience, comfort, user behavior into a practical, operational SRI seems challenging. What do you think are the most realistic next steps to bring these enhancements into actual EU or national SRI frameworks?

SUSTAINABLE PLACES 2025

Thank you!

Smart Readiness in Action: Unlocking Energy Efficiency and Comfort in Buildings

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