



Co-creating OBSERVE's national BSOs: Stakeholders' needs and requirements

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EXECUTIVE SUMMARY






This deliverable presents the preliminary outcomes of the stakeholder needs assessment conducted under Work Package 2 of the OBSERVE project, with the overarching objective of supporting the design and development of six (6) national Building Stock Observatories in selected European Union member states, namely Croatia, Cyprus, France, Greece, Italy, and Spain. The deliverable reports on the first phase of an integrated and participatory working approach, which combined desk-based policy and technical research with national-level interviews and focus groups, as well as an EU-wide online survey. Through this approach, OBSERVE systematically captured the perspectives, expectations, and concerns of a broad and diverse range of stakeholders involved in the decarbonisation, monitoring, and governance of the European building stock.

The assessment was carried out against the backdrop of an increasingly ambitious and evolving EU buildings policy landscape, shaped by key strategic initiatives and legislative frameworks such as the “European Green Deal”, the “European Climate Law”, the “Renovation Wave” strategy, and the “Fit-for-55” package, as well as the recent recasts of the Energy Performance of Buildings Directive and the Energy Efficiency Directive. Collectively, these policies reinforce the European Union’s commitment to accelerating deep renovation, strengthening energy performance standards, and enhancing data-driven policymaking. At the same time, they introduce more stringent requirements for monitoring, reporting, and data governance at national and European levels.

Despite this strengthened policy framework, findings of our needs assessment confirm that significant and persistent challenges continue to impede effective implementation. Stakeholders across countries and sectors consistently pointed to fragmented data landscapes, limited interoperability between existing datasets, inconsistent definitions and methodologies, insufficient coverage of renovation, operational, and socioeconomic data, and governance-related shortcomings. Together, these challenges undermine the capacity of Member States to plan, monitor, and steer building-sector decarbonisation in a coherent, evidence-based, and coordinated manner, and risk weakening compliance with key provisions under the Energy Performance of Buildings Directive.

Against this background, stakeholders consulted both in the six (6) case-study Member States and at the wider European level expressed a clear and consistent expectation for national Building Stock Observatories to function as robust, open, interoperable, and user-friendly policy-enabling infrastructures. Rather than duplicating existing systems, Building Stock Observatories are widely expected to act as integrative hubs that connect and harmonise multiple data sources and support the full policy cycle, from baseline assessment and target setting to monitoring, evaluation, and adaptive policymaking. In particular, stakeholders’ common expectations converged around the following key elements:

-  Integrated, multi-source building data covering both physical characteristics and operational performance.

-  Harmonised indicators, definitions, and metadata aligned with the European Union's Building Stock Observatory framework.
-  Transparent and sustainable governance arrangements capable of ensuring long-term maintenance and institutional ownership.
-  Clear, intuitive visualisation tools and user interfaces suitable for a wide range of users, including policymakers, analysts, and practitioners.
-  Availability of application programming interfaces and data-export functionalities to enable advanced analytical work, modelling, and reuse.
-  Robust legal, organisational, and technical mechanisms to ensure regular, reliable, and timely data updates.

These shared stakeholder insights represent the current outcomes of the needs assessment carried out during the first project phase (from M6 to M14). The consolidated findings will serve as a core input to Work Package 3, where the architecture, functionalities, and governance models of the OBSERVE national Building Stock Observatories will be designed and refined. Through this process, OBSERVE aims to ensure strategic alignment with European-level platforms, in particular the European Union's Building Stock Observatory, thereby strengthening coherence, comparability, and data flows between monitoring frameworks at the national and European Union levels.

At the time of reporting, the consultation activities completed within this deliverable relate to Phase I of the OBSERVE working approach, namely the national interviews and focus groups and the EU-wide online survey. Together, these activities form the primary qualitative and quantitative evidence base underpinning the analysis presented in this deliverable, and provide a robust foundation for the subsequent design, validation, and implementation steps of the OBSERVE project.

KEYWORDS

Building Stock Observatory; Energy Performance of Buildings Directive; EU Buildings Policy; EU Building Stock Observatory; Data Availability and Quality; Energy Performance Certificates; Monitoring and Reporting; Stakeholder Engagement; Minimum Energy Performance Standards; Buildings Decarbonisation.

ABBREVIATIONS AND ACRONYMS

| Acronym | Description |
|----------------|---|
| ADEME | French Agency for Ecological Transition |
| API | Application Programming Interface |
| APN | Agency for Legal Traffic and Real Estate Brokerage |
| BDNB | Base de Données Nationale des Bâtiments (France) |
| BSO | Building Stock Observatory |
| CRES | Centre for Renewable Energy Sources and Saving (Greece) |
| CSTB | Scientific and Technical Centre for Buildings (France) |
| CYSTAT | Statistical Service of Cyprus |
| DBL | Digital Building Logbook |
| DHMZ | Croatian Meteorological and Hydrological Service |
| DHUP | Directorate for Housing, Urban Planning, and Landscapes (France) |
| DPE | Diagnostic de Performance Énergétique (France) |
| EC | European Commission |
| EED | Energy Efficiency Directive |
| EEOS | Energy Efficiency Obligation Scheme |
| ENEA | Italian National Agency for New Technologies, Energy and Sustainable Economic Development (Italy) |
| EPBD | Energy Performance of Buildings Directive |
| EPC | Energy Performance Certificate |
| EPEEF | Environmental Protection and Energy Efficiency Fund |
| ESD | Energy End-Use Efficiency and Energy Services Directive |
| ESR | Effort Sharing Regulation |
| ETUI | European Trade Union Institute |
| EU | European Union |
| EU BSO | European Union Building Stock Observatory |
| EU ETS | European Union Emissions Trading System |
| EU ETS2 | European Union Emissions Trading System for Buildings and Road Transport |
| FIAIP | Italian Federation of Real Estate Agents (Italy) |
| GDPR | General Data Protection Regulation |
| GHG | Greenhouse Gas |

| | |
|----------------|--|
| GIS | Geographic Information System |
| HVAC | Heating, Ventilation and Air Conditioning |
| IEC | Energy Certificate Information System |
| INSPIRE | Infrastructure for Spatial Information in Europe Directive |
| ISGE | Information System for Energy Management |
| ISPU | Physical Planning Information System |
| ISTAT | Italian National Institute of Statistics (Italy) |
| JSON | JavaScript Object Notation |
| KPI | Key Performance Indicator |
| LTRS | Long Term Renovation Strategy |
| MEPS | Minimum Energy Performance Standards |
| MPGI | Ministry of Physical Planning, Construction, and State Assets (Croatia) |
| MINGO | Ministry of Economy and Sustainable Development (Croatia) |
| MPUDT | Ministry of Justice, Public Administration, and Digital Transformation (Croatia) |
| NECP | National Energy and Climate Plan |
| NBRP | National Building Renovation Plan |
| OID | Observatoire de l'Immobilier Durable (France) |
| OPERATE | National platform for monitoring tertiary buildings' energy consumption (France) |
| OSS | One-Stop-Shop |
| RED | Renewable Energy Directive |
| RNB | Référentiel National des Bâtiments (France) |
| RP | Renovation Passport |
| RRF | Recovery and Resilience Facility |
| ROI | Return on Investment |
| SIAPE | National Informative System on EPC (Italy) |
| SBEMcy | Simplified Building Energy Model for Cyprus |
| SCF | Social Climate Fund |
| SMiV | System for Measuring and Verifying Energy Savings |
| SRI | Smart Readiness Indicator |
| SQL | Structured Query Language |
| UN | United Nations |
| UX | User Experience |

XML

Extensible Markup Language

1. Introduction

In the face of escalating concerns related to climate change and the urgent need to meet global climate-neutrality commitments, the European Union (EU) has taken decisive and far-reaching steps to transform its building stock into a more energy-efficient, low-carbon, and climate-resilient asset by 2050. Given that buildings account for a significant share of final energy consumption and greenhouse gas (GHG) emissions in the EU, accelerating decarbonisation in the buildings sector has emerged as a central pillar of the Union's climate and energy strategy.

To this end, a series of ambitious policy packages and legislative reforms have been adopted in recent years. Taken together, these initiatives establish binding long-term climate objectives, strengthen renovation obligations, and introduce enhanced provisions related to monitoring, reporting, transparency, and data governance. Among these, the recently revised "Energy Performance of Buildings Directive (EPBD)" places renewed emphasis on the systematic collection, management, and use of building-stock data, explicitly mandating Member States to optimise their national data infrastructures and to contribute to a more harmonised, EU-wide understanding of building characteristics, energy performance, renovation activity, and progress towards decarbonisation targets.

Despite the growing recognition, persistent and well-documented data-related challenges continue to hinder effective policymaking and implementation. These challenges include fragmentation across data sources, limited interoperability between datasets, methodological inconsistencies, insufficient temporal and spatial coverage of renovation and operational performance data, and institutional capacity and resource constraints at national and sub-national levels. Such issues are widely acknowledged within the EU's evolving regulatory landscape and point to the need for immediate, targeted, and coordinated corrective action at both national and EU levels.

Within this evolving policy context, the OBSERVE project seeks to respond directly to this urgency by supporting Member States to establish national Building Stock Observatories (BSOs), designed to be interoperable with the EU BSO. By improving the availability, integration, comparability, and usability of building-stock data, BSOs are expected to significantly strengthen the evidence base required for tracking progress, supporting compliance with the EU's reporting obligations, informing policy design, and enabling effective, data-driven decision-making in line with the EPBD and the wider EU's legislative framework.

The present report represents a first major step towards addressing these challenges in a systematic and policy-relevant manner.

1.1. Scope and objectives

One of the core objectives of the OBSERVE project is to directly support national authorities in **six (6) targeted Member States**, namely, **Croatia, Cyprus, France, Greece, Italy, and Spain**, in strengthening their capacity to monitor, report, and apply verification schemes related to building-stock data. These efforts are intended to inform and support the (re)design

and implementation of climate and energy policies aligned with the EU's 2030 and 2050 objectives. Achieving this ambition requires a deep and nuanced understanding of the current policy landscapes, as well as of the practical realities faced by policymakers and other stakeholders responsible for data collection, governance, and reporting.

In this context, OBSERVE places particular emphasis on identifying and analysing existing datasets, assessing current data collection and management practices, refining methodological approaches, leveraging advanced analytical and digital tools, and building upon proven best practices already implemented across Member States. Through this comprehensive approach, the project seeks to bridge existing policy and implementation gaps, enhance the robustness and transparency of monitoring and reporting systems, and ultimately support more effective, evidence-based decision-making for a sustainable and climate-neutral future.

A critical first step towards achieving these objectives is the definition of clear, policy-relevant, and operationally feasible requirements for the project's national BSOs. The structure and functionalities of these observatories are being co-created in close collaboration with key policymakers and stakeholders at both national and EU levels. This participatory co-creation approach is designed to ensure that national BSOs are tailored to the concrete needs of end users, while fully accounting for the complex institutional, technical, and regulatory challenges associated with implementing the EPBD and other relevant legislative frameworks- particularly in relation to monitoring, reporting, and compliance processes.

Against this background, the present deliverable aims to provide a comprehensive and structured overview of the needs of key policymakers and other relevant stakeholder groups, including investors, local, regional, and national authorities, researchers, and the wider public, regarding building-stock data availability, quality, and governance arrangements. In doing so, it serves as a strategic roadmap for the design and further development of national BSOs across Europe.

More specifically, this deliverable focuses on two (2) interrelated objectives: (i). assessing policymakers and other relevant stakeholders' requirements concerning building-stock data availability, quality, and methodological approaches needed to strengthen monitoring and reporting processes under the EPBD; and (ii). identifying and understanding the data needs of other critical stakeholder groups in order to effectively support the broader vision of decarbonising the EU's buildings stock in a just, transparent, and evidence-based manner.

To achieve these objectives, the work presented in this deliverable follows a participatory, multi-method approach that combines desk-based policy analysis with systematic stakeholder consultation activities. These activities include semi-structured interviews, focus groups, a detailed EU-level online survey, and two (2) targeted technical co-creation workshops. Together, these methods ensure a holistic understanding of the current policy and data landscape, while capturing the diverse perspectives, priorities, and practical needs of stakeholders operating at different governance levels and across institutional contexts.

Overall, the work presented in this deliverable aims to validate the soundness and credibility of the OBSERVE national BSOs, while also enhancing their policy relevance and practical usefulness. By explicitly accounting for the full spectrum of stakeholder perspectives, the approach seeks to strengthen the relevance (saliency), robustness (credibility), and acceptance (legitimacy) of the proposed observatory structures, particularly when assessed against what is institutionally feasible and operationally achievable in practice.

1.2. Structure of the deliverable

The remainder of this deliverable is structured as follows:

-  **Section 2** provides the policy background, presenting an overview of the current status quo of the relevant EU legislative framework, with a particular focus on provisions related to building-stock data requirements and governance.
-  **Section 3** outlines the participatory multi-method working approach adopted to identify key issues, data gaps, challenges, and specific needs of policymakers and other relevant stakeholders.
-  **Section 4** presents qualitative insights derived from interviews and focus groups conducted with key policymakers and stakeholders across the six (6) OBSERVE case-study countries.
-  **Section 5** presents and analyses the findings of the EU-level online survey.
-  **Section 6** concludes the deliverable by synthesising key findings, outlining limitations, providing policy-relevant conclusions and recommendations, and highlighting next steps.

2. Policy background: Drivers and challenges in the EU's buildings sector towards decarbonisation

Due to its substantial potential for energy savings and energy-related GHG emissions reduction, the buildings sector occupies a central position in the EU's pathway towards climate neutrality by 2050. Buildings represent one of the largest and most structurally complex end-use sectors in the EU's economy, directly influencing energy demand, emissions trajectories, energy affordability, and social outcomes. At present, the sector accounts for approximately 40% of the EU's final energy consumption and around 36% of total GHG emissions, underscoring its critical importance for achieving the Union's long-term climate and energy objectives.

As a result, decarbonisation in the EU's buildings sector lies at the core of the EU's policy agenda, featuring prominently across climate, energy efficiency, energy security, and social policy frameworks. Beyond emissions reduction, transforming the building stock is closely linked to broader objectives, including improving energy affordability, addressing energy poverty, enhancing resilience to climate impacts, and stimulating sustainable economic activity through renovation and innovation.

Despite this strategic importance, actual progress in decarbonising the building stock remains insufficient relative to the pace required to meet the EU's climate targets. Current estimates indicate that the weighted renovation rate across the EU stands at approximately 1% per year, while deep renovations- those capable of delivering substantial and lasting improvements in energy performance- affect only around 0.2% of the building stock annually (BPIE, 2022; Keliauskaite et al., 2025). These figures fall well short of the levels required to align the sector with a climate-neutral trajectory.

The challenge is further exacerbated by the structural characteristics of the existing building stock. Nearly 35% of the EU's buildings are over 50 years old, and close to 75% are considered energy inefficient according to current standards (European Commission, 2024a). These buildings often suffer from poor thermal performance, outdated heating systems, and limited readiness for the integration of renewable energy technologies. At the same time, renovation efforts are unevenly distributed across Member States and building typologies, reflecting disparities in institutional capacity, financing availability, regulatory frameworks, and data availability. Together, these factors highlight the scale and complexity of the task ahead, as well as the urgent need for coordinated, data-driven, and policy-aligned action.

2.1. Strategic legislative drivers for the EU's climate and energy transition

To align sectoral progress with the pace required to achieve the EU's climate-neutrality objective, the EU has adopted a series of comprehensive and mutually reinforcing climate and energy policy packages. At the strategic level, the "European Green Deal" (European Commission, 2019) established an overarching vision for transforming the EU into a climate-neutral, resource-efficient, and competitive economy. This vision was subsequently enshrined into binding law through the European "Climate Law" (European Union, 2021), which requires

coordinated action across key sectors, including energy, climate, environment, transport, industry, agriculture, sustainable finance, and research and innovation.

The European “Climate Law” formalised the EU’s commitment to achieving net-zero GHG emissions by 2050 and introduced a legally binding intermediate target of at least a 55% reduction in net GHG emissions by 2030 compared to the 1990 levels. In addition, it set out a strategic orientation towards a headline reduction target of around 90% by 2040, thereby establishing a long-term trajectory that provides policy certainty and direction for sectoral transformation (European Commission, 2025b). These targets have profound implications for the buildings sector, which must deliver sustained and accelerated emissions reductions over the coming decades.

To operationalise these strategic commitments, the EU introduced the “Fit for 55” package, a comprehensive and coherent legislative framework designed to align EU policies with the 2030 climate target in a fair, cost-effective, and competitive manner (European Commission, 2025a). Through this package, the EU revised and strengthened key elements of its climate and energy legislation, including the EPBD, the “Energy Efficiency Directive (EED)”, and related instruments. Collectively, these revisions reinforce renovation obligations, introduce or tighten performance standards for new buildings, and significantly enhance requirements related to monitoring, reporting, transparency, and data governance. In doing so, they place building-stock data at the heart of policy implementation and compliance.

These efforts have been further reinforced by a set of complementary initiatives responding to recent socioeconomic and geopolitical developments. The “REPowerEU Plan”, launched in response to the global energy market disruption and socioeconomic challenges following Russia’s invasion of Ukraine, underscored the strategic importance of reducing fossil fuel dependence, accelerating energy-efficiency improvements, and scaling up renewables in buildings (European Commission, 2022). In parallel, the “Recovery and Resilience Facility (RRF)”- the central pillar of the “NextGenerationEU” plan- has mobilised unprecedented financial resources to support structural reforms and investments, including large-scale building renovations, digitalisation of public administration, and the strengthening of data systems in Member States (European Commission, 2025d).

Together with the broader EU’s policy architecture, these initiatives contribute to a more integrated and coherent framework for steering decarbonisation efforts across sectors, with buildings occupying a central role. At the same time, they significantly raise expectations with regard to data availability, quality, interoperability, and analytical capacity at national and EU levels. Meeting these expectations requires robust data infrastructures and governance arrangements, capable of supporting policy monitoring, evaluation, and adaptive decision-making- needs that national BSOs are increasingly expected to fulfil.

2.2. Strategic legislative drivers for the energy transition in the EU’s buildings sector

Within the broader architecture of the “Fit for 55” legislative package, the “Renovation Wave” strategy occupies a particularly prominent position with respect to the buildings sector. It represents the EU’s most targeted and ambitious policy initiative aimed at accelerating the

transformation of the existing building stock, with the explicit objective of at least doubling the annual renovation rate and significantly increasing the share of deep renovations capable of delivering substantial and long-lasting energy performance improvements by 2030. To achieve this, the strategy deploys a comprehensive mix of regulatory, financial, and enabling measures, while mobilising action across both the public and private sectors. In doing so, it strengthens incentives, raises building performance standards, and promotes the deployment of information and digital tools designed to support informed decision-making by public authorities, market actors, and citizens alike (European Commission, 2020).

At the same time, the “Renovation Wave” strategy creates heightened requirements for accurate, interoperable, and comprehensive building-stock data. Robust data infrastructures are indispensable for monitoring progress, guiding strategic planning, evaluating policy impacts, and ensuring accountability across Member States. Without consistent and reliable data, the ability of national authorities to assess renovation rates, energy savings, emissions reductions, and distributional impacts remains fundamentally constrained (Hwang et al., 2025). As such, the success of the strategy is intrinsically linked to the availability and quality of building-stock data systems at both national and EU levels.

The primary regulatory framework explicitly addressing these data-related requirements is anchored in the EPBD. First introduced in 2002 as the EU’s dedicated legal instrument governing buildings’ energy performance, the EPBD has undergone successive revisions to reflect evolving policy ambitions and technological developments. Its most recent recast further reinforces the pathway towards a zero-emission building stock by 2050, while significantly strengthening provisions related to data availability, transparency, interoperability, and quality (European Commission, 2024a).

Of particular relevance in this context are two (2) provisions introduced or substantially reinforced under the 2024 EPBD recast. First, **Article 16** establishes enhanced rights of access to building system data for relevant stakeholders, under clearly defined conditions. This includes access to standardised data sources such as the “Energy Performance Certificates (EPCs)”, the “Smart Readiness Indicators (SRIs)”, metering and operational data, and information related to renovation measures. Second, **Article 22** mandates the establishment and maintenance of national building performance databases, explicitly requiring that these databases feed into the EU BSO. Together, these provisions elevate building-stock data from a supporting element to a central pillar of EPBD implementation, monitoring, and enforcement.

Several complementary initiatives further reinforce the importance of robust building data infrastructures. These include, inter alia, the “national Building Renovation Plans (NBRP)”, the “Renovation Passports (RP)”, the development of the “Digital Building Logbooks (DBLs)”, and EU-level reporting obligations established under the “Governance Regulation”. Collectively, these instruments seek to improve data consistency, traceability, and lifecycle coverage, while enabling more granular insights into building performance and renovation pathways (Hwang et al., 2025).

In addition, the EED, first adopted in 2012 as a replacement for the earlier “Energy End-Use Efficiency and Energy Services Directive (ESD)”, has progressively evolved into a central driver of energy-efficiency improvements, with a particularly strong focus on the public sector as a frontrunner in the transition to a zero-emission building stock (European Commission, 2023a). This focus is fully aligned with the EU’s long-term climate-neutrality objective and recognises the exemplary role of public authorities in driving market transformation.

Under the 2023 recast of the EED, comprehensive and binding obligations are placed on public bodies across Member States. These include requirements to achieve an annual reduction of at least 1.9% in total final energy consumption and to renovate each year a minimum of 3% of the total floor area of heated and/ or cooled buildings owned or occupied by public authorities, in line with high energy-performance standards. To provide flexibility and accommodate national circumstances, the directive allows equivalent energy savings to be achieved through alternative cost-effective measures, such as deep renovations, system upgrades, or behavioural-change interventions (Concerted Action on Energy Efficiency Directive (CA EED), 2024).

Beyond these quantitative targets, the revised EED framework seeks to enhance long-term policy certainty and implementation coherence. It extends “Energy Efficiency Obligation Schemes (EEOs)” to 2030 with progressively increasing annual energy-saving targets. Importantly, the directive also integrates social equity considerations, embedding provisions aimed at ensuring a just and inclusive transition. Member States are required to prioritise vulnerable consumers and social housing, mobilise adequate and targeted financial support through innovative financing mechanisms, and improve access to renovation services through the establishment of integrated One-Stop-Shop (OSS) services (European Council for an Energy Efficient Economy (ECEEE), 2024; European Trade Union Institute (ETUI), 2024).

Furthermore, the introduction of **Article 15a** of the revised **Renewable Energy Directive (RED)** (EU 2023/2413) further reinforces the central role of robust building-stock data in supporting the EU’s decarbonisation objectives. By setting an indicative EU-level target of 49% renewable energy in final energy consumption in buildings by 2030, Article 15a requires Member States to define corresponding indicative national shares and integrate them into their National Energy and Climate Plans (NECPs). Achieving and monitoring progress towards this target necessitates reliable, granular, and interoperable data on buildings’ energy consumption, heating and cooling systems, on-site and district-level renewable energy deployment, and the contribution of waste heat and cold. In this context, national BSOs-aligned with the EPBD and interoperable with the EU BSO- can play a critical enabling role by supporting consistent tracking, reporting, and assessment of renewable energy uptake in buildings, thereby facilitating coherent implementation of RED’s Article 15a alongside EPBD requirements.

Transparency and monitoring are further reinforced through mandatory national-level inventories of public buildings and the establishment of comprehensive national energy-performance databases capable of tracking implementation progress, compliance, and

impacts over time (Economidou et al., 2022). These requirements further underline the central role of structured, interoperable, and continuously updated building-stock data systems.

Beyond these core legislative instruments, additional policy measures further consolidate the EU's framework for decarbonising the buildings sector. The “Ecodesign Regulation” and the “Energy Labelling Regulation” play a critical role in shifting markets towards more energy-efficient technologies, including heating and cooling systems, lighting, and household appliances. By setting minimum performance requirements and enhancing consumer information, these instruments support informed purchasing decisions and reinforce the EU's overall energy-efficiency objectives (Gonzalez-Torres et al., 2023; Maduta et al., 2023).

Moreover, the 2023 revision of the EU's “Emissions Trading System (EU ETS)” introduced a new, separate upstream carbon-pricing mechanism- commonly referred to as EU ETS2- covering the use of fossil fuels in the buildings sector. This system is intended to complement existing regulatory measures and facilitate Member States' compliance with their emission-reduction obligations under the “Effort Sharing Regulation (ESR)” (European Commission, 2023b). In parallel, the establishment of the “Social Climate Fund (SCF)” seeks to ensure that the transition remains socially fair and politically sustainable, by supporting vulnerable households and micro-enterprises through targeted investments, including energy-efficiency improvements in buildings (European Commission, 2025c).

Taken together, these legislative drivers significantly elevate the role of data, monitoring, and analytical capacity in the governance of the EU's buildings sector. They also create a clear policy imperative for the development of robust national BSOs, capable of supporting compliance, strategic planning, and adaptive policymaking- an imperative to which the OBSERVE project directly responds.

2.3. Building stock data for tracking the energy transition in the EU's buildings sector

Effective decarbonisation in the buildings sector requires more than ambitious regulatory targets and policy commitments; it critically depends on the availability of high-quality, harmonised, and technically robust building-stock data capable of supporting accurate monitoring, evaluation, and adaptive policy design. Without reliable information on buildings' physical characteristics, energy performance, renovation status, and operational behaviour, policymakers lack the necessary evidence base to plan targeted, efficient, and socially balanced interventions that remain aligned with the EU's long-term climate-neutrality trajectory.

In this respect, limited access to comprehensive and consistent building-stock data continues to constrain the ability of national and EU authorities to establish credible baselines, track progress against policy objectives, and assess the effectiveness and distributional impacts of implemented measures. Addressing these data gaps is therefore not a peripheral technical issue, but a core prerequisite for delivering a credible, transparent, and accountable transition of the EU's buildings sector towards climate neutrality.

2.3.1. Challenges in building-stock data

Despite the establishment of substantial policy commitments and strategic initiatives aimed at accelerating decarbonisation in the buildings sector, major data-related challenges persist across the EU and at the national level (Belini et al., 2024; Wijewickrama et al., 2021). In most Member States, building-stock monitoring systems have developed incrementally and largely independently, resulting in fragmented data landscapes composed of multiple, often disconnected, sources and registries. These include, among other the reporting datasets for NECPs, EPC databases, datasets maintained by national statistical offices and energy agencies, as well as information held by consultancies, research organisations, and other public or private institutions (European Commission, 2024b).

Due to limited interoperability and, in many cases, the absence of standardised data models and common definitions, these datasets rarely communicate with one another in a systematic manner. As a result, data integration remains technically challenging and resource-intensive, undermining the ability to construct coherent, comprehensive, and up-to-date representations of national building stocks (Arbulu et al., 2022).

The lack of a consistent and systematic methodology for building-stock data collection, aggregation, and validation further exacerbates these issues, leading to significant disparities in data availability, completeness, and quality across Member States (Çetin et al., 2023). While a limited number of countries maintain relatively comprehensive and regularly updated datasets, many others rely on partial, fragmented, or outdated information that fails to reflect the actual condition, performance, and evolution of their building stock. This situation weakens the capacity of policymakers to establish accurate baselines, monitor trends over time, and design evidence-based interventions capable of accelerating renovation activity and emissions reductions in a targeted and cost-effective manner (EURAC Research & HotMaps Consortium, 2022).

Additional challenges stem from the absence of a harmonised, EU-wide framework of Key Performance Indicators (KPIs) for the buildings sector, combined with widely diverging data collection practices at national and sub-national levels. These differences significantly hamper cross-country comparability, as well as comparisons between regions within the same Member State, limiting the EU's ability to assess relative progress, identify best practices, and support mutual learning (Arbulu et al., 2022; EURAC Research & HotMaps Consortium, 2022)

Further complications arise from restricted access to technical and operational data held by private actors, which is often treated as commercially sensitive and subject to confidentiality constraints. This is particularly relevant for detailed information related to building systems, energy services, and renovation activities. Moreover, critical gaps persist in the availability and reliability of renovation-related cost, investment, and financing data (Hwang et al., 2025; Mêda Magalhães et al., 2022). In contrast to end-use and energy-consumption data- which are relatively more accessible in many Member States- financial data associated with renovation measures are frequently incomplete, inconsistent, or outdated. This significantly limits the ability of policymakers, planners, and investors to assess cost-effectiveness, evaluate return

on investment (ROI), and design financing schemes that can effectively mobilise private and public capital at scale (Buildings Performance Institute Europe (BPIE), 2022).

Taken together, these interrelated challenges highlight the structural weaknesses of the current building-stock data ecosystem in the EU and reinforce the urgency of strengthening data governance through well-defined institutional frameworks and technically consistent solutions. In this context, the development and operationalisation of BSOs at both EU and national levels emerge as a key systemic response. By enabling structured data integration, harmonisation, quality assurance, and analytical use, BSOs have the potential to address many of the identified shortcomings and to support more transparent, evidence-based, and adaptive policymaking in the buildings sector (Buildings Performance Institute Europe (BPIE), 2025; European Commission, 2024b).

2.3.2. Building Stock Observatories as policy-enabling infrastructures: Their role at the European Union and national levels

Against the backdrop of the data-related challenges in the EU's buildings sector, BSOs are increasingly recognised as critical policy-enabling infrastructures for steering decarbonisation. Rather than functioning as static data repositories, BSOs are conceived as integrated, dynamic systems that support the full policy cycle- from strategic planning and target-setting to implementation monitoring, evaluation, and adaptive policymaking- thereby translating legislative ambitions into actionable and measurable outcomes.

At the EU level, the European Commission (EC) established the EU BSO¹ in 2016 as the first dedicated, centralised platform aimed at addressing the fragmented building-related data landscape. The EU BSO was designed to provide transparent, consistent, and reliable information on the characteristics, energy performance, and evolution of the EU's diverse building stock. Through its comprehensive database and a suite of supplementary tools- including interactive data mappers, country-level factsheets, and visual analytics- the platform enables policymakers, researchers, industry professionals, and other stakeholders to access a detailed and structured overview of building-stock performance across Member States. Importantly, it also integrates key socioeconomic dimensions relevant to the energy transition, thereby facilitating the systematic tracking and assessment of policy effectiveness and emerging trends at the EU level.

A defining feature of the EU BSO is its standardised reporting approach, supported by a common framework for data presentation and indicator development. This approach plays a crucial role in bridging disparities between national data sources and enhancing cross-country comparability, a prerequisite for meaningful EU-wide monitoring, benchmarking, and mutual learning. In 2024, a major upgrade further enhanced the platform's usability and analytical potential, introducing an improved user interface and expanding data availability across several core indicators. This upgrade reflects the EC's commitment to continuously evolving

¹ <https://building-stock-observatory.energy.ec.europa.eu/database/>.

the EU BSO towards broader coverage, improved accessibility, and increased policy relevance (European Commission, 2024b).

Despite these advancements, the overall effectiveness and analytical robustness of the EU BSO remain highly dependent on the availability, quality, and timeliness of data provided by Member States. Significant variations persist in national data collection practices, institutional capacities, and reporting arrangements, which continue to limit the completeness and comparability of EU-wide datasets. These limitations underscore the central importance of robust national data infrastructures capable of feeding into the EU BSO in a coherent and systematic manner.

In this regard, national BSOs are expected to play a pivotal and complementary role. As outlined earlier, the EPBD establishes the conditions for the deployment of national BSOs through two (2) mutually reinforcing provisions: **Article 16**, which strengthens access to building system data through standardised instruments such as EPCs, SRIs, metering data, and renovation records; and **Article 22**, which requires the establishment of national building performance databases feeding into the EU BSO. Taken together, these provisions aim to consolidate existing datasets, enhance interoperability, and create robust national data-governance structures capable of supporting coherent, harmonised, and transparent reporting within Member States and across the EU.

When effectively designed and implemented, national BSOs can significantly enhance the capacity of public authorities to monitor compliance with EPBD and EED obligations, track renovation rates and energy savings, assess progress towards Minimum Energy Performance Standards (MEPSs), and support evidence-based reporting to the EC. Beyond compliance, national BSOs function as strategic decision-support tools, enabling policymakers to establish accurate baselines, identify priority segments of the building stock, and design targeted policy interventions aligned with national circumstances and EU objectives. This role is particularly critical in the context of the “Renovation Wave” strategy, where the effectiveness of policy measures depends on the ability to direct resources towards the least-performing buildings and vulnerable population groups.

At the same time, the deployment of national BSOs represents a demanding and resource-intensive endeavour. It requires substantial technical expertise, sustained investments, and long-term institutional commitment. Fragmented governance arrangements, insufficient financial support, or limited administrative capacity risk undermining the credibility, continuity, and usefulness of these observatories, potentially delaying progress towards the EU's climate-neutrality pathway. Conversely, when successfully realised, the collective architecture formed by the EU BSO and interoperable national BSOs can serve as the backbone of a coherent and resilient building-stock data ecosystem across Europe.

Beyond their analytical and monitoring functions, BSOs also contribute to broader policy coherence and institutional learning. By linking building-stock data with wider energy, climate, and socioeconomic datasets, they facilitate integrated assessments that support alignment between buildings policy and related objectives such as energy security, affordability, social

equity, and climate resilience. Furthermore, by improving data accessibility and transparency, while respecting data protection and confidentiality requirements, BSOs can enhance stakeholder engagement, reduce information asymmetries, and strengthen trust in policy processes among investors, researchers, and civil society.

In this sense, BSOs emerge not merely as technical instruments, but as foundational governance infrastructures. They operationalise data governance, analytical capacity, and feedback loops essential for translating the EU's ambitious climate and energy objectives into effective, measurable, and socially acceptable action in the buildings sector. It is precisely within this policy and institutional context that the OBSERVE project positions its contribution, supporting Member States in the development of credible, interoperable, and policy-relevant national BSOs aligned with the EU's evolving requirements.

3. Working approach

Taken together, the policy drivers, regulatory obligations, and persistent data-related challenges outlined in the previous section underscore a fundamental conclusion: effective decarbonisation in the EU's buildings sector is increasingly contingent not only on ambitious legislative frameworks, but also on the availability of robust, interoperable, and policy-relevant building-stock data infrastructures, supported by strong institutional capacity and sustained stakeholder engagement. The evolving EU legislative landscape- particularly under the recast versions of the EPBD and the EED- places unprecedented demands on Member States to collect, integrate, and use building-stock data in a systematic, transparent, and analytically robust manner, while simultaneously responding to national implementation realities, resource constraints, and diverse stakeholder needs.

In this context, the development of national BSOs cannot be treated as a purely technical or administrative exercise. Rather, it requires a structured, inclusive, and policy-responsive process capable of aligning EU-level legislative requirements with national data ecosystems, governance arrangements, and end-user expectations. The diversity of existing data practices, institutional settings, and policy priorities across Member States further reinforces the need for an approach that is both analytically rigorous and participatory, combining evidence-based policy analysis with direct engagement of the actors responsible for data provision, management, and use. Without such an approach, there is a clear risk that national BSOs may remain fragmented, underutilised, or insufficiently aligned with the practical demands of policy implementation.

It is precisely this need that motivates the working approach adopted in this deliverable and positions OBSERVE as a practical, policy-oriented response to the existing governance and data challenges. Rather than prescribing a single "one-size-fits-all" technical solution, OBSERVE seeks to support Member States in operationalising the EU's policy objectives through context-sensitive, co-created national BSOs that are interoperable with the EU BSO, aligned with the EPBD's requirements, and responsive to real-world institutional and operational constraints. This approach enables the project to move beyond generic solutions, instead fostering the co-creation of credible, feasible, and policy-enabling observatory structures capable of effectively supporting monitoring, reporting, and decision-making across the EU's buildings sector.

Accordingly, and in the context of this deliverable, we adopted a collaborative, multi-method working approach to systematically survey and analyse the needs, expectations, and constraints of policymakers and other relevant stakeholders involved in the collection, management, and use of building-stock data. The primary intention of this approach was twofold: **(a)**. to assess whether the project's proposed solutions effectively respond to the expectations, priorities, and decision-support needs of these actors; and **(b)**. to ensure that the overall structure, scope, and functionalities of the six (6) targeted national BSOs are firmly grounded in the operational realities, institutional settings, and practical challenges

encountered by policymakers and other relevant stakeholders in their day-to-day professional practice.

In practical terms, our work was structured into five (5) main implementation steps (**Figure 1**) and built upon the stakeholder engagement framework established under the project's **WP4 (Task 4.1)**. This framework enabled broad yet targeted participation, as well as a continuous two-way dialogue with key actors across the six (6) OBSERVE case-study countries and, where relevant, at the EU level. By combining qualitative and quantitative methods, the approach ensured both depth of insight and breadth of coverage, while facilitating iterative feedback loops throughout the process. Two (2) phases form the basis of our participatory multi-method approach:

- I. **Phase I** focused on identifying and mapping the needs of target audiences at both the national and EU levels through a combination of semi-structured interviews, focus groups, and an EU-wide online survey. These complementary activities (**Step 1 to Step 3**) were implemented between **M6 (May 2025)** and **M14 (December 2025)** and generated a robust evidence base of preliminary insights. These insights directly inform the initial design and conceptualisation of the OBSERVE national BSOs (developed under **WP3**), while also serving as a reference point for further refinements to be introduced through additional consultation and validation activities over the course of the project.
- II. **Phase II** comprises two (2) forthcoming technical co-creation workshops, scheduled for **M18 (May 2026)** and **M30 (April 2027)**, respectively (**Step 4** and **Step 5**). These workshops are designed to deepen stakeholder engagement by actively involving end users and technical experts in the co-development and validation of the national BSOs' functionalities, data structures, and use cases. The outcomes of these activities will be documented and synthesised in the updated version of **Deliverable D2.1** to be submitted in **M32 (June 2027)**. The insights generated will complement and validate those obtained through the first phase and taken together, will provide a consolidated evidence base to support the co-creation, refinement, and finalisation of the six (6) OBSERVE national BSOs.

At the time of reporting, the consultation activities completed and documented within Deliverable D2.1, relate to the activities of Phase I- namely the interviews (and where applicable focus groups) and the EU-wide online survey. Together, they form the core of the evidence base currently available and provide the primary qualitative and quantitative inputs underpinning the analysis presented in **Section 4**.

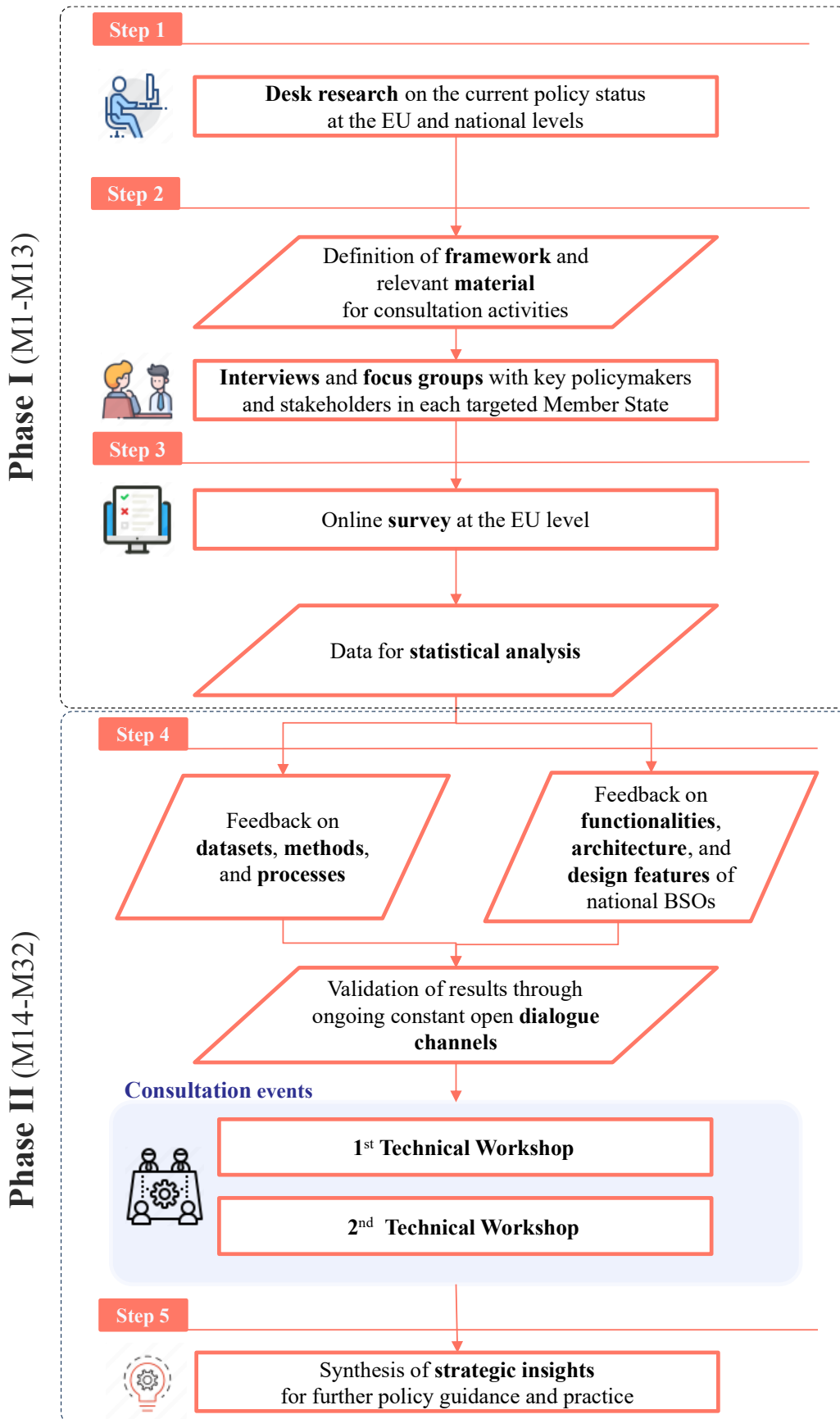


Figure 1. Participatory multi-method approach as followed in the context of the OBSERVE WP2 to identify and assess relevant stakeholders' needs.

3.1. Step 1: Desk research

The first step of our approach comprised extensive desk research aimed at systematically identifying requirements related to the monitoring, reporting, and use of building-stock data, while also developing a comprehensive understanding of the broader policy and regulatory context governing building data across the EU and the selected Member States of interest. This initial analytical phase was essential to establish a solid knowledge base and to ensure that subsequent engagement activities were firmly anchored in current policy developments, regulatory obligations, and institutional practices.

To this end, we conducted an in-depth review of the most recent, relevant, and authoritative EU and national policy documents, placing particular emphasis on the following strategic frameworks and legislative instruments:

- ✓ the overarching vision articulated under the “European Green Deal”, together with the binding long-term objectives introduced through the “European Climate Law”.
- ✓ the “Renovation Wave” strategy, with its strong focus on accelerating energy renovations and improving the quality, availability, and use of building-related data.
- ✓ the recent recasts of the EPBD, EED, and RED, as adopted within the broader “Fit-for-55” legislative package.
- ✓ interrelated and complementary tools, including the NBRPs, NECPs, SRI, RPs, DBLs, EPCs, MEPS, as well as other regulatory instruments shaping data requirements, interoperability expectations, and reporting obligations at Member State level.
- ✓ the distinct, yet mutually reinforcing, roles envisaged for the EU BSO and the national BSOs, including their respective responsibilities in data aggregation, harmonisation, analysis, and policy support.

To complement this policy-focused analysis, we systematically reviewed outputs from previous and ongoing EC-funded projects pursuing comparable or closely related objectives. This included the examination of empirical findings, theoretical and conceptual insights, methodological approaches, lessons learnt, and documented examples of good practice relevant to building-stock data governance and observatory design.

Where relevant, this review was further enriched through consultation of peer-reviewed scientific literature, drawing on established academic databases such as “ScienceDirect” and “Google Scholar”. This body of literature provided additional perspectives on persistent structural, technical, and institutional challenges in building stock data collection, integration, quality assurance, and management practices, which continue to constrain effective, evidence-based policymaking across Member States.

Overall, this desk research phase played a critical role in framing the policy and analytical background for the national-level interviews and focus groups conducted in the OBSERVE case study countries, as well as for the EU-wide online survey. It directly informed the design and calibration of all supporting materials used during stakeholder engagement activities,

ensuring consistency with existing policy terminology, data requirements, and emerging regulatory expectations.

Furthermore, this step generated essential insights into the current policy environment and the structural challenges that national BSOs are expected to address. In doing so, it also laid the analytical groundwork for **Deliverable 2.2 (D2.2)** “*State-of-play of building-stock data: A thorough policy analysis and mapping of existing tools at national and EU level*”, which documents the current state of play of EU and national policies and identifies future provisions and forward-looking functionalities to be incorporated into the six (6) OBSERVE national BSOs.

3.2. Step 2: Interviews and focus groups

The second step brought together a diverse group of policymakers and other relevant stakeholders from the six (6) participating Member States, namely Croatia, Cyprus, France, Greece, Italy, and Spain, through a structured series of interviews and focus groups. These consultation activities enabled direct interaction with actors working at the frontline of building-stock data collection, management, and reporting processes. As such, they provided a valuable opportunity to gain an in-depth understanding of stakeholders' practical needs, operational priorities, and expectations, as well as the common challenges and constraints they encounter in their day-to-day professional activities.

To ensure methodological coherence and comparability across countries, a harmonised interview framework was developed on the basis of the findings and insights generated under **Step 1**. This framework (**ANNEX I**) comprised a set of predefined thematic topics designed to ensure that all interviewees addressed the core areas of interest relevant to OBSERVE. In addition, it included two (2) structured questionnaires: one dedicated to the interviews themselves and one supporting stakeholder classification, developed in line with the project's stakeholder engagement strategy implemented under **Task 4.1**.

While the core structure of the interview questionnaire was maintained across all case studies, each national partner further adapted it to accurately reflect their specific national context, institutional arrangements, and country-specific realities. This approach ensured a well-defined yet sufficiently flexible basis for stakeholder dialogue, allowing discussions to be guided by a shared set of thematic areas, analytical categories, and overarching objectives, while remaining responsive to national particularities.

As a result, the interviews followed a semi-structured format, striking a balance between cross-country consistency and contextual sensitivity. This format ensured the comparability of responses across Member States, while also allowing each discussion to evolve dynamically and capture the distinct roles, responsibilities, and perspectives of individual interviewees. The focus groups complemented the interviews by facilitating collective reflection and exchange among stakeholders, thereby enabling the identification of converging views, divergences, and shared concerns related to building-stock data governance and observatory design.

Across all case-study countries, interviews and focus groups were conducted with stakeholders who were carefully identified, selected, and contacted in accordance with the

detailed guidelines set out in the stakeholder engagement strategy. Particular attention was paid to ensuring balanced and representative coverage of all target stakeholder groups, including ministries, national agencies, technical bodies, research organisations, and professional associations. The qualitative feedback collected through these consultations generated rich, context-specific insights that substantially complemented and deepened the evidence gathered through the EU-wide online survey, thereby strengthening the overall analytical foundation of the OBSERVE project.

3.3. Step 3: Online survey at the European Union level

As a third step, an EU-wide online survey was designed, prepared, and launched with the objective of capturing a broader and more diverse set of perspectives from stakeholders across the quadruple helix, namely policy, business and industry, science, and civil society. The survey aimed to complement the qualitative insights generated through interviews and focus groups by producing structured, quantitative evidence suitable for statistical analysis. This evidence was used to inform and guide subsequent stakeholder engagement activities at the national level, as well as the analytical work underpinning the six (6) OBSERVE case studies.

Beyond eliciting stakeholders' qualitative viewpoints, the survey was explicitly designed to capture systematic information on perceived gaps, data quality issues, governance arrangements, and data integration challenges related to building-stock information across the EU. At the same time, it enabled the quantification of trends, priorities, and preferences that are directly relevant to the organisational and operational set-up of the OBSERVE national BSOs. In this sense, the survey served both as a diagnostic tool and as a strategic input to the design of observatory structures and functionalities aligned with stakeholder needs and policy expectations.

Regarding the survey's population, a non-probability sampling approach was adopted. The survey was disseminated broadly and remained open to all potentially interested and relevant audiences, rather than being restricted to a predefined or statistically representative sample. This approach was selected to maximise outreach and inclusiveness, in line with the project's participatory ethos and the diversity of actors involved in building-stock data ecosystems. Nevertheless, particular emphasis was placed on ensuring strong participation from policy actors at EU, national, and sub-national levels, given their central role in data governance, reporting obligations, and policy implementation.

The survey questionnaire (**Section A** in **ANNEX II**) constituted the main instrument for collecting participants' feedback. Its structure and content were carefully developed by integrating and synthesising inputs and insights derived from multiple sources, including:

- the desk-based policy review conducted under **Step 1**.
- the consultation activities carried out through interviews and focus groups with national stakeholders under **Step 2**.

- the thematic categories and guiding questions used in the national interview and focus group questionnaires, which were here adapted, expanded, and reframed to address an EU-level audience and to enable comparative analysis across stakeholder groups.

3.4. Step 4: Technical workshops

Two (2) technical co-creation workshops, scheduled for **M18** (May 2026) and **M30** (April 2027), constitute the fourth step of the adopted working approach. As originally foreseen in the project design, these workshops will bring together a targeted group of experts operating at different governance and technical scales, who will be directly consulted through a cooperative and open dialogue focusing on the technical functionalities, structural design, and anticipated role of the OBSERVE national BSOs across the six (6) participating Member States.

The technical workshops will be designed to actively involve policymakers from the participating countries, alongside selected professionals and practitioners working directly with building-stock data. These stakeholders possess the institutional knowledge, technical expertise, and operational experience required to critically assess, validate, and steer the development of the OBSERVE's solutions. Their engagement will therefore be essential to ensure that the project's research outputs remain policy-relevant, technically sound, and well aligned with the practical requirements, expectations, and constraints of the intended end users.

The specific content, scope, and level of technical depth of each workshop will be adapted to the respective stage of the project and will be largely demand-driven, responding to emerging insights and stakeholder priorities identified in earlier steps. Overall, the workshop format will place strong emphasis on the transfer, discussion, and refinement of the core concepts underpinning the structure, operation, and practical applicability of national BSOs. These concepts will be iteratively refined and validated through structured feedback, collective discussion, and expert judgement. Throughout the process, workshop participants will be granted access to the full suite of the OBSERVE's solutions, tools, datasets, and methodological resources, ensuring that their contributions are meaningfully grounded in a comprehensive and shared understanding of the project's scope, objectives, and analytical foundations.

Building on this approach, the indicative thematic focus of each of the two (2) technical co-creation workshops is outlined in **Table 1**.

Table 1. Indicative thematic structure of the two technical co-creation workshops.

| | Topic areas |
|--------------------------------------|---|
| 1st Workshop (M18) | <ul style="list-style-type: none"> • Review of the draft minimal common dataset and the data collection methods developed over the course of the project. • Iterative refinements to dataset structures and methodological choices, guided by stakeholder perspectives and domain-specific expertise. |

2nd Workshop (M30)

- Systematic and transparent integration of stakeholder input into the evolving design of the OBSERVE's national BSOs.
- Verification and validation of stakeholder-driven refinements to OBSERVE's datasets, tools, and technical functionalities.
- Final confirmation of the alignment between the proposed national BSOs' structure, stakeholder needs, and technical feasibility across the six (6) Member States.

Depending on prevailing conditions and practical considerations at the time of implementation, the workshops will be organised either in person, online, or in a hybrid format. In the case of hybrid arrangements, local teams will host and facilitate the in-person components, while the wider consortium will participate and provide technical support remotely, ensuring continuity and inclusiveness across all participating countries.

Detailed information on the organisation, implementation, and outcomes of the technical workshops, as well as the insights generated through stakeholder participation, will be reported in the updated version of Deliverable D2.1.

3.5. Step 5: Synthesis of strategic insights for further policy guidance and practice

Building on the preceding methodological steps, this concluding phase will consolidate and synthesise the knowledge, evidence, and insights generated through the earlier stakeholder consultation and co-creation activities. The objective of this step is to translate the diverse qualitative and quantitative inputs collected throughout the process into practical, actionable, and forward-looking insights that can effectively support both EU-level and national actors in the area of building-stock data governance. This synthesis activity will be undertaken towards the final stages of the project and will be fully documented and reported in the updated version of Deliverable D2.1.

Looking ahead to the forthcoming activities, the project's policy team will be responsible for distilling the resulting conclusions into clear, concise, and policy-relevant messages aimed at supporting evidence-based decision-making and informing future planning processes. Particular emphasis will be placed on ensuring that these messages are accessible, strategically framed, and directly aligned with ongoing and forthcoming EU policy developments. In this context, beyond directly informing the design, data architecture, governance structures, and operational logic of the model national BSOs developed across the six (6) OBSERVE case-study countries under **WP3**, this step is further expected to:

- Support policymakers and practitioners in strengthening data quality, accessibility, interoperability, and standardisation practices, ensuring consistency and coherence with the relevant provisions of the recast EPBD, notably **Article 16** and **Article 22**.
- Underpin capacity-building efforts and long-term implementation strategies by identifying enabling conditions, institutional arrangements, and skills-related needs required for the sustainable operation of national BSOs beyond the project's lifetime.

- Contribute to the project's exploitation and dissemination activities (**WP5** and **WP6**) by informing the development of concise, non-technical policy-oriented outputs, including policy briefs and targeted recommendations, designed to facilitate wider stakeholder uptake, replication, and policy impact.

4. Stakeholder needs assessment- Phase I: Interviews and focus groups

As part of Phase I of the stakeholder needs assessment, a total of 23 semi-structured interview and focus group meetings were conducted during the period from **M6** (*May 2025*) to **M14** (*December 2025*). These meetings were coordinated and implemented by the national case-study partners, with each partner carrying out an average of 4 interviews or focus groups within their respective national context. This decentralised yet harmonised implementation model ensured that the consultation process remained sensitive to country-specific institutional settings, while adhering to a common methodological framework across all the six (6) OBSERVE case-study countries.

In practical terms and building on the standardised interview template developed under **Step 2** of our working approach, national partners engaged directly with stakeholders primarily drawn from their established institutional and professional networks. The consultation targeted, in particular, representatives from ministries and regulatory authorities, national and local or regional energy agencies, specialised technical and advisory bodies, as well as professional and sectoral associations. This targeted outreach strategy was designed to ensure that the consultation captured a wide spectrum of institutional perspectives, regulatory responsibilities, and hands-on experience related to building-stock data collection, governance, and reporting. In all cases, stakeholders were contacted and engaged on an individual basis, allowing for focused, in-depth exchanges and the exploration of sensitive or context-specific issues that may not have emerged in group settings.

In line with the agreed semi-structured format, consultation meetings were guided by a shared set of thematic areas, covering key aspects of building-stock data availability, quality, interoperability, governance arrangements, and policy use. At the same time, sufficient flexibility was deliberately built into the consultation process to allow discussions to adapt to the specific roles, mandates, and priorities of each stakeholder group. This approach further reinforced cross-country consistency and analytical comparability, while enabling the capture of nuanced, case-specific insights reflecting national data ecosystems, institutional arrangements, and implementation challenges.

Where applicable, interviews were complemented by focus groups, which provided an additional forum for collective reflection and exchange among stakeholders operating within the same national or thematic context. These focus groups facilitated the identification of shared concerns, converging priorities, and points of divergence related to building-stock data governance and the anticipated role of national BSOs.

Across all the case-study Member States, the identification, selection, and engagement of stakeholders followed the detailed guidelines set out in the project's stakeholder engagement strategy. Particular attention was paid to ensuring balanced and representative coverage across all the target stakeholder groups, including ministries, national agencies, technical bodies, research organisations, and professional associations. This careful selection process

was instrumental in capturing a diversity of viewpoints and ensuring that the consultation outcomes reflect both strategic policy considerations and operational realities.

Overall, the qualitative feedback collected through the interviews and the focus groups generated rich, context-specific insights into current practices, perceived gaps, and future needs related to building-stock data governance. These insights substantially complemented and deepened the evidence gathered- as a next step- through the EU-wide online survey, thereby strengthening the overall analytical foundation of OBSERVE and providing a robust empirical basis for the findings and analysis presented in the subsequent sections of this deliverable.

4.1. Croatia

In the Croatian case study, two (2) interview meetings took place including: (i). a central government authority responsible for policymaking in the areas of physical planning, construction, and housing, as well as for the implementation of programmes financed through EC funds; and (ii). a national agency mandated to improve citizens' quality of life through housing-related interventions, including the construction of subsidised housing, the purchase and rental of apartments, the provision of loans and loan subsidies, and the operation of the energy management system for public-sector buildings.

Together, these two institutions represent the primary and, in practice, the only actors with direct relevance to building-stock data governance in Croatia. The first stakeholder holds overarching responsibility for harmonising construction-related regulations at the national level, while the second is primarily tasked with implementing energy-related regulations and monitoring energy consumption in public-sector buildings. Their combined mandates span data collection and analysis, policy design, and policy implementation, positioning them at the core of Croatia's building-stock data ecosystem.

The consultation revealed a high degree of overlap between the types of building-stock data that stakeholders consider critical for their work and the data that they already collect. Notably, however, stakeholders reported that in several cases more data are being collected than are currently perceived as essential for their core policy and operational needs (**Figure 2**). This suggests potential inefficiencies in data collection practices, as well as opportunities to streamline datasets and prioritise indicators that directly support policy objectives and reporting requirements.

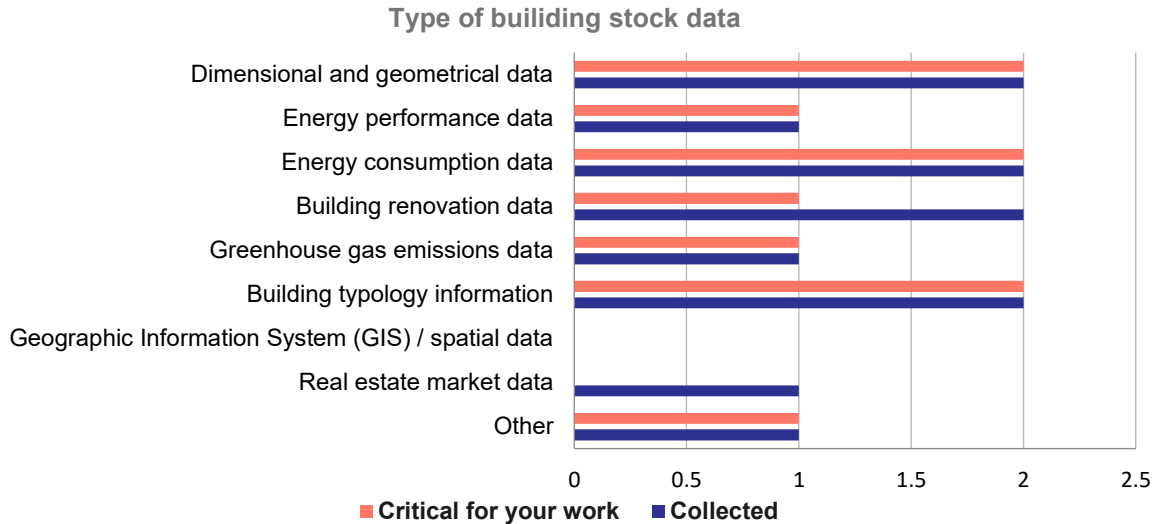


Figure 2. Comparison between the types of building-stock data considered critical for stakeholders' work and those collected by stakeholders (Croatia).

When building-stock data are directly collected or shared between institutions, they are primarily stored and exchanged through structured databases, spreadsheets, and static reporting formats such as "PDF" documents, with a generally low level of automation across processes (Figure 3). Automated data flows and real-time data integration remain limited, resulting in a reliance on manual processing and periodic data updates.

In which format is the data you are currently using available?

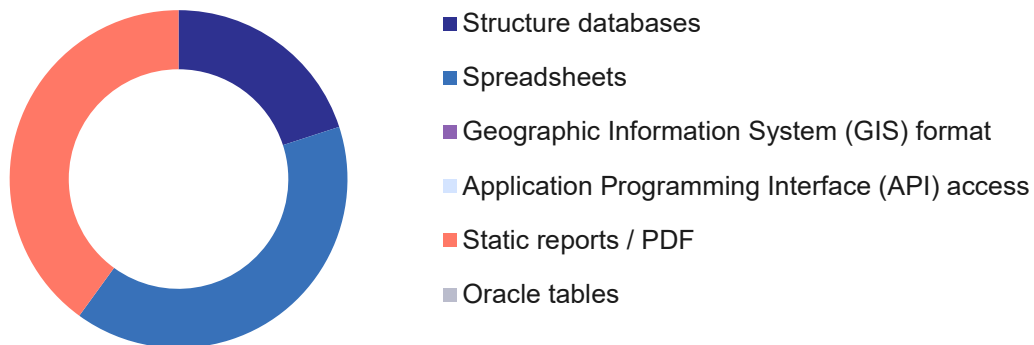


Figure 3. Most common data format used by stakeholders (Croatia).

Stakeholders identified a range of national databases that are frequently used in their daily work. These include the Energy Certificate Information System (IEC) and the Physical Planning Information System (ISPU), both managed by the Ministry of Physical Planning, Construction, and State Assets (MPGI). In addition, the Information System for Energy Management (ISGE), managed by the Agency for Legal Traffic and Real Estate Brokerage (APN), plays a central role in collecting data on energy consumption in public-sector buildings. Further important sources include the Organised Land Portal, a cadastre jointly managed by the Ministry of Justice, Public Administration, and Digital Transformation (MPUDT) and the

State Geodetic Administration; the System for Measuring and Verifying Energy Savings (SMiV), managed by the Ministry of Economy and Sustainable Development (MINGO); the database of the Environmental Protection and Energy Efficiency Fund (EPEEF), which contains information on programmes and projects related to energy efficiency and environmental protection; the Register of Spatial Units maintained by the State Geodetic Administration; and meteorological data provided by the Croatian Meteorological and Hydrological Service (DHMZ).

While some datasets, such as those provided by the DHMZ or the Register of Spatial Units are publicly available as open data, access to other databases requires formal requests and, in many cases, dedicated user accounts with differentiated access rights. For systems such as the ISGE, the SMiV, or the IEC, stakeholders reported that access levels vary depending on institutional role and legal mandate, which can limit data sharing and reuse across organisations.

With regard to data provision barriers, stakeholder responses diverged. One stakeholder noted that some reluctance to provide data existed during the initial establishment of data systems, but that this issue has largely been resolved, as data collection for public-sector buildings is regulated by law and does not raise significant concerns related to data protection. In this context, personal data are limited primarily to basic contact details, and General Data Protection Regulation (GDPR) has not been perceived as a major obstacle. The second stakeholder, however, reported that public-sector reluctance has, in some cases, restricted access to specific datasets. While data related to projects funded through EU or other public sources are generally accessible, data linked to privately funded projects are less readily available, particularly when no explicit reporting obligation exists.

The low level of automation and the heavy reliance on manual processes were identified as major contributors to the challenges faced in the collection, management, and use of building-stock data in Croatia. Key difficulties include the lack of reliable and consistent data, fragmentation across multiple data sources, and shortages of human resources (**Figure 4**). Stakeholders reported that these challenges are currently addressed through collaboration with research institutes, universities, and other external entities, as well as through incremental automation efforts. However, limited funding remains a significant barrier, and manual data cleaning continues to be widely used to address data quality issues.

What are the main challenges / difficulties currently encountered in your line of work?

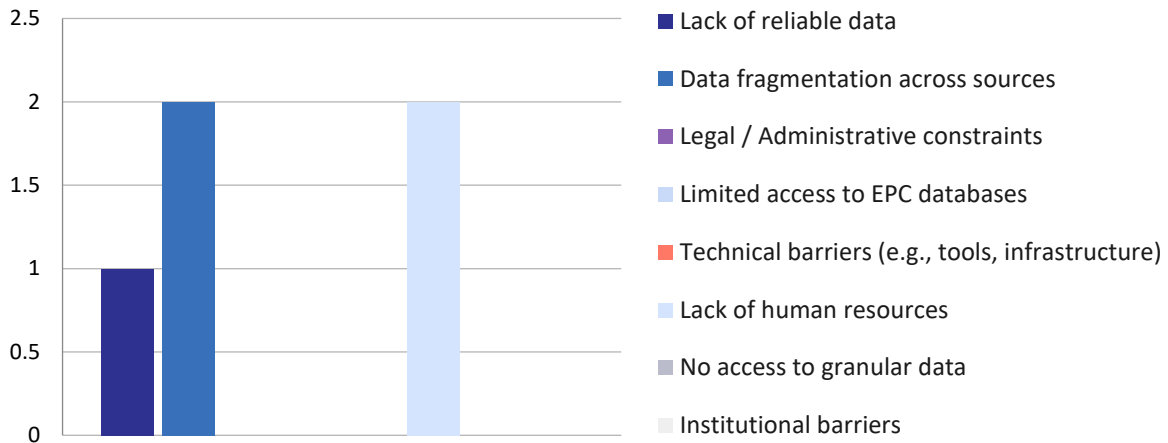


Figure 4. Main challenges and difficulties regarding the collection, management, and use of building-stock data (Croatia).

Both stakeholders strongly emphasised the need for standardised and uniform data collection structures. In particular, they highlighted the importance of clearly defined data formats and unambiguous parameter definitions. For example, when reporting building floor area, it should be explicitly specified whether this refers to gross area, net area, or usable area. Closely linked to this issue is the absence of a universal building identifier, which stakeholders identified as a critical gap preventing effective interconnection and interoperability between existing databases.

Regarding alignment between national and regional data collection practices, stakeholder views again differed. One stakeholder reported that no formal policy misalignment exists, as national authorities define the types of data to be collected at both national and regional levels; however, regional entities often lack the resources or motivation to fully comply with these guidelines. The other stakeholder reported misalignment specifically in the reporting of renovation projects at the regional level, leading to data gaps and inconsistencies when aggregating information at the national level.

Despite these challenges, neither stakeholder considered GDPR to be a significant limiting factor, given that data collection processes are legally defined and involve only minimal personal data. Instead, economic and human resource constraints were identified as the most persistent obstacles. These constraints hinder necessary infrastructure upgrades, slow down data gathering and processing, and delay the transposition and effective implementation of EU directives. Data fragmentation was also reported to result in the exclusion of certain datasets deemed unreliable, leading in some cases to the production of analytical documents based on data samples rather than on the full range of available information.

Furthermore, stakeholders unanimously agreed that additional training and capacity-building initiatives would be highly beneficial, particularly those focused on fostering open dialogue, structured knowledge exchange, and peer learning among institutions involved in building-stock data governance.

Finally, with regard to the implementation of Article 22 of the EPBD, which mandates the establishment of a national building performance database, stakeholders expressed differing views on the most feasible approach. In one meeting, stakeholders prioritised the interconnection of existing databases, while in the other, stakeholders advocated for the creation of a single central database for energy and water consumption, with other building-related data (such as floor area and EPCs) linked from external systems (Figure 5). In both cases, the main challenge identified was the extensive amount of manual work required, particularly given that none of the existing databases are considered fully accurate at present.

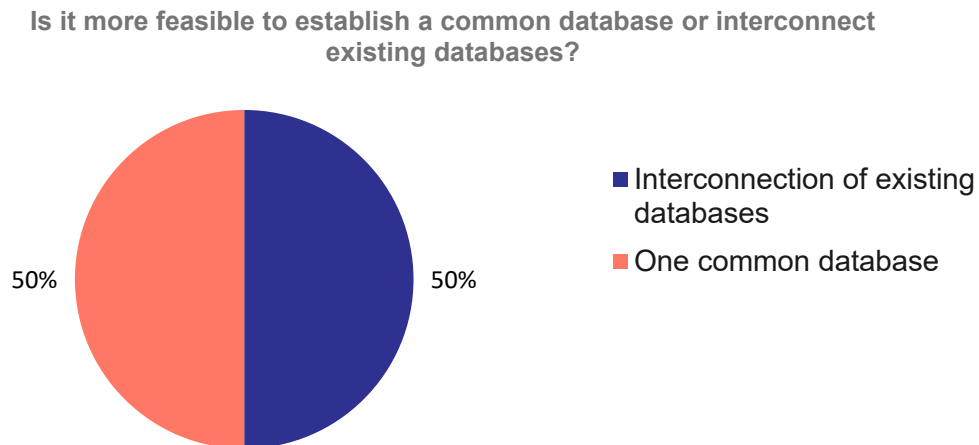


Figure 5. Stakeholders' views on the most feasible approach to improve national building-stock data systems (Croatia).

Overall, while communication and cooperation between stakeholders are already in place, respondents highlighted the need for more structured and systematic collaboration. This could be achieved through the standardisation of data collection practices, regular assessments of the effectiveness of existing processes, and improved dissemination and promotion of available tools and their potential applications.

4.2. Cyprus

In the case of Cyprus, the national consultation involved one (1) interview meeting with the central governmental authority acting as the main national policymaker and strategic and technical decision-maker in the field of buildings. The representative involved holds primary expertise and responsibility across a wide range of domains, including buildings' energy performance, building-stock data management, policy development, technical implementation, standardisation, BSOs, energy certification, and renovations. As such, this authority represents the central institutional node for building-stock data governance and policy implementation in Cyprus.

The consultation revealed a strong alignment between the types of building-stock data considered critical for the stakeholder's work and the data that are currently being collected. In particular, dimensional and geometrical characteristics, energy performance and energy consumption data, as well as building typology information, were identified as being of crucial importance and constitute the primary focus of current BSO-related data collection efforts in

Cyprus. This alignment suggests a clear understanding of policy-relevant data needs, albeit within the constraints of existing data availability and infrastructure.

When building-stock data are directly collected or shared, they are primarily stored and exchanged through structured spreadsheets and static reporting formats, such as “PDF” documents, with a generally low level of automation. Automated data processing and integrated digital workflows remain limited, resulting in a continued reliance on manual procedures for data handling, analysis, and reporting.

At present, comprehensive datasets are available only for residential buildings, while data for non-residential buildings remain largely unavailable. Even within the residential sector, available datasets are limited in scope, although they can be shared publicly. Access to EPC datasets is subject to specific conditions: users must be registered and licensed EPC assessors authorised by the government, who can access certificates through the official EPC system. According to the respondent, BSO-relevant data are primarily derived from the EPC database and from reports produced by the national statistical authority.

In this regard, the official statistical services of Cyprus (CYSTAT) provide annual reports on building permits and permitted building areas (in square metres), which can serve as an additional source of information for annual national building-stock observations. Furthermore, the “SBEMcy” software- made available free of charge by the national energy agency- is used for calculating building energy performance and issuing EPCs. While these datasets are managed by the main national authority participating in the consultation, stakeholders noted that data coverage and analytical capacity could be expanded through structured collaboration with research institutes and private-sector actors. Access to the majority of these datasets is publicly available, subject to the conditions noted above.

When asked whether public or private reluctance to provide data constitutes a barrier, the respondent indicated that this has not been a significant issue in the case of Cyprus. Instead, limited data accessibility was attributed primarily to administrative and technical barriers, rather than to unwillingness on the part of public or private actors to share information. Nevertheless, it was acknowledged that data protection considerations may become more relevant when attempting to access personal or sensitive data, in which case GDPR requirements may impose constraints.

With respect to the main challenges faced, the stakeholder highlighted the lack of reliable and consistent data, as well as the absence of harmonisation across multiple platforms, as the most critical issues. In addition, significant technical barriers were identified, including limitations related to existing technologies and tools, as well as shortages of human resources for operating, maintaining, and analysing current BSO-related systems. These capacity gaps were reported to contribute to delays in the transposition and implementation of EU directives, while also increasing the overall cost of compliance over time.

Regarding potential misalignment between national and regional data collection practices, the respondent reported that no such misalignment has been observed in Cyprus. Similarly, GDPR was not perceived as a limiting factor for accessing and using building-stock data under

current practices, except in cases involving personal or sensitive information. Instead, economic and human resource constraints were identified as the most persistent barriers. These include insufficient funding for data infrastructure and digital tools, the high costs associated with upgrading existing technologies, and the limited availability and high cost of skilled personnel.

To address these constraints, the national stakeholder currently relies on the national EPC database in combination with spreadsheet-based tools and manual processing. External support is often sought through collaboration with universities and research centres, particularly for analytical tasks and methodological development. At the same time, the respondent emphasised the need for enhanced training and capacity-building initiatives to strengthen collaboration and improve technical competencies across institutions. Greater emphasis on shared procedures, structured knowledge exchange, and regular inter-institutional dialogue was seen as essential for moving towards a more integrated and efficient data management framework.

At present, Cyprus does not have a fully standardised framework for collecting BSO-related data. Existing standards and methodologies are primarily linked to EPC calculations and related data collection processes, which were reported to be insufficiently effective for broader database development. This is partly due to the fact that obtaining an EPC is not currently mandatory in Cyprus, as well as to the limited interoperability and uneven adoption of existing frameworks across institutions. These limitations constrain national capacity to effectively transpose and implement EU directives such as the EPBD, and to generate reliable, up-to-date data to support policy design, monitoring, and evaluation. As a result, decision-making processes often rely on incomplete or outdated information.

Looking ahead to the implementation of Article 22 of the EPBD, which mandates the establishment of a national building performance database, the respondent strongly acknowledged the strategic importance of this requirement for improving data availability, consistency, and interoperability. In particular, the stakeholder expressed a clear preference for interconnecting existing databases, such as EPC systems and building typology datasets, rather than developing an entirely new database from scratch. This approach was considered more feasible in the short to medium term, as the creation of a new system would require substantial time, financial resources, and legal adjustments.

Finally, while stakeholder relationships in Cyprus are characterised by ongoing communication and cooperation, the respondent emphasised the need for more structured coordination mechanisms. This could be achieved through standardised data collection practices, regular evaluations of the effectiveness of existing processes, and stronger promotion of available tools and their capabilities. Stable financial support and sustained capacity-building measures were identified as key prerequisites for the development of a modern, interoperable, and policy-relevant building-stock data ecosystem in Cyprus.

4.3. France

In the French case study, four (4) interview meetings took place in the national consultation process, with stakeholders representing the main institutional pillars of the national building-stock data ecosystem (**Figure 6**). Interview participants came from: (i). the Directorate for Housing, Urban Planning, and Landscapes (DHUP) within the Ministry of Ecological Transition, (ii). the Scientific and Technical Centre for Buildings (CSTB), (iii). the French Agency for Ecological Transition (ADEME), and (iv). the Sustainable Real Estate Observatory (OID).

Together, these institutions cover the full spectrum of policy, technical, operational, and market-driven perspectives relevant to building-stock data governance in France. DHUP acts as the primary policy authority, responsible for defining national regulations, transposing EU directives such as the EPBD, and reporting to the EC. CSTB functions as the principal technical and scientific body, with responsibility for tool development, data analysis, and the operation of the National Building Database- “Base de Données Nationale des Bâtiments (BDNB)”, which aggregates information covering the entire French building stock. ADEME plays a central operational role through the management of key data platforms, notably the French Energy Performance Certificate (DPE) observatory, which aggregates EPCs and energy audits for residential buildings, and the “OPERAT” platform, which monitors energy consumption in tertiary buildings over 1,000 m² in the context of compliance with the “Décret Tertiaire”. Finally, OID is an independent, non-profit association financed by its members, providing performance barometers to support real-estate professionals in monitoring and improving energy efficiency, carbon footprint, and broader sustainability indicators in buildings.

In particular, OID represents a distinctive case within the French ecosystem. Due to the absence of a structured, centralised database aligned with the standard questionnaire format, OID was unable to complete the questionnaire in full. Nevertheless, valuable qualitative insights were gathered through the interview process and are incorporated where relevant, particularly to illustrate an alternative, bottom-up data-collection model based on direct reporting by asset owners. The figures presented illustrate the responses from DHUP, CSTB, and ADEME.

Figure 6 illustrates the functional interactions and data flows between the main policy, technical, and operational pillars of the French building-stock data ecosystem. It highlights the strategic oversight role of DHUP, alongside the technical and operational functions performed by CSTB and ADEME. In particular, the figure maps the ingestion of raw data from the “DPE” observatory and the “OPERAT” platform (managed by ADEME) into the centralised BDNB (managed by CSTB), using the National Building Registry (RNB) as a unique pivoting identifier to ensure interoperability across the national building stock.

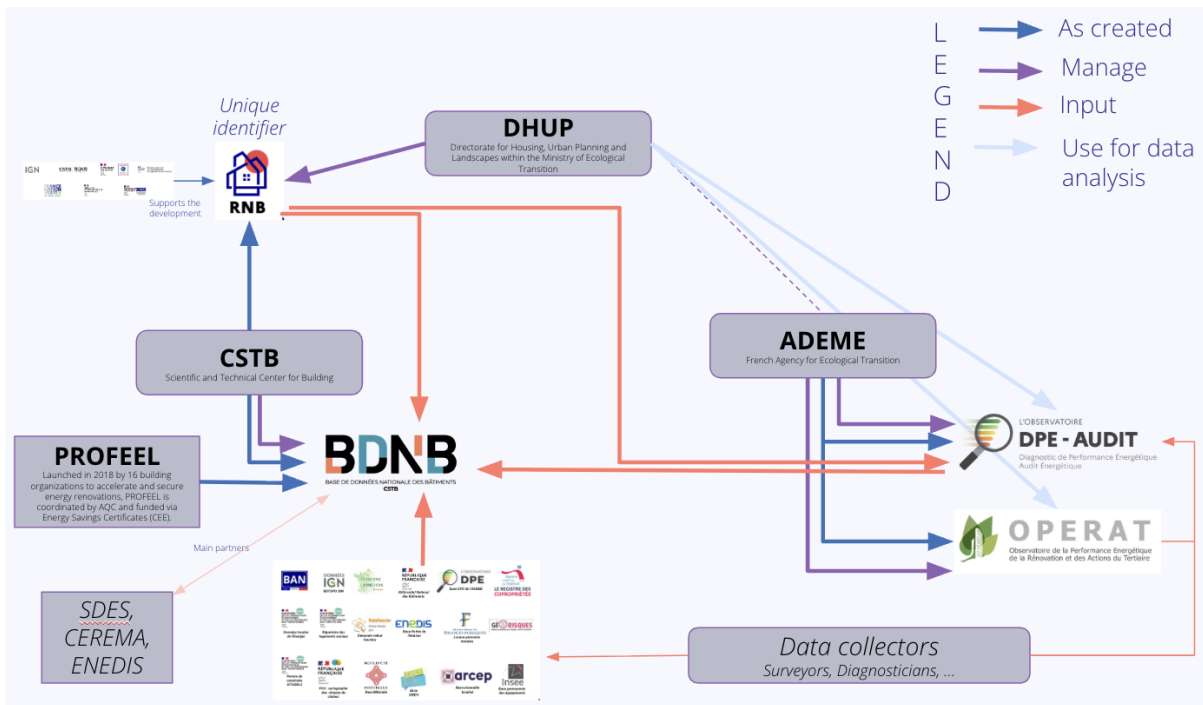


Figure 6. Interactions between the policy, technical, and operational pillars in the French building-stock data ecosystem.

Figure 7 illustrates the comparison between the types of building-stock data that French stakeholders consider critical for their work and those that are currently collected and available within the national data ecosystem. Overall, the results reveal a relatively advanced and structured data landscape, while at the same time highlighting persistent gaps that constrain comprehensive monitoring and policy evaluation.

Stakeholders clearly identified energy performance data, dimensional and geometrical data, building renovation data, energy consumption data, and building typology information as among the most critical information categories for supporting policy design, monitoring compliance with national and EU requirements, and assessing progress towards decarbonisation objectives. For all of these categories the level of data collection appears relatively aligned with stakeholder needs, reflecting the maturity of key national databases and registries, such as the centralised BDNB and EPC-related observatories.

However, stakeholder feedback also highlights systematic mismatches between perceived importance and actual data availability in several areas. In particular, energy poverty indicators and technical system inspection data are perceived as critical yet are reported as only partially collected or insufficiently integrated into existing databases. These gaps limit the ability of policymakers to assess social impacts, target renovation policies effectively, and ensure a socially equitable transition in the buildings sector.

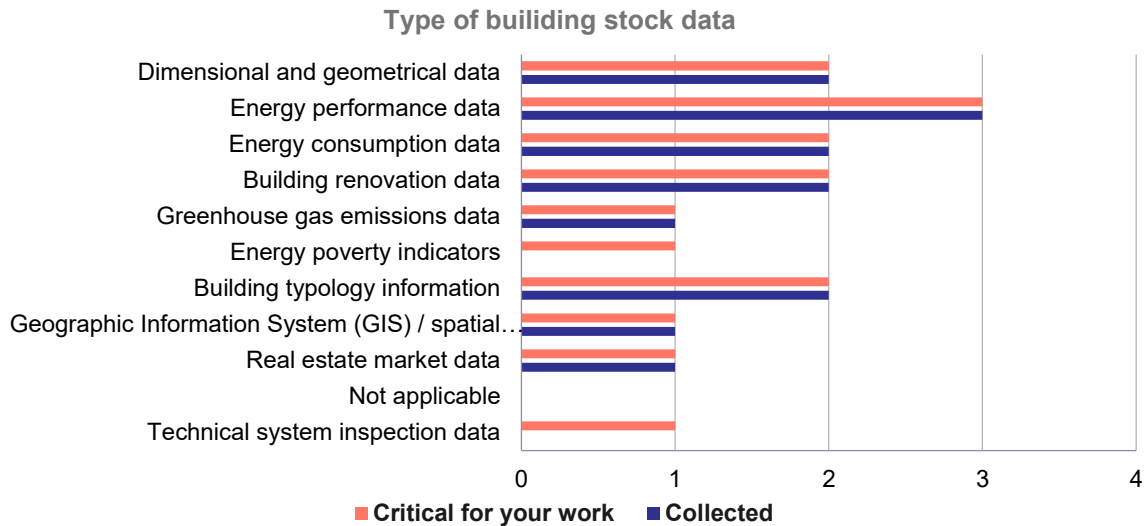


Figure 7. Comparison between the types of building-stock data considered critical for stakeholders' work and those collected by stakeholders (France).

Figure 8 presents French stakeholders' views on the most feasible approach to improving national building-stock data systems, comparing the establishment of a single, common database with the interconnection of existing databases. The results show a clear preference for an interconnection-based approach, supported by the majority of respondents, while a portion of the stakeholders considers the creation of a single, common database to be the more viable option.

This preference for interconnecting existing databases reflects the current maturity and institutional complexity of the French building-stock data ecosystem. Stakeholders emphasised that France already relies on several well-established and functionally specialised systems, such as EPC registries, national building-stock databases, energy consumption monitoring platforms, and cadastral and statistical repositories, which are managed by different institutions with distinct mandates. In this context, interconnection is perceived as a more realistic and proportionate pathway to improving data availability, interoperability, and coherence, while avoiding duplication of efforts, disruption of existing workflows, or unnecessary institutional restructuring.

At the same time, the preference expressed by stakeholders for creating a common database highlights an underlying demand for greater standardisation, simplification, and unified governance. Stakeholders supporting this option typically associate it with clearer data ownership, more consistent definitions, and easier access for end users, particularly for reporting and policy-monitoring purposes. However, they also acknowledge that such an approach would entail substantial legal, technical, and organisational challenges, including the need for long-term investments, extensive coordination across institutions, and careful management of transition risks.

Overall, the figure indicates a degree of alignment among the French stakeholders that interoperability, rather than centralisation per se, should be the primary focus of future efforts to strengthen national building-stock data systems. This finding aligns closely with the

implementation logic of Article 22 of the EPBD, which leaves flexibility to Member States regarding system architecture while requiring coherent, harmonised reporting to the EU BSO. In the French context, stakeholders therefore view an interconnection-driven national BSO as the most feasible and effective solution for enhancing data governance, supporting policy implementation, and enabling robust monitoring of the building-sector transition.

Is it more feasible to establish a common database or interconnect existing databases?

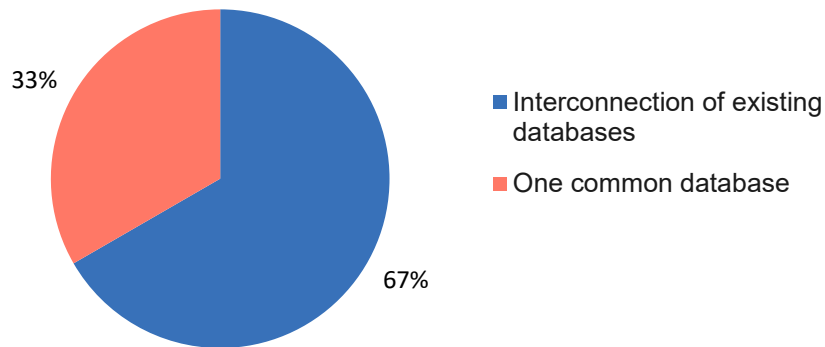


Figure 8. Stakeholders' views on the most feasible approach to improve national building-stock data systems (France).

The primary challenges identified by French stakeholders relate to data fragmentation, data reliability, and institutional and resource constraints (**Figure 9**). Fragmentation remains a key issue, as building-related data are distributed across multiple sources, including ADEME platforms, tax authorities, and energy distributors. While the RNB has largely addressed technical interoperability by providing a unique building identifier, the administrative effort required to link and synchronise datasets across institutions remains substantial.

Data reliability emerged as a shared concern among all stakeholders. The complexity of collecting and validating data for the DPE system was highlighted as a particularly illustrative example. Diagnosticians use one of approximately ten accredited software solutions authorised by DHUP. The data generated undergo quality-control procedures designed by CSTB before being integrated into national observatories. However, the sheer volume of information- each DPE contains between 800 and 1,000 individual data fields- makes exhaustive verification of every entry impractical. Furthermore, while software solutions are evaluated upon market entry, they are currently reassessed only every six (6) years. This extended interval can allow implementation errors in specific data fields to persist over time. Stakeholders suggested that more frequent software evaluations, ideally on an annual basis, could significantly improve data accuracy and consistency.

What are the main challenges / difficulties currently encountered in your line of work?

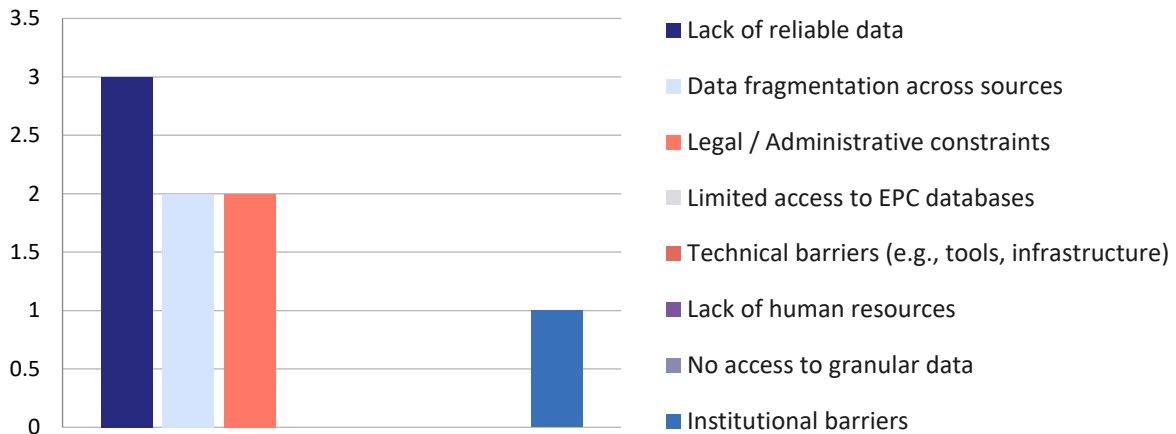


Figure 9. Main challenges and difficulties regarding the collection, management, and use of building-stock data (France).

Legal and institutional considerations also play a central role in shaping the deployment of a national BSO in France. Stakeholders emphasised the importance of clarifying legal mandates related to data aggregation and ensuring sustainable, long-term financing for these infrastructures. Formalising the roles and responsibilities of different actors within official state reporting frameworks may require dedicated administrative arrangements and resources. In addition, accessing data held by private entities, such as actual energy-consumption data, raises complex regulatory questions related to data protection and business confidentiality, which are currently being addressed through ongoing legislative and regulatory discussions.

The consultation on data frameworks (**Figure 10**) revealed distinct operational environments reflecting the mandates of each stakeholder. Policy bodies such as DHUP and ADEME primarily rely on data formats optimised for monitoring and reporting purposes, including spreadsheets (“Excel”, “CSV”) and static reports (“PDF”), often accessed through established portals. By contrast, the technical body CSTB operates within a specialised data-engineering environment, using structured databases, application programming interfaces (APIs), and geographic information system (GIS) formats (e.g., “Geopackage”, “SQL”) to maintain and further develop the centralised BDNB.

In which format is the data you are currently using available?

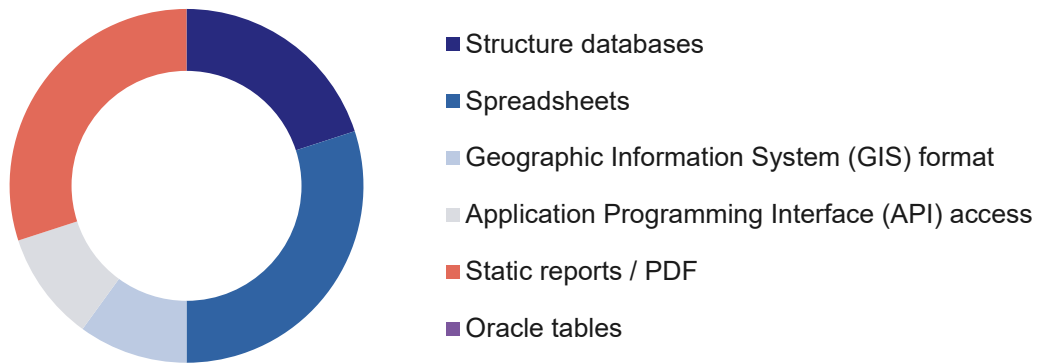


Figure 10. Most common data format used by stakeholders (France).

Despite the overall maturity of the French building-stock data ecosystem, stakeholders identified several persistent limitations related to data completeness and timeliness. First, there is no centralised collection of mandatory inspection reports for heating, ventilation, and air-conditioning (HVAC) systems, creating a compliance gap in monitoring technical system performance. Second, large-scale integration of socioeconomic data with physical building-performance data remains limited, constraining the ability to track energy poverty and effectively target vulnerable households. Third, renovation-financing data constitute a critical blind spot: information on which buildings have received public financial support is often siloed across programmes and institutions. Finally, data “freshness” represents a structural challenge. Because DPE data are typically generated during market transactions (sales or rentals), a large share of the stable building stock remains unmonitored, and national databases may reflect pre-renovation conditions long after improvements have been implemented.

Regarding the EPBD’s requirement to establish a national database for the energy performance of buildings, stakeholders broadly converge towards an interconnection strategy rather than the creation of a new, monolithic database. DHUP interprets the directive primarily as a mandate for interoperability, favouring effective communication between existing databases such as DPE and OPERAT. CSTB supports this interpretation, emphasising that the centralised BDNB already functions as the technical backbone of such an interconnected system, capable of fulfilling the reporting requirements of Article 22, provided governance issues are adequately addressed. At the same time, discussions are ongoing between DHUP and ADEME regarding the integration of additional datasets into the “DPE Audit” database to ensure compliance with the evolving EPBD’s requirements. ADEME, however, cautioned against fundamentally altering the existing DPE system, noting that it has only recently achieved operational stability, recognition, and acceptance among practitioners. Given the political sensitivity surrounding energy diagnostics, maintaining trust in the tool was identified as a priority.

In terms of functional requirements for a future national BSO, DHUP articulated clear priorities oriented towards public-policy usability at all governance levels. The envisaged observatory

should function primarily as a reliable “Open Data” platform, underpinned by a trusted and transparent database. It should bridge national-level monitoring with local-level action by enabling temporal comparisons and supporting rapid, targeted analyses at territorial scale. User experience (UX) was highlighted as a critical factor: the interface must be intuitive and accessible to non-expert users, particularly local authorities. ADEME similarly stressed the importance of careful UX design to facilitate broader uptake, including by citizens, and to ensure that the platform remains fully accessible and user-friendly.

The experience of the “Observatoire de l’Immobilier Durable (OID)” provides a complementary, bottom-up perspective on building-stock data governance. Established in 2012 following the Grenelle environmental roundtables, OID operates as a mutual exchange platform driven by private real-estate actors. Unlike regulatory tools such as the DPE, which rely on theoretical calculations, OID aggregates actual energy-consumption data, updated annually, and progressively expanded to include water usage and certification data. Its scope is significant, covering approximately 65,000,000 m² across tertiary and private residential properties, contributed by 53 members and based on around 150 specific data points reported directly by asset managers rather than by grid operators.

To ensure data reliability for benchmarking and “EU Taxonomy” compliance, OID applies a stringent governance and quality-control framework. All data are anonymised to protect asset confidentiality, processing workflows are fully audited, and technical standards- such as surface-area definitions- are strictly enforced to guarantee comparability. Quality control is particularly demanding: approximately half of submitted buildings are excluded due to data anomalies, ensuring that resulting benchmarks are based on high-quality, verified inputs. Although OID data cannot be released as “Open Data”, the consortium model generates value through mutual exchange among participants. OID is currently implementing the RNB identifier to enable the future integration of its energy-performance datasets with climate-risk databases, further enhancing analytical potential.

Overall, the French case reflects a relatively advanced and well-institutionalised building-stock data ecosystem, underpinned by strong institutional capacities and technical expertise. Nevertheless, persistent challenges related to data reliability, timeliness, governance, and resource allocation remain. Addressing these gaps- particularly through improved integration of emissions-related, socioeconomic, and renovation-financing data- is essential to ensure that national BSO developments fully support EPBD implementation and enable more comprehensive, evidence-based policymaking.

4.4. Greece

In the case of Greece, five (5) interviews and focus group meetings took place with multiple stakeholders representing a diverse spectrum of actors involved in building-stock data governance and management. These included representatives from governmental authorities- most notably different units within the Ministry of Environment and Energy- as well as national research organisations and technical professional bodies. Collectively, interviewees contribute across multiple core domains of the national building-stock data ecosystem, with mandates

spanning strategic policy design, regulatory oversight and implementation, cadastral administration, and technical advisory and analytical support for building-stock assessment, including data collection, monitoring, and reporting to the EU.

For the effective execution of their responsibilities, access to a wide range of building-stock data is essential. However, across all the meetings a clear and consistent mismatch emerged between stakeholders' actual data needs and the information currently available to them (**Figure 11**). In particular, while stakeholders require comprehensive, consistent, and up-to-date datasets to support policy design, monitoring, and reporting, significant gaps persist in both data coverage and quality, limiting the effectiveness of evidence-based decision-making.

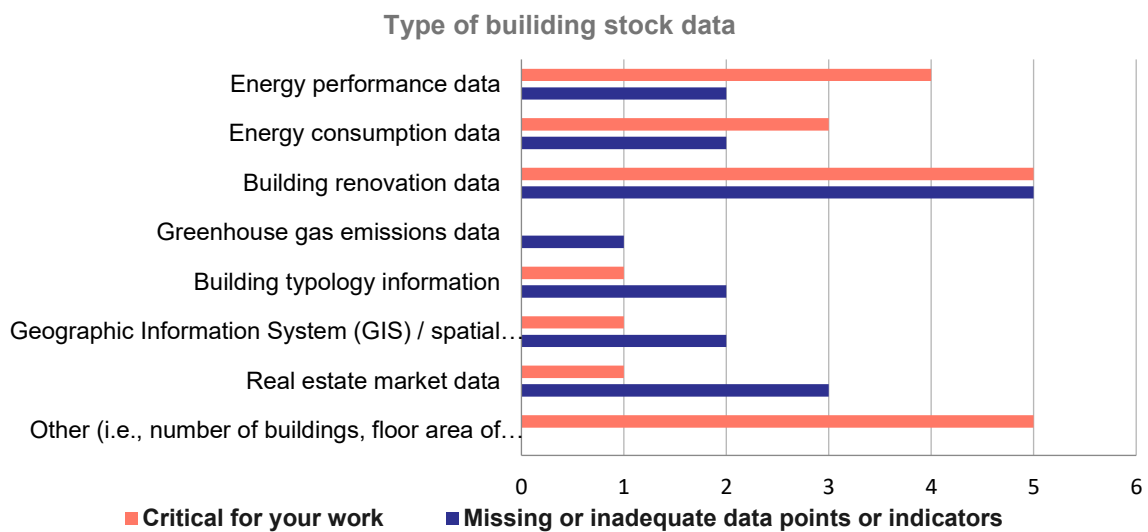


Figure 11. Comparison between the types of building-stock data considered critical for stakeholders' work and those collected by stakeholders (Greece).

This misalignment is further reflected in the heterogeneous practices used for collecting, managing, and sharing building-stock data (**Figure 12**). As indicated by the consultations, data sources range from structured national registries- such as the EPC database managed by the Ministry of Environment and Energy in cooperation with the Centre for Renewable Energy Sources and Saving (CRESS)- to spreadsheets, internal digital systems, and inputs derived from the Hellenic Cadastre. The national Cadastre was repeatedly identified by interviewees as a fundamental data source, albeit one that remains only partially interoperable with other building-related datasets.

In which format is the data you are currently using available?

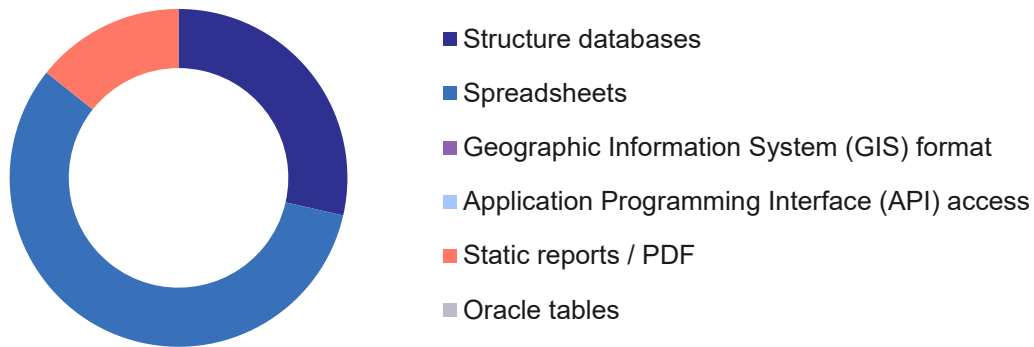


Figure 12. Most common data format used by the stakeholders (Greece).

Beyond heterogeneity in formats and sources, two additional challenges were repeatedly highlighted (Figure 13). First, the overall level of digitisation- and consequently the degree of automation, standardisation, and integration- varies significantly across available data resources. This often results in situations where information must be reconciled manually, increasing the risk of errors and inconsistencies while placing a heavy burden on limited human resources. Second, access to data is frequently conditioned by bilateral arrangements, project-specific agreements, or institutional mandates, which further constrain the availability and usability of building-stock data. According to consultation feedback, some databases, such as EPC registers and statistical repositories, are accessible internally to public authorities, while others are restricted or subject to formal data-sharing agreements, limiting cross-institutional use.

In this context, limited data accessibility in Greece appears to stem primarily from administrative and technical constraints rather than from formal legal prohibitions alone. Interviewees cited institutional fragmentation, ambiguous procedures, and inconsistent permission frameworks as recurring barriers to effective data exchange. At the same time, several stakeholders reported a general reluctance among data holders to share information, which further exacerbates already constrained data-sharing conditions.

Additional critical factors reported include incomplete and unreliable datasets, as well as methodological inconsistencies- particularly between national and regional levels and across sector-specific systems. Interviewees emphasised the absence of a unified and coordinated approach among ministries, regional authorities, and technical bodies with respect to building typologies, ownership and occupancy characteristics, renovation activities, and spatial, geographic, and temporal consistency. The resulting landscape was described as one in which parallel data systems coexist with limited cross-communication, divergent definitions, and different update cycles. Collectively, these conditions hinder the development of a comprehensive, methodologically harmonised national repository with full coverage and internal consistency.

Although stakeholders primarily discussed accessibility challenges at the level of data categories (e.g., renovation or ownership data), these challenges imply limited availability of granular, building-level information, given the fragmented governance arrangements and conditional access mechanisms currently in place.

What are the main challenges / difficulties currently encountered in your line of work?

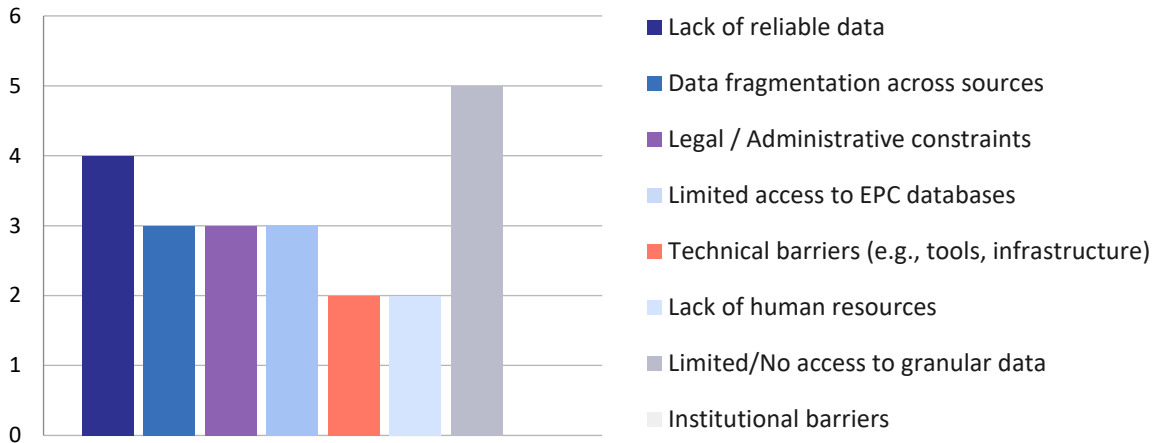


Figure 13. Main challenges and difficulties regarding the collection, management, and use of building-stock data (Greece).

When asked how these challenges are currently addressed, interviewees described a range of adaptive practices, including ad hoc data exchanges, collaboration with academic and research institutions, and manual cross-checking and validation through internally developed methodologies and models. While these approaches help partially mitigate existing gaps, stakeholders acknowledged that they rely heavily on individual initiatives and informal networks and therefore remain limited in scope and sustainability. In the absence of a coordinated national strategy, shared standards, and automated quality-control mechanisms, such practices were widely seen as insufficient to support consistent national-level planning, monitoring, and reporting.

Alongside data fragmentation and non-interoperable methodologies- frequently cited as major barriers to accessing high-quality information- GDPR-related considerations and long-standing resource constraints introduce additional layers of complexity. On the one hand, GDPR is routinely invoked by data holders as a justification for restricting access, even in cases where aggregated or anonymised data could potentially be shared. On the other hand, persistent limitations in financial and human resources compound existing challenges. Interviewees highlighted short-term funding cycles, staff shortages, and ageing system infrastructures as key factors slowing progress towards the modernisation and integration of the national building-stock data ecosystem.

Looking ahead to the implementation of Article 22 of the EPBD, stakeholders expressed broad agreement on its strategic importance and strongly supported the establishment of a national building-performance database. At the same time, they articulated differing views on the most appropriate implementation pathway (Figure 14). The majority considered the interconnection

of existing systems- such as EPC databases, the Cadastre, building permit registries, and public-building datasets- to be the most feasible and resource-efficient approach. A smaller number of interviewees favoured the creation of a single, centralised database to simplify governance and facilitate long-term harmonisation, while others suggested a hybrid model combining both approaches.

Is it more feasible to establish a common database or interconnect existing databases?

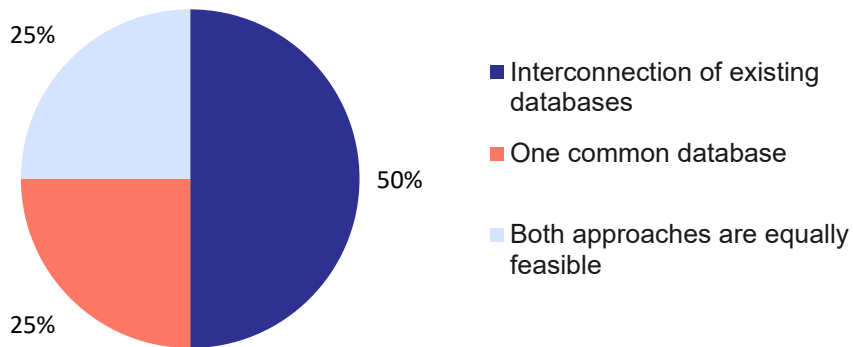


Figure 14. Stakeholders' views on the most feasible approach to improve national building-stock data systems (Greece).

Across all groups, however, robust institutional coordination, standardised procedures, and harmonised data frameworks were reported as necessary prerequisites for successful implementation. This, in turn brought into focus the current state of structured collaboration among building-sector actors and data holders.

On this point, interviewees widely agreed that, while cooperation mechanisms do exist, they are neither systematic nor embedded within formal institutional frameworks. Instead, collaboration tends to materialise through project-based or informal exchanges, largely dependent on individual networks and personal relationships. As a result, data flows across administrative levels and organisational types remain fragmented, inconsistent, and difficult to sustain over time. In response, stakeholders underscored the need for broader and more institutionalised engagement involving municipalities, technical chambers, universities and research centres, as well as private-sector actors, including real-estate associations. Such engagement was seen as essential to enhance data coverage and representativeness, strengthen interoperability, and ultimately improve the coherence and policy relevance of the national building-stock data landscape in Greece.

4.5. Italy

In the Italian case study, seven (7) interview and focus group meetings took place with stakeholders representing a broad and diverse spectrum of institutional, technical, and professional actors involved in the collection, management, and use of building-stock data. These included one policy-level representative, two (2) national agencies with regulatory and statistical mandates, one research body, one technical committee, one professional federation, and one public agency responsible for the management of public assets.

Collectively, these stakeholders cover a wide range of functions across the national building-stock data ecosystem, encompassing data collection, aggregation, analysis, and reporting to the EU, as well as policy design, implementation, and asset management related to energy performance, cadastral information, renovation activity, and public and private building portfolios.

The consultation revealed a pronounced mismatch between the types of building-stock data that stakeholders consider critical for the effective execution of their mandates and the data that are currently available or systematically collected (**Figure 15**). This gap was consistently highlighted across stakeholder categories and reflects structural limitations in data coverage, quality, and accessibility, which constrain the ability to support evidence-based policymaking and monitoring.

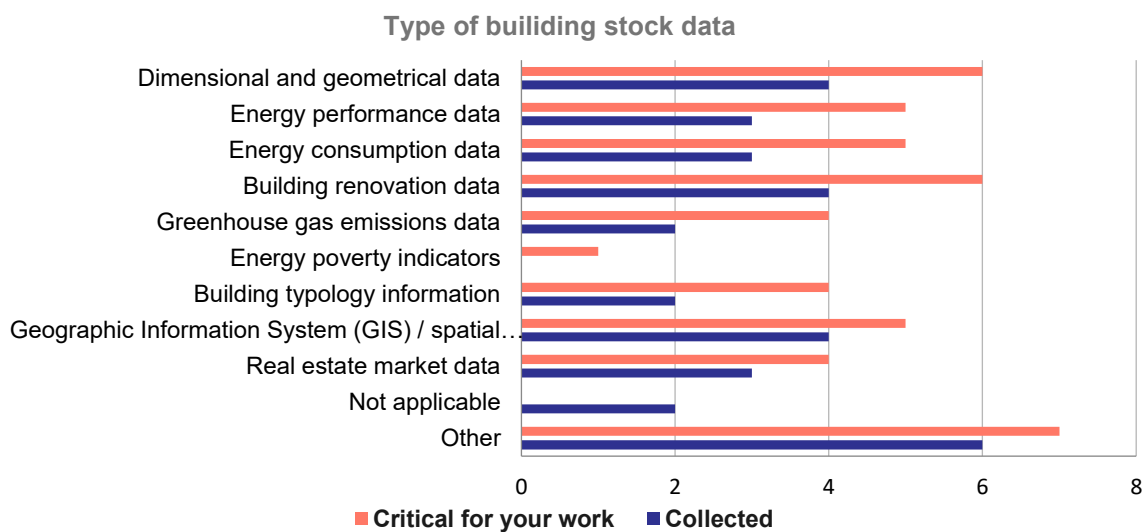


Figure 15. Comparison between the types of building-stock data considered critical for stakeholders' work and those collected by stakeholders (Italy).

When building data are directly collected or exchanged, they are primarily managed through a combination of structured databases, spreadsheets, and GIS-based platforms, although the degree of automation, standardisation, and interoperability varies considerably across institutions (**Figure 16**). While some systems allow for more advanced spatial analysis and structured querying, many data exchanges still rely on semi-manual processes and static formats.

In which format is the data you are currently using available?

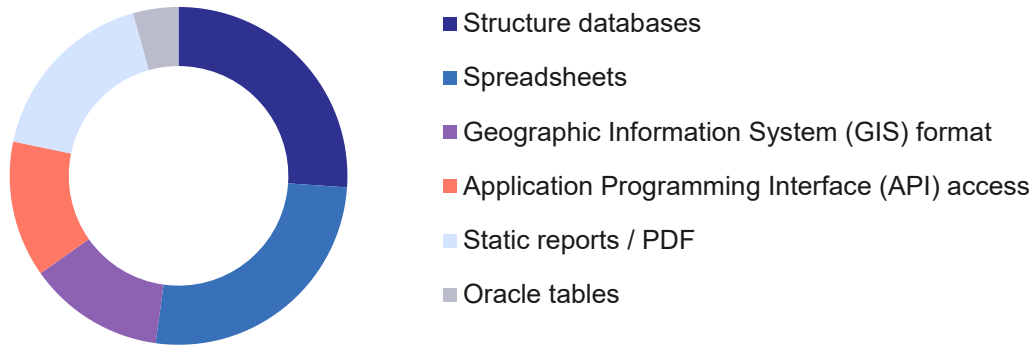


Figure 16. Most common data format used by the stakeholders (Italy).

Among the most frequently used databases are the national EPC registry (“SIAPE”) managed by ENEA; the Building and Land Cadastre and associated GIS archives managed by the Revenue Agency and ISTAT; and a range of internal or sector-specific systems, including datasets maintained by the State Property Agency and professional registries operated by organisations such as FIAIP. In practice, the majority of building-stock data are managed by national authorities or public agencies, sometimes through dedicated internal platforms or in collaboration with research institutes.

Access to these datasets is highly dependent on institutional mandates and the sensitivity of the information involved. Many datasets are only partially accessible or shared under specific agreements, while others remain restricted to internal institutional use. When asked whether public or private reluctance to provide data constitutes a major obstacle, most respondents indicated that this is rarely the primary issue in the Italian context. Instead, limited data accessibility was attributed mainly to administrative and technical barriers, rather than to an unwillingness among data holders to share information.

With respect to the main critical aspects of building-stock data governance, stakeholders converged on a set of recurring challenges. Chief among these are the lack of reliable and consistent data and the fragmentation of information across multiple, poorly connected sources, resulting in insufficient interoperability between datasets (Figure 17). These weaknesses are further exacerbated by non-harmonised methodologies, overlapping institutional responsibilities, and the absence of shared data standards across sectors and governance levels.

What are the main challenges / difficulties currently encountered in your line of work?

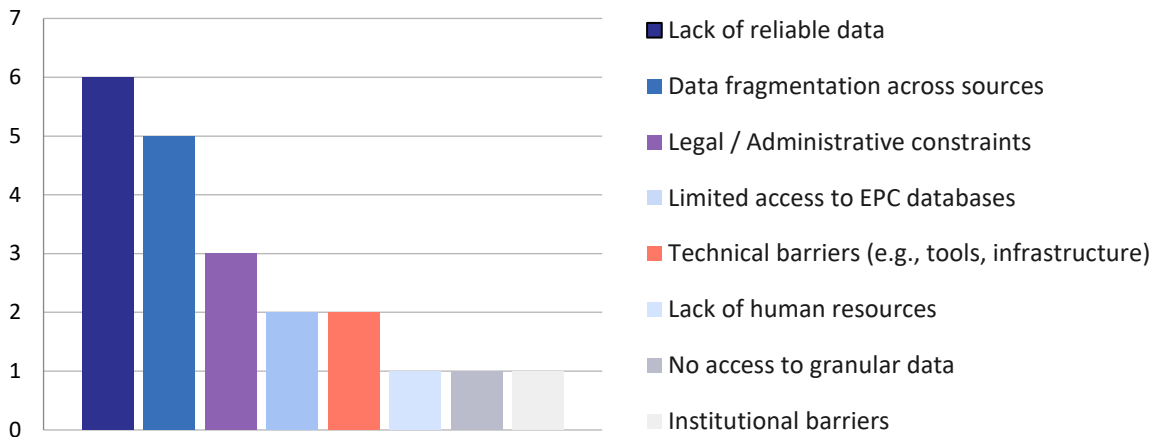


Figure 17. Main challenges and difficulties regarding the collection, management, and use of building-stock data (Italy).

When asked how these challenges are currently addressed, stakeholders described a range of adaptive and largely reactive practices. These include collaboration with universities and research centres, reliance on ad hoc data exchanges between institutions, and the use of GIS-based tools or custom-built internal databases to cross-check and validate information. While such practices help partially mitigate data gaps, they are typically limited in scope and sustainability, as they depend on individual initiatives or project-based arrangements rather than on coordinated, systemic strategies.

Respondents also identified significant gaps in the availability and quality of data related to renovation works, building typologies, ownership and occupancy characteristics, and temporal and spatial consistency. These gaps severely limit the ability to construct comprehensive national inventories and to consistently link technical building characteristics with socioeconomic indicators. As a result, analyses often remain partial and fragmented, reducing their usefulness for strategic planning and policy evaluation.

Several stakeholders further highlighted misalignments between national and regional data systems. Local and regional datasets frequently rely on different classifications, definitions, and reporting practices, which complicates their integration into national frameworks. This fragmentation leads to uneven data coverage across regions, undermines comparability, and creates additional challenges for consolidated national reporting.

Privacy considerations related to GDPR were also reported as a constraining factor for data exchange, particularly with respect to ownership and energy-consumption information. While anonymisation was widely recognised as a viable solution, stakeholders emphasised the need for clearer protocols, shared standards, and institutional guidance on anonymisation practices to facilitate secure data sharing while maintaining regulatory compliance.

Economic and human resource constraints emerged as another critical barrier. Funding for data infrastructures and digital tools is often fragmented, short-term, or project-based, limiting

the capacity to invest in long-term improvements to data quality, interoperability, and analytical capacity. Stakeholders consistently identified stable financial support and sustained capacity-building measures as prerequisites for developing a modern, interoperable, and resilient building-stock data ecosystem in Italy.

The cumulative impact of these challenges on stakeholders' ability to collect, integrate, and process data is substantial. Fragmented and non-interoperable datasets make information gathering and validation time-consuming and complex, often requiring extensive manual reconciliation across sources. This situation reduces data consistency, limits comparability, and undermines the ability to develop a comprehensive and up-to-date overview of the national building stock. Moreover, the absence of shared methodologies and automated quality-control mechanisms constrains the production of coherent analyses and reliable national indicators.

In most cases, data integration across sources continues to rely on manual tools such as spreadsheets or static reports, which are particularly vulnerable to inconsistencies and errors. Some respondents noted that data visualisation platforms, GIS-based applications, and collaboration with research institutions have helped improve validation and accessibility in specific contexts, but these remain isolated or project-based experiences rather than standard practices. Existing standards and frameworks are largely confined to EPC and cadastral systems and are widely perceived as only partially effective, given their limited interoperability and uneven adoption across institutions.

Several respondents emphasised the importance of enhanced training and capacity-building efforts to strengthen inter-institutional collaboration and improve data quality. The development of advanced technical skills, shared procedures, and regular knowledge exchange among institutions are seen as essential steps towards a more integrated and efficient data-management framework.

The challenges identified also directly affect Italy's capacity to transpose and implement EU directives such as the EPBD and to provide reliable data for policy design, monitoring, and reporting. In many cases, decision-making processes are forced to rely on partial, outdated, or proxy information. In this context, the implementation of the EPBD's requirements in Italy was described as progressive but uneven. Stakeholders broadly agreed that the new provisions of the recast directive could act as a catalyst for improvement, but that achieving full compliance will depend on long-term investment in digital infrastructure, enhanced interoperability, and stronger inter-institutional coordination.

Looking ahead to the implementation of Article 22 of the EPBD, which mandates the establishment of a national database on the energy performance of buildings, stakeholders expressed broad agreement on the strategic importance of this requirement for improving data availability and consistency (**Figure 18**). However, differing views were expressed regarding the most feasible implementation pathway.

Is it more feasible to establish a common database or interconnect existing databases?

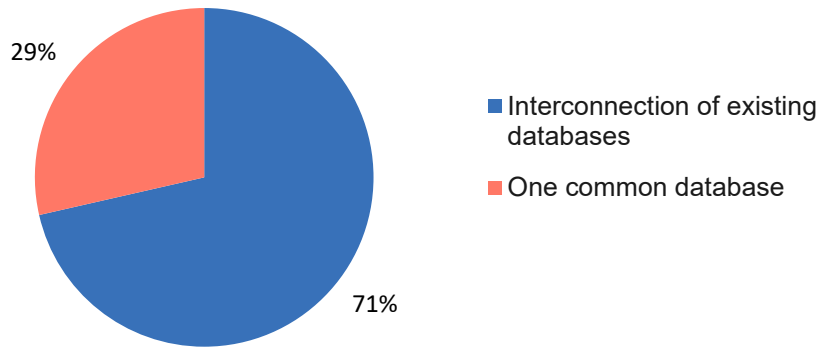


Figure 18. Stakeholders' views on the most feasible approach to improve national building-stock data systems (Italy).

The majority of respondents considered the interconnection of existing databases, such as EPC registries, cadastral systems, and public asset databases, to be the most realistic and resource-efficient approach. By contrast, two (2) respondents favoured the creation of a single, centralised database, arguing that such a solution could simplify governance arrangements and ensure greater long-term data coherence. Despite these differences, there was broad consensus that strong coordination mechanisms, clear data-sharing protocols, and harmonised standards will be essential to ensure that any future system is functional, interoperable, and aligned with the EU's requirements.

Finally, the consultation highlighted that stakeholder cooperation in Italy, while present, remains largely informal and project-based, often relying on personal networks rather than on structured institutional frameworks. Information exchange between agencies is frequently constrained by administrative barriers and the absence of clearly defined protocols for data sharing. Stakeholders agreed that building-stock data management in Italy would benefit from broader and more systematic participation, involving local and regional authorities, research organisations, energy and construction companies, and professional and real-estate associations. Such expanded engagement was seen as critical to achieving comprehensive data coverage, improving coordination between public and private actors, and strengthening the overall coherence and policy relevance of the national building-stock data ecosystem.

4.6. Spain

In the Spanish case study, the national consultation process included five (5) interview meetings, complemented by the involvement of one regional authority in order to explicitly capture the perspective of regional administrations. The interviews were designed to assess the situation of key actors involved across the building-stock data value chain, including primary data collection, aggregated data analysis, public-policy design based on building-stock data, and the transmission of information to the EU.

Despite the relatively limited number of participating organisations, the stakeholders engaged represent a substantial and representative share of the Spanish building-stock data

ecosystem. Collectively, they cover critical functions ranging from the generation of primary datasets to higher-level analytical processing and policy planning, thereby offering a comprehensive view of how building-stock data are currently produced, managed, and used in Spain (**Figure 19**).

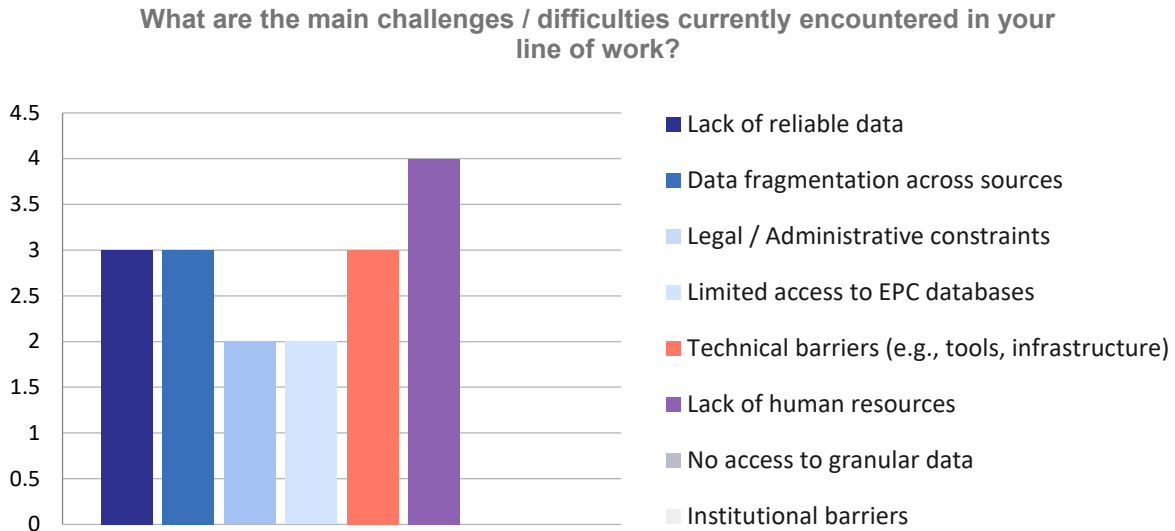


Figure 19. Main challenges and difficulties regarding the collection, management, and use of building-stock data (Spain).

With regard to the availability and quality of data, stakeholders most frequently highlighted issues related to insufficient trust in existing data, followed closely by limitations in human resources. While gaps in specific indicators were also reported, concerns about data reliability were particularly prominent. Stakeholders noted that some of the currently available indicators are not explicitly linked to energy efficiency, which complicates their use for policy analysis and monitoring.

A particularly relevant gap concerns renovation-related information. At present, EPCs do not record the reason for their issuance, making it impossible to determine whether a certificate reflects a renovation intervention or to assess the depth and scope of renovation works. Stakeholders indicated that this limitation significantly constrains the ability to track renovation activity and assess policy impacts. It was noted, however, that the next revision of the EPC format is expected to include information on the scope of renovations, which would substantially improve the availability of renovation-related data.

In addition, stakeholders highlighted the lack of official data on the installation of renewable energy systems and on the performance of thermal systems. While sectoral reports produced by installers or manufacturers exist, these are not considered a substitute for official, standardised datasets, limiting their usability for public reporting and policy design.

Spain's primary data-collection system relies on regional governments, which are responsible for implementing data collection while following data models defined at national level. According to stakeholders, this governance arrangement avoids data overlap and contributes

to overall consistency across regions, even though it introduces additional complexity in terms of coordination and integration.

None of the consulted organisations reported using final energy-consumption data, which is typically owned by energy suppliers. As a result, issues related to GDPR were not perceived as a major barrier in current building-stock data processes. Instead, the absence of access to such data was treated as a structural limitation rather than a regulatory one.

Regarding barriers related to funding and resources, stakeholders generally did not identify these as critical constraints. However, lack of time was mentioned in some cases as a limiting factor, particularly with respect to participation in projects such as OBSERVE. Stakeholders also emphasised that the existing data-collection system- largely based on EPCs and long-established mechanisms- has been in place for more than a decade. Consequently, any changes to data definitions, formats, or documentation must be implemented carefully in order to preserve system stability and functionality.

The issues identified in data collection and processing reinforce the observation that several data sources are not explicitly designed to support energy-efficiency analysis. As a result, stakeholders often rely on alternative sources, assumptions, approximations, or value ranges rather than precise figures, in order to estimate or infer missing information. While such approaches enable continued analysis, they also introduce uncertainty and limit the robustness of policy conclusions.

Furthermore, data-integration practices vary significantly across organisations, reflecting their different roles within the data value chain (Figure 20). Actors responsible for collecting primary data or managing large datasets tend to rely on structured databases, while those engaged in aggregated analysis and policy formulation more frequently use spreadsheets and static reporting formats. The main standards and frameworks applied are inherited from EPC systems and the “INSPIRE Directive”, complemented by more general technical standards such as “SQL”, “XML”, and “JSON”.

In which format is the data you are currently using available?

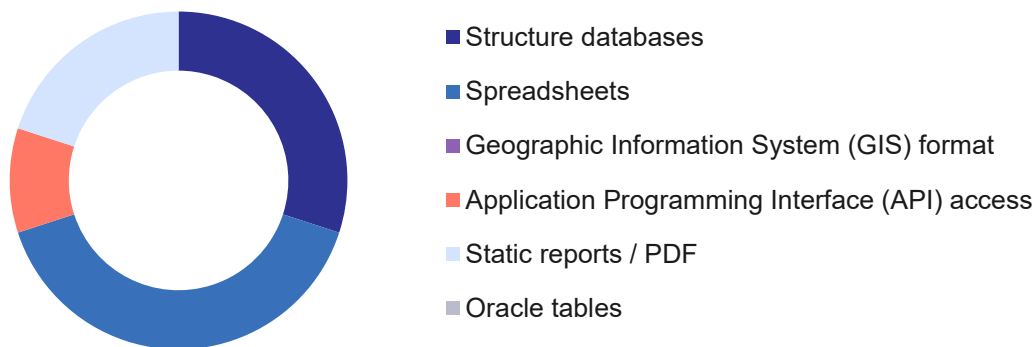


Figure 20. Most common data format used by stakeholders (Spain).

Stakeholders consistently underlined the importance of increased training and capacity-building efforts. In particular, there is a need to strengthen stakeholders' understanding of the full data-governance framework and to encourage clearer responsibility for generating, documenting, and maintaining datasets. Enhanced capacity to design, operate, and maintain structured databases was also identified as a priority for improving data quality and interoperability.

In the context of transposing the EPBD, stakeholders identified several persistent barriers. These include the lack of direct data for certain indicators, the need to estimate values using indirect methods, limited trust in some primary datasets, and the challenge of modifying long-established mechanisms that have been in place for over ten (10) years. In addition, the delegation of energy-policy responsibilities to regional governments adds complexity to harmonised national implementation and reporting.

Looking ahead to the establishment of a national database on building energy performance, most stakeholders expressed a preference for interconnecting existing databases, while acknowledging certain trade-offs (Figure 21). For querying and analytical purposes, several respondents indicated that a single, common database would be preferable in terms of uniformity and consistency. At the same time, they recognised that creating such a database would be significantly more complex, particularly given the decentralised governance structure and the prominent role of regional administrations. In this context, interconnecting regional and national databases was generally seen as a pragmatic and feasible solution.

Is it more feasible to establish a common database or interconnect existing databases?

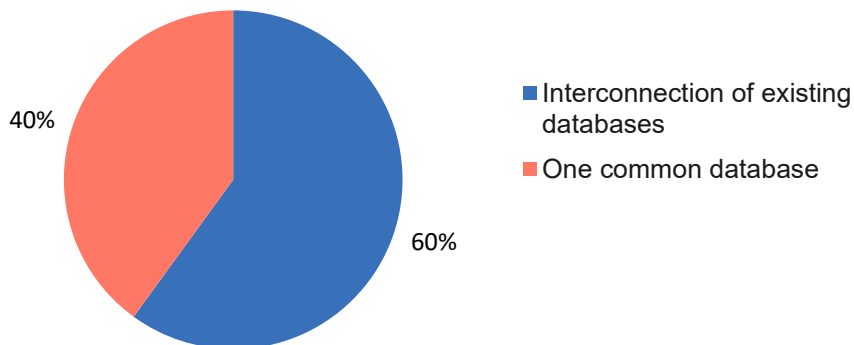


Figure 21. Stakeholders' views on the most feasible approach to improve national building-stock data systems (Spain).

Across both organisations working with primary data and those relying on aggregated datasets, stakeholders indicated that the alignment between critical data needs and currently available data is relatively strong (Figure 22). Nevertheless, several important elements remain insufficiently covered, notably final energy-consumption data, renovation data, emissions data, energy-poverty indicators, and real-estate market information.

These four (4) data categories are characterised by high heterogeneity and fragmented ownership. Final energy-consumption data are held by energy-distribution companies and

would be required to derive emissions estimates; energy-poverty indicators depend on public authorities responsible for socioeconomic studies; and real-estate market data fall largely under the responsibility of private-sector associations and organisations. The absence of systematic mechanisms to integrate these heterogeneous datasets into the building-stock data ecosystem was identified as a key limitation for comprehensive policy analysis.

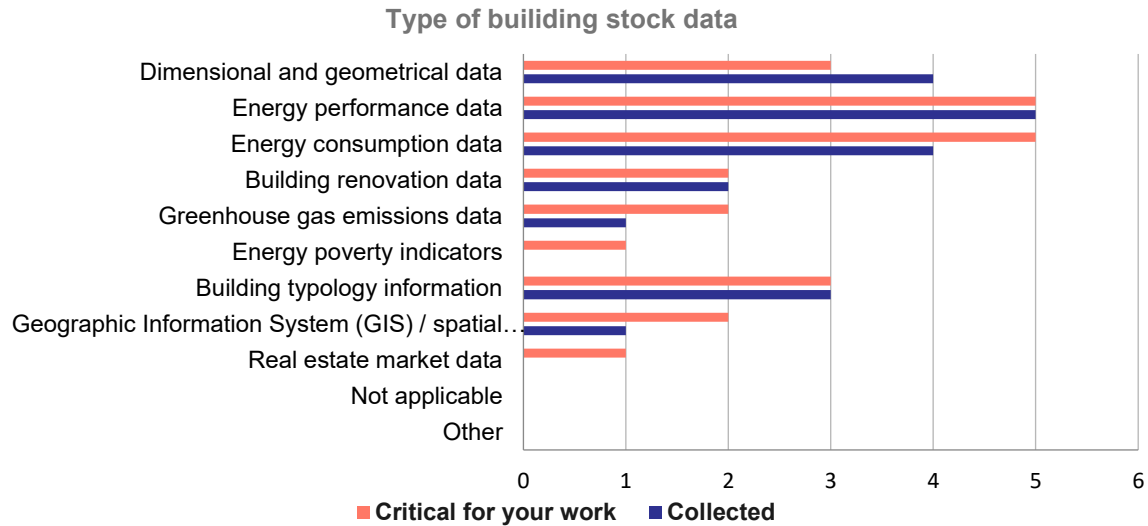


Figure 22. Comparison between the types of building-stock data considered critical for stakeholders' work (Spain).

Overall, the Spanish case illustrates a relatively well-established data-collection framework, underpinned by long-standing mechanisms and clear national and regional coordination structures. At the same time, it highlights persistent challenges related to data completeness, trust, and integration- particularly for renovation activity, final energy consumption, and socioeconomic dimensions- which must be addressed to fully support the implementation of the EPBD's requirements and the development of a robust, policy-enabling national BSO.

4.7. Cross-country synthesis of stakeholder needs and priorities

This section synthesises the main findings emerging from the national consultation meetings (interviews and focus groups) conducted across the six (6) OBSERVE Member States. While national building-stock data ecosystems differ substantially in terms of maturity, governance arrangements, and technical capacity, insights from the consultation process revealed a consistent set of cross-cutting needs, constraints, and priorities that are directly relevant for the design and operationalisation of EPBD-aligned national BSOs. Overall, the evidence confirms that national BSOs are widely perceived as strategically necessary, but their successful deployment will depend on resolving persistent gaps related to data availability and quality, interoperability, governance clarity, institutional capacity, and end-user orientation.

4.7.1. Common structural challenges across national building-stock data ecosystems

Across the OBSERVE Member States, stakeholders repeatedly pointed to **data fragmentation** as a fundamental barrier. Building-stock data are typically distributed across multiple registries, sectoral platforms, statistical sources, and institutional databases that have




evolved independently over time. Even where core datasets exist (e.g., EPC registries, cadastral systems, statistical records), stakeholders reported that they are rarely connected through standardised schemas or shared identifiers, resulting in limited interoperability and high transaction costs for data integration. This fragmentation is compounded by inconsistent update cycles, varying data definitions (e.g., floor-area metrics, typology classifications), and heterogeneous levels of digitisation, which together constrain the construction of coherent, comprehensive, and policy-ready national building-stock inventories.

A second recurring challenge concerns **data completeness** and **coverage**, particularly for policy-critical domains. Across countries, stakeholders highlighted persistent gaps in (i). renovation activity and renovation depth, (ii). technical building systems (e.g., HVAC performance and inspections), (iii). non-residential buildings in several contexts, (iv). socioeconomic and energy-poverty indicators, and (v). renovation financing and investment data. These gaps undermine the ability of national authorities to establish credible baselines, monitor progress over time, and assess the effectiveness and distributional impacts of policy interventions. In several cases, the consultation meetings indicated that decision-making depends on proxies, assumptions, or partial datasets, which limits analytical robustness and can weaken confidence in reported results.

A third, consistently emphasised constraint, relates to **data quality** and **trust**. Stakeholders across countries expressed concern about the reliability of some primary datasets and the difficulty of verifying data at scale. The French DPE example illustrates how volume, complexity, and software-driven inputs can create systemic quality risks even within relatively mature ecosystems. In other contexts, limited automation and manual processing increase the likelihood of errors and inconsistencies. Overall, the consultation meetings showed that quality assurance is not only a technical issue but also a governance one, requiring systematic validation workflows, clear responsibilities, and resourcing.

4.7.2. Interoperability, identifiers, and standardisation as priority enablers

Across all the case-study countries, **interoperability** emerged as a central enabling condition for national BSOs. Stakeholders consistently emphasised the importance of:

-  Adopting **common data models** and **standardised definitions**.
-  Implementing **clear data-collection templates** and **unambiguous parameter specifications** (e.g., gross vs net vs usable floor area).
-  Ensuring **linkage mechanisms** across datasets.

On the other hand, the absence of a **universal building identifier** was reported as a critical limitation in several contexts (explicitly in Croatia and Greece, and implicitly in Italy and Spain), as it prevents the systematic interconnection of EPC data, cadastral information, permits, renovation records, and other datasets. Conversely, the French RNB experience demonstrates the value of an identifier as a technical cornerstone for interoperability, while also highlighting that identifiers alone do not eliminate the administrative and governance effort required to connect institutions and datasets in practice.

Stakeholders also highlighted that interoperability must be approached as both a **technical** and **institutional** task. Even when technical solutions exist, integration is often constrained by institutional boundaries, access permissions, and unclear procedures. Therefore, interoperability requirements need to be embedded in governance arrangements, including formal data-sharing agreements, role clarity, and sustainable operational processes.

4.7.3. Governance and institutional capacity: From project-based exchanges to durable infrastructures

A strong cross-country signal concerns the need to move from informal, project-based, or personality-driven collaboration to **durable institutional governance structures**. Across Greece and Italy in particular, stakeholders described cooperation as often dependent on ad hoc exchanges and individual networks, limiting scalability and continuity. Even in more structured contexts, stakeholders highlighted the importance of clarifying legal mandates for data aggregation, defining responsibilities for national reporting, and securing sustainable financing for observatory infrastructures.

In nearly all Member States of interest, stakeholders emphasised the persistence of human resource and capacity constraints. Shortages of skilled personnel, limited analytical capacity, and constrained budgets slow down system upgrades, reduce the ability to maintain data pipelines, and increase reliance on manual processing. These constraints were explicitly linked to delays in directive transposition and uneven implementation of EPBD provisions. Capacity-building needs were framed not only in terms of technical skills (database management, GIS, API integration, data analytics), but also in terms of shared procedures, documentation practices, and cross-institutional learning.

4.7.4. Access constraints, privacy, and the role of GDPR in practice

Stakeholders' views on data-access barriers reveal important differences across the Member States under study, but also some consistent patterns. In several cases, **limited accessibility** was attributed primarily to administrative and technical constraints rather than explicit unwillingness to share data (notably Cyprus and Italy). In Greece, by contrast, stakeholders reported that reluctance among data holders can further restrict already-limited access conditions, alongside institutional fragmentation and ambiguous permissions. Stakeholders in Spain indicated that GDPR is not presently a major constraint largely because organisations do not use final energy-consumption data (typically held by suppliers), highlighting how “non-use” can function as a practical workaround, while simultaneously limiting analytical completeness.

Across cases, stakeholders recognised that GDPR may become a limiting factor when accessing personal or sensitive data (e.g., ownership, consumption) but also noted that anonymisation and aggregation protocols could enable lawful and useful data sharing. A consistent cross-cutting need is therefore the establishment of clear, shared standards for anonymisation and secure access, enabling policy-relevant use while maintaining compliance and public trust.

4.7.5. Preferred pathways for implementing the Energy Performance of Buildings Directive's Article 22: Interconnection as the dominant strategy



Across the case studies, stakeholders broadly supported the strategic value of the EPBD's Article 22 and the establishment of national building-performance databases feeding into the EU BSO. Importantly, the dominant preference across countries was for an **interconnection strategy**, i.e., linking and synchronising existing databases (EPC, cadastre, permits, public buildings, typologies), rather than creating an entirely new monolithic database. This preference was particularly explicit in Cyprus, France, Greece, Italy, and Spain. Stakeholders generally view interconnection as more feasible in the short to medium term, given legal constraints, resource limitations, and the operational risk of disrupting existing systems that have reached a degree of stability or acceptance.

At the same time, a minority view- present notably in Greece and Italy- supported the creation of a **single centralised database** as a means to simplify governance and improve long-term harmonisation. The consultations indicate that both approaches require strong governance, sustained resourcing, and clear protocols. In practice, several stakeholders implicitly converged towards hybrid architectures: **centralised "back-end" aggregation engines combined with distributed data ownership and modular linkages** (as exemplified by the case of the centralised BDNB in France).

4.7.6. Implications for OBSERVE: Functional requirements and design principles for national Building Stock Observatories

Across the case studies, stakeholders consistently articulated that a national BSO *should not be designed solely for compliance reporting*, but as an **operational decision-support infrastructure**. Several functional requirements and design principles emerge as cross-cutting priorities:

-  **Policy usability** and **multi-level relevance**: National BSOs should support national monitoring and EU reporting, while also enabling actionable insights for regional and local authorities. Stakeholders stressed the importance of territorial analysis and the ability to perform rapid diagnostics of local building stocks.
-  **Temporal comparability** and **"data freshness"**: BSOs must enable tracking over time, including renovations and performance improvements. Stakeholders highlighted that reliance on transaction-triggered EPC issuance creates blind spots in stable parts of the stock, requiring complementary mechanisms.
-  **Transparency**, **trust**, and **quality assurance**: Stakeholders emphasised that observatories must be built on trusted datasets, supported by systematic quality-control procedures and clear accountability for data validation.
-  **User experience (UX)** and **accessibility**: Particularly in France, strong emphasis was placed on ergonomic design and accessibility for non-expert users. Similar expectations were expressed elsewhere in relation to usability by public administrations with limited technical capacity.

-  Integration of **socioeconomic dimensions**: Multiple stakeholders highlighted the need to better integrate social indicators (e.g., energy poverty, vulnerability) alongside technical performance metrics, consistent with the “just transition” orientation of the EU’s policy frameworks.
-  **Training** and **institutional learning**: Across the board, stakeholders requested capacity-building, knowledge exchange, and shared procedures as prerequisites for durable implementation.

4.7.7. Summary: A shared direction with differentiated starting points

In summary, the national consultations revealed a clear shared direction across case-study countries: stakeholders support the establishment of EPBD-aligned national BSOs and recognise their potential to strengthen evidence-based policymaking, monitoring, and reporting. However, the consultation meetings also highlighted that national ecosystems start from different baselines.

France demonstrates a comparatively mature and structured architecture with clear institutional roles and a unique identifier, while Croatia and Cyprus reflect narrower institutional landscapes with specific coverage gaps and capacity constraints. Greece and Italy emphasise fragmentation, access constraints, and the need for stronger coordination, while Spain illustrates a long-established EPC-driven system with persistent gaps in renovation and energy-consumption data and challenges linked to decentralised governance.

These differences imply that OBSERVE’s contributions must combine a shared minimum common approach- grounded in **interoperable datasets**, **standardised definitions** aligned with **EPBD reporting requirements**- with flexible national pathways tailored to institutional contexts and capacities. The evidence gathered from the Phase I of our working approach, therefore, provided a robust foundation for informing (i). the refinement of the **minimal common dataset**, (ii). the design of **national BSO governance models**, and (iii). the technical co-creation activities foreseen under Phase II, with the aim of translating *existing challenges* and *stakeholder needs* into **implementable**, **credible**, and **policy-enabling observatory solutions** across Europe.

5. Stakeholder needs assessment- Phase I: Online survey at the European Union level

In parallel to the national consultation activities, an EU-wide online survey was deployed launched in **M11** (*September 2025*) to complement the qualitative evidence base with broader cross-country insights. By the time of deliverable finalisation (**M15**, *January 2026*), the survey had received responses from **68 participants** in total, representing a wide range of actors active across the six (6) OBSERVE Member States and beyond. Unlike the consultation meetings, the survey followed a non-probability sampling approach, allowing for the inclusion of a diverse and heterogeneous group of respondents drawn from across the European building-stock data ecosystem. The EU survey remains open and will continue to collect responses until the next update of this deliverable.

More specifically, survey participants included policymakers, building-stock data practitioners, technical and industry professionals, researchers, and civil-society actors operating at EU, national, regional, and local levels. This approach ensured that the survey captured perspectives spanning the full data value chain- from primary data generation and technical management to analytical use, policy design, and EU-level reporting- thereby broadening and enriching the evidence generated through the national consultations.

To ensure timely and wide reach across this diverse target audience, a multi-channel dissemination strategy was implemented. At project level, dissemination relied primarily on coordinated social media activities, targeted newsletter circulation, and press-release distribution, complemented by additional outreach actions where relevant. In parallel, partner-level activities reinforced visibility and engagement through:





- Targeted email dissemination within organisational and professional networks, including outreach to sister projects.
- Internal circulation across relevant institutional departments.
- Publication through institutional newsletters and press releases.
- Social media announcements via official organisational accounts.
- Posts on institutional websites and other context-specific communication channels, as appropriate.
- Promotion in relevant national and EU events.

Notably, the survey was featured on the “BUILD UP” platform², the EC’s flagship portal for energy efficiency in buildings, which counts more than **17,000 registered members worldwide**. This significantly enhanced EU-wide visibility and facilitated engagement with a well-established community of practitioners, policymakers, and experts active in the buildings sector. Survey dissemination efforts were systematically monitored through an Excel-based tracking tool, with all partners reporting their activities via this mechanism.

² <https://build-up.ec.europa.eu/en/home>.

5.1. Survey structure, thematic coverage, and scope of activities

Consistent with the overarching methodological framework adopted in OBSERVE, the EU-level survey was structured around a shared thematic logic aligned with the national consultation activities. Specifically, the questionnaire was organised into five (5) main thematic blocks, namely:

-  **General challenges and needs**, including respondents' perceptions of existing tools, key barriers, and EPBD-related implementation issues.
-  **Data availability**, collection practices, and use, focusing on required data types, integration challenges, reporting gaps, and data-reliability constraints.
-  **Data management, interoperability, and infrastructure**, addressing harmonisation practices, integration barriers, system interoperability, and resource requirements.
-  **Stakeholder roles and collaboration**, exploring cross-sector interaction, capacity-building needs, and opportunities for improved synergies and cooperation.
-  **Future data frameworks and policy support**, capturing views on desired national BSO functionalities, alignment with the EU's policy requirements, and priority areas for the development of the OBSERVE solutions.

An additional dedicated section invited respondents to reflect explicitly on OBSERVE, including expected benefits, perceived challenges, and opportunities for future collaboration. This feedback is intended not only to inform forthcoming project activities, but also to validate the relevance and policy alignment of the solutions being developed within the project's scope.

Respondents represented public authorities at national, regional, and local levels, research organisations, energy agencies, statistical bodies, technical committees, professional associations, and private-sector actors involved in construction, real estate, and digital technology services. Collectively, these stakeholders are engaged in a wide range of activities, including EPC administration, cadastral and geospatial data management, renovation tracking, analytical modelling, compliance monitoring, and the broader use of building-stock data to support policy design, implementation, and evaluation.

5.2. Priority data needs and persistent availability gaps

Across all respondent groups, a strong convergence emerged regarding the types of building-stock data considered most critical for professional activities (**Figure 23**). Stakeholders consistently prioritised detailed technical characteristics of buildings, EPC information, renovation history, spatial and georeferenced data, energy-consumption patterns, and GHG emission indicators as essential inputs for policy analysis, strategic planning, monitoring, and modelling.

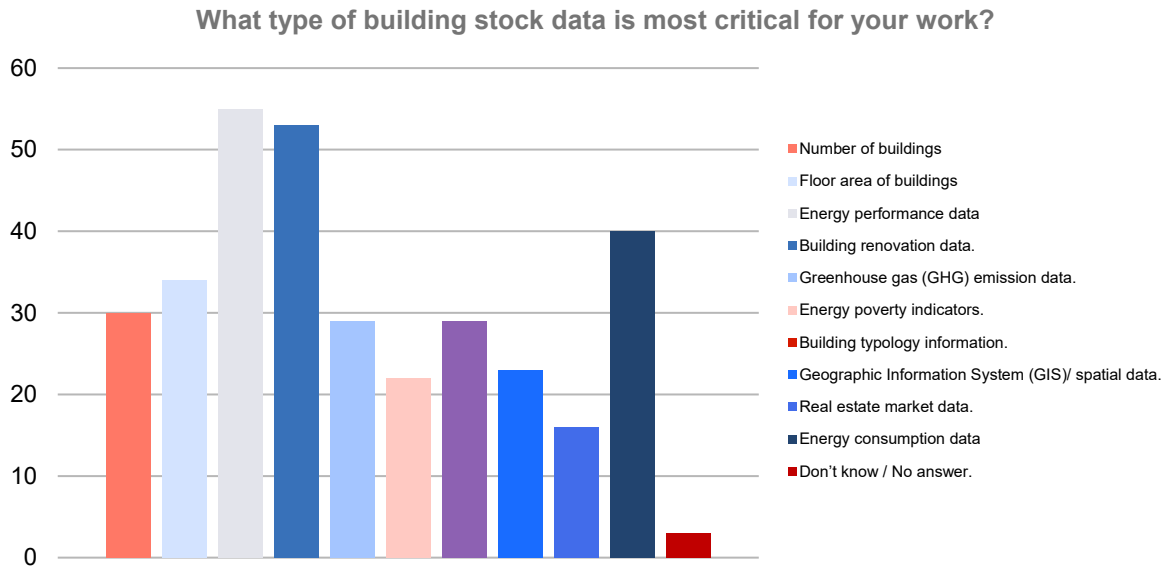


Figure 23. Types of building-stock data considered critical for stakeholders' work (online survey).

Despite these clearly articulated needs, respondents emphasised that many of the most essential data types remain only partially available. Significant gaps persist in renovation-related information, ownership and occupancy data, subnational disaggregation, and socioeconomic indicators. These gaps hinder the capacity to perform robust analysis, identify vulnerable groups, or link building performance with socioeconomic outcomes. The mismatch between data needs and data availability, already visible in several Member States, is therefore confirmed at the EU level.

Despite this clear consensus on data needs, respondents emphasised that many of these essential data types remain only partially available. Significant gaps persist in renovation-related information, ownership and occupancy data, sub-national disaggregation, and socioeconomic indicators. These gaps hinder the capacity to perform robust analyses, identify vulnerable groups, and link technical building performance with broader social outcomes. The mismatch between data needs and data availability- already observed in several Member States- is therefore strongly confirmed at the EU level.

5.3. Data formats, digital maturity, and interoperability

Survey results reveal substantial variation in the formats through which building-stock data are currently accessed and used across Europe (Figure 24). Structured databases are the most widely used format, reflecting reliance on centralised or sector-specific registries. These are followed by static reports and "PDF" documents, and by spreadsheets, which remain common in contexts where digitalisation is still evolving. By contrast, the use of "GIS" formats remains limited, indicating that spatially integrated data systems are far from standard practice across Member States. API-based access is used only marginally, highlighting the scarcity of automated and machine-readable data flows.

In which format is the data you are currently using available?

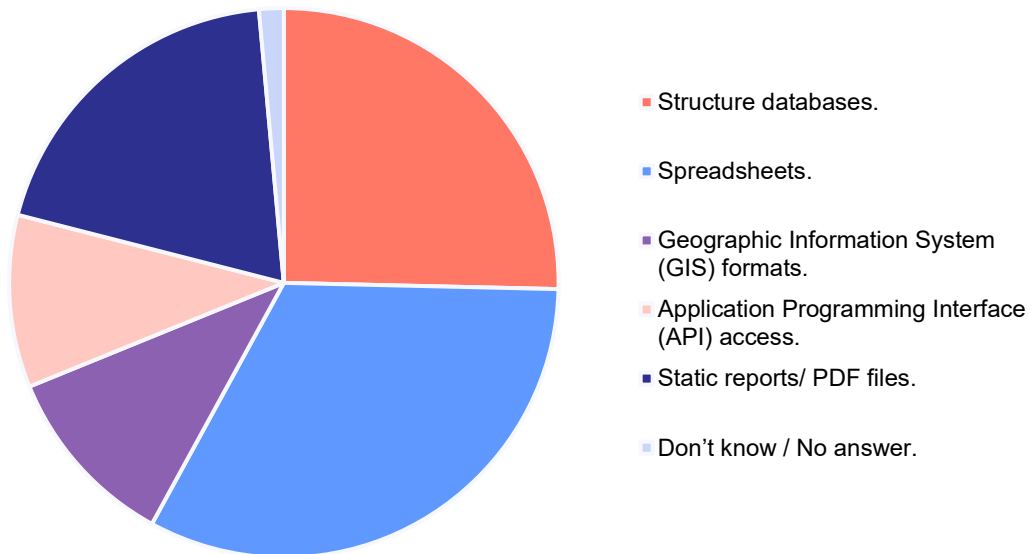


Figure 24. Most common data formats used by stakeholders (online survey).

This distribution illustrates uneven levels of digital maturity across the EU and confirms continued dependence on static or semi-structured formats, which constrain interoperability and increase the burden of manual processing.

5.4. Governance, operational challenges, and mitigation practices

Respondents consistently reported high levels of fragmentation in building-stock data governance (Figure 25). Data are typically distributed across multiple institutions- ministries, energy agencies, cadastral authorities, statistical offices- each operating under distinct mandates, classification systems, and technical standards. Limited access to data was rarely attributed to deliberate reluctance to share information; rather, it was linked primarily to administrative burdens, unclear responsibilities, and methodological inconsistencies. Several respondents also highlighted the existence of relevant datasets held by private actors, such as utilities and real-estate companies, but noted the absence of structured, secure mechanisms for integrating such data into public frameworks.

When describing operational challenges, stakeholders pointed to a combination of structural and practical barriers, including lack of reliable and complete data, fragmentation across systems, limited access to EPC information, and technical limitations in tools and infrastructure. Human-resource shortages and institutional constraints further slow data collection, validation, and integration processes.

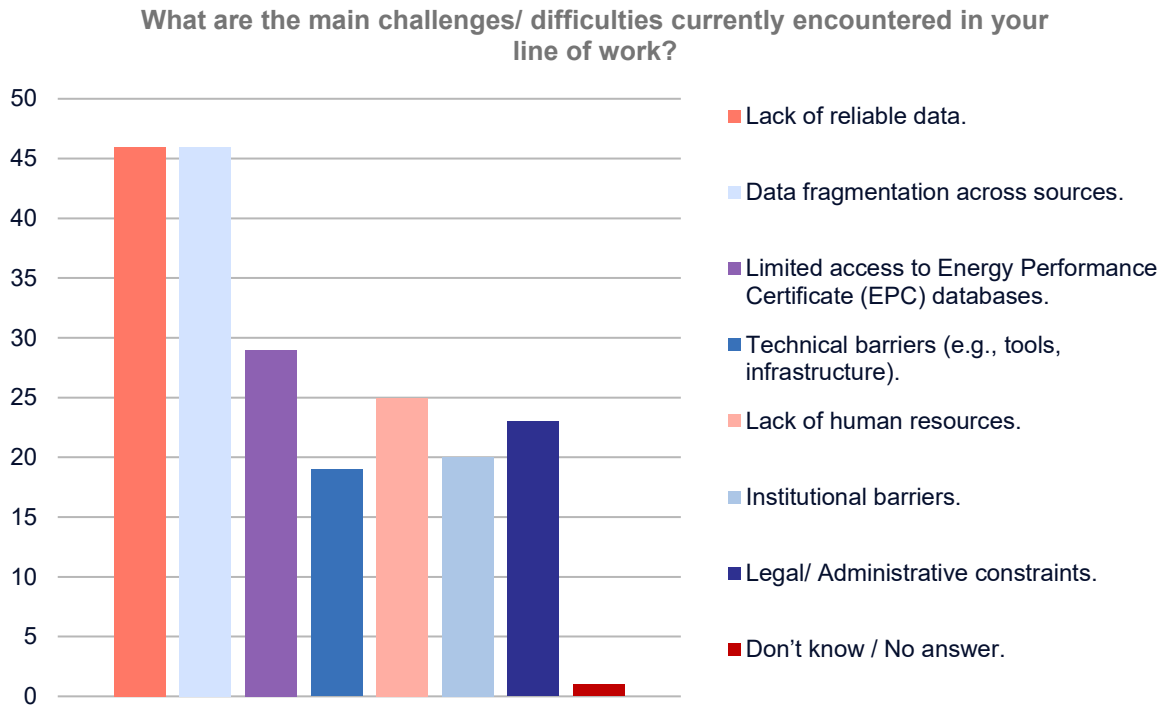


Figure 25. Main challenges regarding the collection, management, and use of building-stock data (online survey).

To mitigate these challenges, stakeholders rely on a diverse range of tools and methodological approaches (Figure 26), including EPC and statistical databases, GIS platforms, in-house analytical tools (often spreadsheet-based), collaboration with research organisations, third-party software, and surveys or field studies. While these practices demonstrate adaptability, they also underscore the absence of standardised, integrated systems capable of supporting consistent workflows across Member States.

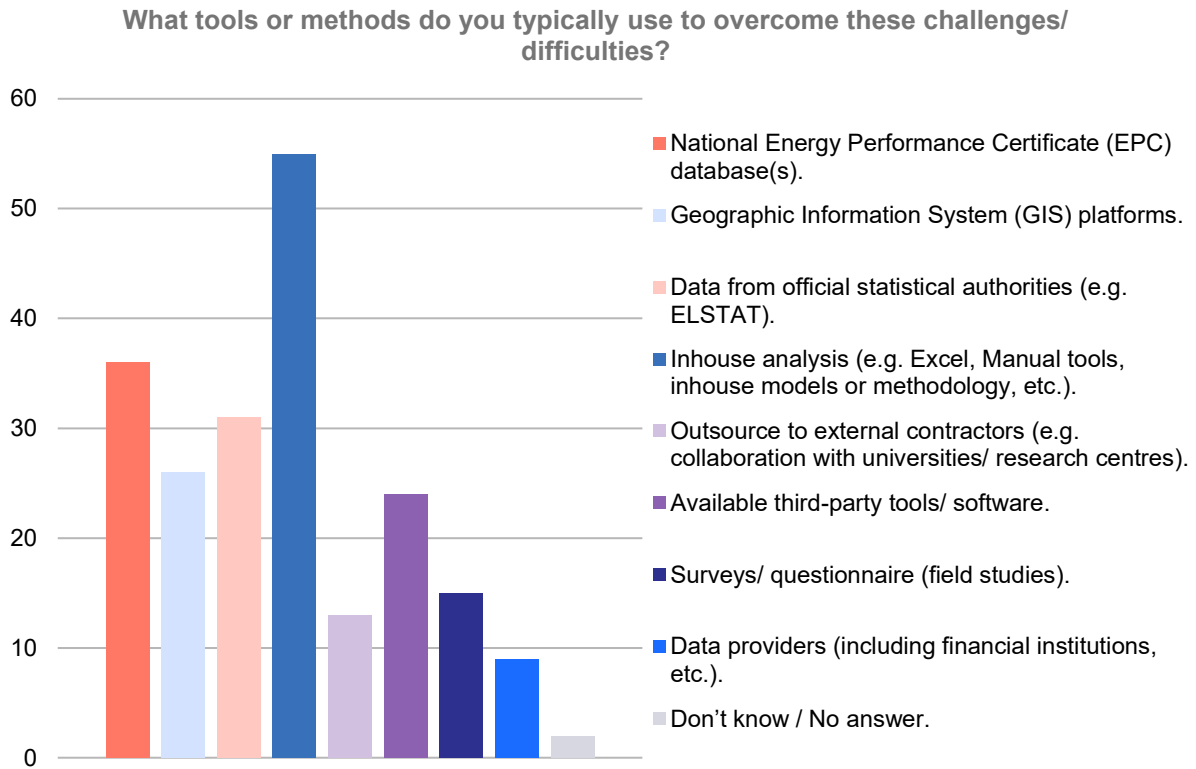


Figure 26. Typical mitigation tools and methods applied by stakeholders (online survey).

Data-protection considerations emerged as an important cross-cutting issue, particularly for datasets involving ownership, occupancy, or energy consumption. Respondents clarified that GDPR itself is not the primary barrier; instead, the lack of harmonised anonymisation and pseudonymisation protocols creates uncertainty and leads institutions to adopt conservative data-sharing practices. Many stakeholders called for EU-level guidance to support secure, legally compliant data exchange.

Resource constraints were also widely reported. Numerous respondents indicated that limited and unstable budgets, combined with shortages of dedicated personnel, constrain their ability to modernise data infrastructure, integrate datasets, and build internal analytical capacity. These constraints often result in reliance on temporary, project-based solutions that undermine the long-term stability and quality of national monitoring systems.

Taken together, these challenges have direct implications for the implementation of the recast EPBD. Respondents repeatedly emphasised that without reliable, harmonised, and interoperable datasets, Member States will struggle to fulfil reporting and monitoring obligations related to renovation trajectories, MEPS, and the transition towards zero-emission buildings. Weaknesses in national systems also affect the reliability of the EU BSO, which depends on consistent and high-quality data inputs from all Member States.

5.5. Perspectives on the Energy Performance of Buildings Directive's Article 22

In this context, the survey explored stakeholder views on the implementation of the EPBD's Article 22, which mandates the establishment of national databases on the energy performance of buildings. Respondents overwhelmingly recognised the strategic importance

of this requirement (Figure 27). However, views diverged regarding the most feasible implementation pathway. A majority favoured the interconnection of existing databases- such as EPC registries, cadastral systems, public-asset inventories, and renovation records- considering this approach more realistic given existing institutional arrangements and financial constraints. Others advocated for the creation of centralised national repositories capable of providing full standardisation and unified governance.

In Is it more feasible to establish a common database or interconnect existing databases?

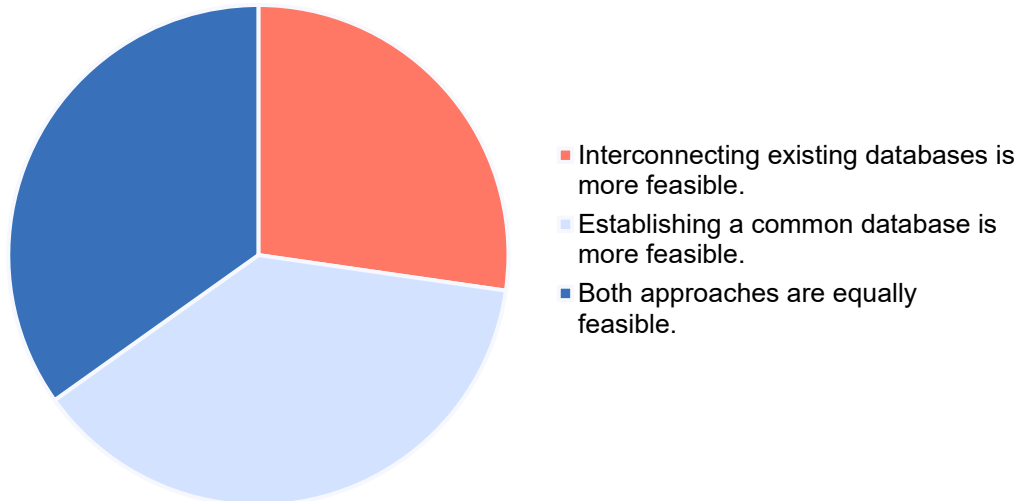


Figure 27. Stakeholders' views on the most feasible approach to improve national building-stock data systems (online survey).

Despite these differing perspectives, respondents converged on the need for strong institutional coordination, harmonised definitions, robust data-sharing protocols, and sustained investments in digital infrastructure and technical capacity. They also stressed the importance of extending collaboration beyond national ministries to include regional authorities, municipalities, social-housing providers, utilities, research institutions, and private-sector data holders.

5.6. Summary: Alignment of the survey findings with the Energy Performance of Buildings Directive's Article 16 and Article 22

Overall, the EU-level online survey confirmed that **cooperation** across building-stock stakeholders remains largely **project-based** and **dependent** on informal networks. Respondents expressed a strong demand for more **stable** and **structured collaboration** frameworks capable of fostering **interoperability**, **improving data quality**, and supporting the **coherent development** of national BSOs. Many highlighted that the progressive establishment of national BSOs, and their systematic integration into the EU BSO, could serve as a key catalyst for **long-term harmonisation**, **improved coordination**, and more effective implementation of the EU policy objectives.

Survey results also provide strong empirical support for the objectives of the EPBD's Article 16, which aims to improve access to building-related data for relevant stakeholders under defined conditions. Respondents consistently identified **limited availability** and **accessibility** of key datasets- particularly renovation data, technical building systems, energy consumption, ownership and occupancy information, and socioeconomic indicators- as a major barrier to effective policy design, monitoring, and evaluation. While stakeholders rarely attributed access constraints to unwillingness to share data, they highlighted administrative burdens, fragmented governance, lack of harmonised anonymisation practices, and unclear access protocols as persistent obstacles.

Survey findings further indicate that existing **access mechanisms** often rely on static or semi-structured formats (e.g., "PDF" format, spreadsheets), with very limited use of APIs or automated data flows. This constrains the **usability** of data for analytical and modelling purposes and undermines the practical implementation of Article 16's ambition to enable meaningful, policy-relevant access to building-stock data. Results therefore underline the need for **clearer operational guidance**, **harmonised data-access procedures**, and **common anonymisation standards** to translate Article 16 into effective practice across Member States.

Furthermore, survey findings strongly validate the rationale underpinning the EPBD's Article 22, which mandates the establishment of national databases on the energy performance of buildings feeding into the EU BSO. A clear majority of respondents recognised the strategic importance of this provision for improving **data consistency**, **transparency**, and **comparability** across Member States. At the same time, stakeholders emphasised that current national data landscapes remain fragmented, with **insufficient interoperability** between EPC registries, cadastral systems, renovation records, public asset databases, and other relevant sources.

In line with Article 22, most respondents favoured an implementation pathway based on the **interconnection of existing databases, rather than the creation of entirely new, monolithic systems**. This preference reflects practical considerations related to institutional mandates, resource constraints, and the risk of disrupting long-standing national systems. However, stakeholders stressed that interconnection alone is insufficient without **common data models**, **unique building identifiers**, **harmonised definitions**, and **sustained investments** in digital infrastructure and institutional capacity.

Overall, the EU-level survey confirms that both EPBD's articles are mutually reinforcing, as improved data access (Article 16) is a prerequisite for functional national databases, while robust national databases (Article 22) are essential for delivering meaningful access, interoperability, and EU-wide reporting. The findings directly support OBSERVE's focus on co-creating policy-enabling national BSOs that operationalise both provisions in a coherent and implementation-ready manner.

6. Conclusions

Deliverable 2.1 presented the preliminary outcomes of the stakeholder needs assessment conducted under the Work Package 2 of the OBSERVE project, with the overarching objective of informing the design, development, and future implementation of national BSOs in six (6) selected EU Member States, namely Croatia, Cyprus, France, Greece, Italy, and Spain. Through a structured and participatory multi-method approach- combining a systematic review of relevant EU and national policy and technical sources with extensive stakeholder consultation activities, including national-level interviews and focus groups as well as an EU-wide online survey- the deliverable provides a consolidated and comparative overview of current practices, structural challenges, and stakeholder expectations related to building-stock data collection, management, governance, and use across diverse institutional and national contexts.

From a methodological perspective, the analysis and interpretation of the evidence collected through the consultation activities conducted were underpinned by a mixed-method approach, deliberately designed to combine qualitative depth with quantitative breadth. On the one hand, semi-structured interviews and focus groups were analysed through a structured thematic coding process, enabling the systematic identification of recurrent patterns, country-specific particularities, and cross-cutting challenges related to building-stock data collection, reporting, and governance. This qualitative analysis provided a nuanced understanding of the technical and operational barriers encountered by stakeholders, as well as the institutional, governance-related, and resource-driven constraints shaping national data ecosystems across the case-study countries.

In parallel, the data derived from the EU-wide online survey was processed using descriptive statistical techniques, allowing for the systematic quantification of stakeholder perspectives across different institutional roles, sectors, and geographical contexts. This quantitative dimension made it possible to identify dominant trends, areas of convergence, and points of divergence in stakeholders' expectations regarding data availability, interoperability, governance arrangements, and the future role of national BSOs. By adding scale and measurable evidence to the qualitative insights derived from interviews, the survey strengthened the robustness of the overall analysis and enabled meaningful cross-country and cross-stakeholder comparisons at the EU level.

Taken together, the triangulation of qualitative and quantitative evidence provided a strong empirical foundation for both in-country and cross-country interpretation of results. This mixed-method design enhanced the analytical validity of the findings and ensured that subsequent conclusions are not driven by isolated perceptions or national specificities but rather reflect broader structural patterns and shared implementation challenges across the EU. Importantly, this triangulated evidence base directly informs the project's forward trajectory, ensuring that all subsequent activities under OBSERVE remain firmly grounded in systematically derived and policy-relevant insights.

Against this empirical background, our findings confirm that, despite the increasingly ambitious and comprehensive EU legislative framework governing the buildings sector, substantial structural and operational barriers continue to constrain effective monitoring, reporting, and evidence-based policymaking at the national level. Across countries and stakeholder groups, respondents consistently highlighted persistent fragmentation of data landscapes, limited interoperability between existing databases, inconsistent definitions and methodologies, and significant gaps in renovation-related, operational, and socioeconomic data. These challenges were not perceived merely as technical shortcomings, but as systemic governance issues embedded in institutional arrangements, legacy data practices, and persistent capacity constraints, collectively undermining the reliability, timeliness, and policy relevance of building-stock data.

In this context, our analysis indicates that these shortcomings are likely to represent a structural impediment to effective compliance with, and implementation of, the revised EPBD. In particular, they directly affect Member States' ability to operationalise Article 16, which requires secure, standardised, and meaningful access to building-related data for relevant stakeholders, and Article 22, which mandates the establishment of national building performance databases contributing to the EU BSO. Without addressing these foundational data and governance gaps, the ambition embedded in the revised EPBD risks remaining only partially realised in practice.

National BSOs were therefore widely perceived by stakeholders as essential policy-enabling instruments for translating EU-level regulatory requirements into actionable national implementation frameworks. Across all the six (6) OBSERVE Member States and stakeholder categories, a strong convergence emerged around the expectation that BSOs should function as interoperable hubs capable of connecting, harmonising, and structuring existing national datasets- such as EPC registries, cadastral systems, renovation databases, public asset inventories, and energy-consumption records- rather than duplicating or replacing them. This preference reflects both pragmatic implementation considerations and a shared recognition of the need to balance harmonisation with respect for national institutional arrangements.

Stakeholders further emphasised that, to fulfil this role effectively, BSOs could be underpinned by harmonised indicators aligned with the EU BSO's framework, transparent and sustainable governance arrangements, clear data-access and data-sharing protocols, and robust quality-assurance mechanisms. Beyond compliance and reporting, user-oriented functionalities- including intuitive interfaces, analytical tools, and data-export or API capabilities- were identified as critical to ensure that BSOs support a wide range of policy, analytical, and planning needs at national, regional, and local levels. In this sense, BSOs are increasingly perceived not merely as reporting infrastructures, but as dynamic policy-support systems enabling continuous learning, evaluation, and adaptive policymaking.

A further key conclusion emerging from the consultation activities concerns the perceived relevance and added value of the OBSERVE project itself. Stakeholders expressed strong interest in the project's objectives and anticipated outputs, recognising OBSERVE as a timely, pragmatic, and implementation-oriented response to the challenges they face under the

evolving EU's policy framework. This recognition was accompanied by a clear willingness to remain actively engaged in subsequent project phases, particularly through technical co-creation workshops, targeted training actions, and capacity-building initiatives. Such activities were consistently identified as critical for ensuring institutional uptake, long-term operability, and sustained use of national BSOs beyond the project's duration.

At the same time, the evidence generated under this deliverable should be interpreted in light of certain limitations. Variations in the scope and composition of national stakeholder consultations reflect differences in institutional accessibility rather than statistical representativeness, while the non-probability sampling approach adopted for the EU-wide survey limits the generalisability of quantitative findings. Moreover, this deliverable captures an intermediate stage of the stakeholder engagement process; further validation, prioritisation, and refinement of findings are expected through forthcoming project activities.

In this respect, the insights generated through this needs assessment will directly shape the thematic agenda and design of the two (2) forthcoming OBSERVE Technical Workshops. These workshops will play a pivotal role in translating identified needs and challenges into concrete, feasible, and stakeholder-validated design choices for the OBSERVE national BSOs, including their functional architecture, data models, and governance options.

Ultimately, a consolidated synthesis of all findings will be reported in the final update of this deliverable. By strengthening methodological rigour, stakeholder engagement, and empirical grounding, OBSERVE is expected to contribute decisively to the development of credible, interoperable, and policy-enabling national BSOs. In doing so, the project will support more coherent national implementation of the EPBD, enhance the reliability and comparability of EU-level monitoring through the EU BSO, and enable more effective, transparent, and socially informed decision-making in support of decarbonisation in the European buildings sector.

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ANNEXES



ANNEX I

Section A

Thematic sections

Table A1. Predefined thematic sections for guiding semi-structured interviews with the national stakeholders.

| | |
|---|--|
| 1 | General information on current challenges and needs |
| | <ul style="list-style-type: none">• Stakeholder's role related to building data |
| | <ul style="list-style-type: none">• Key challenges affecting stakeholders' ability to perform their work |
| | <ul style="list-style-type: none">• Method(s) to overcome the barriers stakeholders are facing, including tools and platforms used |
| 2 | Current challenges and needs in data availability, collection and use |
| | <ul style="list-style-type: none">• Types of data necessary for effective monitoring and reporting |
| | <ul style="list-style-type: none">• Issues faced during data collection, integration, and analysis |
| | <ul style="list-style-type: none">• Gaps in existing building stock data and reporting processes |
| | <ul style="list-style-type: none">• Policy misalignment between national and regional levels |
| | <ul style="list-style-type: none">• Key challenges in ensuring data reliability and consistency |
| 3 | Current challenges and needs in data management, interoperability, and integration of sources |
| | <ul style="list-style-type: none">• Barriers to integrating data from multiple sources |
| | <ul style="list-style-type: none">• Current practices and tools used for data harmonisation |
| | <ul style="list-style-type: none">• Potential for creating interoperable systems or databases |
| 4 | Stakeholders' role and collaboration |
| | <ul style="list-style-type: none">• Sufficiency of resources for the upgrade of data collection infrastructure |
| | <ul style="list-style-type: none">• Key stakeholders and sectors involved in building data management |

| | |
|---|---|
| | <ul style="list-style-type: none"> • Opportunities for improved collaboration among stakeholders • Need for training and/or capacity buildings among stakeholders |
| 5 | Future data framework and policy support |
| | <ul style="list-style-type: none"> • Desired features and functionalities of nBSOs |
| | <ul style="list-style-type: none"> • How stakeholders envision the nBSO supporting their policy-related activities |
| | <ul style="list-style-type: none"> • Priorities for capacity building and alignment with EU and national policy requirements |
| 6 | Stakeholder feedback on OBSERVE |
| | <ul style="list-style-type: none"> • Understanding of OBSERVE's functionalities and tools |
| | <ul style="list-style-type: none"> • Barriers and opportunities to OBSERVE uptake |
| | <ul style="list-style-type: none"> • Impact of OBSERVE functionalities on overcoming barriers in data management |
| | <ul style="list-style-type: none"> • Collaboration after the end of the project, including identifying the next steps |

Section B

Interview questionnaire

1st Thematic section: General information on current challenges and needs

a. What is your primary role in building stock data management?

- Data collection.
- Data analysis.
- Policy implementation.
- Reporting to EU.
- Tool / Platform development.
- Other: _____.

b. What are the main challenges / difficulties currently encountered in your line of work?

- Lack of reliable data.
- Data fragmentation across sources.
- Limited access to Energy Performance Certificate (EPC) databases.
- Technical barriers (e.g. tools, infrastructure).
- Lack of human resources.
- Institutional barriers.
- Legal / Administrative constraints.
- Other: _____.

c. How do these challenges / difficulties impact your ability to transcribe EU directives, such as the Energy Performance of Buildings Directive (EPBD), into national law, and devise national or regional strategies, like the National Energy and Climate Plans (NECPs), or the Long-Term Renovation Strategies (LTRSs)?

- Response: _____.

d. How do these challenges / difficulties impact your ability to gather and process data?

- Response: _____.

e. What tools or methods do you typically use to overcome these challenges / difficulties?

- National Energy Performance Certificate (EPC) database(s).

- Geographic Information System (GIS) platforms.
- Excel / Manual tools.
- Collaboration with universities / research centres.
- Third-party tools / software.
- None.
- Other: _____.

f. How do you perceive the implementation of the EPBD's requirements in [case study country]?

- Fully aligned with current practices.
- Require moderate adjustments.
- Require major changes.
- Unclear at this stage.
- Other: _____.

2nd Thematic section: Current challenges and needs in data availability, collection, and use

a. What type of building stock data is most critical for your work?

- Building stock data.
- Energy performance data.
- Energy consumption data.
- Building renovation data.
- Greenhouse gas emissions data.
- Energy poverty indicators.
- Building typology information.
- Geographic Information System (GIS) / spatial data.
- Real estate market data.
- Not applicable.
- Other: _____.

b. What type of building stock data are you currently collecting?

- Building stock data.

- Energy performance data.
- Energy consumption data.
- Building renovation data.
- Greenhouse gas emissions data.
- Energy poverty indicators.
- Building typology information.
- Geographic Information System (GIS) / spatial data.
- Real estate market data.
- Not applicable.
- Other: _____.
- **How accessible are they for your work?**
 - Response: _____.

c. In which format is the data you are currently using available?

- Structure databases.
- Spreadsheets.
- Geographic Information System (GIS) format.
- Application Programming Interface (API) access.
- Static reports / PDF.
- Other: _____.

d. Do you have the capacity to share the data you are collecting / using?

- Yes, data can be shared publicly.
- Yes, data can be shared under specific agreements.
- Yes, but limited sharing capacity.
- No, data cannot be shared.
- Other: _____.

e. What existed databases are you currently using?

- Response: _____.

f. Who manages this data and how is it accessed / shared?

Response: _____.

g. Are there specific data points or indicators that are currently missing or inadequate?

Yes.

No.

If yes, why is that?

Response: _____.

For example, do you easily find data regarding renovations? What are the main problems that you encounter?

Response: _____.

h. Have you noticed any policy misalignment regarding data collection between the national and the regional levels?

Response: _____.

i. Has public reluctance to provide data hindered your ability to access data?

Response: _____.

j. How does the EU's GDPR regulation impact your access to, or use of, building stock data? Could you provide specific examples?

Response: _____.

k. Have you encountered challenges in accessing data from private companies?

Yes.

No.

l. If yes, what are the main reasons?

Response: _____.

Is GDPR a real limitation? and when / how can a private company force the situation?

Yes.

No.

If yes, in which situation(s)? And when / how can a private company force the situation?

Response: _____.

Is granular data from private entities available?

Yes.

No.

- **If yes, is there any law / force in place to facilitate any exchange? (For public (national or local) authorities)**

Response: _____.

m. In your experience, do economic reasons limit the collection of data?

Response: _____.

3rd Thematic section: Current challenges and need in data management, interoperability, and integration of sources

a. How do you currently manage and integrate data from different sources? What are the primary challenges you face?

Response: _____.

b. What tools or methods have been effective, and where do you see room for improvement?

Response: _____.

c. Are there existing data standards or frameworks that you rely on? How effective are they?

Response: _____.

d. In your opinion, is it more feasible to establish a common database or interconnect existing databases? What challenges do you envision in each approach?

Response: _____.

e. Do you believe there is adequate funding or resources allocated to upgrading data collection infrastructure? If not, what are the biggest gaps?

Response: _____.

4th Thematic section: Stakeholders' role and collaboration

a. Who are the key stakeholders you collaborate with in data management? Have you noticed any problem collaborating with them?

Response: _____.

b. Have you collaborated with, or are you aware of, relevant projects or initiatives related to building energy performance, data collection, or observatory development?

Response: _____.

- **In this context, can you provide details about your key affiliations and networks?**
 - Response: _____.
- c. **What opportunities do you see for enhancing collaboration or forming new partnerships?**
 - Response: _____.
- d. **Are there specific sectors that you believe should be actively involved in building data management?**
 - Response: _____.
- e. **Do you think there is a need for more training or capacity building among stakeholders to improve collaboration?**
 - Response: _____.

5th Thematic section: Future data framework and policy support

- a. **Have you had any previous experience with Building Stock Observatories (BSOs)?**
 - Direct involvement in BSO development.
 - User of existing BSO.
 - Familiar with concept but no direct experience.
 - No previous experience.
 - Other: _____.
- b. **What features would you prioritise in a national Building Stock Observatory (nBSO)?**
 - Response: _____.
- c. **How could such a framework facilitate monitoring and reporting processes? What specific tools or support would be most useful?**
 - Response: _____.
- d. **What functionalities would be particularly beneficial for policy implementation and monitoring? (For regional / local authorities)**
 - Response: _____.
- e. **How would you ensure that data practices align with the EU's or national policy requirements?**
 - Response: _____.
- f. **Are there any specific areas where alignment is particularly challenging?**

Response: _____.

6th Thematic section: Feedback on OBSERVE and exploitation beyond the project

a. To your understanding, what are the main functionalities / tools that OBSERVE could offer?

Data standardisation and interoperability tools.

Harmonised indicators / KPIs.

BSO architecture and interface mock-ups.

Governance models for national BSOs.

Visualisation / Dashboards.

Other: _____.

b. Which OBSERVE concept / functionalities / tools seemed most valuable for your work?

Building stock data harmonisation.

Interoperability with existing databases.

Support for reporting obligations.

Energy Performance Certificates (EPCs) integration.

Regional / Municipal planning applications.

Data-driven energy efficiency policy development.

Building energy performance data standards.

Greenhouse gas (GHG) emissions tracking.

Energy poverty mitigation strategies.

Smart technologies and Internet of things (IoT) integration.

National Building Renovation Plans (NBRP).

Data governance and data privacy.

Digital twins for building stock analysis.

Machine learning for energy prediction.

Geographic Information System (GIS) and spatial analysis for building stock.

National / Regional BSO implementation.

Benchmarking and KPI framework for building performance.

Other: _____.

c. In what ways could the OBSERVE project support your needs, or address current challenges in data collection, management, and interoperability?

Response: _____.

d. What do you think the main barriers to the OBSERVE project are?

Technical (e.g., system incompatibilities).

Institutional (e.g., responsibilities unclear).

Budgetary constraints.

Legal / Regulatory issues.

Lack of awareness.

No major barriers identified.

Other: _____.

e. Can you think of any enabling factor or opportunity for the implementation of OBSERVE?

Reform processes in progress.

Upcoming EU / national funding opportunities.

Open data policy at national level.

Synergies with digital logbooks, Smart Readiness Indicator (SRI), etc.

Willingness from national authorities.

Other: _____.

f. Are you interested in further collaborating during or even beyond the end of the project? If yes, in what way(s)?

Yes- in co-developing OBSERVE tools.

Yes- in reusing results / data structures.

Yes- in piloting OBSERVE in policy work.

No.

Unclear.

Other: _____.

o. In this context, are you willing to participate in any other engagement activity?

Yes.

No.

○ **How much time do you anticipate being able to commit to further engagement activities?**

- High- regular engagement possible.
- Medium- regular engagement possible.
- Low- quarterly engagement possible.
- No available time commitment.
- Project-specific only.

○ **What engagement activities are you willing to participate in?**

- Follow-up interview.
- In-person workshops.
- Written consultation.
- Technical working groups.
- Policy dialogue.
- Training sessions.
- Conference events.
- Other: _____.

g. In what ways could your participation in the OBSERVE project benefit you?

- Provide access to better data.
- Opportunities for knowledge exchange.
- Influence on policy development.
- Technical support.
- Assistance with network expansion.
- Offer research opportunities.
- Support for implementation and compliance with EPBD's requirements.
- Other: _____.

h. In which areas of the project could your expertise be most valuable?

- Policy development.
- Technical expertise.
- Data sharing.

- Implementation support.
- Knowledge transfer.
- Network access.
- Training / Capacity building.
- Pilot testing.
- Other: _____.

i. Can you identify any barriers to your further participation in engagement activities?

- Resource constraints.
- Competing priorities.
- Technical limitations.
- Legal / Policy restrictions.
- Data privacy concerns.
- Other: _____.

j. Finally, what do you think should be the next steps for OBSERVE?

- Integrate OBSERVE tools with ministry / agency systems.
- Propose regional / municipal pilots.
- Explore national co-funding for follow-up.
- Organise national training workshops.
- No clear next steps yet.
- Other: _____.

ANNEX II

Section A

Survey questionnaire

Dear participant,

This survey is conducted as part of the European Commission-funded LIFE-CET project “**OBSERVE**” (Grant Agreement ID: 101167643) to identify stakeholder needs regarding building data availability and to guide the design of national Building Stock Observatories (nBSOs) across six (6) European Union (EU) member states, namely: Croatia, Cyprus, France, Greece, Italy, and Spain.

OBSERVE seeks to address the need for a systematic method of gathering and aggregating quality data by developing innovative data collection methodologies and strategies. Essentially, the project will design OBSERVE prototypal nBSOs aiming to guide national authorities from the six (6) focus countries and beyond to develop their own nBSOs. A robust data framework will enable the EU to better design and refine strategies to accelerate the transition to energy-efficient buildings, as quality data is essential to policymakers and other relevant actors, so that they efficiently monitor energy consumption trends, prioritise renovation efforts, and ensure that relevant actions are aligned with the EU’s overarching climate and energy goals.

In this context, your feedback is of high importance to us, as it will support the collaborative development of the structure and the functionalities of the OBSERVE nBSOs, while ensuring that the developed framework addresses stakeholders’ practical needs and policy challenges effectively.

Privacy statement

Any type of personal data collected will be handled in strict compliance with the General Data Protection Regulation (EU) 216/679, ensuring data privacy, security, and ethical management throughout the project. Your personal data is processed only by authorised OBSERVE project team members and will not be shared with external third parties.

1. What data do we collect?

We process the following personal data from you:

Identification data: specialisation/ working sector, organisation (optional), country of operation, role in organisation, field of expertise, working experience.

Your perspective on questions regarding the data needs and existing gaps for the creation of robust national Building Stock Observatories (nBSOs).

2. Why do we process your data, and on what legal basis?

OBSERVE processes your data in accordance with the GDPR and relevant EU and national data protection regulations. The purpose of data processing is to support stakeholder

engagement, policy development, and data governance strategies related to national Building Stock Observatories (nBSOs). The legal basis for processing is Article 6(1)(a) (consent) and Article 6(1)(f) (legitimate interest) GDPR.

3. Is automated decision-making or profiling used?

OBSERVE does not use automated decision-making or profiling in its data processing.

4. Will your data be transferred to a third country or international organisation?

No personal data will be transferred outside the European Economic Area (EEA) or shared with international organisations.

5. How long will your data be stored?

Your collected personal data will be securely stored for up to 10 years in compliance with scientific best practices, after which it will be deleted.

Questions

The following questions include personal information such job experience, expertise, and position.

Please briefly tell us about your working background, which company or institution you belong to, and if you are familiar with the concept of Building Stock Observatories (BSOs).

a. In which sector or professional domain are you currently active?

- Government body.
- Statistical institution.
- Research institution.
- Private company.
- Industry association.
- Standardisation body.
- Technical expert group.
- Non-governmental organisation (NGO).
- Financial institution.
- Building industry professional.
- Don't know / No answer.
- Other (please specify): _____.

b. What is the name of your organisation? (optional)

Response: _____.

c. In which country your organisation is based?

- AT – Austria.
- BE – Belgium.
- BG – Bulgaria.
- HR – Croatia.
- CY – Cyprus.
- CZ – Czechia.
- DK – Denmark.
- EE – Estonia.
- FI – Finland.
- FR – France.
- DE – Germany.
- EL – Greece.
- HU – Hungary.
- IE – Ireland
- IT – Italy.
- LV – Latvia.
- LT – Lithuania.
- LU – Luxembourg.
- MT – Malta.
- NL – Netherlands.
- PL - Poland.
- PT – Portugal.
- RO – Romania.
- SK - Slovak Republic.
- SI - Slovenia.
- ES - Spain.

SE - Sweden.

d. What is the size of your organisation?

Small (<50 employees).

Medium (50-250 employees).

Large (>250 employees).

e. What is your role in the organisation?

Response: _____.

f. What is the geographic scope of your work?

National.

Regional.

Local.

European.

International.

Don't know / No answer.

g. What is the level of your authority?

(Multiple answers allowed)

Strategic decision-maker.

Technical decision-maker.

Policy influencer.

Implementation role.

Data provider.

Advisory role.

End user.

Don't know / No answer.

Other (please specify): _____.

h. Have you had any previous experience with Building Stock Observatories (BSOs)?

Direct involvement in BSO development.

User of existing BSO.

- Familiar with concept but no direct experience.
- No previous experience.
- Don't know / No answer.
- Other (please specify): _____.

In this section we would like to know about challenges related to building data, which you deal with in your work.

General information on current challenges and needs

a. What is your primary role in building stock data management?

(Multiple answers allowed)

- Data collection.
- Data analysis.
- Policy implementation.
- Reporting to EU.
- Tool/Platform development.
- Don't know / No answer.
- Other (please specify): _____.

b. What are the main challenges/difficulties currently encountered in your line of work?

(Multiple answers allowed)

- Lack of reliable data.
- Data fragmentation across sources.
- Limited access to Energy Performance Certificate (EPC) databases.
- Technical barriers (e.g., tools, infrastructure).
- Lack of human resources.
- Institutional barriers.
- Legal/ Administrative constraints.
- Don't know / No answer.
- Other (please specify): _____.

- c. How do these challenges/difficulties impact your ability to transcribe EU directives, such as the Energy Performance of Buildings Directive (EPBD), into national law, and devise national or regional strategies, like the National Energy and Climate Plans (NECPs), or the National Building Renovation Strategies (NBRPs)?**

(Multiple answers allowed)

- Cause delays in transposing EU directives.
- Affect the quality of strategic plans.
- Increase the cost of the process.
- Limit collaboration with other stakeholders.
- Don't know / No answer.
- Other (please specify): _____.

- d. How do these challenges/difficulties impact your ability to gather and process data?**

(Multiple answers allowed)

- Reduce data accuracy.
- Slow down data collection processes.
- Increase the cost of data collection/processing.
- Hinder system interoperability.
- Don't know / No answer.
- Other (please specify): _____.

- e. What tools or methods do you typically use to overcome these challenges/difficulties?**

(Multiple answers allowed)

- Data from official statistical authorities (e.g., ELSTAT).
- National Energy Performance Certificate (EPC) database(s).
- Geographic Information System (GIS) platforms.
- Inhouse analysis (e.g., Excel, Manual tools, inhouse models or methodology).
- Outsource to external contractors (e.g., collaboration with universities/ research centres).
- Available third-party/custom tools/software.

- Surveys/Questionnaires (field studies).
- Data providers (including financial institutions, etc.).
- Don't know / No answer.
- Other (please specify): _____.

f. How do you perceive the implementation of the EPBD's requirements in your country?

- Fully aligned with current practices.
- Require moderate adjustments.
- Require major changes.
- Unclear at this stage.
- Don't know/ No answer
- Other (please specify): _____.

In this section we would like to know about the challenges regarding data availability, collection and use.

Current challenges and needs in data availability, collection, and use

a. What type of building stock data is most critical for your work?

(Multiple answers allowed)

- Number of buildings.
- Floor area of buildings.
- Energy performance data.
- Energy consumption data.
- Building renovation data.
- Greenhouse gas (GHG) emission data.
- Energy poverty indicators.
- Building typology information.
- Geographic Information System (GIS)/ spatial data.
- Real estate market data.
- Don't know / No answer.

Other (please specify): _____.

o **How accessible are they to your work?**

Response: _____.

b. Do you collect building stock data per building type? If yes, for what building type(s)?

(Multiple answers allowed)

Residential buildings.

Single-family houses.

Multi-family buildings.

Non-residential buildings.

Social housing (buildings or units).

Educational buildings.

Hospitals.

Hotels and restaurants.

Sport facilities.

Wholesale and retail trade service buildings.

Public buildings.

Other type of non-residential buildings (Please describe).

I don't collect building stock data per building type.

c. In which format is the data you are currently using available?

(Multiple answers allowed)

Structured databases.

Spreadsheets.

Geographic Information System (GIS) formats.

Application Programming Interface (API) access.

Static reports/ PDF files.

Don't know / No answer.

Other (please specify): _____.

d. Which existing databases are you currently using?

(Multiple answers allowed)

- National Building Stock Observatory (nBSOs).
- Energy Performance Certificate (EPC) database.
- Digital building logbooks.
- Smart Readiness Indicator (SRI) repositories.
- Smart metering data.
- Remote sensing and satellite imaging.
- National Cadastre.
- Statistical Institution reports.
- Don't know / No answer.
- Other (please specify): _____.

e. Who manages this data?

(Multiple answers allowed)

- Public authorities (e.g., national agencies).
- Private companies.
- Regional authorities.
- Academic institutions.
- Don't know / No answer.
- Other (please specify): _____.

f. How is it accessed/ shared?

(Multiple answers allowed)

- Open and freely shared.
- Restricted access with permissions.
- Not shared at all.
- Don't know / No answer.
- Other (please specify): _____.

g. Are there specific data points, or indicators that are currently missing or inadequate?

(Multiple answers allowed)

- Number of buildings.
- Floor area of buildings.
- Energy performance data
- Energy consumption data.
- Building renovation data.
- Greenhouse gas (GHG) emission data.
- Energy poverty indicators.
- Building typology information.
- Geographic Information System (GIS)/spatial data.
- Real estate market data.
- Don't know / No answer.
- Other (please specify): _____.

h. What are the main problems that you encounter?

(Multiple answers allowed)

- Lack of availability.
- Poor data quality.
- Inconsistent formats.
- Incomplete or ambiguous data description.
- Uncertainty about extent of data requests from other stakeholders (e.g. utilities).
- Uncertainty about the legal form in which data can be obtained or provided.
- Don't know / No answer.
- Other (please specify): _____.

i. Have you encountered challenges in accessing data from public institutions?

- Yes, frequently.
- Yes, occasionally.
- No, rarely.
- No, never.
- Don't know / No answer.

j. How does the EU General Data Protection Regulation (GDPR) impact your access to, or use of, building stock data?

- Significantly limits data access.
- Somewhat limits data access.
- No impact on data access.
- Don't know / No answer.
- Could you provide specific examples?**
 - Response: _____.

k. Have you encountered challenges in accessing data from private companies?

- Yes, it often occurs.
- Yes, but rarely.
- No.
- Don't know / No answer.
- If yes, what are the main reasons?**

(Multiple answers allowed)

- Lack of willingness to share data.
- Legal restrictions.
- High costs associated with data access.
- Don't know / No answer.
- Other (please specify): _____.
- Do private companies ever use General Data Protection Regulation (GDPR) as a reason to deny data sharing?**
 - Frequently.
 - Sometimes.
 - Rarely.
 - Never.
 - Don't know / No answer.
 - Other (please specify): _____.
- In your experience, when can General Data Protection Regulation (GDPR) be a real limitation in accessing data from private companies?**

- When obtaining personal or sensitive data.
- When sharing data across national borders.
- Don't know / No answer.
- Other (please specify): _____.

I. In your experience, do economic reasons limit the collection of data?

- Yes, significantly.
- Yes, somewhat.
- No, not significantly.
- No, not at all.
- Don't know / No answer.
- **If yes, what are the primary economic barriers?**

(Multiple answers allowed)

- High cost of upgrading data collection technology.
- Limited funding.
- High cost of skilled personnel
- Don't know / No answer.
- Other (please specify): _____.

In this section we would like to know about the challenges you face in your work regarding data management, interoperability of databases, and integration of different sources.

Current challenges and need in data management, interoperability, and integration of sources

a. How do you currently manage and integrate data from different sources?

(Multiple answers allowed)

- If possible, common parameters in the analysed sources.
- Automated tools.
- Collaboration with external partners (e.g., universities).
- Geographic Information System (GIS) platforms.

- Inhouse data merging (e.g. Excel, Manual tools, inhouse models or statistical methodology, etc.).
- Outsource to external contractors (e.g. collaboration with universities/ research centres).
- Available third-party tools/software.
- Limited/ No integration of data.
- None.
- Don't know / No answer.
- Other (please specify): _____.

○ **Where do you see room for improvement?**

Response: _____.

b. What are the primary challenges you face when integrating data from different sources?

(Multiple answers allowed)

- Lack of standardised data formats.
- Data quality issues.
- Limited technical expertise.
- Lack of interoperability between systems.
- Limited technical expertise.
- Don't know / No answer.
- Other (please specify): _____.

c. Are there existing data standards or frameworks that you rely on for interoperation with external sources? How effective are they?

- Yes, they are highly effective.
- Yes, they are somewhat effective.
- Yes, but they are insufficient.
- No, we don't use standardised frameworks.
- Don't know / No answer.
- Other (please specify): _____.

d. In your opinion, is it more feasible to establish a national database for the energy performance of buildings consisted of a common database (which would gather data from different sources) or interconnect existing databases?

- Establishing a common database is more feasible.
- Interconnecting existing databases is more feasible.
- Both approaches are equally feasible.
- Don't know / No answer.
- Other (please specify): _____.

e. Do you believe that there are adequate funding/ resources allocated to upgrading data collection infrastructure?

- Yes, adequate funding is allocated.
- No, finding resources are inadequate.
- Don't know / No answer.
 - **If not, what are the biggest gaps?**

(Multiple answers allowed)

- Insufficient funding for technology upgrades.
- Limited skilled personnel.
- Lack of training opportunities.
- Don't know / No answer.
- Other (please specify): _____.

In this section we would like to know details about your collaboration with other relevant stakeholders in data management and related initiatives.

Stakeholders' role and collaboration

a. Who are the key stakeholders you collaborate with when it comes to data management?

(Multiple answers allowed)

- Public authorities.
- Private companies.
- Regional/local government bodies.
- Academic Institutions.

- Don't know / No answer.
- Other (please specify): _____.
- **Have you encountered any problem collaborating with them?**

(Multiple answers allowed)

- Limited communication or coordination.
- Conflicted priorities.
- Lack of shared tools.
- Don't know / No answer.
- Other (please specify): _____.

b. Have you collaborated with, or are you aware of, relevant projects or initiatives related to building energy performance, data collection, or observatory development?

- Yes.
- No.
- Don't know/ No answer.

○ **In this context, can you provide details about your key affiliations and networks?**

- National programmes/initiatives: _____.
- EU-funded projects/initiatives: _____.
- Other (please specify): _____.

c. What opportunities do you see for enhancing collaboration or forming new partnerships?

(Multiple answers allowed)

- Shared platforms or tools for collaboration.
- Capacity building activities.
- More stakeholder engagement events.
- Don't know/ No answer.
- Other (please specify): _____.

d. Are there specific sectors that should be actively involved in building data management?

(Multiple answers allowed)

- Construction industry.
- Real estate market.
- Energy providers.
- Policy and regulatory bodies.
- Private companies.
- Don't know/ No answer.
- Other (please specify): _____.

In this section we would like to gather your insights on priorities, functionalities, and challenges when it comes to the design of national Building Stock Observatories (nBSOs).

Future data frameworks and policy support

a. What features would you prioritise in a national Building Stock Observatory (nBSO)?

(Multiple answers allowed)

- User-friendly interface with visualisation.
- Regular data updates.
- Interoperability with existed systems and databases.
- Data export capabilities.
- Standardised reporting formats.
- Easy access to disaggregated data.
- Compliance tracking with EU directives and national policy requirements.
- Scenario modelling for policy impact.
- Trend analysis tools.
- Don't know/ No answer.
- Other (please specify): _____.

b. How could such a framework facilitate monitoring and reporting processes?

(Multiple answers allowed)

- Dashboard for tracking compliance with EU directives and national policy requirements.
- Automated data aggregation tools.

- Standardised template for reporting.
- Don't know/ No answer.
- Other (please specify): _____.

c. What functionalities would be particularly beneficial for policy implementation and monitoring??

(Multiple answers allowed)

- Easy access to disaggregated data.
- Compliance tracking with EU directives and national policy requirements.
- Scenario modelling for policy impact.
- Trend analysis tools.
- Don't know/ No answer.
- Other (please specify): _____.

d. How would you ensure that data practices align with EU or national policy requirements?

(Multiple answers allowed)

- Enhanced collaboration with relevant stakeholders.
- Establishing standardised data collection practices.
- Establishing standardised governance processes.
- Regular audits and assessment of data collection practices.
- Don't know/ No answer.
- Don't know / No answer.

e. Are there any specific areas where alignment is particularly challenging?

(Multiple answers allowed)

- Harmonising data formats and standards.
- Ensuring frequency of updates.
- Legal/Administrative constraints.
- Limited stakeholder engagement.
- Don't know/ No answer.
- Other (please specify): _____.

f. Are you willing to participate to any other engagement activity?

- Yes.
- No.
- Don't know/ No answer.

g. What engagement activities are you willing to participate in?

- Follow-up interview(s).
- In-person workshop(s).
- Written consultation.
- Technical working groups.
- Policy dialogue.
- Training sessions.
- Conference events.
- Don't know/ No answer



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