Smart Built4EU
The European Smart Buildings Community

Smartness upgrades and the Smart Readiness Indicator






This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.

Security level: RINA/CL/SENSITIVE

Deploying Augmented intelligence solutions in EU buildings using Data analytics, an interoperable hardware/software Architecture and a Novel self-energy assessment methodology

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Auto-DAN: Key Facts & Figures

- 48 Month Project (currently in M34)
- €5,675,186 Total Costs (€4,415,246 provided by EU)
- 12 Partners across 4 Countries
- 6 Demonstration Sites

48 Months
12 Partners
4 Countries
6 Demo

The Team

Demonstration Sites

O Cualann Cohousing Cooperative

Greenogue & Aerodrome Business Park

Dublin, Ireland

Palazzo Terragni

Lissone, Italy

Delta Ecopolis

Milan, Italy

Residencia Camino de Santiago

Burgos, Spain

VideBURGOS Foundation

Burgos, Spain

@Auto-DAN Project @AUTODAN_PROJECT

www.autodan-project.eu

This project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement no 101000169

Auto-DAN: Key Project Objectives

1. Create a flexible, **smart hardware infrastructure** that can be applied to all small-to-medium sized buildings

2. Develop an **interoperable software architecture** that can provide all the analytical capabilities needed to self-assess & self-optimize buildings in the EU

3. Deliver **Augmented Intelligence** (AuI) solutions to enable buildings and their users to become self-optimising

4. Create a **live self-energy assessment method** that incorporates operational monitoring, appliance/system performance and smart capabilities that will improve the accuracy of current energy assessment procedures

5. Accelerate investment in sustainable energy by EU companies (3rd Parties) & their clients.

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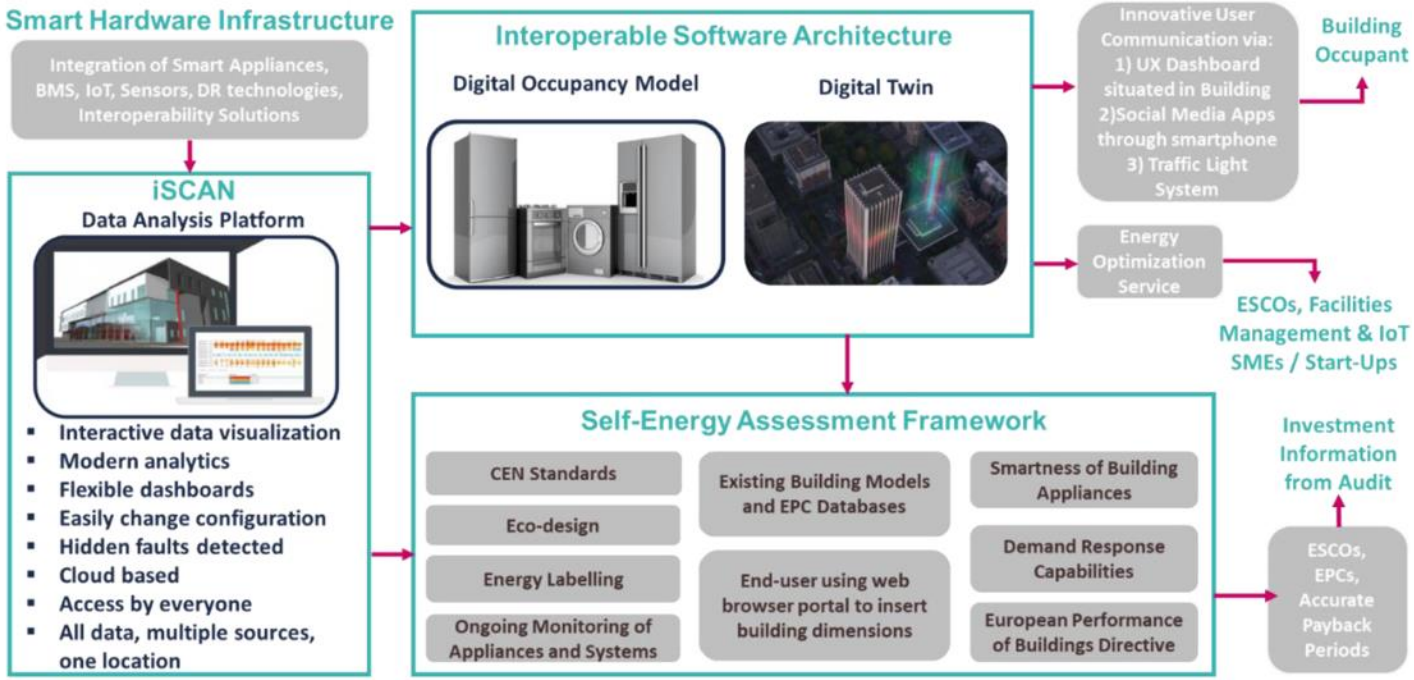
Auto-DAN: Key results and their value proposition

We successfully created a flexible smart Hardware Infrastructure

that was tailored to all the project demo sites for the smart metering of consumption and the provision to building users of the information they need to improve their energy behaviour at an appliance and system level, as well as improving their indoor comfort.

We are developing the interoperable Software Architecture

to have both a userfriendly dashboard and social media apps integrating all the analytical capabilities developed within the project



We are working on the Digital Occupancy Model and their integration with the Self Energy Assessment

that will allow to disaggregate energy loads at a system and appliance level assisted by agent-based occupancy models (created within the project), while identifying local energy bill reduction opportunities

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Auto-DAN: Barriers and Challenges

Barrier 01.

Difficulties in the installation of the Auto-DAN product in the context of existing buildings with such a wide variability of pre-existing conditions (installations, building use, pre-existing configuration).

Barrier 02.

Supply chain problems present in this historical period have greatly impacted the possibility of realizing these smart buildings .

Challenge 01.

Grounding a project like Autodan that aims to create a simple and replicable system, but for the variability of context it is very challenging.

Challenge 02.

Project had challenges on choice of hardware systems also due to problems related to the supply chain of these materials

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Auto-DAN

Thank you for your attention!

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RINA

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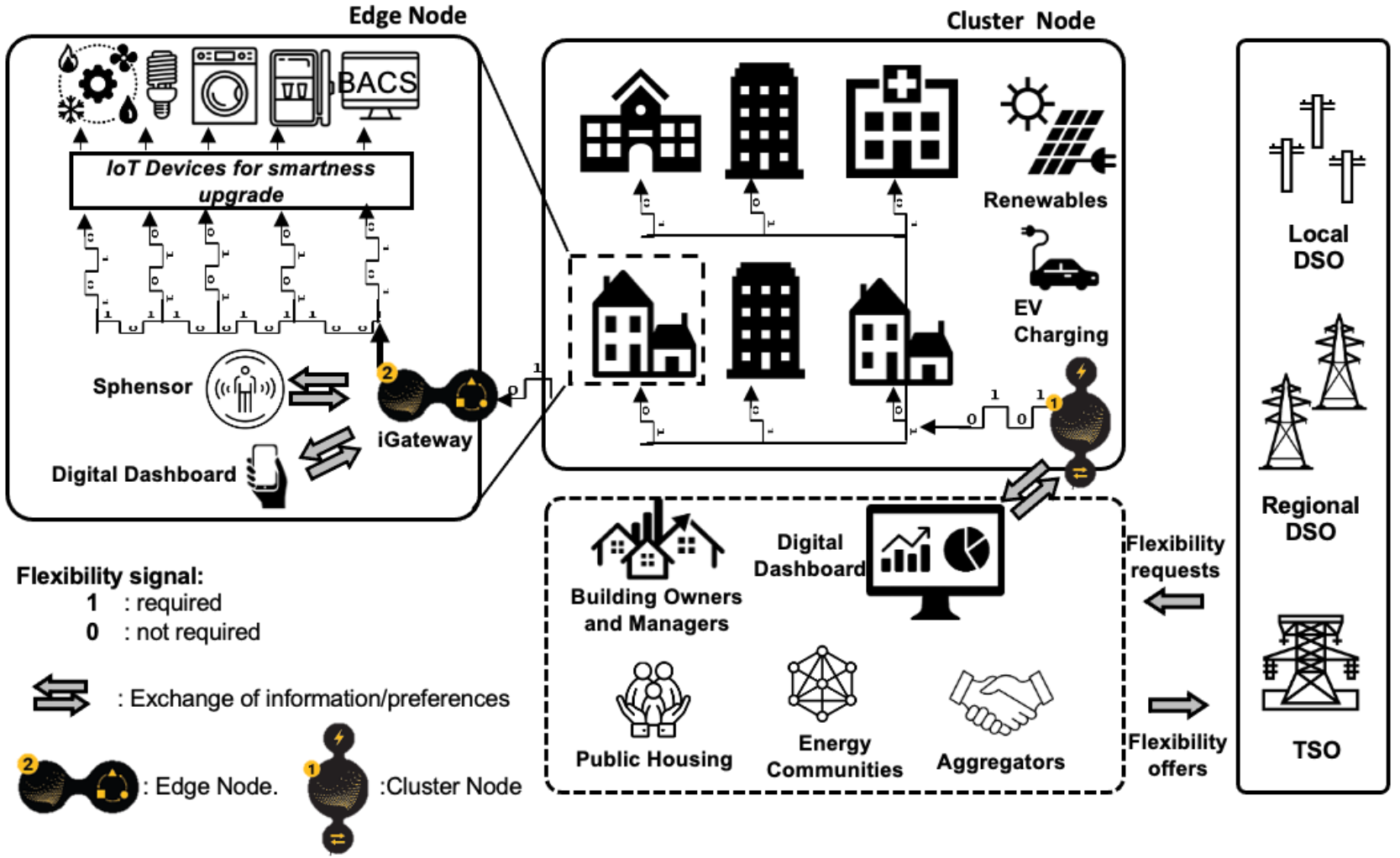
COLLECTiEF

Collective Intelligence for Energy Flexibility

- 14 partners from 6 European countries
- 4 Years June 2021-May 2025
- 4 urban pilots in Cyprus, France, Italy and Norway

In COLLECTiEF, we design, test and implement an energy management system based on **Collective Intelligence**.



COLLECTiEF

COLLECTiEF aims at

- Integration of legacy equipment, existing buildings and urban energy systems into a collaborative network.
- Reducing installation cost and the need for data transfer and computational power.
- Increasing data security, energy flexibility, climate resilience, user comfort and cost-effectiveness.

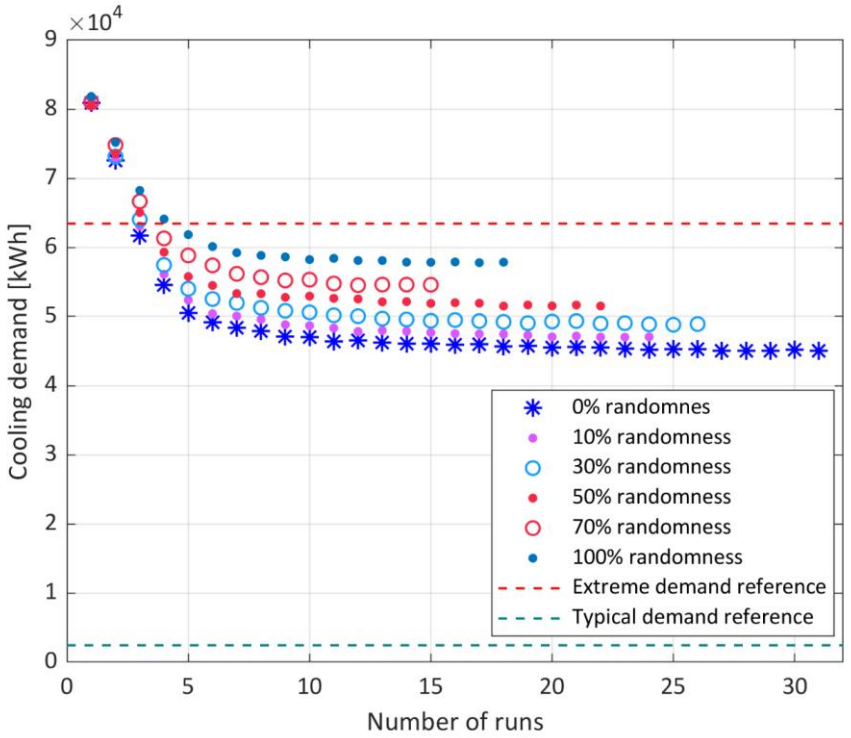
COLLECTiEF’s impacts will be

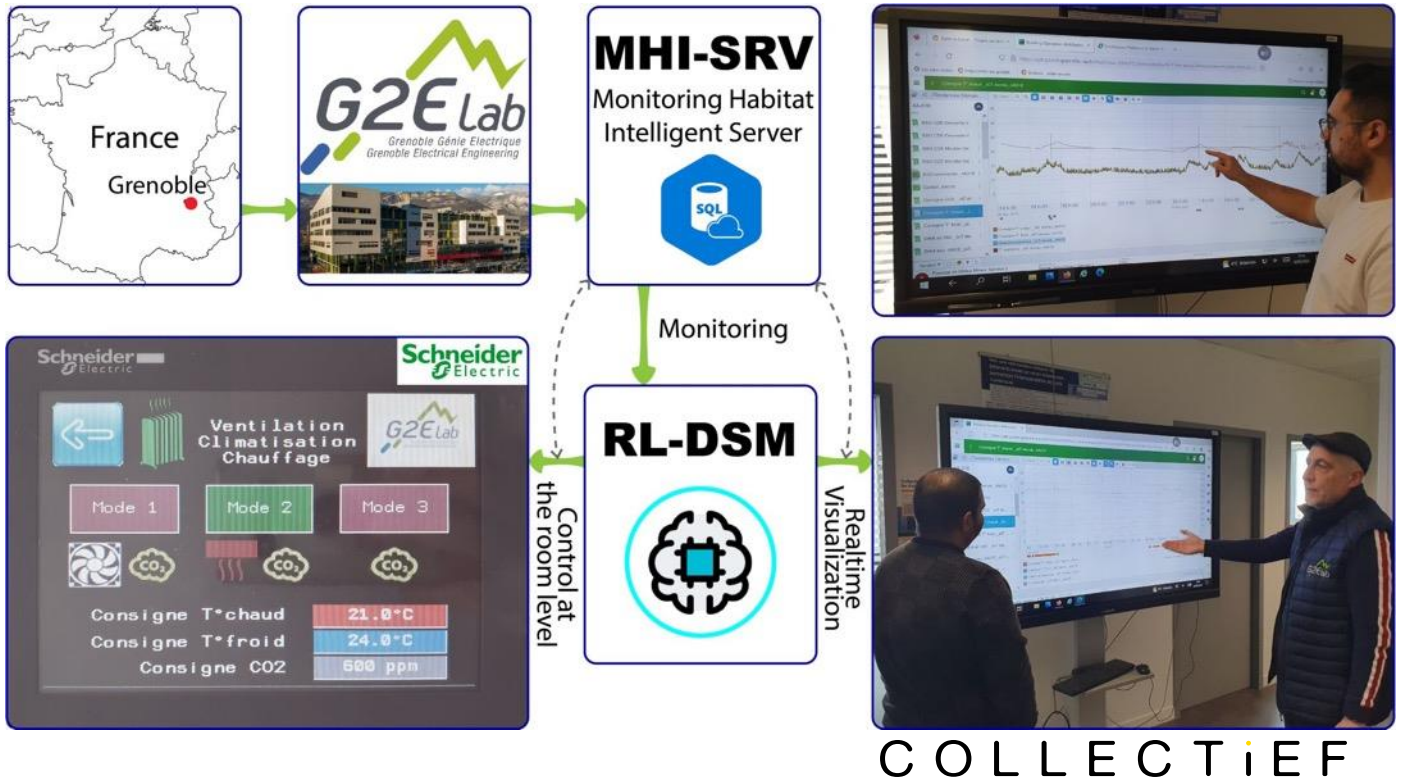
- Upgrading existing buildings to higher smartness levels
- Reducing in energy consumption and costs
- Primary Energy Savings
- Investment in sustainable energy
- Increased user satisfaction
- Increased climate flexibility and resilience in urban areas
- Higher integration of renewable generation

Some COLLECTiEF results (so far!)

A major step that we have taken is developing our novel DSM approach further by combining Collective Intelligence with Reinforcement Learning.

The implications of AI in energy management is very promising. Still we need the human innovation to come up with novel approaches that address our needs.





www.collectief-project.eu

COLLECTiEF

PHOENIX

Adapt & Play Holistic Cost Effective and user-friendly Innovations
with high replicability to upgrade smartness of existing buildings with legacy equipment

Presentation for the SmartBuilt4EU Final Conference

Alfonso Ramallo, UMU

This project has received funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under grant agreement no 893079.

Mission: PHOENIX will provide a portfolio of ICT solutions to increase the smartness of legacy systems and appliances in existing buildings which will increase the SRI and energy efficiency. These improvements will translate in human-centric new services for building users and an improvement on both execution of grid operations and data sharing.

KO1: Allow Adapt-&-Play seamless integration of domestic appliances, legacy equipment and building systems
KO2: Create building knowledge with innovative techniques to upgrade the smartness of existing buildings
KO3: Enable real-time communication with energy stakeholders to optimise the grid operation.
KO4: Provide cost-effective services for building end-users to maximize the energy efficiency and overall performance.
KO5: Allow security and privacy of building data regarding the revised EPBD and the GDPR law
KO6: Create suitable business models and exploitation strategies to target the broad market of smart building
KO7: Develop human-centric approach and training/awareness activities to prepare citizens for smart buildings

This means:

- We need the software, the platform, and the connection means
- We need the hardware
- We need to apply it all to pilots
- And we need to draw conclusions (with good results)

Project planning

PHASE 1 [M1-M10]
Requirements, design, development, integration and first version of PHOENIX Proof-of-concept (PoC) in 1 pilot site Related to Objectives O1-O5

- Establishment of strong project management procedures (WP1)
- Requirements analysis of Regulatory, Business and Social (WP2)
- Design and specifications of PHOENIX architecture and ICT tools (WP2)
- Development, partial integration and first PHOENIX release (WP3-6)
- Use-Cases Preparation (WP7)
- Proof-of-Concept (PoC) (WP7)
- Launch activities of Dissemination & Communication (D&C) (WP8)

Phase 1 gate: *Initial requirements documented and architecture specified. Completed Proof-of-Concept evaluation. (M10) related to MS4*

PHASE 2 [M11-M21]
Development, Integration & Second Demonstration stage Related to Objectives O1-O7

- Final architecture specifications (WP2)
- Complete development and integration of second PHOENIX release with all services (WP3-6)
- Deployment and evaluation in all Pilot Sites (WP7)
- Completion of second demonstration and collected feedback (WP7)
- Scale-up efforts of D&C, innovations standardisation and exploitation (WP7)
- Successful completion of the project's mid-term review.

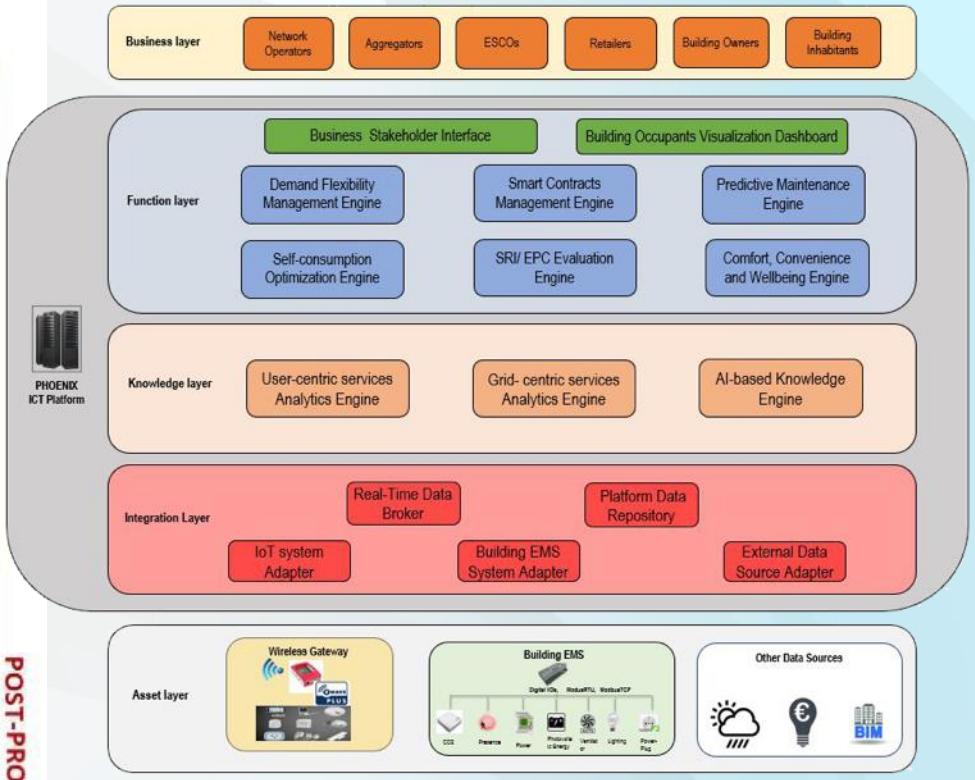
Phase 2 gate: Final version of PHOENIX architecture specifications, *Intermediate evaluation of integrated PHOENIX release (M21), related to MS07*

PHASE 3 [M22-M36]
Third Integration/Demonstration & Impact maximisation – related to Objectives O2-O7

- Enhanced developments and complete integration of third PHOENIX release (WP3-6)
- Iterative pilots execution and feedbacks evaluation to achieve TRL 7-8 by M36. (WP7)
- Stakeholder engagement (WP8)
- Development of training and awareness activities (WP8)
- Activities completed of D&C, innovations standardisation and exploitation (WP8).
- Successful completion of the project's final review.

Phase 3 gate: Final evaluation of PHOENIX *solution demonstrated at TRL 7-8 in real-world buildings scenarios. All activities completed for exploitation, D&C and standardisation; Successful completion of the project (M36).*

POST-PROJECT



Results and impacts

KPI ID	Data needed to calculate KPI	KPI value	KPI Target
Energy performance measured	- Building energy consumption -Temperatures -Weather data -Questionnaires	Calculation on Energy performance based on measuring data is being done **1.83 W/K·m^2**	- Energy performance compare to baseline normalization - Energy performance based on measured data
Improved smartness of buildings and smart readiness indicator (SRI).	-Building energy consumption -PV energy production -Temperatures -Weather data -Questionnaires	First results of SRI automatic were done. **SRI before and after interventions:** Full catalogue: - From 9% to 41% Triage process: - From 13% to 60%	SRI evaluation framework
Load and demand shifted (% and kWh). Decreasing of 20% on peak power loads. 18% energy cost reduction due to demand shifting on a variable tariff scheme	-Building energy consumption -Temperatures - Energy price - Questionnaires	**18% of demand shifted** from high cost period to low cost period. Estimation of 50kWh in the whole building. **29% of energy cost reduction.**	20% reduction on peak power loads 18% energy cost reduction
Load and demand shifted (% and kWh). Shifting of 15% of demand towards periods of high renewable production	-Building energy consumption -Energy production -CO2 emissions -Temperatures -Questionnaires	**24% demand shifted** to high renewable period. Estimation of 50kWh in the whole building.	15% demand shifted towards periods of high renewable production

PHOENIX

Adapt & Play Holistic Cost Effective and user-friendly Innovations
with high replicability to upgrade smartness of existing buildings with legacy equipment

Any Questions?

Contact details:

Alfonso Ramallo, UMU

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SATO
OF BUILDING ENERGY

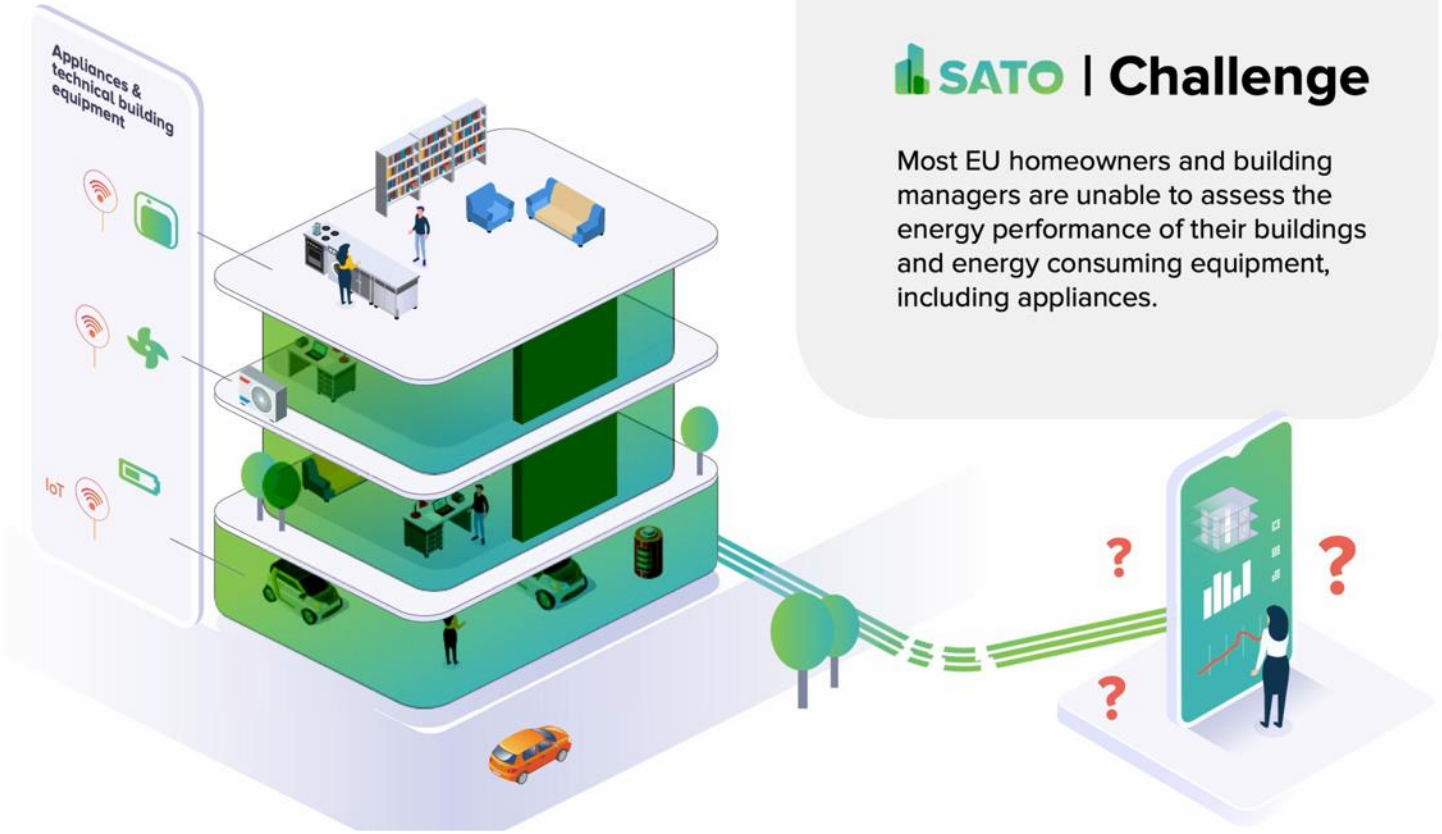
Self Assessment Towards Optimization of Building Energy

Smart Buildings in Europe

SmartBuilt4EU Final public conference

LC-SC3-B4E-10-2020
Self-assessment and self-optimisation of buildings and appliances for a better energy performance

This project receives funding in the European Commission's Horizon 2020 Research Programme under Grant Agreement Number 957128



SATO | Challenge

Most EU homeowners and building managers are unable to assess the energy performance of their buildings and energy consuming equipment, including appliances.

What's our objective?

Create
an IT platform for **automated self-assessment and optimization** of building's energy,

capable of
Assessment of real-life building energy use and energy consuming equipment operation

Impacts

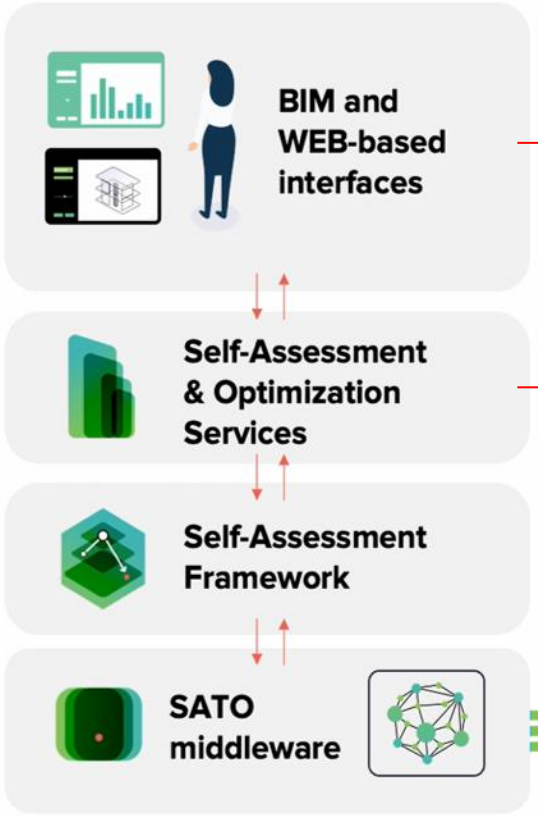
- Increased accuracy in energy performance and energy consumption assessments
- Forward-looking contributions to EPBD, SRI, and labelling approaches
- Consumption reduction to exceed ICT cost and operation
- Significant primary energy savings and reduced greenhouse gas emissions
- Trigger investments in sustainable energy and smart technologies

BIM-based deployment and interface approach

- Building structure and systems are specified and input through BIM (IFC)
- KPIs and assessments are displayed through BIM

IoT systems integration and computing services

- Knowledge Graph (KG) for IoT level integration
- Context-awareness layer supports building self-operations
- Automated computational workflows for KPIs, assessments, and services

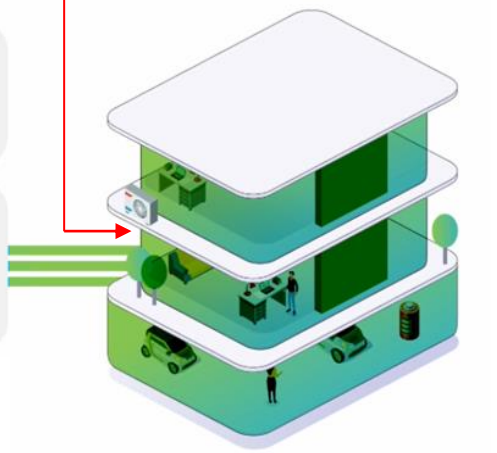


Context-aware self-assessment framework

- Dynamic AI predictive framework exploits KG data and context
- Around 40 Assessments in 5 categories are implemented (including SRI)

Energy management control services

- Simultaneous management of energy efficiency, flexibility, and user satisfaction
  - Hierarchical approach to integrate legacy systems
  - Holistic AI-based control



User interfaces

- BIM-based for service buildings
- WEB-based for residential buildings
- Mobile app for real-life appliance assessment (Performance, efficiency, utilization patterns)

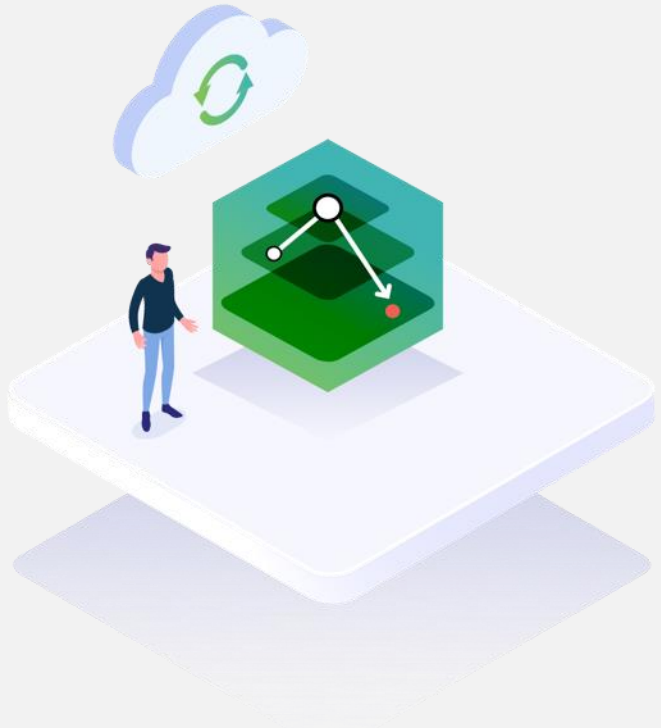
Lessons learnt & good practices

It is very **hard to setup pilots** that are on **the edge of building capabilities.**

Significant untapped potential for **data visualization in BIM**

Building energy systems and components are **not IOT enabled or open (big problem).**

There is a need to identify a **small set of KPIs that users understand**



Project pitches and panel session:

Smartness upgrades and the Smart Readiness Indicator

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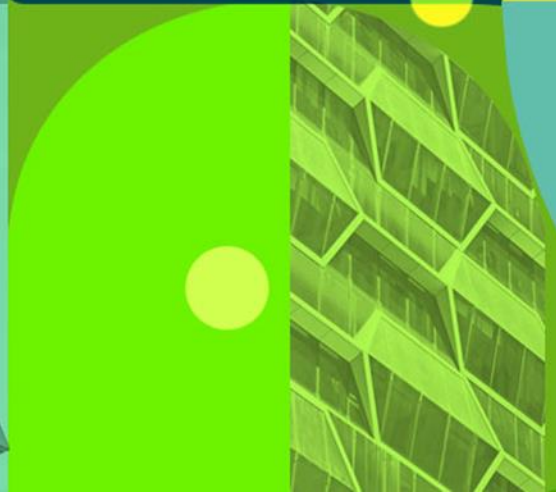
Policy recommendations

Régis Decorme, R2M Solution







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Policy recommendations – approach

Our policy recommendations are based upon the work done with the Smart Building Innovation Community from February 2021 to July 2022:

- 12 White Papers written by 4 Task Forces:

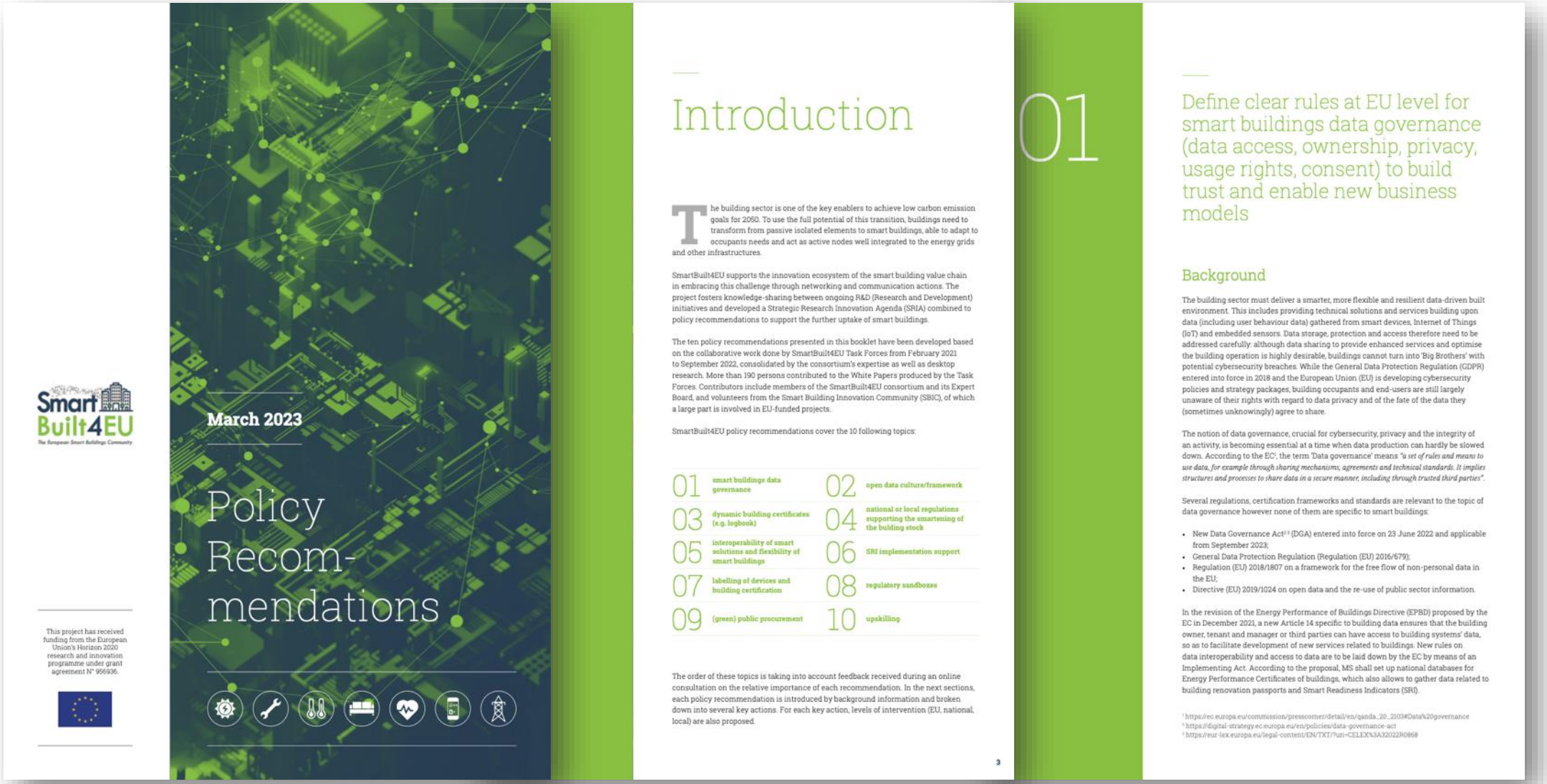
Task Force 1: Interactions with users

Task Force 2: Efficient building operation

Task Force 3: Interactions with the external environment

Task Force 4 : Crosscutting issues

Policy recommendations – approach



Policy recommendations – overview of topics covered

1. smart buildings data governance
2. open data culture/framework
3. national or local regulations supporting the smartening of the building stock
4. regulatory sandboxes
5. labelling of devices and building certification
6. dynamic building certificates (e.g. logbook)
7. SRI implementation support
8. interoperability of smart solutions and flexibility of smart buildings
9. (green) public procurement
10. upskilling

PR1: Define clear rules at EU level for smart buildings data governance (data access, ownership, privacy, usage rights, consent) to build trust and enable new business models

1

Action 1.1 Design and implement clear guidelines on data collection and data management procedures for smart buildings, in line with the proposal for the revision of the EPBD

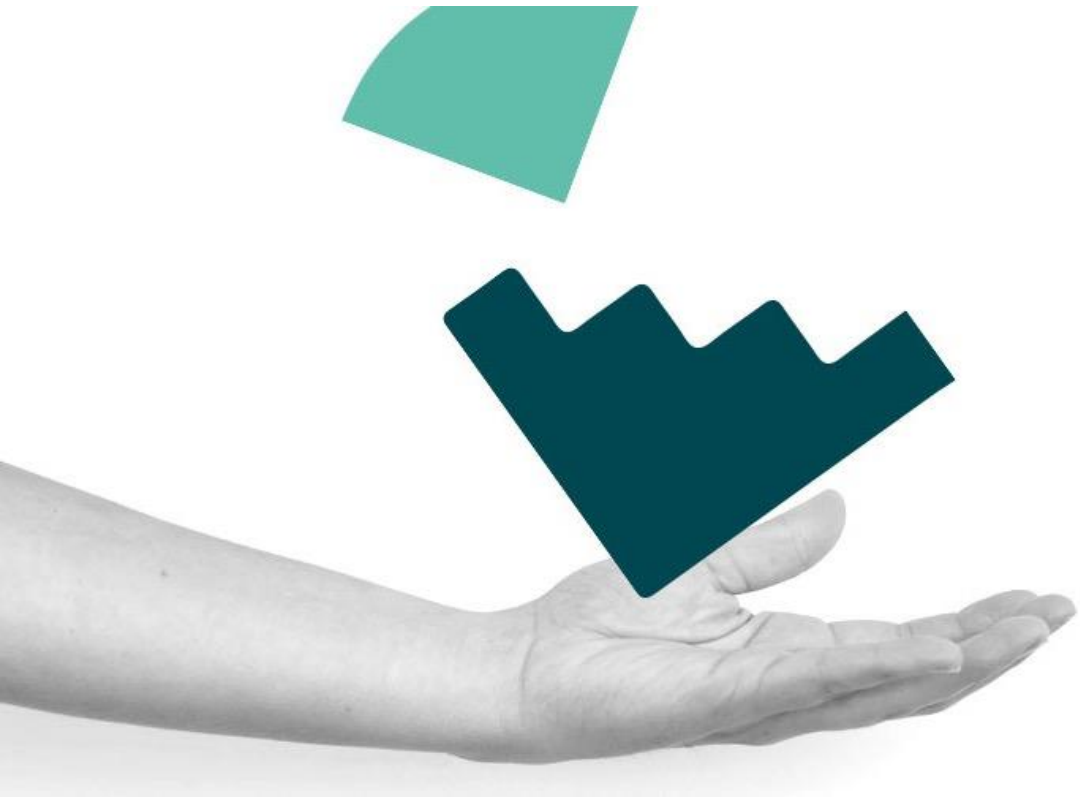
2

Action 1.2 Clearly define the governance framework and the role of trusted third parties as warrant of cybersecurity and data privacy to build trust, in line with the Data Governance Act

3

Action 1.3 Set up a central registry or data space to give users a personal unique interface to make their data available and control it, in a just and safe way

PR2: Develop and enforce an open data culture to improve knowledge sharing and replication on building performances



1

Action 2.1 Develop a framework for an open-access platform to enable data access and data sharing in buildings and districts, and to promote the replication of successful stories

2

Action 2.2 Include "open source" requirements in regulation

PR8: Support the roll-out of interoperability of smart solutions and flexibility of smart buildings through data-driven standards and regulation

1

Action 8.1 Design principles and rules for integration of interoperability in EU regulation

2

Action 8.2 Develop open, modular end-to-end interoperability and data management frameworks

3

Action 8.3 : Support the development of certifications with the establishment of end-to-end interoperability between energy networks, BEMS and devices