Smart Readiness of Buildings: links with SRI Platform & Methodology

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SmartWins

Overview

- The smart readiness indicator rating of a building depends on its capacity to accommodate smart-ready services.

- The 'smartness' of a building refers to its ability to sense, interpret, communicate and actively respond in an efficient manner to changing conditions.

- The SRI rates the smart readiness of buildings (or building units) in their capability to perform 3 key functionalities:
  - optimise energy efficiency and overall in-use performance
  - adapt their operation to the needs of the occupant
  - adapt to signals from the grid (for example energy flexibility)

SRI Aim

- The SRI will raise awareness of the benefits promised by smart building technologies:
  - building automation and electronic monitoring of building systems including heating, hot water, ventilation, lighting, etc.

- The implementation of the SRI framework supports
  - technological innovation in the construction sector and
  - creates an incentive for the integration of cutting-edge smart technologies in buildings.

SRI legal vs technical frameworks

- The SRI legal framework is defined by the 2018 revision of the European Energy Performance of Buildings Directive (EPBD), the Commission Delegated Regulation (EU) 2020/2155 and its annexes consists of the structure and principles of the SRI calculation methodology.

- The SRI technical framework must be provided by national authorities implementing the SRI. Therefore, each country must define:
  - a catalogue of smart-ready services,
  - functionality levels and
  - all parameters used to aggregate the calculations into **a single score**.

- However, a generic technical framework, which was designed after extensive Europe-wide stakeholder consultations can be provided by the EU.

SRI general assessment context

- The methodology can assess the smart readiness of a building which in turn influences energy efficiency, occupant comfort and the building's ability to adapt its operation to the grid.

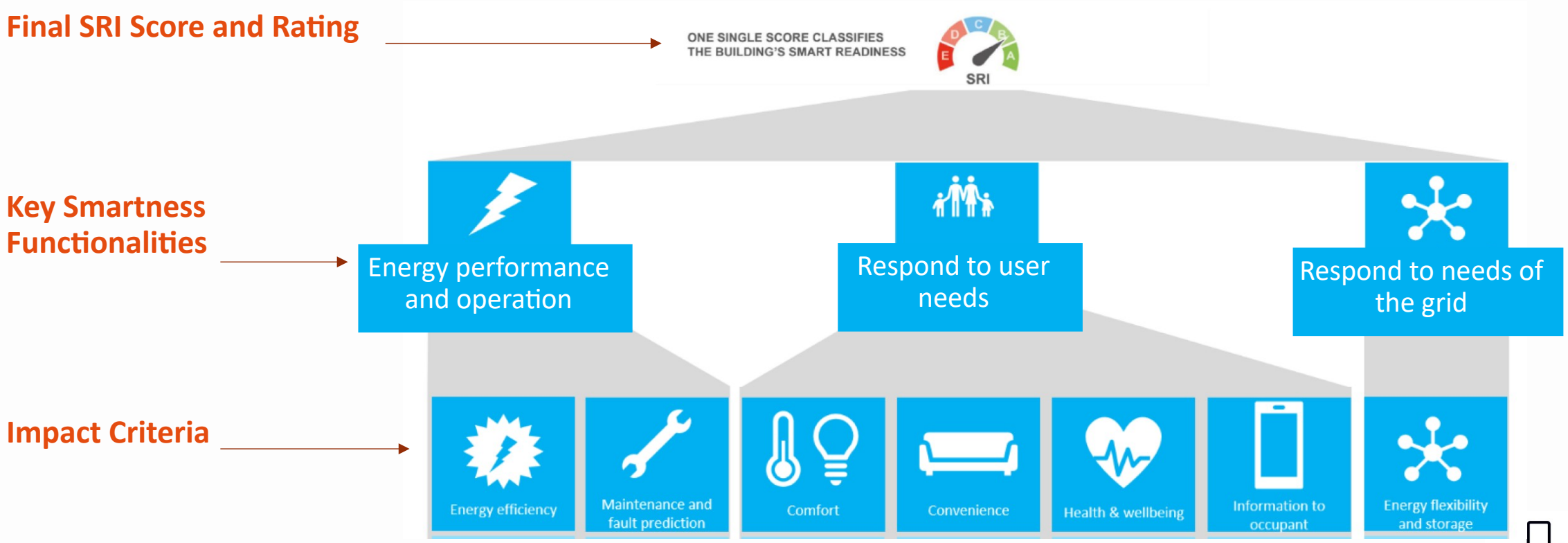


Figure source: Verbeke et al. "Final report on the technical support to the development of a smart readiness indicator for buildings", June 2020

Technical domains and services

The methodology assesses 9 technical domains:

- ✓Heating
- ✓Cooling
- ✓Domestic hot water
- ✓Controlled ventilation
- ✓Lighting
- ✓Dynamic building envelope
- ✓Electricity
- ✓Electric vehicle charging
- ✓Monitoring and control

- Each domain contains services, where each one describes a particular aspect of building or system automation.
- A functionality level, or "smartness" level is then assigned to each service.

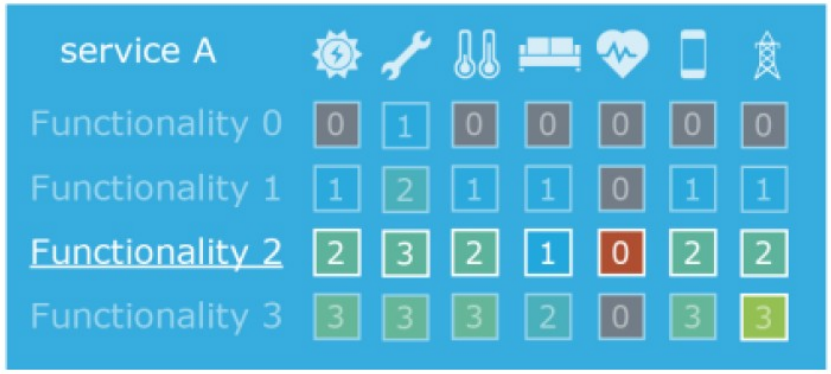


Figure source: Verbeke et al. "Final report on the technical support to the development of a smart readiness indicator for buildings", June 2020

SRI assessment methods

Considers 27 services

Considers 54 services

A Simplified method	B Expert SRI assessment	C *In-use smart building performance*
Checklist approach with limited, simplified services list	Checklist approach, covering full catalogue of smart services	*Measured / metered data (potentially restricted set of domains)*
Online self-assessment by end-user (no certification) OR On-site inspection by third-party qualified expert (formal certification)	Online self-assessment by technical expert (no certification) OR On-site inspection by third-party qualified expert (formal certification)	*In-use buildings, metered data* *Part of the commissioning?* *TBS self-reporting their actual performance*
Up to one hour	½ day to 1 day, depending on the complexity	*Gather data over a long period (e.g. 1 year)*
Residential buildings and small non-residential building (net surface floor area < 500m²)	Non-residential buildings (and residential buildings if desired)	*Residential and non-residential* *Restricted to occupied buildings (not in design phase)*

SRI digital calculation tools

Several initiatives are currently being implemented to develop digital tools that support the implementation of SRI assessments, and that provide complementary SRI-related services to improve smartness of buildings.

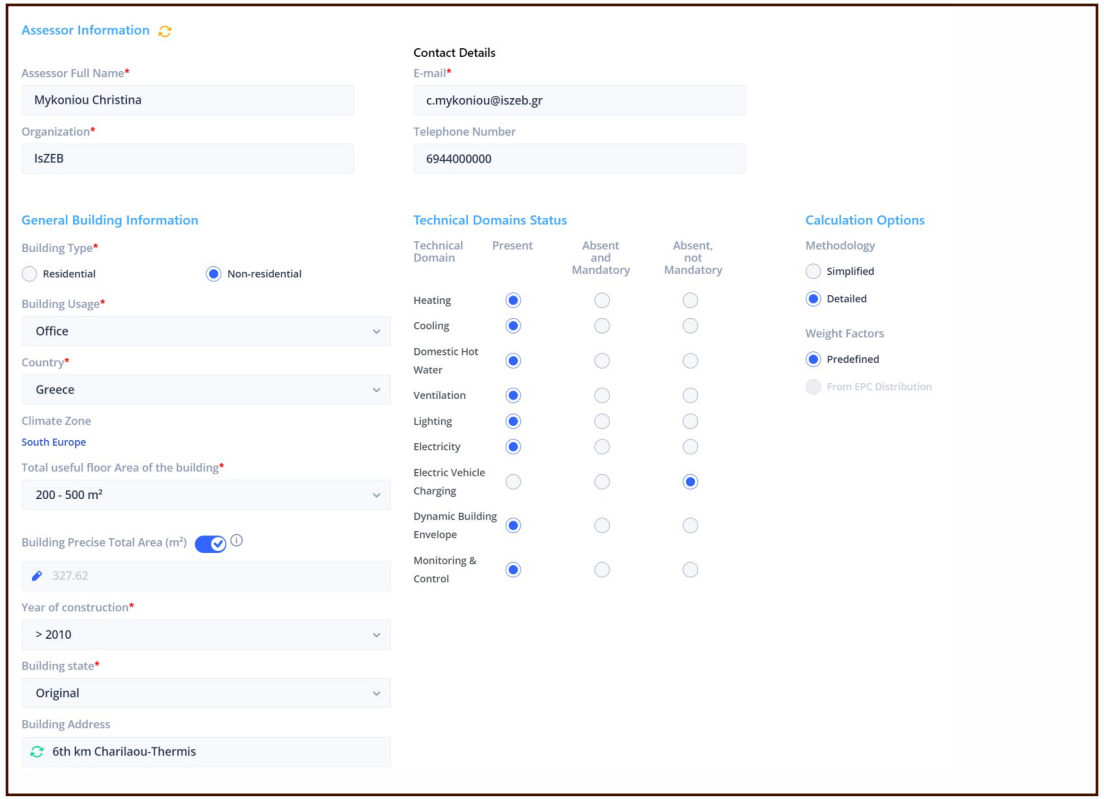
- D^2EPC Building Performance Module-SRI Calculation Subcomponent +
- EPC-RECAST BIM supported SRI assessment tools +
- Smart-Ready-Go® +
- Smart2B Smart performance assessment & Advisor (SPA&A) +
- SRI2MARKET platform +
- SRI Calculator in IsZEB Certify +
- U-CERT Smart Readiness Indicator (SRI) digital tool +

Source: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/implementation-tools_en

The IsZEB SRI calculator

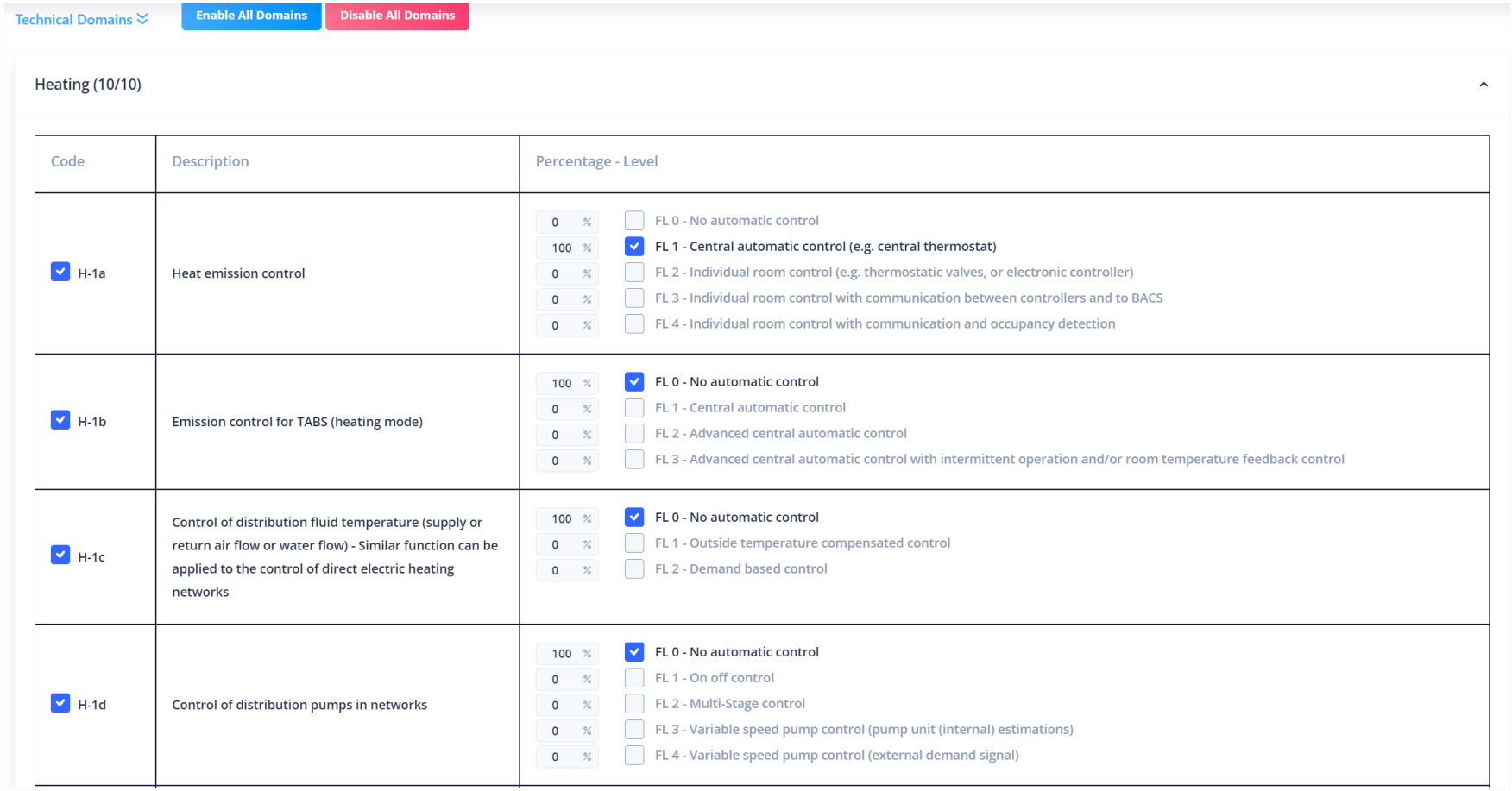
SRI Calculator: A novel computational tool has been developed to perform buildings' SRI assessments, according to the SRI methodology.

Added value: The tool can bring added value to the buildings owners by evaluating the buildings SRI and highlighting buildings' smartness improvement scenarios.



The assessor inputs general info about the building as well as initial options about the SRI calculation.

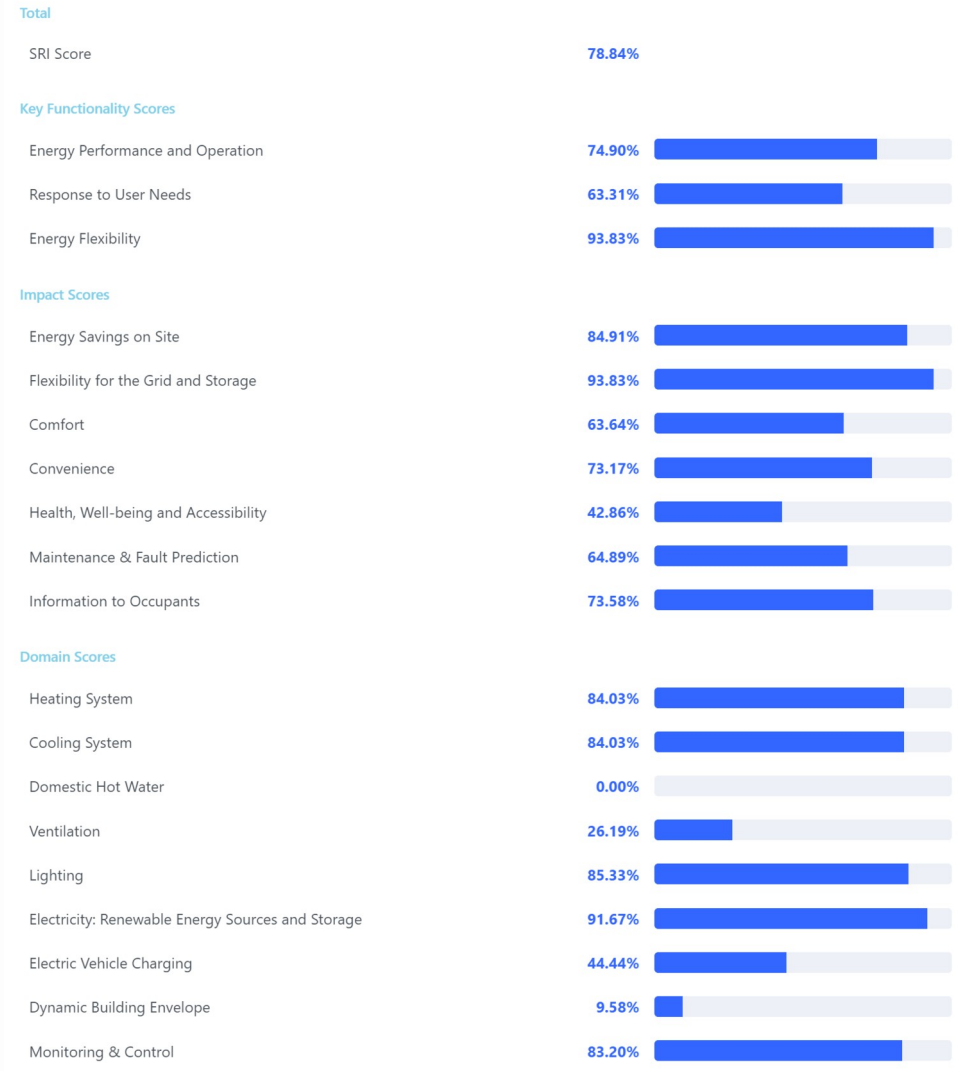
SRI calculation process



The assessor chooses the proper Functionality Level for each technical domain service.

The Catalogue of services is automatically updated based on the Mechanical, Electrical and Plumbing (MEP) systems present in the building.

SRI Analysis



Reports:

- ✓ Overall SRI Score
- ✓ Technical Domains Score
- ✓ Impact Criteria Score

Higher SRI scores mean that a building has:

- ✓ More technologically advanced automation systems and
- ✓ Is 'smarter' more capable to address the key functionality required.

SRI Matrix of Results

INTELLIGENT SOLUTIONS FOR ZERO-ENERGY BUILDINGS

Smartness Readiness Indicator Results (SRI)

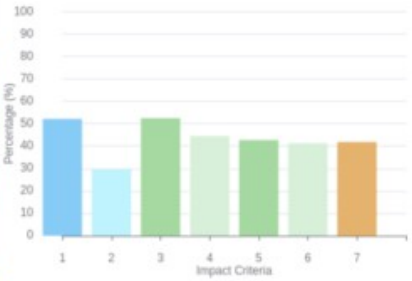
IMPACT CRITERIA

TECHNICAL DOMAINS	Smartness Readiness Score	Energy Efficiency	Maintenance & Fault Prediction	Comfort	Convenience	Health, Well-being and Accessibility	Information Distribution to Tenants	Energy Flexibility & Energy Storage	Technical Domain Score
	Heating	57.14%	20.00%	50.00%	36.36%	40.00%	50.00%	36.36%	39.68%
	Cooling	40.91%	40.00%	50.00%	36.36%	40.00%	50.00%	27.27%	37.27%
	Domestic Hot Water	63.64%	50.00%	0.00%	57.14%	0.00%	33.33%	36.36%	46.32%
	Ventilation	64.29%	50.00%	80.00%	75.00%	77.78%	66.67%	0.00%	66.00%
	Lighting	50.00%	0.00%	60.00%	60.00%	0.00%	0.00%	0.00%	44.00%
	Dynamic Building Envelope	40.00%	100.00%	40.00%	50.00%	25.00%	100.00%	0.00%	61.88%
	Electricity	28.57%	16.67%	0.00%	45.45%	0.00%	33.33%	36.36%	31.47%
	Electric Vehicle Charging	0.00%	0.00%	0.00%	83.33%	0.00%	66.67%	25.00%	41.67%
	Monitoring & Control	37.50%	27.27%	0.00%	29.41%	25.00%	22.22%	77.78%	43.11%
	Impact Criteria Score	52.18%	29.59%	52.46%	44.44%	42.74%	41.34%	41.83%	

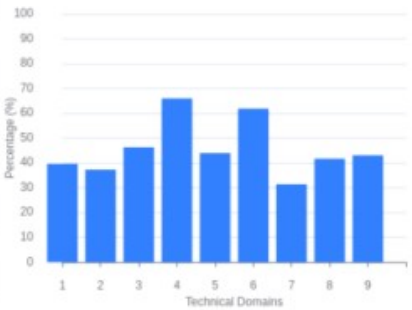
BASIC SMART READINESS FUNCTIONS	Energy Efficiency and Function	User Needs Adaptability	Energy Flexibility	Smartness Readiness Indicator (SRI)
	40.88%	45.25%	41.83%	42.65%

Smartness Readiness Category: Between 35% & 50%

Impact Criteria Score	
1. Energy Efficiency	52.18%
2. Maintenance & Fault Prediction	29.59%
3. Comfort	52.46%
4. Convenience	44.44%
5. Health, Well-being and Accessibility	42.74%
6. Information Distribution to Tenants	41.34%
7. Energy Flexibility & Energy Storage	41.83%



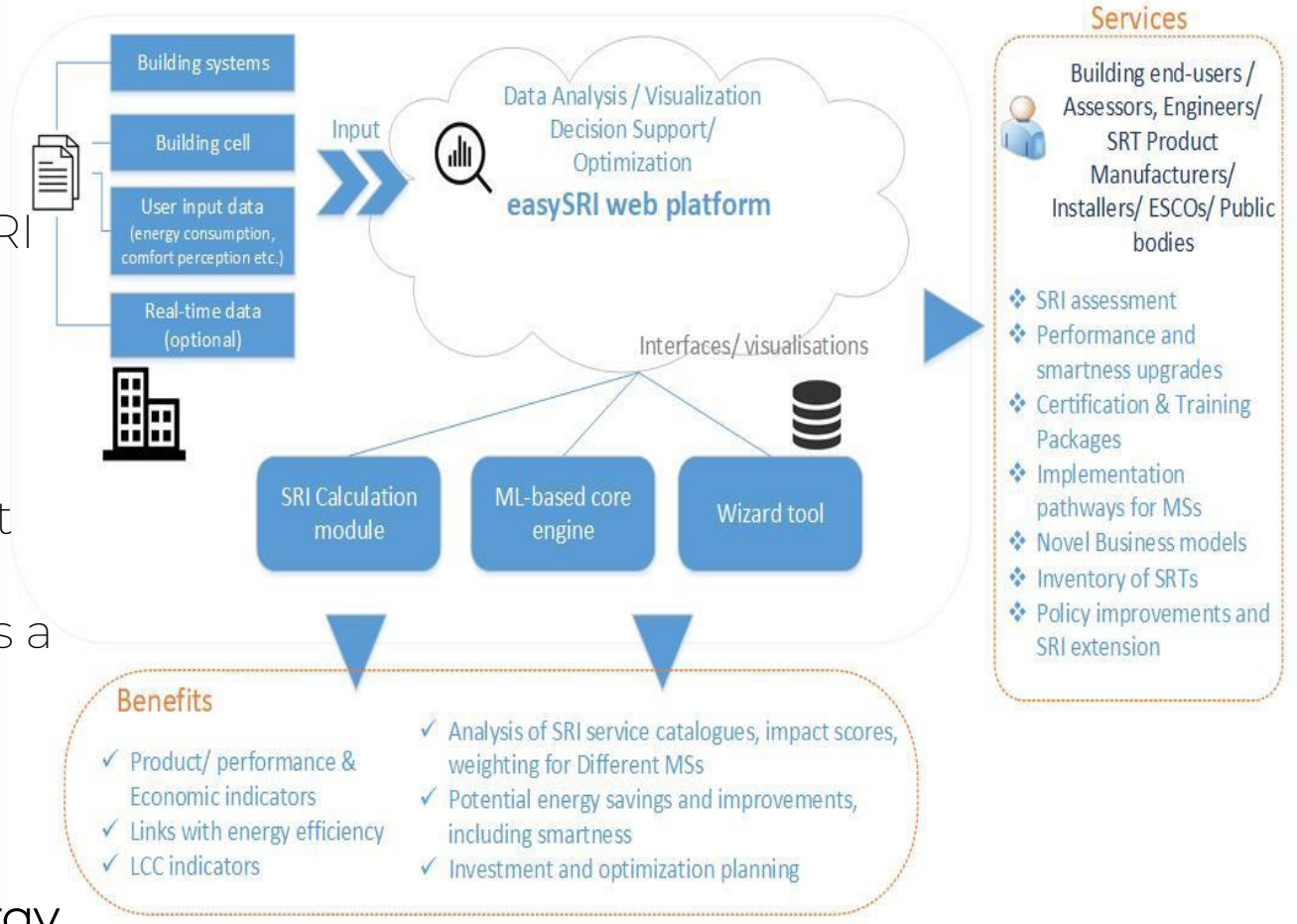
Technical Domain Score	
1. Heating	39.68%
2. Cooling	37.27%
3. Domestic Hot Water	46.32%
4. Ventilation	66.00%
5. Lighting	44.00%
6. Dynamic Building Envelope	61.88%
7. Electricity	31.47%
8. Electric Vehicle Charging	41.67%
9. Monitoring & Control	43.11%



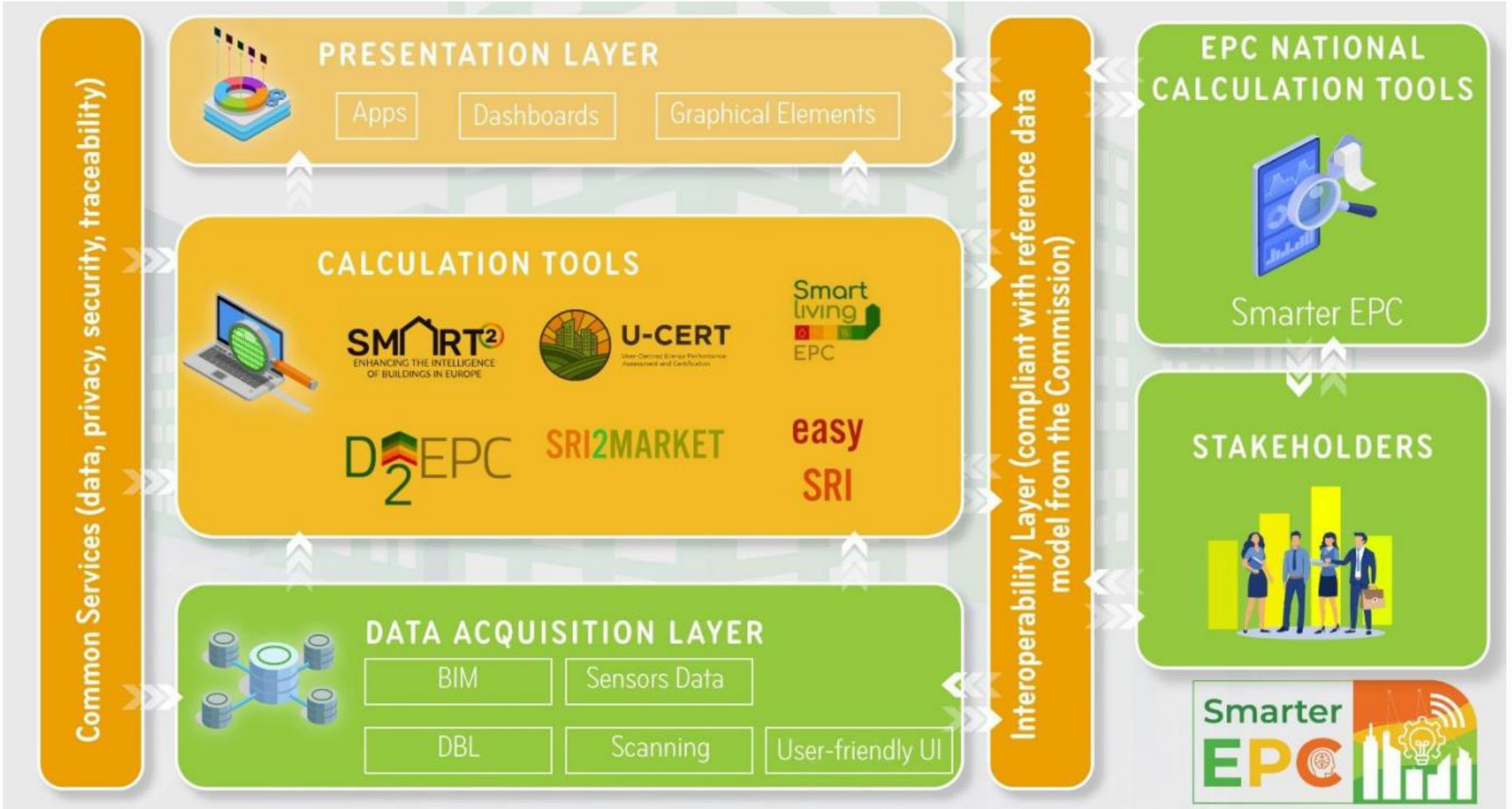
Ongoing research

- ✓ easySRI offers a **single platform** that combines:
  - ➢ A **SRI Calculation engine**,
  - ➢ A **SRI Wizard tool &**
  - ➢ A **ML-based core engine** identifying best SRI renovation solutions & making recommendations for upgrades.

- ✓ **Enable services** aimed to:
  - ➢ <u>Promote</u> & <u>exploit</u> the rollout of ICT & Smart Ready Technologies (SRTs)
  - ➢ <u>Promote</u> & <u>disseminate</u> the SRI adoption as a **standard index for evaluating** efficient building operation
  - ➢ <u>Generate</u> **new** "Green & Sustainable" **businesses**
  - ➢ <u>Reduce</u> (as indirect & inducted effect), **energy consumption** in buildings.



Ongoing research



Ongoing research

Smarter EPC
Smarter Energy Performance Certificates
Integrating smart readiness aspects into buildings energy certification and tools for market uptake

Main Aim

- A platform which **offers access to seven different tools for issuing EPCs and SRIs**

Integration of tools

- Smarter EPC plans to integrate tools developed by projects like **D2EPC, SmartLivingEPC, UCERT, Smart², easySRI, SRI2Market, and UCERT** into a unified platform.

Customization & user friendliness

- The project envisions facilitating the smart input of building data and **allowing users to select the appropriate tool for issuing EPCs and SRIs**.

Harmonization

- **Harmonize building assessment schemes** by developing common inspection procedures, adapting existing European standards
- Common EPC and SRI certificates will be explored, with **a visual solution combining both certificates.**

SmartWins

SRI Challenges & Future trends

- Developing universally applicable criteria and metrics to assess smart readiness across diverse building types and geographical regions poses a significant challenge.
- Integrating the SRI into existing building regulations and certification schemes (e.g. EPC) while ensuring compatibility with emerging technologies and industry practices remains a key issue.
- In the future SRI may face deeper integration with building automation systems, IoT devices, and energy management platforms to provide real-time monitoring and optimisation capabilities. → SRI Method C

Boosting Research for a Smart and Carbon Neutral Built Environment with Digital Twins – **SmartWins**

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