

PAPER • OPEN ACCESS

Smart Data Collection for Building Sustainability Assessment: The Case of Call Centres and the Smart Readiness Indicator

To cite this article: Paris A. Fokaides *et al* 2025 *IOP Conf. Ser.: Earth Environ. Sci.* **1558** 012003

View the [article online](#) for updates and enhancements.

You may also like

- [Smart city planning and sustainable development](#)
Ali Abdulsamea Hameed
- [ISO standards or global indices: Who decides if a city is smart?](#)
K Prevelianaki, F Sherratt and C Henjewele
- [Towards Integrated Building Assessment: A Unified Certificate for Energy Performance and Smart Readiness](#)
Theoklitos Klitou, Paris Fokaides, Sophie Dourlens-Quaranta *et al.*

Smart Data Collection for Building Sustainability Assessment: The Case of Call Centres and the Smart Readiness Indicator

Paris A. Fokaides^{1*}, Nicholas Afxentiou¹, Pablo Carnero Melero², Marco Pietrobon³, Afroditi Zamanidou^{4,5}

¹ School of Engineering and Applied Sciences, Frederick University, 7, Y. Frederickou Str., 1036 Nicosia, Cyprus

² Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA), Brussels, Belgium

³ R2 M Solution, Piazza della Vittoria, 2, 27100 Pavia, Italy

⁴ Electrical & Computer Engineering Department, Faculty of Engineering, University of Western, Macedonia, Greece

⁵ Intelligent Solutions for Zero and Positive Energy Buildings (IsZEB), 6th km Charilaou-Thermi, Thessaloniki, Greece

*E-mail: p.fokaides@frederick.ac.cy

Abstract. The Smart Readiness Indicator (SRI) is an initiative by the European Commission under the Energy Performance of Buildings Directive, designed to assess a building's capability to integrate smart technologies. These technologies contribute to decarbonization while enhancing comfort and energy efficiency. A building's smartness refers to its ability to detect, interpret, communicate, and efficiently respond to changing conditions related to technical building systems, the external environment, including energy grids, and occupant needs. This research examined the implementation of call centre questionnaires as an innovative tool for SRI data collection. The methodology involves a structured data collection process leveraging call centre interactions to evaluate building smart readiness indicators effectively. It examines over 545 responses from Germany, providing valuable insights into building smart readiness. This approach addresses common challenges in SRI assessment, such as scalability, cost, and precision. Key findings demonstrate the potential of this method to provide comprehensive and cost-effective insights compared to traditional approaches like on-site audits and manual surveys, which often face limitations in terms of cost, scalability, and data precision. This research contributes to the existing body of knowledge by offering validated methodologies for technical and survey-based SRI assessments. Implementing the SRI framework promotes technological innovation within the construction sector, offering a strong incentive for integrating cutting-edge smart technologies in buildings.



1. Introduction

The European Union has introduced the Smart Readiness Indicator (SRI), a common EU scheme that indicates how well buildings are equipped to use smart technologies to enhance energy efficiency, improve user comfort, and support flexible interaction with the energy grid. [1] As part of the updated Energy Performance of Buildings Directive (EPBD), the European Union introduced the SRI to adopt smart technologies in the building sector. [2] These technologies allow buildings to run more efficiently, adapt to changes, and support a cleaner energy system. The SRI evaluates how technical building systems, such as heating, lighting, or ventilation, make a building more intelligent and responsive to its environment. According to the EU's final SRI framework and practical guide, two official assessment methods have been introduced, one simplified and one detailed. These were developed with experts and stakeholders to ensure broad applicability across different building types. While both follow a similar structure, Method A includes a smaller set of services and is intended for small, less complex buildings such as single-family homes or small offices. In contrast, Method B is more comprehensive and suited to larger or more complex buildings like office blocks or multi-family housing. Both methods were initially available via an Excel-based calculation sheet and supported by a step-by-step guide published on the EU's official SRI portal. [3]

SRI is critically transitioning from voluntary pilot testing to a potential mandatory requirement for large non-residential buildings across Europe. Several Member States have already begun voluntary testing phases to explore how the SRI could fit into their national energy performance frameworks. Some, like France, have integrated SRI pilot assessments into their existing Energy Performance Certificate (EPC) systems, while others remain in the preparatory or exploratory stages. In parallel, efforts are being made to align the SRI with the revised Energy Performance of Buildings Directive (EPBD), which proposes that 2027 SRI assessments become mandatory for non-residential buildings with heating or cooling systems above 290 kW. This has prompted meaningful discussions on harmonizing the SRI with EPCs and regulations concerning Building Automation and Control Systems (BACS). Although progress has been made, several challenges remain. Standardization of assessment methods, digital interoperability, and the need for trained accredited SRI assessors are key areas being addressed. Moreover, integrating SRI evaluations with digital building models is gaining interest in simplifying and streamlining the assessment process for future large-scale implementation. [4]

To support this transition, the main goal of this study examines the value of using call centre questionnaires as a new approach to collecting SRI data using the Smart-Ready-Go tool. This approach is based on a structured process, where building representatives are guided through a short checklist to evaluate the smart readiness of their buildings. The methodology was developed under the EU-funded Smart Square project and is designed to enable quick self-assessments typically completed in under 10 minutes using the simplified Method A of the SRI framework. By offering a practical and time-efficient alternative, this approach helps make SRI assessments more scalable and accessible, especially for small and less complex buildings. It examines over 545 responses from Germany, providing valuable insights into building smart readiness. This approach addresses common challenges in SRI assessment, such as scalability, cost, and precision. The key findings demonstrate the potential of this method to provide comprehensive and cost-effective insights compared to traditional approaches like on-site audits and manual surveys, which often face limitations in terms of cost, scalability, and data precision. This research contributes to the existing body of knowledge by offering validated methodologies for technical and survey-based SRI assessments. Implementing the SRI framework promotes technological

innovation within the construction sector, offering a strong incentive for integrating cutting-edge smart technologies in buildings. [6]

Smart-Ready-Go tool is a novel web application tool, that makes SRI assessments more efficient, accessible, and user-friendly. This cloud-based tool is designed to help users evaluate the smart readiness of buildings using Method A and Method B. With a simple and intuitive interface, Smart-Ready-Go! is accessible through web and mobile applications, allowing users to complete assessments, review detailed results, and receive personalized recommendations to improve a building's smart features. The tool also offers features like performance dashboards and user accounts, helping building owners and stakeholders better understand how their buildings perform and what steps can be taken to enhance their intelligence. [5][6]

The SRI has evolved from a conceptual framework to an officially recognized EU scheme, undergoing technical refinements, regulatory adoption, and voluntary test phases. With the EPBD recast mandating SRI application for large non-residential buildings by 2027, the current focus is on standardizing methodologies, increasing adoption, and integrating the SRI into national energy policies. Moving forward, a collaboration between the European Commission, national governments, and industry stakeholders will ensure effective implementation and maximizing the benefits of smart-readiness assessments.

2. Methodology

2.1 Investigation of the SRI across Europe

In accordance with the final technical support report for the SRI for buildings, Method A is defined as a simplified, checklist-based quick scan that enables a building's smart readiness to be assessed in under one hour. [6] This method is particularly suited for online self-assessment and is designed to be accessible to users with no technical background. In this study, the SRI Call Centre has been introduced as a key mechanism to support the deployment of Method A across a wide range of buildings. Its primary objective is to facilitate the issuance of a minimum number of SRI certificates during its operational phase. To achieve this target, the Call Centre will operate through the online assessment of SRI certificates based on the completion of structured questionnaires. The questionnaire itself is formulated using clear and accessible language, ensuring that all users regardless of technical expertise can provide reliable input. Upon completion, certificates will be automatically issued in electronic form. To guarantee privacy and data protection throughout the process, a simplified yet GDPR-compliant methodology has been developed. In addition, the Smart-Ready-Go! tool will be used to support the operation of the Call Centre.

The structure of SRI Method A is implemented through a simplified questionnaire-based approach. The process begins with basic information about the building and the identification of applicable technical domains. Each domain undergoes a "triage process," where a series of targeted questions assess the presence of smart services across key areas such as heating, cooling, lighting, electricity, and electric vehicle charging. The questionnaire is designed to be concise and accessible, enabling a rapid evaluation of a building's smart readiness level through a structured sequence of domain-specific questions and services.

The data processing workflow for generating SRI assessments is carried out using the Smart-Ready-Go! platform. Survey data in .csv format is mapped to the appropriate fields and used to create assessment-related database objects such as "Assessment," "Call Centre," "Call Centre Domain," and "Call Centre Service". Throughout the process, data validation steps are carried out to ensure accuracy and consistency. The "Result Controller" then performs all necessary

calculations to generate final outputs, including the “Result”, “Domain Score”, “Impact Score”, and “Detailed Score” objects, which together form the full SRI assessment.

Beyond certification, the Call Centre will also serve as an information hub, gathering valuable data on the current level of smart functionality in buildings across Europe. These data will contribute to the ongoing refinement and improvement of the SRI methodology. To promote widespread participation, the project’s communication strategy will include targeted outreach campaigns, leveraging both social media and established EU dissemination channels to increase awareness and encourage engagement among building users.

3. Results and Discussion

3.1 Overview of SRI across Germany

The analysis begins with the evaluation of the assessed buildings, revealing that 81.65% were residential, while the remaining 18.35% were non-residential. Regarding the technical domains in these assessments, it is essential to note that heating and domestic hot water systems were highly prevalent, observed in 91.95% and 85.21% of the buildings, respectively. On the other hand, lower rates of integration were recorded for cooling (42.13%), ventilation (32.77%), monitoring and control systems (31.65%), electric vehicle charging (28.09%), and dynamic building envelope (27.90%) systems. The distribution of the total SRI scores is illustrated in **Figure 1**. Based on the analysis of the dataset, it is evident that the buildings are distributed across a wide range of SRI classes, namely from A to G. It can be observed that the most common classes are D and E, together accounting for more than half of the sample evaluated. Classes F and C followed with 113 and 50 assessments, respectively, while G represented a lower proportion of the buildings assessed. Higher SRI classes A and B account for only a minor share, with 5 and 11 assessments, respectively. In total, 545 evaluations were considered in this analysis.

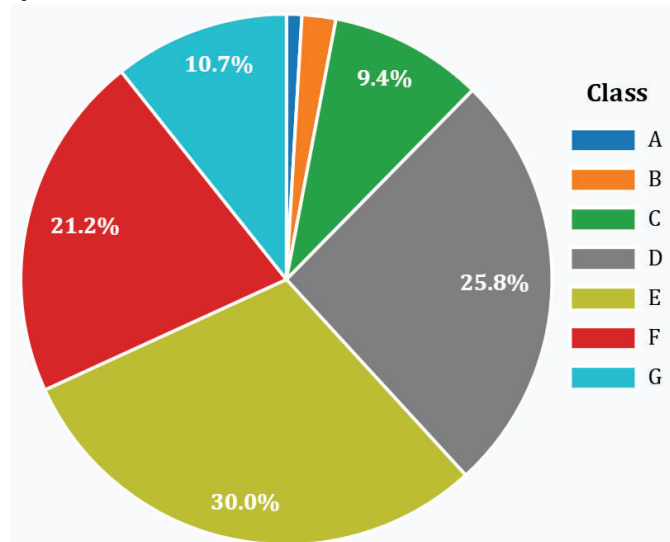


Figure 1: Distribution of SRI Scores in Germany

The analysis proceeds with the evaluation of each technical system, focusing specifically on the functionality levels. Initially, the heating domain is examined, as illustrated in Figure 2. A notable presence of intermediate functionality levels was observed within the heating domain. In particular, for heat emission control (H-1a), most assessments were distributed between functionality level 1 (39.1%) and functionality level 2 (40.73%), indicating widespread use of

central and individual room controls. Control of heat pump generation (H-2b) and other heat generators (H-2a) predominantly operated at functionality levels 0, 1, and 2, with limited presence of higher levels. Similarly, control of distribution fluid temperature (H-1c) exhibited a balanced distribution across levels 1 to 3. For information reporting on heating system performance (H-3), functionality was distributed broadly, with a considerable share (31.16%) achieving functionality level 2. **Figure 3** displays the DHW domain, a lower degree of smart functionalities was generally recorded. Control of DHW storage charging (DHW-1a) mainly was at the basic levels, with 46.15% at level 0 and 40% at level 1. Regarding information feedback (DHW-3), although basic reporting was standard, a significant portion of assessments also achieved functionality levels 2 and 3, indicating an increasing integration of historical data tracking and performance evaluation. The cooling domain exhibited an encouraging level of smart functionalities, showed in **Figure 4**. Cooling emission control (C-1a) assessments mainly clustered around functionality levels 1 and 2 (36% and 38.22%, respectively), suggesting the frequent implementation of central and individual room control systems. Cooling generator control (C-2a) showed a similar trend. Reporting information regarding cooling system performance (C-3) and flexibility and grid interaction (C-4) were characterized by a relatively high proportion of assessments at functionality levels 2 and 3, indicating a gradual move towards predictive control and demand side management. In the ventilation domain in **Figure 5** supply airflow control (V-1a) assessments were mainly distributed across functionality levels 1 to 3, with relatively few assessments achieving the highest functionality level. Information regarding indoor air quality (V-6) showed a higher presence of intermediate smart functionalities, particularly at functionality levels 2 and 1. **Figure 6** displays a less advanced level of smart control integration in the lighting domain. Occupancy control for indoor lighting (L-1a) showed a significant concentration at functionality level 0 (48.62%), suggesting that manual controls still dominate the assessed buildings.

Nevertheless, a moderate presence at functionality levels 1 and 2 indicated some degree of automation. For the dynamic building envelope domain, relatively advanced functionalities were noted, as shown in **Figure 7**. Solar shading control (DE-1) demonstrated a high concentration at functionality level 2 (41.61%) while reporting systems (DE-4) showed a more even spread from functionality level 1 to 4, indicating a good level of automation and predictive maintenance capability in some buildings. **Figure 8** illustrates the electricity domain, reporting of local electricity generation (E-2) and electricity consumption (E-12) services demonstrated a strong presence at functionality levels 2 and 3, suggesting increasing real-time feedback and historical data integration. Conversely, services related to storage (E-3) and reporting on energy storage (E-11) revealed a higher share at the basic and intermediate functionality levels. Concerning electric vehicle charging in **Figure 9**, a progressive trend towards higher functionality was evident. The provision of EV charging capacity (EV-15) showed a substantial share at functionality levels 2, 3, and 4, indicating a growing installation of recharging points in parking spaces. EV grid balancing (EV-16) and EV connectivity and information (EV-17) predominantly achieved functionality levels 1 and 2. Finally, **Figure 10** displays the monitoring and control domain, functionalities relating to centralized reporting (MC-13), smart grid integration (MC-25), and automated TBS coordination (MC-30) predominantly achieved functionality levels 1 and 2. A small but notable proportion also reached functionality levels 3 and 4, suggesting that certain buildings are beginning to implement predictive and grid-interactive smart building strategies.

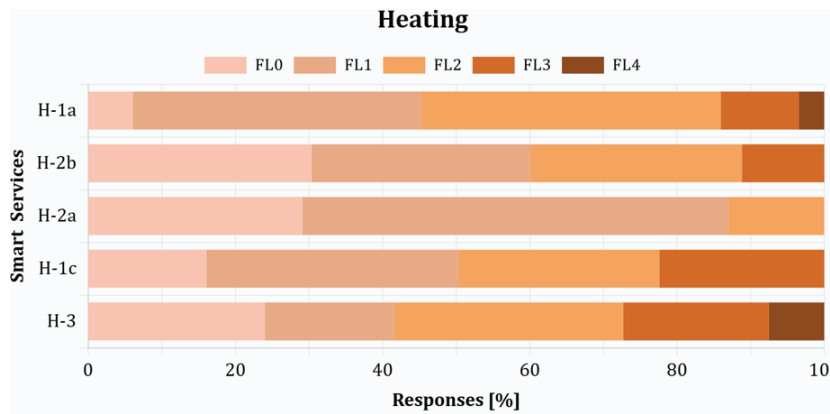


Figure 2: Heating domain – Distribution of smart services across functionality levels

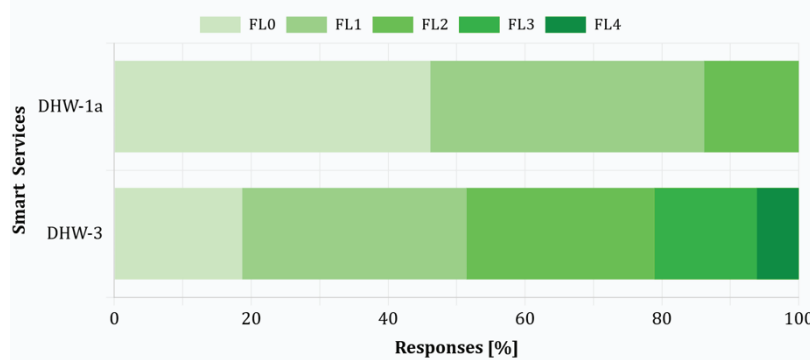


Figure 3: DHW domain – Distribution of smart services across functionality levels

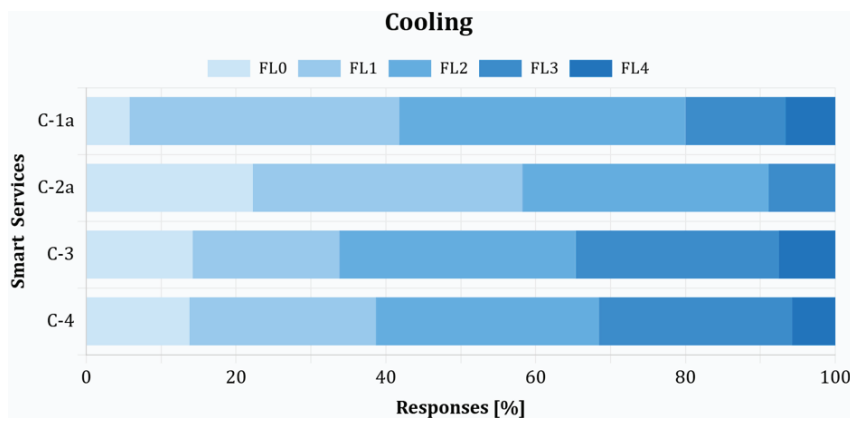


Figure 4: Cooling domain – Distribution of smart services across functionality levels

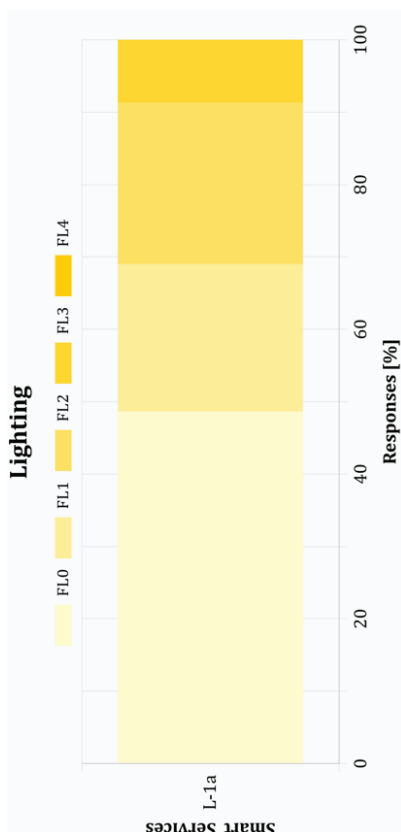


Figure 6: Lighting domain – Distribution of smart services across functionality levels

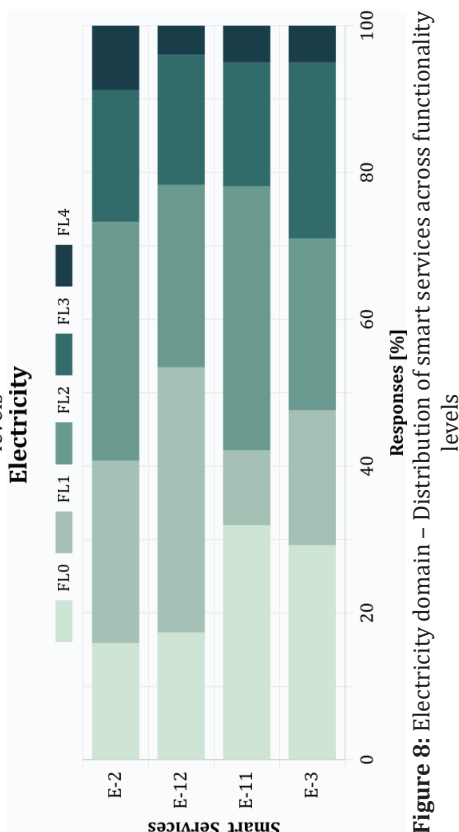


Figure 8: Electricity domain – Distribution of smart services across functionality levels

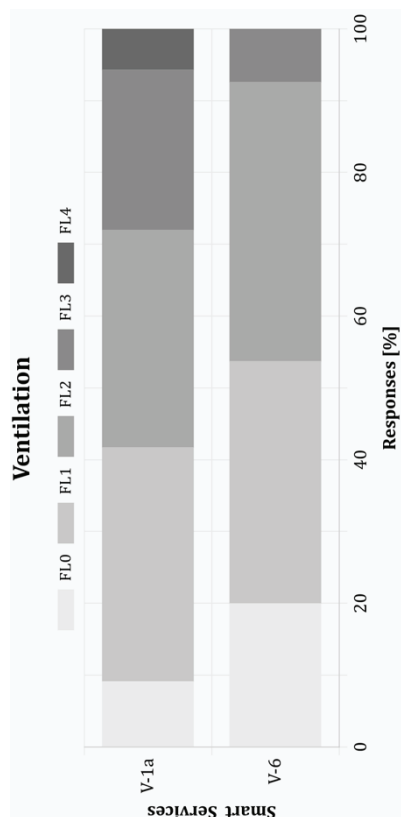


Figure 5: Ventilation domain – Distribution of smart services across functionality levels

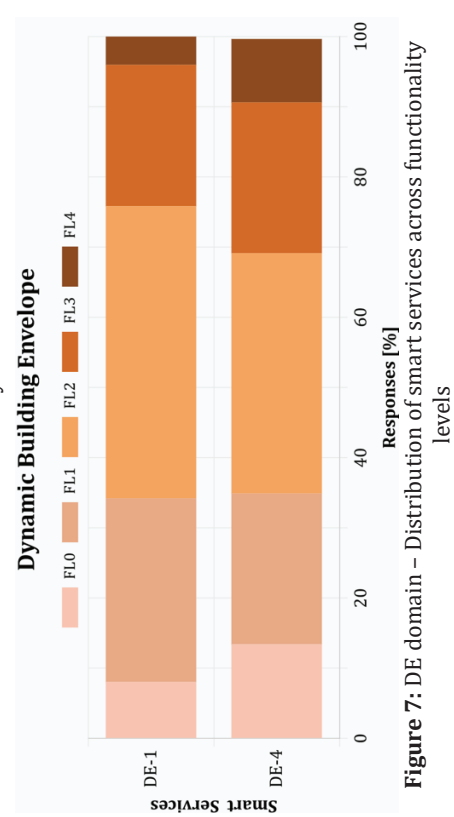


Figure 7: DE domain – Distribution of smart services across functionality levels

The overall smartness of each technical service derived from the 545 assessments conducted is illustrated in **Figure 11**. The figure presents a matrix that visualizes the average functionality level achieved for each smart service across the assessed building stock. Each colored cell represents the functionality level attained, ranging from functionality level 0 (basic manual control) to functionality level 4 (advanced automated and predictive control), following a colour gradient from light to dark green. Several heating, cooling, ventilation, and electricity services frequently achieved intermediate functionality levels, particularly functionality level 2. Conversely, services related to lighting and some aspects of domestic hot water systems remained predominantly at lower functionality levels. This matrix enables a clear and concise comparison between different technical domains, highlighting areas where smart readiness is more developed and identifying domains with greater potential for future improvement.

In conclusion, the presentation of the average impact and domain scores provided a comprehensive overview of the smart readiness levels observed across the assessed building stock. **Figure 12** presents the average impact scores calculated across the 545 assessments conducted. The results reveal that the highest impact was achieved in the category of Health, Well-being and Accessibility, with an average score exceeding 60%. Smart functionalities contributing to occupants' health and well-being are widely integrated. Energy efficiency and comfort are closely followed, highlighting the focus on improving building performance and user satisfaction. In contrast, Maintenance and Fault Prediction recorded the lowest average score, indicating that predictive maintenance features are less commonly implemented. Convenience and Energy Flexibility and Storage also exhibited comparatively moderate scores, suggesting potential areas for further enhancement in future smart building strategies.

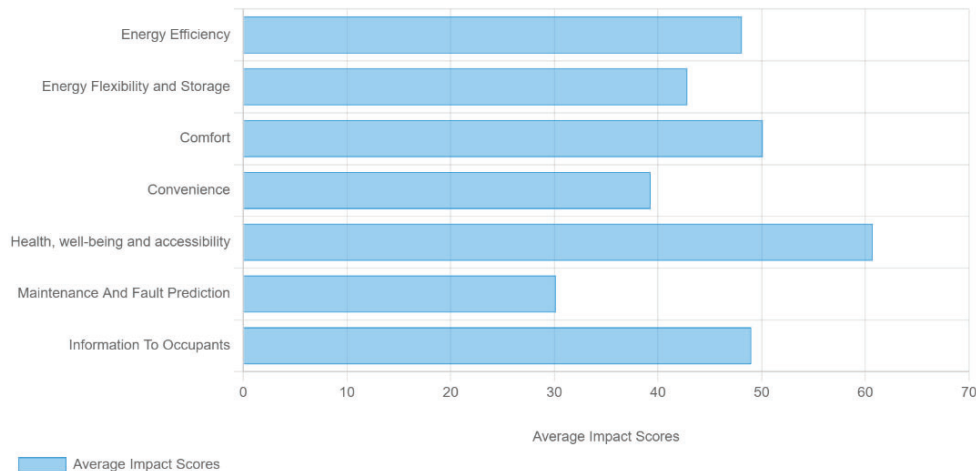


Figure 12: Average impact scores based on the 545 assessments

Figure 13 illustrates the average domain scores for the main technical domains evaluated. The Monitoring and Control domain achieved the highest average score, reflecting the growing integration of centralized control systems and energy management strategies. Ventilation, Dynamic Building Envelope, and Heating domains also achieved high average scores, indicating a relatively mature deployment of smart features in these areas. Conversely, the Lighting and Electric Vehicle Charging domains obtained the lowest scores among the assessed domains, suggesting a more limited integration of advanced smart services, particularly in lighting automation and EV infrastructure. Overall, the distribution of domain scores highlights the domains where smart readiness is more developed and emphasizes the domains where greater improvements could be targeted.

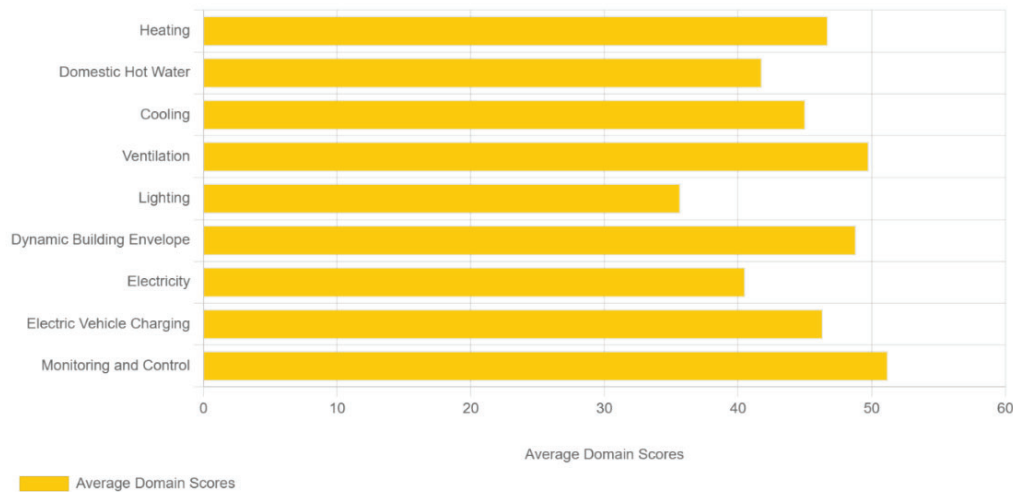


Figure 13: Average domain scores based on the 545 assessments

4. Conclusion

This study introduces the SRI Call Centre as a novel, simplified, and scalable method for deploying assessments across Germany. The implementation of this methodology was evaluated through its application in 545 assessments. The resulting dataset comprising 545 completed assessments spans a broad spectrum of building types and operational scenarios. In conclusion, 81.65% of the assessed buildings were residential, primarily within SRI Classes D, E, and F. Heating systems operated across FL0–FL2, with most reaching FL1–FL2. DHW services remained basic, concentrated at FL0–FL1. Cooling systems showed strong integration, typically at FL1–FL2. Ventilation systems were well-developed, frequently reaching FL2. Lighting remained minimal at FL0. Dynamic envelope systems performed well, often at FL2. Electricity services achieved high functionality at FL1–FL2. EV charging showed strong adoption, mostly at FL1–FL2. Monitoring and Control systems consistently operated at FL1, reflecting robust integration. The success of this implementation establishes a robust precedent for future SRI assessments.

Acknowledgment

This study is part of the dissemination activities of the research project ‘Smart Tools for Smart Buildings: Enhancing the intelligence of buildings in Europe (Smart Square)’ (Grant ID Number 101077241), funded under the Horizon Europe call LIFE-2021-CET-SMARTREADY.

AI was used to edit the manuscript for language clarity. All outputs were reviewed, validated, and, where necessary, revised prior to submission; responsibility for the manuscript’s content and results remains with the authors.

References

- [1] Implementing regulation on optional scheme for rating smart readiness of buildings C(2020) 6929, https://energy.ec.europa.eu/document/download/b385ee9d-f4d7-4351-9158-76e4b9591144_en?filename=smart_readiness_buildings_implementing_act_annex_c2020_6929.pdf
- [2] Revision of the European Energy Performance of Buildings Directive (EPBD) 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.156.01.0075.01.ENG

- [3] Verbeke, S., Aerts, D., Reynders, G., Ma, Y., & Waide, P. (2020). Final Report on the Technical Support to the development of a Smart Readiness Indicator for Buildings. European Commission: Brussels, Belgium.
- [4] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2020.431.01.0009.01.ENG&toc=OJ:L:2020:431:TOC
- [5] <https://www.smart-ready-go.eu/>
- [6] <https://www.smartsquare-project.eu/>