

Empowering data platforms: guidelines to enhance the capacity of policymakers & stakeholders

Project acronym	BuiltHub
Full title	Dynamic EU building stock knowledge hub
Ga no	957026
WP, Deliverable #	WP7, D7.8
Version	1.0
Date	14.04.2024
Dissemination Level	Public
Deliverable lead	ICLEI
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Keywords	Governance Layers, Multi-level Governance, Evidence-based Policy, Building Data Community



This project has received funding from the EU's Horizon 2020 programme under grant agreement no 957026.

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1. Introduction

Complementing the [BuiltHub roadmap](#), which is set to be published by project end and establish pathways for enhanced data collection and exploitation, the guidelines compiled in this report serve to provide focused advice to local, national, and EU-level policy makers. This report proffers concise and actionable guidance on how project outputs can be best applied and exploited, with guidance clearly highlighting the benefits of doing so whilst also identifying current challenges and approaches to address these. Underpinning the guidance, the report includes relevant contextual information, where relevant, to highlight the urgent need for action. Moreover, guidance is enriched by the inclusion of stakeholder quotes / testimonials to encourage adoption. The report constitutes three tailored guidance documents, addressing principal layers of governance, with the intention to disseminate content as a compendium as well as in sections for targeted outreach to the three target audiences individually.

Whilst all three guidelines draw inspiration from BuiltHub outputs such as the roadmap, business cases and strategies, each set is informed by additional research or stakeholder inputs received in the context of workshops or dialogues. Moreover, the guidelines benefit from BuiltHub partner engagement in related projects (e.g., [MATRYCS](#), [BIGG](#), [BEYOND](#), et al.), initiatives (e.g., the [European Covenant of Mayors](#), [GlobalABC](#)) and consultation processes (e.g., [recast EPBD](#), [EED](#), [RED](#), [Committee of the Regions opinions](#), etc.).

The concluding remarks in the report reflect on key action areas that cut across layers of governance, whilst also outlining planned efforts to disseminate the three guidelines and reflecting on how BuiltHub achievements will be leveraged in cooperation with government actors beyond the project's lifetime.

2. Local policymaker guidelines

As the level of government that is closest to on-the-ground data collection and management, as well as efforts to enact sustainability transformations, local governments are a key change agent for data.

As key decision-makers within their jurisdictions, local policymakers are instrumental in harnessing built environment data to inform strategic decisions and address community needs effectively. Indeed, local governments are key users and beneficiaries of improved building stock data, considering their role as strategy developer and integrated urban planner, architect, building owner, advisor to private homeowners, aggregator of energy efficiency projects, among others. By utilizing robust, accessible, and comparable data, they enhance urban planning, infrastructure development, and resource allocation. Data empowers policymakers to understand the state of building stock (including performance as well as socio-economic conditions), identify trends, assess the impact of policies, and foster sustainable growth while ensuring equitable access to services such as One-Stop-Shops.

The BuiltHub project, an initiative aimed at centralizing and standardizing built environment data collection and analysis, aligns with the imperative for comprehensive data utilization. It creates the foundation for a rapid and cost-effective transformation of the European building stock by fostering a community of data contributors and users through its accessible datahub platform. BuiltHub promotes the standardization of data governance and services while developing a roadmap to ensure sustained dataflow to the EU Building Stock Observatory (BSO). Through these efforts, the project aims to contribute significantly to the overall decarbonization of buildings across Europe, streamlining information access and enhancing the efficacy of local policymaking endeavours.

BuiltHub holds significant relevance to local policymakers as it provides a centralised platform for comprehensive built environment data collection and analysis, aligning with the imperative for data-driven decision-making. By fostering a community of data contributors and users, BuiltHub facilitates rapid and cost-effective transformation of the EU building stock, crucial for local governments' efforts in urban planning, infrastructure development, and resource allocation. In summary, BuiltHub can enhance the effectiveness of local governance, enabling policymakers to efficiently address community needs while making significant contributions to Europe's overall decarbonisation goals.

The below subchapters provide a summary of actionable steps for the local-level policymakers.

2.1. Summary actionable steps

Enhanced building data accessibility, quality and comparability are critically important underpinnings for evidence-based policy making at local government level. Comprehensive strategies and action plans to address building decarbonisation and socio-economic sustainability transformations in the built environment depend on robust information pertaining to the local building stock. Whilst the "why" is clear, this chapter serves to provide advice on "how" local governments can take concrete steps to create, manage and leverage

built environment data. The local government guidelines draw from the BuiltHub roadmap as well as relevant projects / initiatives and their outputs, whilst also building on insights shared in stakeholder dialogues involving six European ICLEI Member Cities.

2.1.1. Political

The digitalisation of processes or the introduction of new platforms requires substantial investment of time and energy. Against this backdrop, it is imperative that the "buy in" of political stakeholders across possible political divides is secured (to ensure long-term, election-cycle-proofed commitment). Moreover, it should be acknowledged that pushback can be expected within local administrations themselves, as a resulting increasing workload across a multitude of departments is set against limited financial resources to hire additional personnel and/or enhance in-house technical capacities. Against this backdrop, it is imperative that organisation-internal awareness raising efforts focus on benefits of new and improved building data collection / analysis. In conjunction, relevant departments must be involved in the development of any workplans related to setting up or adopting new data platforms and methods, to ensure that concerns voiced are reflected and process ownership moving forward is secured.

"Political support for sustainability initiatives can be temporary, as indicated by upcoming local elections and potential changes in administration,"

- ICLEI Member City

Local government decision makers must not only look within, but it is also imperative that local governments engage in regional, national, and European consultation processes linked to shaping policies, strategies and initiatives linked to built environment data. Going beyond positions lodged in the context of formal consultation processes, local governments should endeavour to engage in the shaping of policies proactively, to ensure that these address on-the-ground opportunities and bottlenecks adequately at the design stage. Considering limited resources and capacities, local governments may wish to join national or international local government networks, to carry out advocacy efforts on their behalf.

2.1.2. Economic

Obtaining the financing for new data collection, storage and analysis processes is flagged as a key precondition for local governments. It is therefore vital that regional and national support is identified and tapped into. Moreover, EU-level funds are often identified as an important source of support that can be availed of. Should no funding be readily available at any governance level, local governments should endeavour to advocate for the introduction of long-term funding, stressing the vital role of improved data for innovation, evidence-based policy making and climate action.

Local government budgets should also be carefully appraised, to identify existing budget envelopes that could be used to enhance buildings data collection and use. To exploit synergies, it may also be prudent to explore collaboration opportunities with neighbouring local governments.

2.1.3. Social

The transformation of the local built environment necessitates the engagement of a broad ecosystem of stakeholders in the renovation and construction value chain. Local strategy development and action planning must capture the needs of a diverse set of actors. To this end, local governments are encouraged to make use of existing solutions such as the BuiltHub data community to inform decision making and drive innovation. Moreover, broad and meaningful stakeholder engagement must underpin the development of local strategies and plans – in general as well as in relation to built environment data specifically.

To support engagement within local government departments and of the broader community of stakeholders, awareness raising on the benefits of built environment sustainability more broadly, as well as smart buildings and data more specifically, must be carried out continuously. In addition to awareness raising, it is important to also gain the trust of data suppliers. One-Stop-Shops (OSS)¹ have proven to be effective vehicles to enhance knowledge and technical capacities in this regard and should be recognised by local governments as an important means to address supply and demand-side fragmentation in the local renovation and construction sector. Local governments should explore their setup

“There is often a lack of trust in administrations or entities accessing personal data.”

- ICLEI Member City

and long-term operation by referring to good practice examples and identify regional, national or EU-level support schemes. When established OSS can, among others, help local governments seize trigger points for the enhancement of data collection and sustainability in building stock as well as aid the identification of identify worst performing buildings and vulnerable groups that require tailored support. Within the context of identifying worst-performing buildings, OSSs play a

crucial role in leveraging data and expertise to assess the performance of existing building stock. By consolidating data from various sources, including energy usage, structural integrity, and occupancy patterns, OSSs can conduct comprehensive building assessments. These assessments help identify buildings that are underperforming in terms of energy efficiency, structural safety, or overall sustainability.

Lastly, in what concerns ensuring the acceptance of data collection initiatives within the local built environment, it is crucial to incorporate a participatory process that involves building owners. This process should focus on clarifying the purpose of data usage, assuring anonymity and aggregation measures to protect privacy, and outlining the potential benefits to the community and individual owners. By actively engaging building owners and soliciting their feedback, local governments can foster a sense of ownership and trust in data collection efforts. Moreover, providing valuable services or insights derived from the collected data back to building owners can further incentivize their participation and support.

¹ A One-Stop Shop (OSS) is a centralized resource supporting stakeholders in construction, providing expertise and streamlining processes. It assists in navigating regulations, accessing funding, and implementing sustainable practices. OSSs serve as hubs for information exchange and collaboration, facilitating efficient engagement across the renovation and construction sector.

Ultimately, building owner acceptance and cooperation are vital for the success and sustainability of data-driven initiatives aimed at improving the built environment.

2.1.4. Technological

An important first step preceding the introduction of new technological solutions and tools for improved buildings data is a thorough stocktaking exercise. Local governments must define local needs in relation to building and other sectoral data. Against this backdrop, local government stakeholders must establish whether their current technologies / platforms are fit for purpose and what their current weaknesses are. Local governments are discouraged from reinventing the wheel – rather, key characteristics of platforms and processes should be defined and the possibility of adapting current solutions or the adoption of existing platforms such as BuiltHub should be explored. When exploring new support tools or platforms, important considerations include: the avoidance of being locked into proprietary software packages; the flexibility of the platform or tool, to allow for the introduction of new indicators or the connection to existing data environments; the security of platforms in terms of GDPR² compliance and external threats. Additionally, it's essential to assess the scalability of the solution to accommodate future growth and the ease of integration with other systems for seamless data exchange and interoperability.

Moreover, national governments can play a crucial role in supporting local governments by providing guidance materials and templates for data collection, along with frameworks for database setup. They can also host centralised databases with designated sections for each local government to utilise, ensuring consistency and efficiency across regions.

Furthermore, building databases are closely intertwined with the digitalisation of existing datasets, such as cadastral data. Integrating building data with these datasets enhances the overall quality and accessibility of information, facilitating more comprehensive analyses and decision-making processes.

2.1.5. Legal

Local governments oftentimes have limited scope to craft regulations and codes that diverge from national or regional frameworks. It is therefore imperative that local government engages in meaningful co-creation to ensure they reflect local opportunities and bottlenecks for a data driven renovation wave and future-proofed new construction.

A key area in which local governments oftentimes can impose legal criteria that go beyond regional or national levels of ambition links to publicly owned buildings and land. Indeed, local governments play a multiple of key roles in shaping the built environment, as: building owner, architect, urban planner, procurer and even as demand-side awareness raiser, supply-side capacity builder or aggregator of energy efficiency projects. Against this backdrop, local governments should endeavour to retain control of their buildings and land by not selling assets, but rather leasing out property or land and link such arrangements to

² General Data Protection Regulation

leasing contracts that stipulate development criteria that go beyond ambitions / minimum requirements set at regional or national level. Such stipulations can include smart building and data-related requirements, more stringent minimum performance standards or social sustainability considerations such as the provision of affordable housing, among others.

2.1.6. Environmental

Tackling built environment sustainability transformations requires an integrated and cross-sectoral approach (see SECAP chapter below, as one example of such planning). At the buildings-level, overarching integrated planning considerations are put into action, with the resolution of synergies and conflicts (e.g., climate adaptation and mitigation, energy security, biodiversity, cutting-edge technology and affordability, social considerations, etc.) coming to the forefront. As already mentioned, it is therefore imperative that the management and shaping of the built environment is understood as a cross-departmental undertaking that requires communication and collaboration within local governments and with the broader local and regional stakeholder ecosystem. Furthermore, local governments must combine data on the physical state of their building stock with additional data sets so that strategies, policies, and actions respond to / align with needs such as blue and green infrastructure provision, the counteracting of biodiversity loss, etc.

In this holistic approach to urban sustainability, integrating sensors onto buildings becomes instrumental. These sensors not only provide valuable environmental insights, such as noise levels, air quality, and heat island effects, but also offer crucial data points for addressing broader sustainability challenges. By incorporating such data into their planning processes, local governments can ensure that their strategies align with diverse needs, from building management to biodiversity conservation, fostering a comprehensive and synergistic approach to sustainability.

2.2. BuiltHub as a tool to support SECAP development, implementation and monitoring

Sustainable Energy and Climate Action Plans (SECAPs) are developed by local authorities or municipalities as part of the European Covenant of Mayors initiative, which is a movement involving local and regional authorities committed to increasing energy efficiency and using renewable energy sources on their territories.

SECAPs outline the actions and strategies that local authorities will undertake to mitigate climate change and adapt to the impacts of climate change. They typically include measures related to energy efficiency improvements in buildings, transportation, and public infrastructure, as well as initiatives to promote renewable energy deployment and sustainable land use planning.

In consultation with stakeholders and citizens, SECAPs act as roadmaps for achieving sustainable energy and climate goals at the local level. Targets, timelines, and indicators for monitoring progress are often included in these plans, aiding local governments in tracking their performance and demonstrating their commitment to sustainability.

The BuiltHub **data community** can be used to enhance public engagement, particularly at the local level, by serving as a conduit for sharing information and fostering collaboration among citizens, local authorities, and stakeholders. By leveraging this data community, citizens can not only stay informed about energy-saving initiatives but also actively participate in decision-making processes related to their community's SECAP progress. This engagement empowers individuals to contribute meaningfully to sustainability efforts while fostering a sense of ownership and responsibility within the community. Moreover, the influence of this data community extends beyond mere awareness-raising, enabling collective action and the implementation of impactful measures to address local challenges effectively.

The BuiltHub **platform** offers a comprehensive suite of data and indicators tailored to support local policymakers in developing, implementing, and monitoring SECAPs. With access to energy consumption data from various building types and greenhouse gas emissions, BuiltHub can empower local authorities, when the respective local data is collected and uploaded, to closely monitor progress towards SECAP targets for energy efficiency improvements and decarbonisation initiatives.

Moreover, through sophisticated analysis tools, policymakers can delve into energy consumption trends, pinpoint inefficient buildings, and accurately measure the impact of implemented measures, facilitating informed decision-making. The platform's data insights can inform investment planning, aiding decisions regarding targeted energy efficiency retrofits or renewable energy installations aligned with sustainability objectives. Finally, by enabling benchmarking exercises, policymakers can compare the energy performance of buildings within their municipality or against regional/national averages, fostering healthy competition and driving continuous improvement efforts towards sustainability objectives.

2.3. Supporting resources

- [Appendix](#) – Summary of the findings of the stakeholder dialogues held with six municipalities.
- [Global Covenant of Mayors - A complete collection of action plans and monitoring reports from MyCovenant reporting platform](#): a dataset containing a comprehensive and harnessed collection of action plans and monitoring reports from MyCovenant platform in the context of the GCoM initiative.
- [CDP Cities, States and Regions Open Data Portal](#): a dataset encompassing climate change and sustainability data sourced from over 1,200 city, state, and regional governments. This dataset comprises information reported by cities through CDP-ICLEI Track platform. The wealth of insights garnered from this dataset informs crucial policy and investor decisions.
- The [Copernicus Urban Atlas](#) furnishes comprehensive land cover and land use maps encompassing 788 Functional Urban Areas throughout Europe.

3. National policymaker guidelines

National governments across the EU have committed to ambitious decarbonisation targets and are in the process of enabling on-the ground action to deliver on these ambitions. Considering that buildings are estimated to be responsible for 40% of the EU's energy consumption and 36% of greenhouse gas emissions, growing attention is being focused on the decarbonisation of the built environment. To take action, national governments require robust data to inform policy making and monitor progress. The following guidelines provide a set of considerations that should be taken on board, to better leverage built environment data as well as supporting tools such as BuiltHub and enable subnational sustainability transformations.

The BuiltHub project aims to centralise and standardise built environment data collection and analysis, fostering a community of data contributors and users. By promoting data standardisation and governance, it lays the groundwork for a cost-effective transformation of the European building stock. BuiltHub aims to sustain data flow to the EU Building Stock Observatory (BSO), contributing to decarbonisation efforts and improving the effectiveness of local policymaking.

3.1. Summary actionable steps

While progress in creating frameworks to establish the enabling conditions for energy efficiency improvements in and the decarbonisation of buildings over recent years are commendable, the urgency to address remaining bottlenecks should not be underexaggerated. The swift and comprehensive transposition of EU directives and improved multi-level governance are perhaps the most pressing areas of action at the Member State (MS) level. Efforts to harness supporting tools and data platforms as well as the development of skills and capacities to collect, manage and analyse data for evidence-based policy making and targeted action should also be highlighted as important. The below subchapters provide some more granular guidance for national policymakers, to catalyse sustainability transformations in the built environment.

3.1.1. Political

Member States are encouraged to swiftly transpose guidance and directives linked to homogenising and improving Europe's built environment data. Prior to transposition, the tailoring to national realities should be mapped out in comprehensive transformation plans that are underpinned by broad and substantive stakeholder engagement. Most pressingly will be to transpose the revised EPBD effectively. It's crucial that this process involves meaningful collaboration among subnational government actors and stakeholders. This collaboration should aim to develop a unified regulatory framework that utilises both qualitative and quantitative data from subnational levels. Moreover, ensuring adequate technical and financial resources at the subnational level is essential for establishing and sustaining robust data systems. A key feature of the recast EPBD will be the development of renovation roadmaps at Member State level, to renovate worst-performing buildings. Subnational governments and other stakeholders need to be actively engaged in this

process to ensure that roadmaps reflect on-the-ground realities and can be operationalised, with sufficient technical and financial resources earmarked for subnational implementation.

In order to effectively identify worst-performing buildings within datasets, it is imperative to establish nationally defined criteria for their classification. This prerequisite ensures that building data can be leveraged accurately to pinpoint these structures. By setting clear and standardised criteria at the national level, Member States can streamline the process of identifying and prioritising renovation efforts for these buildings, aligning with the objectives outlined in the revised EPBD.

3.1.2. Economic


Subnational stakeholder interviews have underscored the importance of funding schemes to support data collection and management. To drive sustainability transformations in the built environment, national governments must ensure that long-term financial support for subnational building data collection and management is made available. It should be stressed that such funding must be offered for the long-term to ensure that established systems can be maintained. In addition to funding data-related initiatives, it should also be stressed that broader funding (incl. private sector and hybrid financing) for sustainable construction and renovation must be unlocked, if Europe is to become carbon neutral by 2050.

Circling back to the cross-sectoral nature of built environment management and shaping, it is important to note that the introduction of tools and processes should be prioritised at national level to support the articulation of integrated on-the-ground strategies and action plans at subnational level. To support evidence-based policy articulation across governance levels, national governments should explore BuiltHub project outputs, particularly its platform functionalities related to streamlined data integration. This data can inform scenario-making processes, leveraging economic considerations to drive the development of integrated on-the-ground strategies and action plans at the subnational level.

3.1.3. Social

A just sustainability transition is a key priority at all levels of governance, and it is therefore imperative that national governments incorporate robust mechanisms to ensure the support of vulnerable groups in plans and actions linked to the built environment. Social sustainability considerations must be anchored in National Energy and Climate Plans (and linked long-term renovation strategies), EPBD-linked renovation planning and associated regulatory frameworks and incentive schemes. Data plays a key role in informing the necessary scope of policies and programmes with tools such as BuiltHub providing functionalities that can be utilised for centralised data collection and scenario planning, facilitating the incorporation of scenarios into decision-making processes.

Together with key stakeholders (subnational government, relevant interest groups, academia, the private sector, etc.) national governments should endeavour to co-create policies and schemes that support those that are most in need. Particularly



“One of the main barriers is the lack of financial resources”.

against the backdrop that buildings with low energy performance can oftentimes be classed as “naturally occurring affordable housing”, it will be important that their identification and later investment efforts are appropriately handled. Lastly, it should be noted that One-Stop-Shops function as a key catalyst to drive private building renovation activity. National governments must develop funding schemes that allow for their setup and long-term operation at subnational level, so that homeowners’ awareness of building renovation benefits is raised and support in navigating (financial) support services is facilitated.

3.1.4. Technological

Whilst technological solutions for the decarbonisation of new and existing buildings exist today, these are oftentimes not yet fully cost competitive. National governments must design building codes as well as subsidy / grant schemes that allow for the mainstreaming of innovative technologies from an economic perspective and ensure that construction / renovation value chain stakeholders have sufficient awareness and technical capacities. Moreover, national governments must ensure that buildings can be constructed or renovated to be “smart”, where relevant, which includes the adaptability for retrofitting innovative technologies including sensors and other means to monitor building performance and share data with platforms such as BuiltHub.

Lastly, it must be emphasised that Article 19 of the recast European Performance of Buildings Directive (adopted in March 2024) calls for the establishment of databases that collect and allow for the Member State and EU-level aggregation of data on the energy performance of buildings. The BuiltHub platform provides a blueprint of how such a database could be set up and operationalised.

“There is a need for clearer guidelines or directives from higher levels of government on choosing appropriate tools or systems”.

- ICLEI Member City

3.1.5. Legal

The importance of multi-level governance to ensure vertical policy alignment cannot be overexaggerated – particularly when addressing a complex and cross-sectoral domain such as the built environment. At this key inflection point in Europe’s quest to decarbonise and future-proof building stock, the swift and comprehensive transposition of key EU directives such as the recast EPBD can be seen as a priority. As already counselled, it will be imperative that regulatory framework reform and the shaping of support schemes is conducted in an inclusive manner, with both broad and deep engagement of subnational governments as well as other stakeholders in the construction / renovation value chain. Built environment data must play a leading role in the formulation of policies that underpin the sustainability transformation of EU Member States’ building stock. To this end, it must be ensured that data collection responsibilities delegated to subnational government level is backed up by appropriate financial and technical support, so that quality, consistency and comparability is ensured.

National legal frameworks must furthermore enable the catalysation of the European Renovation Wave by: [1] enhancing green (public) procurement guidelines to pave the way

for improved building operation monitoring; [2] creating legal requirements and support schemes for the establishment of One-Stop-Shops and other schemes to tackle local supply- and demand-side fragmentation in the construction / renovation market; [3] co-designing and enforce clear and measurable targets on the building decarbonisation and energy efficiency that are backed up by comprehensive support schemes; [4] formulating national guidelines or directives to point subnational government entities towards good practice approaches and useful tools such as BuiltHub to support bottom-up built environment sustainability transformation.

3.1.6. Environmental

Whilst the current discourse on buildings in Europe emphasises the “energy efficiency first” principle and strongly focuses on decarbonisation, the broader environmental impact of the built environment cannot be ignored. National governments must therefore push for the stronger vertical integration of binding targets regarding soil sealing, ensure that integrated planning approaches emphasise blue-green infrastructure and smart densification rather than sprawl and that, at the buildings level the environmental impact of embodied building materials are considered /circular approaches are mainstreamed and green roofs / facades are promoted, for instance. As in the case of carbon and energy, policies must be informed by data: platforms such as BuiltHub can serve as a data repository and scenario-making tool that can incorporate environmental data to develop strategies that tackle sectoral conflicts and synergies (e.g., adaptation vs. mitigation measures) and should therefore be explored for decision making support.

3.2. BuiltHub as a tool to support NECPs

As part of the EU's efforts to achieve its climate and energy targets and meet its commitments under the Paris Agreement, strategic documents known as National Energy and Climate Plans (NECPs) are developed by European Union (EU) member states.

These plans outline, for the period of 2021-2030, each member state's objectives, policies, and measures to address energy and climate-related challenges, in alignment with EU-wide goals. They encompass diverse areas such as renewable energy deployment, enhancements in energy efficiency, targets for reducing greenhouse gas emissions (decarbonisation), initiatives for research and innovation, and strategies to enhance energy security.

NECPs play a significant role in coordinating energy and climate policies across the EU, promoting a more integrated and sustainable approach to energy use and environmental protection. They also contribute to fostering collaboration and sharing best practices among member states to accelerate progress towards a low-carbon, resilient, and secure energy future for Europe.

The BuiltHub **data community** can significantly contribute to supporting National Energy and Climate Plans (NECPs). Firstly, it serves as a catalyst for collaboration among diverse stakeholders, including policymakers, businesses, researchers, and the general public. By fostering an inclusive approach, the data community encourages collective action towards addressing energy and climate challenges, particularly within the building sector. By

facilitating stakeholder engagement and collaboration, the BuiltHub data community promotes knowledge sharing and co-creation of innovative solutions essential for effective NECP implementation. Through these collaborative efforts, stakeholders can leverage valuable insights and expertise to align NECPs with national sustainability goals and commitments.

The comprehensive data and indicators available in the BuiltHub **platform** cater to key areas outlined in NECPs, providing invaluable support to policymakers in their formulation and execution. For instance, BuiltHub can offer insights into decarbonization efforts through indicators such as greenhouse gas emissions and renewable energy usage, facilitating informed decision-making in line with NECP objectives. Additionally, data on energy efficiency metrics, like heating supply efficiency and primary energy demand reduction could aid policymakers in identifying priority areas for intervention within NECP strategies.

By consuming data from BuiltHub, national policymakers gain access to reliable and up-to-date information crucial for NECP implementation and monitoring. Dashboards and storylines provided by BuiltHub might empower policymakers to make evidence-based decisions, such as setting targets and prioritizing interventions effectively.

The BuiltHub platform can also facilitate the sharing of data among countries, enabling cross-border collaboration and identifying regional cooperation opportunities. By comparing data across nations, policymakers can gain insights into regional energy and climate policy landscapes, aiding in the identification of common challenges and opportunities for collaboration. This collaborative approach strengthens the effectiveness of NECPs and promotes alignment with EU energy and climate objectives.

3.3. Supporting resources

- [All National Energy and Climate Plans submitted in 2018](#)
- [Good practices in long-term renovation strategies](#)
- [Smart buildings and smart technologies in Europe: state of play and perspectives](#) - Summary of EU-funded projects on smart buildings that are being / were implemented at MS-level.
- [Assessment of Building Materials in the European Residential Building Stock: An Analysis at EU27 Level](#)
- [New European Interoperability Framework](#): Promoting seamless services and data flows for European public administrations.

4. EU-level guidelines

EU frameworks have been put in place, creating a robust framework for Europe's Green Deal ambitions. In the built environment domain, key noteworthy steps include the recast Energy Performance of Buildings Directive, the amended Energy Efficiency Directive as well as the updated Renewable Energy Directive. Against this backdrop, significant focus is now placed on the translation of these into comprehensive regulations at Member State (MS) level and EU decision makers must ensure that processes are inclusive (marked by broad and meaningful stakeholder engagement) and retain the level of ambition agreed at EU-level. Ensuring data quality and interoperability as well as the leveraging of building data for strategy and action planning as well as policy reform will be an important focus in the upcoming years. BuiltHub project outputs provide valuable insights and tools in this context.

The BuiltHub project concentrates on centralising and standardising data collection and analysis within the built environment. Its goal is to bolster comprehensive data utilisation by nurturing a community of contributors and users via its accessible datahub platform. Through advocating for standardised data governance and maintaining uninterrupted data flow to the EU Building Stock Observatory (BSO), BuiltHub endeavours to play a substantial role in Europe's building decarbonisation efforts. Simultaneously, it seeks to improve information accessibility and enhance the effectiveness of local policymaking.

4.1. Summary actionable steps

Over the past five years, great efforts have been invested to translate the continent's ambition to become carbon neutral into a comprehensive framework to enable action - including in the built environment domain. The set of guidelines summarised below, provide a snapshot of recommended considerations for EU decision makers, to ensure that the overall framework is enabled via supporting MS regulatory reforms. Particularly local governments must be supported, being the closest level of government to on-the-ground action.

4.1.1. Political

The Green Deal has set the trajectory for ambitious efforts to decarbonise Europe's Built Environment. Linked updates to key directives (e.g., EPBD, EED, RED – described further below) have created a comprehensive framework for progressive implementation. Whilst further updates can and should still be entertained in future, the immediate priority should lie on Member State (MS) swift transposition, operationalisation and establishment of enabling conditions for on-the-ground action. European decision-makers are recommended to continue efforts to establish broad consensus across political divides regarding the centrality of the built environment in addressing energy security, the climate crisis, and economic recovery. They should also insist on effective multi-level governance processes for evidence-based policy making and revision at the MS level and promote integrated urban planning such as SECAP development to drive climate action. Additionally, it is crucial to introduce well-considered requirements and guidelines for MS on data collection and management, emphasizing urgency while critically appraising the quality and ambitiousness of MS building renovation plans, building codes, and other relevant regulations. Moreover, it's important to ringfence and even increase EU-level funding for built environment sustainability

transformations (including supporting actions related to data) that can be directly accessed by subnational rather than national governments. Lastly, it's essential to ensure that MS establish sufficient support mechanisms available to subnational governments to collect, manage, and analyse buildings data, as well as to harness supporting tools such as BuiltHub, and translate policies into climate action.

4.1.2. Economic

From an aggregated European perspective, the economic implications of operationalising the EU Renovation Wave are daunting, emphasising the critical role of public subsidies and grants in mainstreaming deep renovations and sustainable construction practises. However, leveraging private finance is essential to adequately address the climate crisis. European Institutions should therefore develop tailored funding mechanisms in cooperation with private finance to drive the aggregated (and potentially serialised) renovation of privately owned buildings. Additionally, they should support local endeavours to tackle supply- and demand-side fragmentation in the building sector by raising awareness of the multitude of co-benefits of sustainable buildings, enhancing private sector capacities and skills, and better exploiting trigger points for energy renovation / construction and the deployment of smart building solutions.

4.1.3. Social

Recognising that the sustainability transformation of Europe's built requires the inclusion of all stakeholders, EU policymakers must ensure that Member States harness the power of Energy Communities and support the formation of groups of change agents modelled on BuiltHub good practices to drive building data sharing and exploitation. Additionally, they should ensure the appropriate utilization of future Social Climate Fund resources and introduce complementary measures to identify and support vulnerable households, including marginalized groups, the elderly, and individuals experiencing energy poverty. Lastly, it should be noted that the EU should promote a mindset shift towards a data-sharing culture – to this end, greater emphasis on awareness raising campaigns, leveraging initiatives such as the European Covenant of Mayors or the New European Bauhaus could be entertained.

4.1.4. Technological

Whilst technological solutions have emerged that promise to disrupt the construction and renovation sector, substantial resources must continue to be invested to drive innovation (e.g., tools, processes, materials) so that new solutions can be replicated and mainstreamed. Noting that innovative EU-funded project with substantial potential may not always be able to establish sufficiently robust business models within given funding periods, follow-up funding for a selected subset of projects could be entertained. Particularly in the buildings domain, where external factors can often delay the implementation of innovation or coordination and support actions, it may be prudent to develop a dedicated funding envelope for de facto project extensions.

Regarding the ultimate use of innovative tools, practices and technologies, tailored human and technical capacity resourcing needs to be addressed at EU-level. Barriers to adoption must consider capacity constraints at the level of municipalities, but also awareness and risk

aversion in the private sector. Overall, the EU would be well-advised to continue promoting the digitalization of processes – and interoperability of data -across the construction and renovation value chain, so that platforms such as BuiltHub can unleash their full potential for data aggregation, storage and analysis, thus lessening the administrative burden on involved stakeholders.

4.1.5. Legal

To ensure the swift and comprehensive transposition of directives, it may be prudent to leverage DG Reform funding, or call for support service tenders, to support multi-level dialogues across the EU, to ensure that policy revisions are co-created from the outset, harnessing data and tools such as BuiltHub and reflecting on-the-ground opportunities and challenges for implementation.

The increased generation and use of data to drive the sustainability transformation of Europe's built environment raises important concerns regarding privacy, ownership / data / intellectual property protection as well as licensing. European decision makers should therefore endeavour to set out clear rules and engage with BuiltHub experts on the development of data provision model agreement and Intellectual Property (IP) rights strategies.

4.1.6. Environmental

As already noted, integrated evidence-based planning is imperative to ensure the reflection of cross-sectoral consideration in the articulation of subnational plans for built environment transformation. It is therefore recommended that the development of SECAPs or similar integrated planning is further mainstreamed. To achieve this, city networks and initiatives such as the European Covenant of Mayors play a central role and should be funded to support peer-exchanges, the promotion of good practices and the offering of technical assistance.

Recognising the cross-sectoral nature of built environment sustainability transformations, EU funding and initiatives should strive to enhance a data-driven understanding of co-benefits, synergies but also conflicts at the subnational level when it comes to balancing a diverse set of development priorities linked to climate adaptation and mitigation, the prevention of soil sealing and biodiversity loss, energy security, a just transition and housing affordability. Moreover, with attention shifting from operational to embodied carbon considerations in the built environment, the mainstreaming of circular principles in construction and renovation will require stronger incentivization, rule setting and data-linked requirements in the lead-up to 2030.

4.2. The EU context for BuiltHub

The upcoming directives, initiatives, and strategies within the EU are poised to shape the future of sustainability in the built environment. Among the directives, the recast Energy Performance of Buildings Directive (EPBD) stands out, requiring member states to develop renovation roadmaps and establish one-stop shops for improved access to information and finance. Additionally, the Renewable Energy Directive (RED) emphasises harnessing

existing datasets and establishing a Union database for renewable energy fuels. The Energy Efficiency Directive (EED) promotes digital platforms for aggregated consumption data and databases for building energy performance certificates. Standards such as those outlined by ISO/TC 59/SC 1380 for organising and digitising building information, ISO/TC 18481 for automation systems, and CEN/TC442 for Building Information Modelling (BIM) play a crucial role in promoting sustainable practises. Additionally, standards like the Industry Foundation Classes (IFC) and Green Building XML (gbXML) Schema facilitate interoperability between building design and engineering software, while the International Cost Management Standard (ICMS) supports benchmarking and reporting of construction project costs.

Moreover, recent initiatives like the European Green Deal and the EU Renovation Wave underscore the EU's commitment to sustainability. These initiatives aim to accelerate building renovations, promote energy efficiency, and create green jobs. National Energy and Climate Plans (NECPs) and the European Covenant of Mayors further drive sustainability efforts at the local level by outlining strategies for energy efficiency and renewable energy integration.

Lastly, the Level(s) framework provides a common methodology for assessing the environmental performance of buildings throughout their lifecycle. European and international standards, such as those for Building Information Modelling (BIM) and automation systems, offer guidelines for sustainable building practices.

The [BuiltHub roadmap](#)³ aligns with these directives, initiatives, and standards, enhancing their value by providing support tools and promoting adoption across the construction and renovation value chain. Additional information is included in the report with the identical title.

4.2.1. Directives

- **The recast Energy Performance of Buildings Directive (EPBD):** The recast directive was adopted by the European Parliament in March 2024 and can be seen as the completing keystone of the EU's "Fit for 55" package, as it paves the way for addressing the EU's climate neutrality goals in the built environment domain. Among others, it requires Member States (MS) to develop renovation road maps to renovate the 16% of worst-performing non-residential buildings by 2030, it tackles the decarbonisation of heating systems and introduces minimum energy performance standards in the non-residential sector as well as binding energy consumption trajectory for the residential sector. Moreover, the EPBD requires MS to establish one-stop shops and improve access to quality information as well as finance.

Specifically related to building stock data, it is noteworthy that:

- Articles 13 and 14 of the regulation focus on enhancing building efficiency and data access. Article 13 strengthens the Smart Readiness Indicator for large non-residential buildings starting in 2026, whilst Article 14 introduces specific provisions for building data access, ensuring that owners, tenants, managers, and third parties can access building systems' data.

³ Roadmap towards dynamic and automated building data collection

- Articles 16 to 19 aim to enhance existing regulations concerning energy performance certificates, including their issuance, display, and management. By 2025, all energy performance certificates within the EU must adhere to a standardized scale of energy performance classes and comply with a prescribed template. These classes will undergo a rescaling process to align with the objective of achieving a zero-emission building stock by 2050.

Moreover, MS are required to establish national databases for energy performance certificates of buildings. These databases will also collect data concerning building renovation passports and smart readiness indicators.

The EPBD also calls on MS to:

- Ensure direct access to building systems' data by interested parties.
 - Introduce 'digital building logbooks' that include on energy performance (e.g., EPCs), renovation passports and smart readiness indicators.
 - Guarantee national building database interoperability, so that data can be shared with the Building Stock Observatory at least once per year.
- **Renewable Energy Directive (RED):** This directive, which was amended and entered into force in November 2023, sets binding targets for increasing the use of renewable energy sources like solar, wind, and geothermal across the EU. Member States have individual targets to achieve by specific dates, promoting a shift towards clean energy production. In relation to data, the RED emphasises:
 - the need to harness existing rather than entirely new datasets.
 - the promotion of initiatives linked to improved demand response in energy systems, through interoperability and data exchange.
 - the protection of commercially sensitive and personal data, where appropriate.
 - the establishment of a "Union database" by November 2024, with public and robust data on the production and consumption of bio- (and recycled carbon) fuels.
 - the need to ensure interoperability of EU and national databases.
 - the use of data and tools for environmental impact assessments of renewable energy projects.
 - **Energy Efficiency Directive (EED):** This broader directive aims to improve energy efficiency across all sectors in the EU. It sets a legally binding target for reducing energy consumption and introduces measures like promoting energy audits, renovating buildings, and improving the efficiency of products and services. In relation to data, the EED calls for, among others:
 - The establishment of digital platforms or tools to facilitate the collection of aggregated consumption data from public bodies. MS to development and

upkeep of databases for building energy performance certificates that include an inventory of public and, where appropriate, social housing and other building stock characteristics (to support private sector energy efficiency project planning, evidence-based policy making – being linked to national building renovation plans).

4.2.2. Initiatives and Strategies

Recent progress in creating the framework for built environment transitions can be attributed substantially to the European Green Deal, a comprehensive initiative aimed at transforming the European Union into a climate-neutral and sustainable economy by 2050. It encompasses a wide range of policies and measures across various sectors, including energy, transportation, agriculture, and industry. Key objectives include reducing greenhouse gas emissions, boosting renewable energy sources, improving energy efficiency, promoting sustainable agriculture and biodiversity, and transitioning towards a circular economy. The Green Deal also aims to create green jobs, ensure a just transition for affected communities, and enhance the EU's resilience to climate change. It represents a bold and ambitious plan to tackle the pressing challenges of climate change and environmental degradation while fostering economic growth and social progress. A key set of legislative initiatives linked to the Green Deal is brought together in the “Fit for 55” package (which includes the REPowerEU initiative). Noteworthy connections to buildings include the packages focus on energy efficiency, renewable energy use, and emissions reduction within the building sector. The

The EU Renovation Wave also deserves to be mentioned in the context of EU-level initiatives, as it aims at improving the energy efficiency and sustainability of buildings across the European Union. It seeks to accelerate renovations of existing buildings to make them more energy-efficient, comfortable, and resilient while reducing greenhouse gas emissions. The Renovation Wave focuses on mobilising public and private investment, promoting innovative financing mechanisms, and providing technical assistance to support building renovations. By upgrading the EU's building stock, the initiative aims to create jobs, enhance living standards, and contribute to the EU's climate and energy objectives. The obligation to develop National Energy and Climate Plans (NECPs) at MS-level can be seen as another important catalyst for Europe's built environment sustainability transformation. The documents include national Long-Term Renovation Strategies, energy efficiency targets, strategies for renewable energy integration, the decarbonisation of heating and cooling, the promotion of smart technologies as well as the outlining of financial support and incentives mechanisms. By nature, the formulation of these plans and linked progress tracking rely heavily on the availability of granular and robust built environment data.

Another noteworthy initiative is the European Covenant of Mayors, which enables built environment sustainability by fostering commitment, knowledge sharing, capacity building, stakeholder engagement as well as access to funding and resources for signatory cities. Through these mechanisms, the CoM empowers local authorities to take concrete actions to promote energy efficiency, renewable energy, and overall sustainability in their communities. The formulation of integrated plans (SECAPs) deserves to be mentioned, as these ensure that climate action in the built environment domain is undertaken holistically and underpinned by a robust monitoring and reporting framework,

Finally, the Level(s) framework deserves to be mentioned, as it paves the way for building design that considers both embodied and operational carbon considerations. The voluntary reporting framework developed by the European Commission promotes sustainable building practices across the EU by providing a common language and methodology for assessing and benchmarking the environmental performance of buildings throughout their lifecycle. Level(s) focuses on six key performance areas: carbon emissions, resource use, water consumption, health and comfort, resilience to climate change, and life cycle cost. By using Level(s), stakeholders can evaluate the sustainability of buildings, set targets for improvement, and track progress towards achieving environmental objectives.

4.2.3. Standards

In the realm of sustainable construction and renovation practices, adherence to established standards is paramount for ensuring interoperability, efficiency, and quality across various stages of the building lifecycle. European and international standards serve as essential guidelines for specific building and data use cases, offering a framework for organisations to align their processes and technologies.

European and international standards exist for specific building and data use cases. Based on BuiltHub community feedback, it is recommended that additional guidelines and support tools for the below-listed standards are formulated to support adoption / compliance across the construction and renovation value chain. Moreover, the development of an overarching standard as well as supporting tools should be considered.

- ISO/TC 59/SC 1380 on “Organization and digitization of information on buildings and civil engineering, including BIM”.
- ISO/TC 18481 on “Automation systems and integration”.
- CEN/TC442 on “Building Information Modelling (BIM)”.
- Industry Foundation Classes (IFC)82 and Green Building XML (gbXML) Schema83 for interoperability between building design and engineering software.
- International Cost Management Standard (ICMS) for benchmarking and reporting of construction project cost84.

4.3. Supporting resources

- [Roadmap towards dynamic and automated building data collection](#): the report presents a roadmap for sustained data flow characterising the EU building stock, from data collection to exploitation, with the purpose to continuously inform and improve building-related policies and business through a community and its data hub.
- [BuiltHub Platform](#)
- [EU Building Stock Observatory](#): A web tool to monitor the energy performance of buildings across Europe.

- [Policy Recommendations from the SmartBuilt4EU project](#): The booklet outlines ten policy recommendations formulated through collaborative efforts by SmartBuilt4EU Task Forces between February 2021 and September 2022. These recommendations were refined by the consortium's expertise and desktop research, with input from over 190 individuals, including members of the SmartBuilt4EU consortium, its Expert Board, and volunteers from the Smart Building Innovation Community (SBIC), many of whom are engaged in EU-funded projects.

5. Conclusion

The BuiltHub guidelines bring together important considerations to inform decision-making and comprehensive action planning by policy makers at various levels in Europe. Importantly, the guidelines emphasise the importance of enabling subnational governments to address on-the-ground opportunities and challenges as well as the value of leveraging BuiltHub project results to drive Europe's built environment transformation.

A key feature that cuts across the three guidelines is the importance of ensuring effective multi-level governance to ensure the impact delivery of the EU Green Deal policy framework in the buildings domain. The guidelines emphasise the importance of broad stakeholder engagement and multi-level co-creation of regulatory measures and incentive schemes – particularly in relation to the Member State transposition of key directives such as the EPBD.

Another element that permeates throughout the guidelines is the importance of underpinning evidence-policy making in relation to buildings with robust datasets. To this end, results from and solutions proffered by the BuiltHub project should be explored – particularly in relation to the establishment of databases and the activation of the building data community.

Recognising the importance of buildings data, the guidelines furthermore stress the importance of dedicated financial support, capacity building and awareness raising in relation to data collection, management and analysis as well as the mainstreaming of standards.

The guidelines pave the way for the broader exploitation of BuiltHub results and will be disseminated in the context of the project's final event as well as via targeted messaging to key policy makers at the local, national as well as EU-level. BuiltHub partners are committed to ensure impact beyond the BuiltHub project lifetime, by exploring the long-term operation of the developed platform itself, but also by incorporating good practices and other learnings in the context of future advocacy work as well as in future project acquisition.

Appendix – Summary of the findings of the stakeholder dialogues held with six municipalities

The following tables contain the key insights collected from two stakeholder dialogues orchestrated by ICLEI, involving the municipalities of Eskişehir (Turkey), Gdynia (Poland), Izmir (Turkey), Valencia (Spain), Limerick (Ireland), and Tartu (Estonia). These dialogues, held on March 6th and March 13th, were instrumental in delving into the interests, needs, and expectations of these cities regarding data and buildings.

Understanding the unique needs and perspectives of each city is crucial as ICLEI works to empower local stakeholders through tailored guidelines. The insights gathered from these dialogues serve as a guiding light, helping us align our efforts with the specific requirements of each city.

During the dialogues, stakeholders explored various aspects of their cities' strategies for improving building energy efficiency and reducing carbon emissions. The discussions were about existing datasets and tools, the level of political support, and challenges related to data management and meeting expectations. The insights gathered from these discussions were essential for the development of Deliverable 7.8.

Eskişehir (TK)
Eskişehir Metropolitan Municipality aims to reduce greenhouse gas emissions by 55 percent by 2030.
Turkey has a program to classify buildings' energy efficiency from A to G (certificates), implemented since 2016. However, only around 10,000 out of 100,000 Eskişehir's buildings have this certificate, making it challenging to address energy efficiency. Collecting data for all 100,000 buildings requires significant resources in terms of money, human resources, and time.
There's a plan to develop a model to predict energy efficiency using sample data, collaborating with technical universities (using a small amount of data to generalize all buildings).
The city representatives highlighted a collaboration with Budapest Metropolitan Municipality where a climate agency is being established to improve energy efficiency in private buildings. The plan is to have a similar agency in Turkey, with a focus on securing funds and loans for renovation. Importance of addressing private buildings' energy efficiency. Around 40% of greenhouse emissions come from private buildings in Turkey, according to the city SECAP, similar to Budapest.
The municipality faces challenges with the national government, possibly due to differences in ideologies or regulations. This can hinder resource allocation or project implementation. To overcome challenges posed by national governments, the municipality explores options such as creating its own funds or seeking European resources.
Currently, projects are carried out in collaboration with European organizations or initiatives such as the Covenant of Mayors or Net Zero Cities . Several times, the municipality expressed interest in European projects indicating a willingness to engage in collaborative efforts. They are open to partnerships and await offers from potential partners.
The municipality faces a major barrier when it comes to accessing energy consumption data from commercial energy suppliers, but currently, there are no rules or rights to directly obtain this data. Privacy concerns for homeowners (may be) a barrier to accessing this information.

The municipality has sufficient technical human resources, but they are dispersed across different departments and working on various issues. There is a need to reorganize these resources to effectively manage energy data. Reorganizing departments and building institutional capacity are crucial steps in this process. There is a need for increased awareness and capacity building within the municipality to better manage and share energy data. Departments such as GIS should also focus on managing energy data alongside their current responsibilities. Currently, their GIS department only works with tasks related to demolishing buildings.

Gdynia (PL)

There used to be a data platform where building administrators could input energy invoice data for communal buildings, but it was closed last year. Data from 2017 till 2023 is available.

Currently, the municipality has data from public buildings, particularly schools. They are also receiving online data from energy distributors, but there is a lack of real-time data from buildings, as the available data is received after a delay of two months. This hinders the ability to identify and address issues promptly.

Even with these barriers, based on this data, the municipality has calculated the carbon footprint and planned activities. Currently, they are in the process of developing a SECAP.

The city faces major challenges with data management, using spreadsheets for now but aim to develop a building management system and energy management system in the future. Financial resources are a major obstacle, as such initiatives are often low on the priority list.

There are plans to implement a building management system for kindergarten buildings, through projects like Horizon Europe projects [BuildON](#) and [META-BUILD](#).

Accessing energy consumption data is challenging due to the absence of smart meters in all buildings and, additionally, the energy suppliers do not provide data about the municipality's own buildings, making it difficult to gather comprehensive information. Energy distributors offer limited granularity in the data provided, with detailed information about energy consumption available only at intervals of one day or one hour. Access to more granular data, such as data collected every 15 minutes, requires payment.

There is a need to educate building administrators and city workers on how to use the collected data effectively. While some individuals within the municipality's department may understand the data, others may require training to interpret and utilize it properly.

There have been attempts to partner with district heating and distribution companies, as well as private-public partnerships, but these efforts have faced challenges, including financial constraints and difficulties in collaboration.

There is support from the city president for initiatives related to energy efficiency and sustainability, although there may be some lack of understanding among stakeholders about how to implement new tools or systems effectively. There is a need for clearer guidelines or directives from higher levels of government on choosing appropriate tools or systems for energy-related projects. Currently, decisions are made based on limited guidance, which can lead to uncertainty.

One of the main barriers is the lack of financial resources, indicating a challenge in funding energy efficiency initiatives and projects.

Energy renovations in buildings primarily rely on support from European projects, with only a few renovations being carried out independently, which suggests a dependency on external funding for energy-related initiatives.

Izmir (TK)

The metropolitan municipality considers the building sector a weak point in their climate plans.

The metropolitan municipality emphasized the challenges in obtaining comprehensive data on building energy performance certificates due to governmental regulations and limitations in accessing data from relevant ministries.

District municipalities bear the responsibility of gathering building-related data and inputting it into ministry systems, yet ministries are reluctant to share this data with municipalities. Without access to comprehensive data from governmental ministries, the ability to develop efficient information is restricted.

Currently, Izmir possesses limited datasets concerning buildings, primarily comprising information on building types (residential, commercial, municipal, etc.) and their respective floor counts. This data is sourced from their GIS platform.

Regarding political commitment to emission reduction: Izmir aims to reduce emissions by 40% by 2030 and is recognized as one of the 112 climate-neutral mission cities (NMC). The SECAP is approved by the City Council, indicating political support and within the SECAP, there are ten outlined actions, including enhancing energy efficiency in buildings, which is crucial in Izmir due to its location near earthquake fault lines. The earthquake hazard presents both challenges and opportunities, prompting the need to upgrade the existing building stock to ensure safety, resilience, and healthiness.

Political support for sustainability initiatives can be temporary, as indicated by upcoming local elections and potential changes in administration, raising uncertainty about future support and motivation. Despite political changes, the municipality emphasizes the continuity of projects, recognizing that election cycles do not align with the continuous nature of sustainability initiatives.

The metropolitan municipality highlighted the importance of granular and location-based data. Detailed data about building stocks and their specific locations are crucial for formulating effective energy efficiency interventions.

Inconsistent data formats, standards, and quality across different institutions (and projects) make it difficult to combine and utilize data effectively.

Securing financial resources for implementing energy efficiency measures in buildings is a challenge, as is navigating regulatory barriers and bureaucratic hurdles.

The metropolitan municipality expressed a desire to learn from the experiences of other cities and countries in overcoming similar challenges.

Limerick (IE)

The municipality monitors energy consumption in all civic buildings, converting it into CO2 emissions and tracking energy costs, including transportation, using an international database by the Sustainable Energy Authority of Ireland.

They aim to reduce energy consumption by 50% by 2030, compared to a baseline average between 2016 and 2018. The city demonstrates progress annually and holds ISO 50001 accreditation.

City experts pointed out specific challenges in data collection: gathering energy bills from all buildings is difficult, and they are procuring a service to automate this process. The city is also experimenting

with a digital twin of the city to aid in energy management.

Limerick has approximately 75 smart buildings providing energy consumption data in real-time, correlating it with environmental monitors to assess air quality and other factors. They aim to promote smart services adoption among building owners to achieve behavioural changes and energy savings. With more building owners sharing data, they could provide better energy profiles and recommend energy efficiency measures and cost savings based on these profiles.

There are challenges with digital twin utilization: building internal skill sets to effectively use the digital twin is a challenge, despite some training during the City Exchange project.

While there is political support, the local government structure in Ireland poses challenges in driving energy efficiency initiatives, though there are signs of progress with the upcoming election of the first directly elected mayor.

Regarding political commitment and support, there is a lack of understanding around building efficiency and climate action at the executive level in Ireland, highlighting the need for education. Presenting data on carbon emissions and showcasing successful initiatives, such as installing heat pumps, can help educate elected members and shift conversations towards climate action and funding allocation. City representatives anticipate a shift in conversations within the next 18 months, as more stakeholders recognize the importance of addressing climate change and allocate resources accordingly.

Despite the interest in climate action, communities are more focused on installing solar panels than understanding building efficiency. There is reluctance to share data, hindering efforts to incentivize others and create advocates for climate action.

Additionally, despite efforts such as providing free sensors and personalized dashboards, getting people to share data, and become champions for climate action remains challenging.

European projects finance data collection efforts but maintaining data access and privacy agreements after project completion is a challenge. Additionally, encouraging citizens to share building energy data is challenging, as they may not see immediate benefits or may be hesitant due to privacy concerns. Finding ways to incentivize citizens to share building energy data, such as emphasizing the benefits to the community, remains an ongoing challenge.

In Ireland, standard rating systems are oriented towards buildings constructed after 1940, leading to historic buildings being rated poorly despite their actual energy efficiency.

Poor energy ratings affect the value of historic buildings on the market, creating a cycle where improving energy efficiency is deemed unprofitable.

Initiatives like developing a digital twin and producing guidance documents for historic buildings aim to provide accurate models and strategies for improving energy efficiency.

Valencia (ES)

City experts highlighted the challenges faced in gathering accurate data on private buildings and the limitations in current tools for assessing building energy performance and recommending renovation measures.

The municipality has a digital platform for internal use, providing information on energy and monetary consumption of public buildings.

Data on electricity and gas consumption for private buildings is available at the city level, but this does not allow for a comprehensive diagnosis of the building stock due to limitations in data precision. Several European projects have attempted to gather information on residential buildings

through various sources, including open data and energy performance certificates. However, the resulting diagnosis is not always accurate due to data limitations.

The Renovale tool utilizes open data sources and matches them with a database of simulated building models to provide information on the energy performance of individual buildings. It offers insights into potential renovation measures, costs, savings, and impacts. But lack of information on building renovations and specific characteristics hinders the accuracy of building diagnoses, limiting the effectiveness of tools like Renovale.

Valencia is currently engaged in a European project that focuses on using real data for building digital twins. This project aims to extrapolate the gathered data to the entire city, and potentially to other regions within the country. Three additional pilots in different countries are also involved in this project, with the goal of utilizing this tool as a data source in the future.

There is a political will to support building stock data sets and tools for building renovation. These initiatives receive backing from both EU projects and public administrations, with financial contributions from regional and national governments. While there is a need for more detailed building-level consumption data to facilitate proper diagnosis and renovation planning, such analysis requires higher budgets than utilizing existing tools and open data sources. In this case, clear political support for increased investment is lacking.

Decision-making at the local level prioritizes social and economic factors over energy concerns when targeting specific neighbourhoods or buildings for renovation. Initiatives such as opening energy offices focus on areas with high energy poverty rates, reflecting broader socio-economic analyses.

Renovation efforts often target areas identified as vulnerable based on socioeconomic factors, including poor building quality and energy poverty. Political support for renovation projects is influenced by these social and economic considerations.

The municipality stressed the difficulty of obtaining data at the necessary level (granularity) of detail and quality to advance to the next stage of analysis.

The city acknowledged the importance of building trust with data providers to encourage their participation in sharing data, as there is often a lack of trust in administrations or entities accessing personal data.

The municipality highlighted that addressing data challenges requires increased financial resources to conduct fieldwork and technical tasks effectively.

Tartu (EE)

Tartu has a good understanding of energy consumption in municipal buildings through building management systems, all integrated into one larger system.

The Regional Energy Agency monitors data and consumption for the region, but data availability varies. For example, obtaining heat consumption data is straightforward because most of the city is served by district heating. The district heating company readily shares building-based consumption data upon request.

Accessing building-based data on energy consumption is challenging due to the National service provider system, where each apartment in buildings has its own contract. Aggregated data on a building level is accessible only to the apartment owner association manager, resulting in limited access overall. The difficulty in obtaining building-based electricity consumption data leads to limited understanding of energy consumption at the building level.

The Ministry of Economy is working on real-time energy certificates, integrating up-to-date energy consumption data into the national building registry. However, this system is still under development and not operational yet. They estimate it will be operational in 3-4 years.

The city is not actively working on understanding building energy consumption at the city level, as they are awaiting the implementation of the national solution. Once the national system is operational, it may render the city-level efforts redundant.

There is overall political support for better understanding and collecting data to make informed decisions, although the focus may not solely be on energy consumption in buildings. Example: There is a greater interest in understanding social indicators and vulnerabilities related to climate change effects, rather than solely focusing on energy consumption at the building level.

While energy consumption data at the building level may not be a top priority, there is more support for data collection at the neighbourhood or city level, although accessing such data may be more challenging.

Emphasis on building management and services: The municipality prioritizes providing services and support to building owners and managers to help them better manage their buildings and understand energy consumption data.

