Affordable sustainable housing in the EU

European Economic and Social Committee

Study on "Affordable Sustainable Housing in the EU"

Final Report

Contents

Foreword

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Within the **Civil Society Organisations' Group**, we have placed the **fight against poverty**, as well as ensuring a just transition, at the centre of our activities. For many Europeans, **housing and energy are the first and biggest household expenses**. Arguably, they should be a priority when it comes to fighting poverty and preventing homelessness.

In addition, **access to decent and affordable housing has become a major concern** in recent years. Fuelled by rises in construction costs, mortgages and short-term rentals, both housing prices and rents have increased in almost all Member States[1]. According to Eurostat, in 2023, more than 10% of households in cities and 7% of households in rural areas spent more than 40% of their disposable income on accommodation. At the same time, the question of **sustainability warrants our attention**, as we will need to continue mitigating the climate crisis through sustainable housing, as well as preparing our homes for increasing environmental hazards.

Therefore, **our Group took the initiative to request an EESC study on affordable and sustainable housing**, which comes at a time of growing awareness of the situation. In her political guidelines 2024−2029, Ursula von der Leyen has committed to urgently "addressing the housing crisis" and designated a Commissioner for Energy and Housing.

In this context, it is with great pleasure that **I commend to you this study on *Affordable Sustainable Housing in the EU***, which was commissioned by the European Economic and Social Committee and carried out by the Center for Social and Economic Research (CASE).

Within the field of affordable and sustainable housing, this research focuses on to two very specific and distinct topics, closely related to the work of many members of our Group: firstly, **the state of play and potential of digitalisation**, and secondly, **the role played by social economy entities when it comes to the provision of housing**. On the basis of case studies in six Member States, the authors explore innovative policy solutions in these fields, with a view to determining their potential to contribute to affordable and sustainable housing in the EU.

Ahead of the new political mandate, this study delivers valuable insights on the potential scalability of these initiatives and their relevance at European level. Against this background, I would like to highlight the study's recommendation for a **joint approach at European level**, supporting Member States in tackling the housing crisis. Furthermore, in this context, let us look at housing in its broad sense, encompassing **habitability and comfort, community and connectivity, economic accessibility, resource efficiency and circularity, as well as resilience and adaptation**, as proposed in this study.

Finally, let me thank my vice-president Rudolf Kolbe, leading on the topic of housing within our Group's presidency and co-rapporteur for the EESC opinion on *Social housing in the EU*. My hope is that this investigation will support **policymakers and practitioners** such as liberal professionals, social economy housing providers and civil society organisations alike, and serve as a call and foundation for further research into the topic.

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[1] European Parliament, Rising housing costs in the EU, October 2024.

Abstract

This study explores policy solutions for affordable and sustainable housing in the European Union (EU), emphasising a number of factors which are crucial throughout the building process: habitability, community, economic accessibility, resource efficiency, circularity, and climate change resilience. It investigates two emerging trends: digitalisation and the integration of social economy entities into housing provision, which not only address immediate housing challenges but also align with broader societal shifts such as ageing populations. Digitalisation optimises planning, construction, and management, enhancing resource efficiency, while social economy entities prioritise community-oriented, sustainable housing solutions that promote affordability, long-term stability, and resilience. The research offers medium and long-term policy recommendations aimed at fostering inclusive, affordable, and sustainable housing across Europe.

Executive Summary

Housing is a fundamental social need and right, essential for human development, identity, and belonging. However, many Europeans struggle to find affordable housing, which affects not only the most vulnerable but also those who earn too much to qualify for social housing yet too little to afford private market accommodations comfortably. In the long term, lack of access to affordable and sustainable housing can lead to health issues, social inequalities, increased healthcare costs, reduced productivity, and environmental damage.

The study maps and analyses policy solutions and initiatives for affordable and sustainable housing in the EU, focusing on:
  ➢ **digitalisation in the housing sector;** and
  ➢ **housing structures involving the social economy**.
It identifies widely accepted typologies of affordable and sustainable housing, assesses factors impacting affordability and sustainability, and reviews existing policy frameworks, governance mechanisms, and financing opportunities. Additionally, it evaluates the coordination of housing initiatives and the effectiveness of collaboration patterns. The methodology used in this research combines a literature review, the examination of key databases and a case-study-based approach. The findings from these analyses inform policy recommendations for the medium-term (up to 2030) and long-term (up to 2050).

What Makes Housing Affordable and Sustainable?

Affordable sustainable housing is a complex issue influenced by social, economic, environmental, and institutional factors. Although not official, legal or regulatory definitions of affordability typically relate to housing cost compared to income levels and are shaped by a wide range of factors – underlining the interplay of economic, regulatory and demographic forces in a country. Sustainability of housing, however, encompasses environmental, social, cultural, and economic dimensions.

Taking into account both concepts—housing affordability and housing sustainability—**affordable sustainable housing encompasses a number of factors that ought to be applied throughout every phase of the building and construction process, which can be clustered around five main themes: habitability and comfort, community and connectivity, economic accessibility, resource efficiency and circularity, as well as resilience and adaptation to climate change.**

Policy perspective

While the EU lacks direct authority in housing policy, it plays a significant role in shaping housing conditions through various initiatives aimed at affordability, sustainability, and social inclusion. Key initiatives include, among others: the European Pillar of Social Rights (EPSR) and the European Green Deal (EGD), including Renovation Wave Strategy, Fit for 55 Package, Energy Performance of Buildings Directive (EPBD), and, most importantly, New European Bauhaus (NEB).

Housing policies in the EU-27 countries differ significantly due to unique historical developments, demand characteristics, and national regulations, leading to distinct national profiles. However, there is limited comparative research on this topic. When it comes to governance structures of housing policies, they do not align with typical country groupings or state organisation patterns. Four types of governance structures were identified: concentrated, overleaping, scattered, and sectoral, which also vary in terms of levels of governance.

Instruments of affordable housing policy can be divided into supply-side measures (e.g., development of social/affordable housing) or demand-side measures (e.g., housing allowances). Since 2009, there has been a trend towards reduced public expenditure on supply-side measures and

increased expenditure on demand-side measures. Sustainable housing policies consider social, economic, and environmental factors, using direct benefits (grants, subsidies) and indirect benefits (favourable fiscal and lending conditions, regulations).

Digitalisation and Affordable Sustainable Housing

Digitalisation levels vary significantly across the EU-27; eighteen countries have policies for digitalising construction, with some focusing specifically on the sector. However, nine countries lack dedicated strategies for digitalising building permits, which remain paper-based or partially digital in many states. Building Information Modelling (BIM) adoption is moderate across the EU, mainly among larger firms in the private sector. Databases on building energy performance are also unevenly implemented. Artificial Intelligence (AI) in construction is in its early stages, mostly in pilot projects.

The case studies of Plandata.dk in Denmark, Paris Habitat in France, and the Integral Energy Transition for Existing Buildings (IEBB) in the Netherlands illustrate diverse strategies to enhance affordable and sustainable housing through digitalisation:
  ➢ Plandata.dk enhances urban development by centralising planning data, promoting transparency, and facilitating compliance with zoning and environmental standards. In contrast,
  ➢ Paris Habitat focuses on improving social housing management through digital tools, fostering community engagement, and integrating sustainable materials and green spaces to enhance liveability.
  ➢ The IEBB initiative prioritises large-scale energy-efficient renovations, using AI and data-driven insights to optimise building performance, reduce costs, and integrate renewable energy sources. Together, these initiatives demonstrate how digitalisation can improve housing affordability, sustainability, and resilience across different urban contexts, supporting inclusive and environmentally conscious urban development in Europe.

The Role of the Social Economy as a Provider of Affordable Sustainable Housing

Over the past two decades, national policies have increasingly empowered local governments to both develop and implement housing policies tailored to local needs. This decentralisation allows local authorities to interact directly with communities and businesses, influencing decisions on social housing quantity and criteria for new developments. The shift towards demand-side measures since 2009 has also involved greater participation from the private sector, as well as social economy entities. As a result, the direction of the implementation of social housing provisions is shifting away from heavy municipal engagement.

The case studies of Wohnpark Alterlaa in Vienna, Social Rental Agency (SRA) in Dąbrowa Górnicza, and La Borda Housing Cooperative in Barcelona highlight the significant role of social economy initiatives in advancing affordable and sustainable housing solutions:
  ➢ Wohnpark Alterlaa exemplifies "fair living" through its 3,18q affordable apartments, supported by extensive green spaces and social infrastructure that foster community cohesion and resident involvement in decision-making.
  ➢ SRA in Dąbrowa Górnicza addresses housing exclusion with fully equipped apartments and support services, focusing on immediate needs amid socio-economic challenges.
  ➢ La Borda Housing Cooperative pioneers a cooperative model in Barcelona, promoting sustainability through passive design and community engagement, enhancing resilience to climate change.

Conclusions

This study highlights the transformative potential of new partnerships and technological advancements in addressing housing challenges across the EU. Integrating social economy entities and digital solutions in housing provision offers significant opportunities to enhance affordability and sustainability.

Despite EU-wide efforts to promote digitalisation in construction, its adoption varies significantly among Member States, influenced by traditional stakeholder perspectives, perceived low returns on investment, and high implementation costs. The persistence of paper-based systems and the underutilisation of available data highlight the pressing need for wider integration of digital tools such as BIM across all construction activities. Denmark sets a precedent in digital integration with platforms such as Plandata.dk, facilitating transparent and efficient planning processes. Meanwhile, countries like the Netherlands lead in the adoption of AI, using advanced technologies to optimise design and detect errors, exemplified by initiatives like the IEBB promoting circular economy goals and energy-efficient housing. **However, it is worth noting that the cost savings achieved through digitalisation often benefit investors' margins more than they enhance affordability for end-users**. These savings contribute to greater accuracy, trustworthiness, improved quality standards, and timely delivery of complex projects within budget constraints.

Digitalisation also enhances residential management and accessibility, as seen with Paris Habitat in France, which employs bespoke mobile applications and Salesforce platforms. Despite challenges in digital inclusivity, Paris Habitat enhances housing management efficiency, promotes digital literacy, and fosters community resilience, illustrating the transformative impact of digitalisation in housing sectors.

The involvement of social economy entities is crucial in expanding affordable housing options and fostering community cohesion. Examples from Austria, Poland, and Spain illustrate how non-profit and cooperative models contribute to affordable, sustainable housing solutions tailored to local needs. These initiatives provide not only affordable apartments, but also essential services, integrating vulnerable populations and promoting long-term housing stability.

The study emphasises the importance of inclusive urban planning and construction practices to ensure housing accessibility across diverse population segments. Future research should explore the impacts of emerging technologies (such as AI) on housing development and management, building on successful practices identified in this study. Additionally, further investigation into different social economy models and housing policies across EU countries could provide insights into innovative approaches to enhance housing affordability and sustainability.

Key Recommendations

Based on the comprehensive literature review and case study analysis, the following key policy recommendations are proposed:

	Medium-term (up to 2030)	Long-term (up to 2050)
The overall approach to housing policies at the EU level	• The overall approach at the EU level should **prioritise the establishment of a comprehensive "New European Deal for Affordable Sustainable Social Housing".**	• Housing affordability and sustainability **require systemic, gradual changes that address multidimensional challenges. EU policymakers should involve local and regional authorities** (LRAs) more extensively in decision-making processes, focusing on localised solutions and fostering ambitious, long-term reforms. Comprehensive monitoring and evaluation, supported by detailed city/region-specific data, are essential for effective policy implementation.
	• An **EU Housing Directive should be introduced** to harmonise efforts across Member States, focusing on affordability, sustainability, and facilitating long-term financing options, thereby ensuring cohesive and effective housing policies at the Union-wide level.	
	• **Principles and guidelines dedicated to sustainable affordable housing should be formulated under a Task Force**, facilitating annual EU summits and creating	

	a platform to support national, regional, and local housing strategies.	
Digitalisation	• The development of **interoperable digital platform**s to streamline the building permit process should be prioritised.	• Digitalisation across all housing sectors should be mandated through **legislative support and circular economy approaches**.
	• Enhance building design to prioritise energy efficiency, leveraging databases like the Basic Registration of Building and Addresses (BAG) to **optimise performance and meet environmental standards and enhance twin transition.**	• **Stakeholders, including planners, agency staff, and citizens, should be engaged in the incremental development of digital tools**, beginning with interested municipalities and then gradually make it obligatory based on practical benefits.
Social economy	• Innovative **housing models such no- and limited-profit housing and cooperatives should be supported,** as they have proven effective in addressing local affordability challenges.	• In order to address housing challenges effectively, it is crucial **to redefine "social housing" as "societal housing"** that serves a broader population beyond the most vulnerable.
	• **Flexible financial support mechanisms, including subsidies and low-interest loans, should be ensured** to maintain affordability in housing projects while community participation is encouraged and social housing principles are preserved.	
	• The **development of community spaces within neighbourhoods should be encouraged** to strengthen social bonds and promote inclusivity, with a focus on amenities such as green areas and access to job opportunities.	• It is important to not only focus on building new and renovating already existing housing stock, but also **utilise available unused buildings for housing purposes**. It is also important to anticipate who will inhabit these apartments and what their needs will be.
	• A **structured framework should be established at both national and EU levels** to facilitate the exchange of best practices and successful models in addressing local affordable housing challenges.	

Introduction

Housing is both a social need and a social right.[2] It plays a pivotal role in human development, beyond simply providing shelter. It is a cornerstone of an individual's identity and sense of belonging in society. **Yet many Europeans are struggling to find affordable housing**.

House prices and rents have increased by 47% and 18%, respectively; the overall level of housing prices compared to the EU average has increased in 17 Member States and decreased in 10 between 2010 and 2022.[3] Evictions remain a widespread issue across European countries, often resulting in homelessness.[4] The age at which at least half of EU citizens leave their parental homes has risen from 26 in 2007 to 28 in 2019, indicating reduced housing security.[5] Also, a recent increase in rent arrears, mortgages, and utilities has been observed among vulnerable groups such as single parents at risk of poverty.[6]

However, the excessive costs affect not only the most vulnerable but also those whose incomes are too high to qualify for social housing but too low to comfortably afford private market accommodation.[7] People may be able to afford secure housing, but it may be inadequate for their needs, e.g. lacking space, or of poor quality or the location itself may be a bad match for the householders' social, employment or service needs.[8]

The pressing problems in the housing sector have been exacerbated by the COVID-19 pandemic and the resulting health, economic and social crises, as well as the energy supply crisis triggered by Russia's war on Ukraine. The rise in energy prices stemming from the latter posed a serious issue for the disposable income of many EU citizens in the 2022/2023 winter season, particularly for the most vulnerable groups living in poorly insulated, energy-inefficient dwellings.[9] Low-income households, youngsters, the elderly, as well as those with disabilities and refugees, can easily become even more vulnerable if the energy crisis continues. At the same time, sufficient energy efficiency measures and heating renovations need to be put in place to reduce the energy poverty rates currently affecting various households.[10] Effectively, **housing is becoming more expensive, with the house price index rising in most of the European countries**. This is especially the case in urban areas, where around two-thirds of Europeans live.[11]

On the other hand, **housing is a major source of GHG emissions and air pollution in many countries.** The built environment depends on the extraction of materials and resources and housing construction accounts for as much as 50% of all extracted materials.[12] In terms of GHG emissions, the building and construction sector accounts for almost 40% and, within this, residential construction alone accounts for a significant 17%.[13] The only way to achieve carbon neutrality by 2050 is to promote decarbonisation in different contexts across Europe—including the adoption of sustainable practices across the housing sector and the use of environmentally friendly materials and resources needed to deliver them. By prioritising measures such as whole-life carbon emission reduction, energy efficiency, and effective water and waste management practices, the environmental footprint of housing can also be reduced.

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[2] Aidukaitė J., Ubarevičienė, R (2022). *Measuring Universality in Social Protection: A pilot study of housing support benefits*.
[3] Eurostat (2023). *Housing in Europe – 2023 edition*.
[4] Eurofound (2023).*Unaffordable and inadequate housing in Europe.*
[5] Ibidem.
[6] Ibidem.
[7] EESC (2020). *Universal access to housing that is decent, sustainable and affordable over the long term* (own initiative opinion), TEN/707.
[8] Eurofound (2023). *Unaffordable and inadequate housing in Europe.*
[9] IEEP (2023). *Who took the burden of the energy crisis*?
[10] IMF (2022). *Helping Europe's Households. Governments risk worsening the energy crisis by seeking to suppress price rises—there are better options.*
[11] ECSO (2019). *Housing affordability and sustainability in the EU.*
[12] EC (n.d.). *Internal Market, Industry, Entrepreneurship and SMEs, Buildings and construction.*
[13] UN (2021). 2021 Global Status Report for Buildings and Construction.

On top of that, the EU has already experienced many extreme weather events directly linked to climate change—including floods, wildfires, and heatwaves which will become more intense and more frequent[14] with serious impacts on ecosystems, the economy, and human well-being. Man-induced conflict and violence are also causing significant damage to the urban built environment and people's homes. This leads to the displacement of communities and makes housing inaccessible, particularly affecting minority and migrant groups.[15] **Ensuring quality, resilient housing is essential to improve individual and collective preparedness for such crises, but also to meet the four key principles of the EU Adaptation Strategy adopted in 2024** (to make adaptation smarter, swifter, and more systemic, and to step up international action on adaptation to climate change).[16]

In the long term, lack of access to affordable and sustainable housing can affect people's health, create inequalities in living conditions and opportunities, and lead to increased health costs, reduced productivity and environmental damage.[17] **Addressing the urgent need for affordable and sustainable housing is not only a matter of social justice but also a vital step towards healthier communities and economic prosperity in the EU, as well as safeguarding our planet for future generations.**

The issue of access to housing is multifaceted, with policies aimed at improving affordability sometimes failing to enhance access or quality of life as intended.[18] **Policy solutions connected to two growth trends across the EU**—digitalisation and the development of housing provision structures with the involvement of social economy entities—**could not only address immediate housing issues but also support longer-term societal trends such as ageing populations.**

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[14] EEA (2023). *Extreme weather: floods, droughts and heatwaves.*
[15] World Green Building Council (n.d.). *Sustainable and Affordable Housing.*
[16] EC (n.d.) *Climate Action, EU Adaptation Strategy.*
[17] Eurofound (2023). *Unaffordable and inadequate housing in Europe.*
[18] Ibidem.

Scope of the Work

When it comes to the timing of such trends, over the past decade, there has been growing stakeholder involvement in housing provision across European countries, particularly through social economy entities that aim to achieve a balance between housing availability, affordability, and sustainability.[19] Concurrently, digital tools and technological advancements offer substantial potential to enhance sustainability in construction and support inclusive housing systems. Considering these developments amidst challenges posed by multiple crises, the study, launched at the request of the Civil Society Organisations' Group of the European Economic and Social Committee (EESC), aims **to map and analyse possible policy solutions for affordable and sustainable housing in the EU, focusing on these two distinctive areas:**

> **Digitalisation of the housing sector (including the digitalisation of building permits, the use of AI and the creation of relevant databases)**; and
> **Structures in housing, property development and the social economy.**

This was achieved by examining several initiatives at the (sub)national level that innovate in the field of housing and assessing their relevance in a European context

Based on the conclusions from a selection of case studies, policy recommendations—applicable at the national level and comparable to the existing EU policy context—are formulated on what should be done at the EU level to improve housing policy in the areas of digitalisation and housing structures. The recommendations are formulated for two time horizons: the medium-term (up to 2030), and the long-term (up to 2050), taking into account expected future developments in the field.

Having considered the context of the study and the specific research objectives, the study is structured as follows:

Chapter 1. Affordable and Sustainable Housing in the EU

The first part of the study provides a brief overview of the factors that should be applied to both existing buildings and throughout the construction phase for affordable sustainable housing, as well as relevant policy and strategic solutions applied at both the EU and Member State levels. The methodological approach includes a comprehensive literature review and an analysis of key databases, including Eurostat and the Organisation for Economic Cooperation and Development (OECD) Affordable Housing Database. The results of this exercise provide a theoretical and policy basis for the relevant chapters, with working definitions of the core concepts (affordable housing and sustainable housing). This part also examines the potential impact of two major trends on the accessibility, affordability and sustainability of the housing sector: digitalisation and social economy-based initiatives in housing structures and property development.

Chapter 2. Digitalisation as a Pathway to Affordable Sustainable Housing

The second part of the study examines the potential of digitalisation initiatives to improve the affordability and sustainability of housing, focusing on the digitalisation of building permits processes, the use of AI techniques and the establishment of relevant databases. A brief analysis of the state of play across EU Member States is conducted based on desk research and the examination of key databases, including the European Construction Sector Observatory (ECSO) and Eurostat. The analysis adopts a focused case study approach by examining the cases of Denmark, France, and the Netherlands to provide a comprehensive exploration of digitalisation initiatives and projects in the housing sector, including a robust strengths, weaknesses, opportunities and threats (SWOT) assessment. The selection of countries is balanced in terms of the geographical coverage of EU Member States and (1) provides a balance in

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[19] Housing Europe (2023). State of Housing in Europe in 2023.

terms of the type of digitalisation policy/initiative in place in the Member State; (2) takes into account the type of digitalisation policy in place at the national level (horizontal vs. vertical); (3) takes into account the level of digitalisation of the building permit system to provide the best practice example; (4) takes into account the percentage of companies in the construction sector using at least one of the AI technologies in their activities; (5) ensures the existence of clear practices and tools related to the digitalisation of the housing sector. The analysis of the selected case studies is primarily based on the results of interviews with relevant stakeholders.[20]

Chapter 3. The Role of the Social Economy as a Provider of Affordable Sustainable Housing
The third chapter examines the potential impact of social economy structures in housing provision on the affordability and sustainability of housing. Recognising that structures and legal frameworks vary considerably between countries, this section provides an overview of the legal context in EU Member States. This overview is based on desk research and analysis of key legislation and relevant databases, including the OECD Affordable Housing Database. The chapter then adopts a focused case study approach, analysing the cases of Austria, Poland, and Spain (specifically Catalonia) and includes a comprehensive SWOT assessment. These countries were selected because of their decentralised housing delivery systems and the presence of social economy structures within their housing sectors. The selection of countries highlights a variety of approaches to housing governance and explores initiatives that enrich the ongoing discourse on affordable and sustainable housing solutions. The analysis of the selected case studies is primarily based on findings from interviews with relevant stakeholders.[21]

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[20] The detailed list of interview stakeholders according to the initiative is included in the Annex VIII.
[21] The detailed list of interview stakeholders according to the initiative is included in the Annex VIII.

1. Affordable and Sustainable Housing in the EU

Housing affordability and sustainability are complex concepts, shaped by a variety of factors and reflecting the interplay between many domains. Therefore, access to affordable and sustainable housing should be seen as a holistic approach encompassing social, economic, environmental and institutional dimensions.

This chapter presents the theoretical and policy background for the study, outlines the most widely accepted typologies of affordable and sustainable housing, and briefly presents a set of factors (principles) that should be applied at each stage of the design and construction of affordable and sustainable housing, as well as relevant policy and strategic solutions applied at both EU and Member State levels.

1.1.1 What Makes Housing Affordable and Sustainable?

Although no single—official, legal or regulatory—definition of *housing affordability* is accepted across EU Member States, the term generally refers to "**the cost of housing services and shelter—for both renters and owner-occupiers—often relative to a given individual's or household's disposable income**".[22] A more operationalised definition proposed by the United Nations Human Settlements Programme (UN-Habitat) describes affordable housing as "housing that is priced at or below market rate, whilst considering the average household income of the area (Area Median Income) so that the net monthly expenditure on housing cost does not exceed 30% of the total monthly income of the household".[23] This approach seems to be supported by policymakers, with the assumption that households should not spend more than 30–40% of their income on housing expenditure.[24] Alternatively, according to the European Investment Bank (EIB), housing affordability is the "gap" between social housing (the sector for low-income persons, typically eligible for housing allowances) and "market rate housing".[25]

In other cases, affordable housing can be shaped by a wide range of factors, underlining the interplay of economic, regulatory, and demographic forces in a country. These may include the level of housing cost overburden, the size and structure of the rental market, the proportion of the population in arrears, the level and support for home ownership and tenure, the regulation of the rental market, the productivity of the construction sector, including the rate of housing construction and planning restrictions (as well as the relationship between construction costs and standardisation requirements), the existence of targeted national policies for investment in social infrastructure and support for financing housing improvements, and demographic change.[26]

The housing sector plays a noteworthy role in the current environmental and climate crisis, but it also offers one of the largest possibilities of any sector in climate change mitigation and adaptation actions. Although the definitions of *housing sustainability* are usually linked to environmental friendliness, given the numerous functions of housing as both a physical and socio-cultural system, the UN-Habitat opts for a definition that "seeks to enhance and harmonise the environmental, social, cultural, and economic dimensions of housing sustainability to ensure prosperous residential neighbourhoods and

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[22] EP (2020). *Policies to Ensure Access to Affordable Housing*.
[23] UN Habitat (2020). *Addressing the Housing Affordability Challenge: A Shared Responsibility*.
[24] EC (2017). *EU Urban Agenda: The challenge of "affordable housing" in Europe;* EP (2020). *Policies to Ensure Access to Affordable Housing*.
[25] EIB (n.d.). *Social and Affordable Housing with the EIB. Advanced Finance for a Basic Need*
[26] The detailed exploration of such factors is included in the Annex I.

equitable cities".[27] Hence, **sustainable housing should be seen as a comprehensive process that takes into account:**

➢ **social factors,** including dignity, resilience, quality infrastructure, inclusive urban environment, as well as empowerment participation and general inclusion measures;

➢ **economic factors,** including employment and education, capital asset and expenditure, among other economic activities;

➢ **and environmental factors,** such as resource consumption, building design and facilities, water and waste management, the resilience of housing strategies, and the provision of green spaces.[28]

Taking into account both concepts—housing affordability and housing sustainability—affordable sustainable housing encompasses a number of factors, which can be treated as guiding principles, taking into consideration the cross-cutting nature of many of the issues (Table 1).

Table 1. Factors (Principles) — Affordable Sustainable Housing

AFFORDABLE SUSTAINABLE HOUSING	**HABITABILITY AND COMFORT**	➢ Dignity, privacy and security — providing enough space to prevent overcrowding as well as protect against evictions, destruction and demolition, with appropriate entitlements of land and property; ➢ Indoor environmental quality to boost occupants' mental and physical well-being and reduce factors that can lead to viral transmission and ill health, by considering all relevant health and comfort determinants, including air, light, water, sanitation, acoustic, thermal and visual comfort; ➢ Outdoor environmental quality and access to green spaces.[29]
	COMMUNITY AND CONNECTIVITY	➢ Empowerment, participation, and inclusion—especially when it comes to accessibility issues for persons with disabilities—adopting the universal design principles;[30] ➢ A quality infrastructure (sustainable and affordable mobility, public transportation, water, energy sources, and public spaces) as well as the accessibility of vital community services including schools, shops, healthcare facilities, and amenities for families and children — fostering opportunities for an inclusive urban environment[31] and supportive social and cultural atmosphere.
	ECONOMIC ACCESSIBILITY	➢ Affordable purchase, and upfront rental costs, with options to secure housing beyond direct payment; ➢ Accessible and affordable operation, maintenance and ongoing improvement costs; ➢ Financial security and a suitable housing option for any income level, whilst supporting the progression of a growing household to a successively higher quality of living, habitat and infrastructure; ➢ Affordable utilities and services to increase occupants' discretionary income; ➢ Source locally and utilise local industries to reduce building costs and support economic development; ➢ Employment and provision of access to quality education and professional development for residents.[32]

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[27] UN-Habitat (2012). *Sustainable Housing for Sustainable Cities. A policy framework for developing cities.*

[28] Ibidem; The detailed exploration of such factors is included in the Annex I.

[29] UN-Habitat (2012). *Sustainable Housing for Sustainable Cities. A policy framework for developing countries.*

[30] UN OHCHR (20016). *Convention on the Rights of Persons with Disabilities.* With this regard, affordable sustainable housing should: (1) be useful and relevant to a wide group of tenants, accommodating a wide range of individual preferences and abilities; (2) be designed in an easily understandable manner, regardless of the knowledge, experience, language skills, or concentration level of the tenants; (3) be based on effective communication of information to the tenant regardless of the ambient condition or the sensory abilities; (4) minimise the hazards and adverse consequences of unintended actions of the user; (5) allow ease of use with a minimum of fatigue; (6) use the size and space for approach - reach, manipulation and use should be appropriate regardless of the body.

[31] ESCO (2019). *Housing affordability and sustainability in the EU.*

[32] Ibidem.

RESOURCE EFFICIENCY AND CIRCULARITY	➢ Target whole-life carbon emission reduction, working towards net zero operational and embodied carbon at building and community scales; ➢ Energy efficiency and microgeneration while considering the whole lifecycle of residential buildings;[33] ➢ The possibility of installation of smart home appliances and other digital functionalities and installing energy-efficient appliances for heating, cooling, cooking, and lighting and ventilation;[34] ➢ Effective water and waste management practices require prevention measures that should be adopted already during the construction phase that impact both water quantity and quality.	
RESILIENCE AND ADAPTATION TO CLIMATE CHANGE	➢ Ensure housing is adaptable, durable, and easy to maintain through its lifecycle, to facilitate ease of retrofit and reuse; ➢ Enhance nature-based solutions (NbS) maintaining and preserving ecological processes to support whole-life impact on ecological health, prioritise the regeneration of ecosystem services and enhance bio-climatic resilience; ➢ Ensure structural safety is met and designed to withstand climate change scenarios to offer long-standing usability; ➢ Thorough consideration of contextual environmental hazards, such as floods, landslides, and earthquakes.[35]	

Source: own elaboration, CASE based on World Green Building Council (n.d.). Sustainable and Affordable Housing & Desk Research.

Hence: (1) habitability and comfort; (2) community and connectivity; (3) economic accessibility; (4) resource efficiency and circularity; and (5) resilience and adaptation to climate change will guide the study with regard to assessing affordability and sustainability of housing. These factors ought to be applied throughout every phase of the building and construction process—including design and planning, supply chain and manufacturing, actual construction work, ongoing operation and maintenance, redevelopment or repurposing initiatives, efficient management of materials during both construction and demolition phases, end-of-life (EOL) considerations, land acquisition and site selection, as well as financial planning and budgeting.[36]

1.1.2 Housing Policy on the EU Agenda

While the EU lacks direct authority over housing policy, as its jurisdiction primarily lies in domains that significantly impact housing conditions within Member States, such as state aid, fiscal, and competition laws, housing policy remains a purely national competence. However, the EU is still in a position to address the topic through housing-related initiatives. Primarily utilising "soft power" strategies—including administrative measures, recommendations, general principles, guidelines for national and local policymakers, communications, and other non-binding instruments—several EU-level policy initiatives have emerged in recent years focusing on improving access to housing, its affordability, and sustainability.

To start with, affordable and sustainable housing is one of the key principles of the European Pillar of Social Rights (EPSR).[37] It is also present in the cohesion policy 2021–2027 objectives, including:
   ➢ *objective 1 on a smarter Europe with regard to innovation and digitisation;*
   ➢ *objective 2 on a greener, carbon-free Europe where energy transition, renewables and the fight against climate change are tackled;*
   ➢ *objective 4 on a more social Europe and quality employment, education, skills and social inclusion-oriented policies;*

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[33] UN-Habitat (2012). *Sustainable Housing for Sustainable Cities. A policy framework for developing countries*.
[34] Ibidem.
[35] Ibidem.
[36] *World Green Building Council (n.d.). Sustainable and Affordable Housing.*
[37] EC (n.d.). *European Pillar of Social Rights - Building a fairer and more inclusive European Union.*

> ➤ *objective 5 on a Europe closer to citizens where bottom-up endeavours and sustainable urban development-oriented actions across the EU are covered.*[38]

Buildings are responsible for ca. 40% of the total energy consumption and 36% of CO_2 emissions within the EU.[39] Hence, the objectives of **the European Green Deal (EGD)**—a package of policy initiatives (such as European Climate Law, EU strategy on adaptation to climate change, EU biodiversity strategy for 2030, European industrial strategy, and Circular economy action plan, among others) setting the EU on the path of achieving climate neutrality by 2050—impact the housing sector significantly. That is because appropriate changes in the housing sector can lead to emissions reductions in EU Members States in light of the fact that ca. 75% of the current building stock in the EU has poor energy performance.[40]

Effectively, there are also specific buildings-oriented actions stemming from the European Green Deal. **The Renovation Wave** strategy for Europe, introduced in 2020, aims to make 35 million buildings renovated, greener and more accessible while creating up to 160,000 additional green job opportunities across the EU by 2030. Currently, only 11% of the EU building stock is renovated annually, and even less is renovated in a complex manner following the best practices in building performance including heating and cooling techniques.[41] This strategy intends to at least double these rates in the EU by 2030, eliminating previously encountered barriers to complex refurbishments of buildings (financial, administrative, lack of information, among others) as well as improving the reuse and recycling of materials used, ensuring environmental sustainability. Affordable housing is a cornerstone of the Renovation Wave strategy securing that social housing facilities are not only affordable, but also healthy, decent and are being taken care of.[42]

In 2021, **the "Fit for 55 package"**[43] was introduced within the EGD framework to help achieve the target of a net 55% reduction in emissions by 2030 in the built environment and "upgrade" the climate ambitions of the EGD from an idea into an actual law (to work in tandem with the Renovation Wave). Among others, the package introduced the Social Climate Fund (SCF)[44] supporting the most vulnerable groups (both individuals and microenterprises) in their endeavours targeting energy efficiency and deployment of renewable energy sources (RES), effectively leading to lower energy bills and higher housing affordability. As some details of the package are still being negotiated as of June 2024,[45] it is yet to be seen to what extent the SCF will support households in need in pursuing energy efficiency-oriented investments.

Another legislative framework supporting the European Green Deal's main objective of achieving climate neutrality by 2050 is **the revised Energy Performance of Buildings Directive (EPBD)** that came into force in May 2024.[46] The directive updates the 2018 regulatory framework to align with higher climate goals and social considerations while allowing flexibility for Member States to account for regional building differences. It does not mandate renovations for individual homeowners. The proposed measures aim to increase the rate of the refurbishment of the building stock, also by ensuring

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[38] EC (2023). *Cohesion Policy 2021-2017 outcome of programming*.

[39] Council of the European Union (n.d.). *Fit for 55: making buildings in the EU greener*.

[40] EC (n.d.). *Energy Performance of Buildings Directive*

[41] EC (2020). *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions a Renovation Wave for Europe - Greening Our Buildings, Creating Jobs, Improving Lives Com/2020/662 Final.*

[42] EC (n.d.). *Renovation Wave*.

[43] Council of the European Union (n.d.). *Fit for 55: making buildings in the EU greener*.

[44] EP (2023). *At A Glance - Fit for 55 explainer, Social Climate Fund*.

[45] Carbon Market Watch (2024). *European Commission's consultation on the 'Do No Significant Harm' Principle in the Social Climate Fund*.

[46] Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (recast).

a stable environment for investments – making it more resilient, supporting better air quality, digitalising energy systems for buildings (see Chapter 2) and supporting the roll-out of infrastructure for sustainable mobility.

Another initiative stemming from the European Green Deal, **the New European Bauhaus (NEB)**, links issues of sustainability, practical aesthetics and inclusiveness of the built environment in cities and towns. Effectively, initiatives supported by the NEB combine buildings' "energy efficiency, sustainability, design, liveability, accessibility, affordability and investment to ensure a fair green transition".[47]

Furthermore, the NEB:

1) Provides a neutral platform for cooperation between different sectors responsible for the housing policies: i.e. arts and culture (designers) meet with science and technology (constructors of new building materials) and local authorities;
2) Allows for experimentation and co-creation of public spaces ensuring inter- and transdisciplinarity;
3) Links green transition of the built environment (environmental sustainability) with a digital one (see Chapter 2 below) as well as cultural ("Baukultur") aspects based on inclusion.[48]

The digital transition is crucial for the development and implementation of the NEB, as digital tools such as 5G, AI, data-driven applications, robotics, and 3D printing technologies (including digital twins) can significantly enhance the sustainability performance of materials, products, and buildings in the construction industry.[49] NEB movement also centres around collective and private experiences, emphasising the importance of building bridges between people and fostering connections that enhance social cohesion. In this respect, social economy entities, local organisations, and associations play a pivotal role in making a place unique—providing opportunities for connection and interaction that foster a sense of belonging within communities, reinforcing the core values of NEB.[50] It is expected that NEB will considerably transform the residential sector.[51] However, a thorough impact assessment of NEB on housing sustainability and affordability will have to await as this initiative is also still in its early stages (initiated only in late 2020).

It is important to mention that even before the European Green Deal launch, some important steps were taken at the EU level to coordinate actions targeting sustainable affordable housing. For example, Member States' common strategies for urban policy are set out in the **Leipzig Charter (2007)**[52] **and the New Leipzig Charter (2020)**.[53] The charters emphasise access to affordable and high-quality housing for all citizens, promoting sustainable building practices and energy-efficient homes, as well as strengthening social housing—focusing on supporting vulnerable groups, expanding social housing stock, improving existing housing conditions, and ensuring fair access to housing resources. These principles aim to create sustainable and equitable housing solutions within urban environments.[54]

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[47] EC (n.d.). *Renovation Wave – The New European Bauhaus.*
[48] New European Bauhaus (n.d.) *About the initiative.*
[49] EC (2021). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions New European Bauhaus Beautiful, Sustainable, Together.*
[50] Ibiden.
[51] Habitat for Humanity (2022). *The Affordable Housing Initiative and the New European Bauhaus: EU policy implications at national and local levels.*
[52] EU2007.DE (2007). *The Leipzig Charter on Sustainable European Cities.*
[53] EU2020.DE (2020). *Implementing The New Leipzig Charter Through Multi-Level Governance*
[54] EP (n.d.). At A Glance - *The New Leipzig Charter.*

The Leipzig Charter established the concept of integrated urban development at the EU level and was influential in the development of EU initiatives such as the **Urban Agenda for the EU**, adopted in 2016 (that is also supported by the afore-described NEB with its focus on sustainability, inclusion, and aesthetics combined with citizen-centric approach). To ensure multi-level governance of urban matters including housing policy, the agenda essentially allows local and regional authorities (LRAs), national administration representatives, as well as EU bodies to share their ideas and discuss and assess former and ongoing initiatives impacting cities.[55] Most importantly, the agenda's three main principles—better regulation, better funding, and better knowledge[56] — all have a direct impact on the creation of housing projects, their financing, and exchanging the best practices in this respect. At the same time, there is still room for improvement when it comes to ensuring sustainable cooperation and partnerships between different stakeholder groups so that the multi-level governance of housing policies (EU, national, and local level) can truly be in place.[57]

1.1.3 Housing Policy in the EU Member States

On a national level, housing policies vary significantly across the EU-27 and are shaped by unique historical developments, demand characteristics, and national regulations. Over time, these factors have led to distinct national housing policy profiles. Despite this diversity, there is limited research offering a comparative perspective. The survey conducted by the Institute for Housing and the Environment (IWU)[58] revealed no distinct, recurring patterns of organisational structure among countries. Also, the organisational setup of housing policies does not align with typical country groupings (e.g., Nordic, Central European, etc.) or state organisation patterns (federal vs. unitary, centralised vs. decentralised). Larger countries tend to have sectoral structures due to the administrative workload. Interestingly, the presence of "housing" in the titles of governmental units varies, reflecting the scattered responsibility and perceived importance of housing policy across the EU. As a result, four types of governance structures (with a wide understanding of this matter) emerged from the IWU research:

(1) **Concentrated type**: one leading multi-purpose unit, often named the "Ministry of Housing", handles housing policy, supported by a few single-purpose units. Portugal is the sole example, where housing policy is highly centralised and coordinated within one central governmental actor;

(2) **Overlapping type**: at least two multi-purpose units handle housing simultaneously, often resulting in overlapping competencies. This structure is found in six countries: Finland, Latvia, the Netherlands, Slovakia, Slovenia, and Spain;

(3) **Scattered type:** numerous units with overlapping portfolios. Seven countries (Austria, Croatia, Cyprus, Czech Republic, Denmark, Luxembourg, and Sweden) fall into this category. Despite the distinct aspects of the housing policy they manage, multiple units are responsible for each portfolio;

(4) **Sectoral type**: single-purpose units covering distinct aspects of housing policy under a single portfolio, necessitating inter-ministerial cooperation. It is the largest group, with thirteen countries (Belgium, Bulgaria, Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Poland, and Romania). Belgium is unique within this group as its housing

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[55] EC (n.d.). *Urban Agenda for the EU.*
[56] EC (2019). *Urban agenda for the EU. Multi-level governance in action.*
[57] EC (2021). *Review of the contributions of the Urban Agenda for the EU to the implementation of the New Urban Agenda.*
[58] IWU (2022). *Housing Policies in the EU.*

policy is primarily managed at the regional level, with national units focusing on financial issues.[59]

IWU also highlighted significant differences when it comes to levels of governance of housing policies in the EU. Countries can be categorised into six governance types:

(1) **Exclusively national:** Malta's housing policy is governed at the national level due to its small size;

(2) **Nationally dominant:** Croatia and Greece exhibit a centralised organisational style with national-level dominance;

(3) **National leadership with a strong local level:** Bulgaria, Denmark, Finland, France, Ireland, Latvia, Netherlands, Poland, Slovakia, Slovenia, Spain, and Sweden feature strong local involvement, more significant than the regional level;

(4) **Balanced involvement across all levels:** Austria, Germany, Italy, and Portugal show balanced involvement at national, regional, and local levels.

(5) **Regional focus:** In Belgium, housing policy is primarily regionalised, with the national and local levels playing lesser roles;

(6) **No regional involvements**: Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Luxembourg, and Romania: Exhibit varying relationships between national and local levels without regional involvement.[60]

When it comes to the goals and functions of housing policies across, IWU research grouped them into six clusters: efficiency of the housing market—matching supply and demand; ensuring affordable price level in the rental and homeowner market; ensuring high-quality standards of dwellings; improving the energy efficiency of new buildings and old buildings; ensuring integrated housing markets—transitions between tenures; high rates of homeownership; high rates of rental housing.

Table 2 presents an overview of the objectives as part of each Member State's guiding principles regarding housing.

Table 2. Objectives of Housing Policy Across Member States

Member State	Guiding Principles of Housing Policy						
	Efficient housing markets	Affordable housing	Quality of housing	Energy efficiency	Integrated market tenures	High rates of homeownership	High rates of rental housing
Austria	green	green	green	green	green		
Belgium	green	green	green	green		green	
Bulgaria	green			green			
Croatia	green			green		green	
Cyprus		green		green			
Czechia	green	green	green	green	red	green	only recently
Denmark	green	green	green	red		red	red
Estonia	red	red	green	green	red		red
Finland	green	green	green	green			
France	green	green	green	green			
Germany	green	green	green	green	green		

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[59] Ibidem.
[60] Ibidem.

Greece	🟥	🟥	🟥	🟩	🟥	🟩	🟥
Hungary	🟩	⬜	⬜	🟩	⬜	🟩	⬜
Ireland	🟩	🟩	🟩	🟩	⬜	⬜	🟩
Italy	🟥	🟩	🟩	🟩	🟥	🟩	🟥
Latvia	🟥	🟩	🟩	🟩	🟥	🟩	🟩
Lithuania	🟥	🟩	🟥	🟩	🟥	🟩	🟩
Luxembourg	🟩	🟩	⬜	⬜	⬜	⬜	⬜
Malta	⬜	🟩	⬜	🟩	⬜	🟩	⬜
Netherlands	⬜	🟩	🟩	🟩	⬜	⬜	⬜
Poland	🟩	🟩	⬜	🟩	⬜	⬜	⬜
Portugal	🟩	🟩	⬜	🟩	🟩	🟩	🟩
Romania	⬜	🟩	⬜	🟩	⬜	⬜	⬜
Slovakia	🟩	🟩	🟥	🟩	🟥	🟩	🟩
Slovenia	🟩	🟩	🟥	🟩	🟥	🟩	🟥
Spain	🟥	🟩	🟩	🟩	⬜	🟥	🟩
Sweden	🟩	🟩	🟩	🟩	🟩	🟥	🟩

Source: IWU (2022). Housing Policies in the EU (green -yes; red – no).

The housing policies in most EU countries aim at establishing and maintaining efficient housing markets—matching supply and demand, recognising the goal of the provision of affordable housing, and usually include energy efficiency concerns. However, access to quality housing is not always a guiding principle.[61] It is interesting to note that in Southern (Cyprus, Italy, Greece, Malta, and Portugal) and Central-Eastern (Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Slovakia, and Slovenia) Member States, as well as in Belgium, one of the goals of housing policy is to achieve high rates of homeownership.[62] This is mainly caused by the shift towards market-oriented approaches in housing systems, which has been observed since the 1980s—the transfer of public housing to homeownership in Eastern Europe during the post-Communism phase, and the implementation of policies encouraging homeownership in Western Europe through subsidies and market reforms.[63] In 2023, in every Member State except Germany (47.6%), homeownership was the prevailing norm and the preferred form of housing tenure.[64] The lowest rates of homeownership were also observed in Austria (54.3%) and Denmark (60%).[65]

When it comes to the **instruments of housing policy aimed at housing affordability** adopted in Member States, following the OECD Affordable Housing Database,[66] the main types of them include schemes for homeowners/buyers, schemes for homeowners and tenants, and schemes for tenants. The table below presents an overview of these types of instruments present across Member States, highlighting the level of governance.

Table 3. Affordable Housing Policy Instruments Present Across Member States

Type of instrument	Instruments	Member States
Schemes for home	Support to finance housing regeneration	Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia,

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[61] IWU (2022). *Housing Policies in the EU.*
[62] Ibidem.
[63] Haffner M.E.A. (n.d.).*Housing Affordability in the European Union.*
[64] Centre for Economic Performance (2022*). Housing policy and affordable housing.*
[65] Eurostat database, Distribution of population by tenure status, type of household and income group - EU-SILC survey, 2023.
[66] OECD (n.d.). *Public policies towards affordable housing - Indicators.*

		Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, the Slovak Republic, Slovenia, Spain, and Sweden
	Subsidised mortgages and guarantees to home buyers	Austria, Belgium, Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Romania, and the Slovak Republic
	Tax relief for homeowners and/or home buyers	Belgium, Croatia, Czechia, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Poland, Portugal, the Slovak Republic, Slovenia, Spain, and Sweden
	Subsidies to facilitate home ownership	Austria, Croatia, Cyprus, Estonia, Germany, Hungary, Ireland, Latvia, Luxembourg, Malta, the Netherlands, and Spain
	Mortgage relief for over-indebted homeowners	Belgium, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, and the Slovak Republic
Schemes for homeowners and tenants	Housing allowances	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, the Slovak Republic, Slovenia, and Sweden
	Financial support to developers of affordable housing (other than social)	Austria, Croatia, Cyprus, Czechia, France, Germany, Ireland, Luxembourg, Portugal, the Slovak Republic, and Spain
Schemes for tenants	Social rental housing	Austria, Belgium, Bulgaria, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands (including housing associations), Poland, Portugal, Romania, the Slovak Republic, Slovenia, and Spain
	Minimum quality regulations for rental dwellings	Belgium, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Latvia. Lithuania, Luxembourg, the Netherlands, Portugal, the Slovak Republic, Slovenia, Spain, and Sweden
	Rent controls (on initial levels and/or increases)	Austria, Croatia, Czechia, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Poland, Portugal, Spain, and Sweden
	Tax relief measures for rental costs	Austria, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Portugal, Spain, and Sweden
	Rent guarantees and deposits	Austria, Belgium, Germany, Luxembourg, Portugal, and Sweden

Source: OECD (n.d.) Public policies towards affordable housing (Indicators), results of the 2021, 2019 and 2016 Questionnaire on Affordable and Social Housing (QuASH).

Many EU Member States have a mix of affordable housing policy instruments covering all the main types of instruments and some decided on more subject-oriented instruments and object-oriented funding. The instruments and schemes can be broadly divided into supply-side measures and demand-

side measures.[67] Since 2009, the general trend has been towards a reduction in public expenditures on housing supply-side (i.e. the development of social/affordable housing) and an increase in public expenditure on demand-side housing measures (social welfare-type payments), such as housing allowances.[68] **As a consequence, the traditional role of the state as a provider of housing has increasingly shifted away from central to local levels of government and, to the private sector, non-profit organisations and housing associations.**[69]

Sustainable housing policies that consider social, economic, and environmental factors in the EU countries are also implemented through variety of instruments—direct benefits such as grants or subsidies directly allocated to individuals or families as well as direct funding in the form of e.g. public investment in residential construction. Other instruments allocate indirect benefits such as favourable fiscal conditions, favourable lending conditions, guarantee benefits or new regulations. The focus on policy interventions can be clustered around six main themes (Table 4.)

Table 4. Sustainable Housing Policy Instruments Present Across Member States

Theme	Type of instruments[70]	Countries
Energy efficiency and renovation	Direct	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden
	Indirect	All EU-27 countries
Renewable energy sources	Direct	Belgium, Bulgaria, Croatia, Czechia, Estonia, Hungary, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, and Sweden
	Indirect	Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, and Slovenia
Climate adaptation[71]	Direct	Austria, Bulgaria, and Denmark
	Indirect	Finland, Hungary, Ireland, and Lithuania,
Inclusion and cultural aspects	Direct	Austria, Belgium, Czechia, Denmark, Finland, and Sweden
	Indirect	Austria, France, Malta, Poland[72], and Romania,
Spatial planning	Direct	Denmark, Luxembourg, Spain, and Sweden
	Indirect	Austria, Belgium, Cyprus, Finland, France, Greece, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, and Sweden

Source: Own elaboration based on ECSO (2019). Housing affordability and sustainability in the EU; and desk research.

While energy efficiency policies are widespread across EU Member States, employing various measures such as fiscal stimulus, saving schemes, and grants, among other policies promoting the use of renewable energy, is less common. Housing policies targeting vulnerable populations are not prevalent in the EU, and those that do exist are primarily grant-based. Social inclusion policies for the elderly, focusing on housing adaptations, are the most commonly implemented by Member States. There are few housing policies directed at disadvantaged populations and ethnic minorities in Europe (see Chapter

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[67] Council of Europe Development Bank (2017). *Housing inequality in Europe: Tackling inequalities in Europe: the role of social investment.*

[68] EP (2020). *Policies to Ensure Access to Affordable Housing*; Housing Europe (2019). *The State of Housing in the EU 2019.*

[69] Council of Europe Development Bank (2017). *Housing inequality in Europe: Tackling inequalities in Europe: the role of social investment.*

[70] Direct (grants, subsidies for individuals/households, public investments in residential construction) vs. Indirect (favourable fiscal conditions, loans, guarantee benefits, new regulations)

[71] Since 2019 all EU-27 MS have adopted climate change adaptation strategies on national and/or regional level.

[72] According to recent development of housing polices – see Chapter 3.

3, Country-based case study—Poland). As the sustainability of residential areas depends on robust infrastructure (public transport, water, energy sources, and public spaces) and access to essential community services (schools, shops, healthcare, and facilities for families and children), some countries address these needs through spatial planning—including digitalisation initiatives (see Chapter 2, Country-based case study—Denmark).

Despite the varied approaches to housing policies, Member States face the common challenge of ensuring access to affordable and sustainable housing. How can the development of new partnerships and structures (such as cooperative housing, social and community housing, and mixed housing programmes) impact affordable sustainable housing solutions? Additionally, how can fostering innovations and the development of digitalisation technologies (including data-based approaches) capture possible financing solutions to support the delivery of new quality housing and the renovation of existing housing, thereby reducing construction costs and guaranteeing inclusive access to sustainable, quality housing? These questions will be explored in the following parts of the study.

2.   Digitalisation as a Pathway to Affordable Sustainable Housing

Digital transformation is characterised by a fusion of advanced technologies and the integration of physical and digital systems.[73] Digitalisation levels vary substantially across the EU-27. Countries' performance in digitalisation is monitored with the Digital Economy and Society Index (DESI),[74] helping to identify areas requiring priority investment and action. However, when it comes to the construction sector, Member States follow different policy approaches and are in different stages of the advancement and implementation of these technologies.

The aim of this part of the study is to give an overview of the state of play of the presence (or absence) of initiatives concerning: (1) the digitalisation of building permits; (2) the use of artificial intelligence (AI) techniques to reduce the building time and cots and optimise sustainability and recycling; (3) establishment of relevant database for buildings in EU Member States; including the legal context and stakeholders involved.

After a brief analysis of the situation across the EU Member States, the study adopts a focused approach by examining the cases of Denmark, France, and the Netherlands to provide a comprehensive investigation of digitalisation and innovation in the housing sector.

The decision to focus on this particular country set is underpinned by several key criteria. Firstly, the selection ensures a well-balanced representation concerning the type of digitalisation policies present in the Member States (horizontal versus vertical). This criterion is crucial for capturing the diverse approaches taken by EU Member States towards digital transformation in the housing sector. Secondly, the stage of digitalisation of the building permit system within each country is taken into account to identify best-practice examples (considering fully or partially digitalised levels). Thirdly, the percentage of enterprises in the construction sector utilising Artificial Intelligence (AI) technologies plays a significant role in the selection process. By considering this criterion, the study aims to highlight the correlation between AI adoption and advancements in construction practices, thus identifying opportunities for further innovation. Lastly, the existence of clear practices and tools relating to the digitalisation of the housing sector is a pivotal criterion, as each country-focused case study concludes with an in-depth analysis of best practice projects/initiatives while assessing their potential to foster affordable and sustainable housing. Furthermore, considerations regarding scalability and replication across other EU Member States are explored.

2.1.1   Overview of Digitalisation in the Housing Sector Across the EU

ECSO categorised policy approaches to digitalisation in the construction sector present in EU-27 into two dimensions: (1) horizontal digitalisation strategies, which include national digitalisation policies, covering a wide range of sectors, technologies and areas; and (2) vertical digitalisation strategies for the construction sectors (that target specifically the digitalisation of the construction sector).[75]

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[73] EC (2019). *BUILD UP, Digitalisation in the construction industry.*
[74] EC (n.d.). *DESI 2023 dashboard for the Digital Decade.*
[75] ECSO (2021). *European Construction Sector Observatory.*

Table 5. Digital Construction Policies and Strategies Across the EU-27 (according to horizontal and vertical dimensions taken)

Type of Digital Construction Policy		
Horizontal Policy/ Strategy – does not compromise construction	**Horizontal Policy/ Strategy – compromises construction**	**Vertical Policy/Strategy – targets the construction sector**
➢ Belgium, ➢ Hungary, ➢ Italy, ➢ Malta, ➢ The Netherlands, ➢ Poland, ➢ Portugal, ➢ Romania, ➢ Slovakia.	➢ Austria, ➢ Bulgaria, ➢ Croatia, ➢ Cyprus, ➢ The Czech Republic, ➢ Denmark, ➢ Latvia, ➢ Slovenia.	➢ Estonia, ➢ Finland, ➢ France, ➢ Germany, ➢ Greece, ➢ Ireland, ➢ Lithuania, ➢ Luxembourg, ➢ Spain, ➢ Sweden.

Source: ECSO (2021). European Construction Sector Observatory.

Eighteen out of 27 Member States have in place policies covering or targeting the digitalisation of the construction sector, demonstrating the interest of policymakers in tackling this issue. Among these 18 countries, eight adopted horizontal strategies that include the construction sector and 10 have adopted vertical strategies that focus specifically on digital construction technologies. The construction sector was not included in nine Member States' digitalisation strategies or policies. However, this does not mean digitalisation initiatives are non-existent in these countries. Quite the opposite, some of these countries have in place several advanced side initiatives on digital technologies in the construction sector.[76]

In the construction and housing industry, a critical stage in any project involves planning and obtaining building permits, which are necessary for legal construction to proceed. However, the process of obtaining these permits remains prone to errors, time-consuming, and subjective in numerous Member States. This issue is partly attributed to the absence of a solid legal framework enabling efficient automation in public administration, alongside societal resistance to such advancements.[77] Although there have been some initiatives, such as European Network for Digital Building Permits (EUnet4DBP)[78] promoting the **digitalisation of building permi**ts, the process of issuing remains a national competence and is typically administered at the local level.

ECSO distinguishes between three main stages of development of the building permits system: (1) paper-based building permit system (not digitalised); (2) partially digitalised (some of the steps, or all the steps of the application for a building system can be managed online); (3) complete digitalisation of the building permit system, characterised by a fully digital process with machine-readable documents allowing for the exploitation of data. This final evolution relates to the compatibility with **Building Information Modelling (BIM),** allowing to have a fully automated process with 3D models. The figure below presents the stage of the building permit system digitalisation in the EU Member States.

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[76] Ibidem.
[77] Fauth J. et,al, (2022). *Digitalisation of the building permit process - a case study in Italy.*
[78] *European Network for Digital Building Permits – website.*

Figure 1. Digitalisation of the Building Permits System in the EU
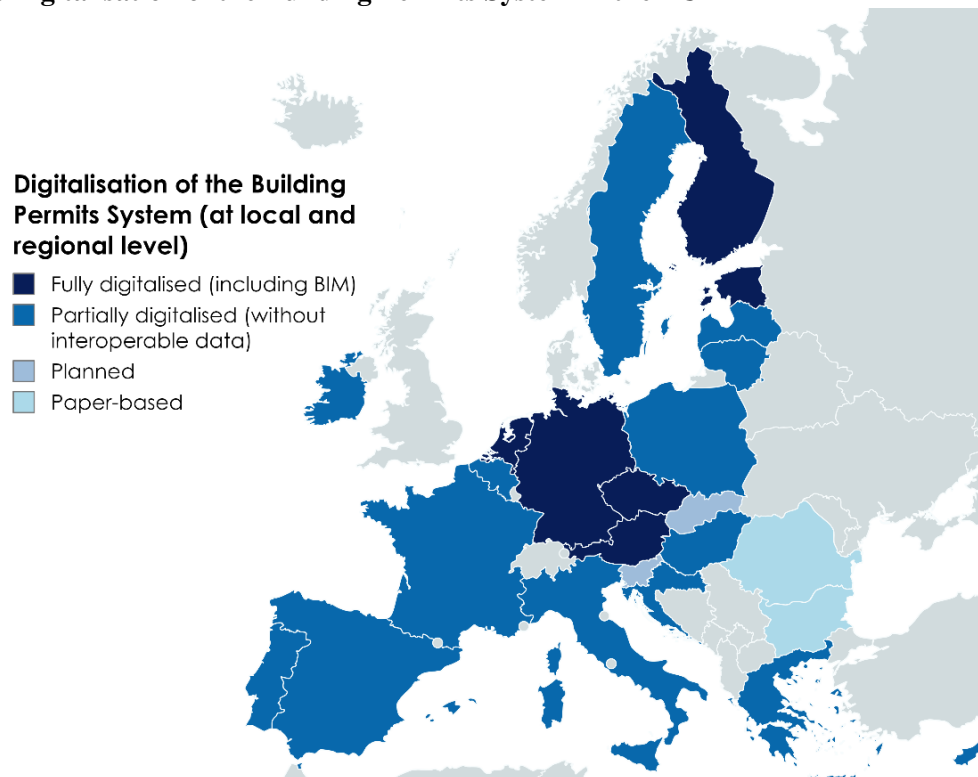
Source: ESCO (2021). European Construction Sector Observatory complimented by: Republika Slovenija (n.d.) Real estate environment, Authority for Spacial Planning and Construction of the Slovak Republic (n.d.). Digitalisation, Ministry of Economic Development and Technology, Republic of Poland (2021). We are digitising the construction process – you will submit your application easily, quickly, and on-line.

Although BIM is arguably the most developed and used digital technology in the construction sector, its market adoption in the EU is still moderate and implemented mainly by large companies.[79] Essentially, BIM is an integrated process based on a 3D model. The technology covers the entire AEC (architectural, engineering and construction) industry and integrates graphic and non-graphic data with a digital model allowing information management for all project participants at all stages (starting from the investor's requirements, through the construction stage, to the operational phase of the facility).[80] Thanks to the use of various BI (Business Intelligence) desktops, it is possible to analyse the collected data, visualise it, and create reports in real-time. Such advanced multi-purpose databases present a promising approach to mitigate the environmental footprint of the sector—streamlining processes, optimising resource utilisation, and, ultimately, reducing GHG emissions associated with construction activities, such as material extraction, manufacturing of construction products, and building construction and renovation.

In alignment with this urgency, the EU Building Stock Observatory (BSO) was established in 2016 as part of the "Clean energy for all Europeans package". It aims to provide a better understanding of the energy performance of the building sector through reliable, consistent and comparable data.[81] The BSO operates as a multifaceted platform, comprising a database, a data mapper, and interactive factsheets. These resources offer access to a wealth of data pertaining to the EU building stock and energy consumption. Users can visualise information through interactive graphs and tables on-screen, as well as download data for further analysis and application. However, despite the launch of the BSO at the

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[79] ECSO (2021). *European Construction Sector Observatory.*

[80] Nawari, N.O., Ravindran S.(2019). *Blockchain and Building Information Modeling (BIM): Review and Applications in Post-Disaster Recovery. Buildings.*

[81] EC (n.d.). *EU Building Stock Observatory.*

EU level, widespread implementation across Member States remains deficient (according to available information accessible through BSO), highlighting the lack of accessible, digitalised building databases at national levels.

AI has recently acquired ground-breaking capabilities thanks to important progress made in computational power, whose impact can stretch through the whole lifecycle of building infrastructure.[82] During the design phase, AI solutions have the capability to aid architects and planners through generative design techniques, involving integration into BIM software to explore numerous design possibilities, considering the constraints and boundary conditions provided by designers and engineers. Additionally, machine learning has emerged as a tool to detect potential errors and inconsistencies associated with design variations.[83] However, the adoption of AI is still very limited and mainly confined to pilot projects in the construction and housing sector. According to the Eurostat database, the highest percentage of companies in the construction sector that use at least one of the AI technologies in their activities are in Luxembourg (11.3%), Portugal (10%), Finland (9.4%), Denmark (8.9%), Belgium (8.3%), Germany (8.3%), Malta (7.6%) and the Netherlands (7.4%). However, as stated by ECSO, the AI solutions can be used not only during the design and construction phase, but also for the facility management, predictive maintenance and optimal energy management.[84]

Figure 2. Percentage of Enterprises in the Construction Sector Using at Least one of the AI Technologies in Their Activities (EU-27, 2021)
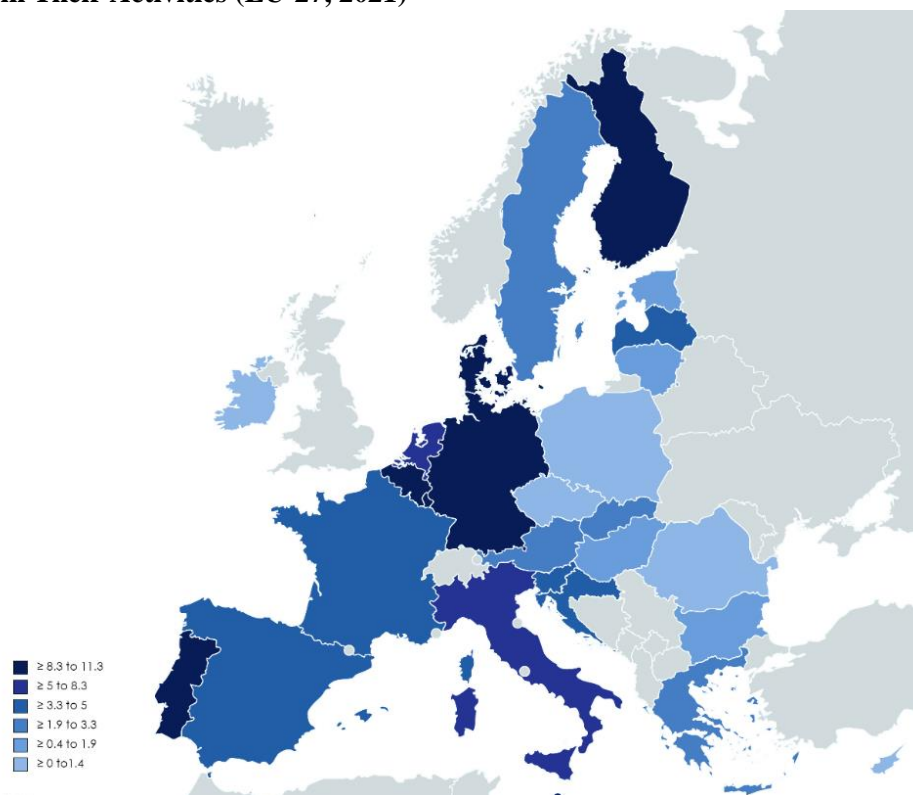
Source: own elaboration, CASE based on Eurostat database, ICT usage in enterprises (Artificial intelligence by NACE Rev.2 activity).

According to the PlanRadar survey among over 1,300 industry professionals from 15 countries (including Austria, Croatia, Czechia, France, Germany, Hungary, Poland, Romania, Slovakia, and Spain), 77% of them consider the introduction of new technologies in their teams and/or company as a whole to be difficult (53%) or very difficult (24%). **The main barriers to the further development**

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[82] ESCO (2021). *European Construction Sector Observatory.*
[83] Ibidem.
[84] Ibidem.

of technological solutions include overly traditional views of stakeholders, perception of low return on investment, overly expensive implementation, lack of government incentives (subsidies), lack of training and digital profiles that promote new technologies, as well as lack of regulations that oblige the industry to change.[85]

Despite the barriers, digitalisation trends present in the housing and construction sectors can positively impact the sustainability of buildings, as well as social, economic, and environmental outcomes. The following parts of the study will examine this potential based on country-specific case studies.

2.1.2 Country-Based Case Studies

2.1.2.1 Denmark

E-government, digital business transformation, digital public services, and common digital ecosystems have been a Danish political priority for the last 20 years.[86] Aligned with the priorities outlined by the EU for the national Recovery and Resilience Plans (RRPs), Denmark's RRP[87] supports investments for an integrated green innovation strategy. The plan emphasises financial backing and assistance for a comprehensive strategy centred on green innovation. The anticipated outcome is a reduction in carbon dioxide emissions within Denmark's highest-emitting sectors, in a cost-effective and a socially just manner.[88]

This endeavour translates in measures such as green and digital investments supported by the Danish government through various subsidy schemes, as well as tax deductions for citizens and enterprises investing in new green and digital technology, research, and development with many of the initiatives targeted at renovations of buildings with poor energy performance. This includes digitalising the public administration, strengthening digitalisation within businesses and industries as well as supporting SME enterprises in digitalising their business systems. Under its RRP, Denmark also allocated 89 million EUR towards promoting digitalisation initiatives in the country (e.g. use and public availability of data as well as implementation of new technologies), also providing tax deductions to boost Research and Development (R&D) in companies, contributing to furthering the digital agenda (that involves the construction sector as well).[89] Moreover, the initiative supports the Renovation Wave recommendation of addressing energy efficiency of private buildings. [90]

With regard to the stage of the digitalisation process in the Danish building sector:
> ➢ The **building permit system** process in Denmark is partially digitalised: the building permission can be applied, managed and validated electronically.[91] Permits must be processed through a centralised web portal, mandatory for any construction project across the country, irrespective of its location. The system is designed to be user-friendly, allowing users to visually find and select the plot of land for a project. This visual aid helps in accurately identifying the project location, which is crucial for subsequent steps.[92]
> ➢ However, Denmark was the first country to mandate the usage of BIM back in 2007. More than a decade ago, the country mandated its state clients (from Ministries to Universities) to adopt BIM practices both for new construction projects and restoration.[93]

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[85] PlanRadar (2023). *Digitalisation in the construction and real estate sector Challenges and growth prospects based on a survey of over 1,300 industry professionals*

[86] The Danish Government (2021). *Denmark's Recovery and Resilience Plan.*

[87] Ibidem.

[88] Ibidem.

[89] Ibidem.

[90] Ibidem.

[91] ECSO (2021). *European Construction Sector Observatory.*

[92] Interview no. 3.

[93] ECSO (2021). *Country profile – Denmark.*

➢ According to the Eurostat database, **Denmark is among the countries with the highest percentage of companies in the construction sector that use at least one of the AI technologies** in their activities (8.9%).[94] The EIB Group survey on investment and investment finance 2020 for Denmark[95] shows that, specific to the Danish construction sector, the share of firms that adopted the concept of drones stood at 31.0%, which is higher than the EU-27 average (19.0%). Similarly, around 17.0% of the construction firms adopted augmented or virtual reality in Denmark in 2020, whereas the EU-27 average for the same stood at 11.0%. 3-D printing was adopted by 10.0% of Danish construction firms in 2020, in line with the EU-27 average (10.0%).

➢ **Denmark is also a frontrunner in digitalising building data and making them publicly accessibl**e. Although some of the databases were initially established for purposes of taxation, preservation, and energy savings, they can be put to new use from a circularity perspective. These databases include the Main Danish Building and Dwelling Register (BBR), which contains building preservation status, a register comprising building energy data and construction waste data[96], (which is essential for architects and building constructors as it provides a reliable source of information needed for planning and executing construction projects[97]); *Dataforsyningen,*[98] with free public access to geodata; and *Miljoeportal,*[99] which includes data on the environment, water, nature, land use, and climate adaptation. Moreover, Denmark has an official, countrywide digital plan register, operating open geodatabase including e.g. over 34,000 effective local development plans.[100]

Case Study 1. Easy Access to Public Plans: Danish Digital Plan Register

Plandata.dk ensures easy access to public plans i.e., local, municipal, and national planning data (this also applies to data from the Construction and Housing Authority). The digital data are freely available to ensure one place where everyone has access across all administrative boundaries, facilitate municipal workflows by simplifying the submission of plans to the state, and assign geography on all plans to precisely identify plan boundaries. The digital plans allow the administrators to see all relevant data for a single property when evaluating building permits.[101] The system is useful to both national and municipal case working, as well as for Danish citizens who have easy access to knowledge about local plans across municipal borders.[102]

Institution implementing: The digitalisation of plan data and the register Plandata.dk is currently driven as a top-down process, with the Danish Agency for Planning and Rural Development responsible for managing, operating and maintaining, and the municipalities responsible for continuously updating the content of the system by reporting new plans and updating old ones.

Stakeholders involved: there are several actors involved in the digital plan data. Some of the main actors are:

➢ The Ministry of Industry, Business and Financial Affairs, responsible for all national legislation and planning (including the Planning Act);

➢ Other public ministries/agencies (e.g., the Danish Tax Agency, the Nature Agency);

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[94] Eurostat database, ICT usage in enterprises (Artificial intelligence by NACE Rev.2 activity).
[95] EIB (2020). *EIB Group survey on investment and investment finance 2020 Country overview Denmark.*
[96] Andersen R. et al. (2021). *Using digitized public accessible building data to assess the renovation potential of existing building stock in a sustainable urban perspective.*
[97] Interview no. 3.
[98] https://dataforsyningen.dk/
[99] https://miljoeportal.dk/
[100] ESPON (2020). *Denmark, Norway and Switzerland show the way to digital plan data in spatial planning.*
[101] ESPON (2021). *DIGIPLAN – Digital plans and plan data in Denmark.*
[102] Interview no. 1.

> ➢ Local Government Denmark (da: Kommunernes Landsforening), the association and interest organisation of the 98 Danish municipalities;
> ➢ and various private consultancies.

Objectives: The purpose of the system is to provide both the public and other case handling systems with easy access to the plans – e.g. municipal local plans, and rural zone permissions. According to its objectives, Plandata.dk complies with the Law on planning (da: Lov om planlægning[103]), which specifies the plans, decisions, etc. that must be both digitised and published through the platform. The main objectives are as follows:

> ➢ To ensure one place where everyone (citizens, businesses, municipalities, the state, etc.) have access to all plan data across administrative boundaries such as municipal boundaries;
> ➢ To facilitate municipal workflows by simplifying the submission of plans to the state;
> ➢ To assign geography on all plans in order to precisely identify plan boundaries.[104]

Implementation process: The first registry of planning data in Denmark, (da: Planregistret), was established in 1986. Until 2013, digitisation considerations were only a topic of discussion. In 2013, the Danish digital strategy formed a working group involving ministries, Local Government Denmark and other stakeholders to propose digital local plans. Despite a lack of funding, informal collaboration between the Ministry of Industry, Business and Financial Affairs, and Local Government Denmark persisted. Collaboration intensified in 2016 when the Ministry of Taxation recognised the potential of plan data for property assessment, prompting intensive work to expand the planning data registry (at that time – PlansystemDK). By 2017, the enhanced system, renamed Plandata.dk, was developed, with the initial registration of additional data from 33,500 local plans and 50,000 municipal plans completed.[105]

Outcomes:

> ➢ Plandata.dk provides access to official and legally binding planning documents in the form of PDFs or links to national planning directives – these are easily accessible to anyone with an internet connection, promoting transparency and public engagement in planning processes.
> ➢ The geodata available on Plandata.dk serves as the cartographic representation of plan elements, enhancing the visualisation of planning elements, and aiding in understanding and analysis. However, despite the developments, the legally binding plans are still the PDF-version, not the geodata.
> ➢ Plandata.dk offers options to download plan data as PDFs or geodata, allowing users to both access and utilise planning data according to their needs and preferences.
> ➢ The platform hosts digital plan data from both national and local levels, ensuring comprehensive coverage of planning information and accommodating various planning instruments, ranging from general strategic orientation to detailed cartographic representations, catering to diverse planning needs and scales.[106]

Combined with other tools and databases, Plandata.dk forms part of a comprehensive digital framework that helps planning entities work more efficiently. Many other aspects of planning are managed outside of this portal. However, the tool is essential for ensuring transparency and legal compliance, but it does not significantly streamline the overall planning process on its own.[107]

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[103] Retsonformation (n.d.). *Lov om planlægning.*
[104] ESPON (2021). *DIGIPLAN – Digital plans and plan data in Denmark.*
[105] Ibidem.
[106] Ibidem.
[107] Interview no. 2.

Impact on affordable and sustainable housing:[108] Plandata.dk is primarily a documentation tool rather than a development tool. It contributes to addressing the challenges of housing development by improving access to planning data, streamlining administrative processes, and promoting informed decision-making. Affordable housing projects will be reflected in planning documents once initiated, but their presence in these plans does not guarantee their feasibility or implementation. Ultimately, while the digitalisation of planning documents can improve aspects of urban development like sustainability and efficiency, its impact on affordable housing is more nuanced and indirect.[109]

➢ **Habitability and comfort:** Providing a single platform for accessing planning data ensures that development projects align with zoning regulations and environmental considerations, thus promoting habitable and comfortable living environments.

➢ **Community and connectivity:** Streamlining the process for accessing planning data facilitates efficient urban development that impacts densification and mixed-use development, ensuring that there are no conflicting plans in neighbouring areas. However, municipal planners also rely on other tools and direct communication with neighbouring municipalities.[110]

➢ **Economic accessibility:** There is no evident impact on the affordability of housing. Plandata.dk alone is a small component within the broader planning framework. It is essential for ensuring transparency and legal compliance, but it does not significantly streamline the overall planning process on its own.[111]

➢ **Resource efficiency and circularity:** The platform's ability to provide access to plans across administrative boundaries supports integrated planning efforts, facilitating best practice learning in planning cases. With the search functionality, when planner intends to develop, for instance, a solar panel installation, they can easily search for and access relevant plans. Given the increasing prevalence of solar panel projects in Denmark, planners find it invaluable to review how other municipalities have managed similar initiatives.[112]

➢ **Resilience and adaptation to climate change:** Access to comprehensive planning data enables stakeholders to identify areas suitable for housing projects.

Potential for scalability and replication in other EU Member States:

➢ While digital plan portals may seem commonplace in regions where they are already established, many countries still lack comprehensive, easily accessible portals that cover the entire nation or even specific parts of it. A digital portal can serve as a central entry point for locating plans, visualising them, and supporting participation processes. Furthermore, digital plan data can be accessed more easily and quickly than analogue data, offering the added advantage of increased transparency regarding existing planning documents;

➢ Establishing a centralised agency responsible for overseeing digitalisation efforts, supported by active participation from local municipalities in data maintenance and updates would be crucial. Such a collaborative framework ensures scalability and consistency in planning data management across diverse national contexts within the EU.

2.1.2.2 France

France has dedicated EUR 8.4 billion to advance the digital transformation of the nation, including the digitalisation of companies through its National Resilience and Recovery Plan (NRRP).[113] This

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[108] Own elaborations, *CASE based on desk research and interviews no. 1,2 and 3.*
[109] Interview no. 2.
[110] Interview no. 2.
[111] Interview no. 2.
[112] Interview no. 2.
[113] French Government (2021). *Plan National De Relance Et De Résilience.*

investment aims to foster innovation and promote the extensive adoption of these technologies.[114] The proposal also includes an allocation of EUR 5.8 billion for enhancing the energy efficiency of both public and private buildings, aiming to upgrade their energy performance and comfort levels. This initiative seeks to lower the nation's energy expenses, decrease greenhouse gas emissions, and alleviate energy poverty.[115]

PlanBIM 2022 is an appointed (vertical) policy that focuses on digital construction technologies.[116] The BIM 2022 Plan builds on the Digital Transition Plan in the Building (PTNB), which has been in place since 2015 to establish a solid framework for the digitalisation of the construction sector. In particular, the BIM 2022 Plan aimed to generalise the use of digital technology in buildings by 2022 and mobilise and support the building sector, by providing professionals with practical methods and tools to spread the use of digital technologies.[117]

With regard to the status of the digitalisation of the housing industry:
  ➢ **The building permit system process in France is partially digitalised** – the government website offers the possibility to obtain building or renovation permission in electronic form;[118] Since January 1, 2022, a user can submit their building permit application online, at any time and wherever they are, in a simplified process and free of charge. All municipalities must be able to receive planning permission applications in electronic form. However, these are PDF files (and not digital BIM models)[119].
  ➢ According to the Eurostat database, **4.1% of companies in the construction sector in France use at least one of the AI technologies in their activities.**[120] As per the survey of the EIB Group,[121] about 28.0% of French construction sector firms were expected to have implemented digital technologies within their business, either fully or partially by the end of 2020. The top digital technologies implemented by businesses in France, either partially or fully, in the broad construction sector include IoT (15.0%), 3-D printing (13.0%), drones (11.0%) and augmented or virtual reality (6.0%). BIM is very common in France, and its growth rate is about 10–15% per year with a current business adoption rate of greater than 35%.[122]
  ➢ **The BDNB (National Buildings Database), released in April 2022, is a mapping of the existing building stock**, built by geospatial crossing of twenty databases from public bodies. It contains an identity card for each of the 20 million buildings, residential or tertiary. The BDNB is intended to be shared and to constitute an open repository, the basis for the development of multiple services supported by public and private actors, as well as a place to capitalise on existing buildings.[123] More sensitive versions are then reserved for "landowners"—in this case, public institutions such as local authorities. These data include the living area of a house, the presence of a swimming pool, the number of bathrooms and other data with a similar level of accuracy.[124]
  ➢ Digitalisation practices are also present within the social housing structures, with a good practice linked to the leading player in social housing provider in Paris.

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[114] ECSO (2021). *European Construction Sector Observatory.*
[115] French Government (2021). *Plan National De Relance Et De Résilience.*
[116] Ibidem.
[117] Ibidem.
[118] Ibidem.
[119] Interview no. 6
[120] *Eurostat database, ICT usage in enterprises (Artificial intelligence by NACE Rev.2 activity).*
[121] EIB (2020). *EIB Group survey on investment and investment finance 2020.*
[122] Otte K. et. al. (2022). *Digitalisation for the Energy Efficiency of Buildings Operations: Lessons Learned from the EE Hub Digitalisation Working Group.*
[123] European data (n.d.). *National Buildings Database - Plateforme ouverte des données publiques françaises.*
[124] Ibidem.

Case Study 2. Digitalisation of Social Housing: Paris Habitat

Paris Habitat is the French largest public utility with a social housing company. Linked to the Paris' City Hall, it both owns and manages 124,000 social dwellings relying on digital solutions (including multi-site organisation, renovations, construction, and rental management). These social dwellings provide housing for more than 310,000 residents, within Paris, who are low-income households. The social mission is to provide affordable homes of good quality and adapted to the needs of residents.

Institution implementing:

Paris Habitat Group comprises two Social Housing Enterprises (ESH): Aximo and L'Habitation Confortable and is linked to the Paris local authority and under State's supervision for the control of its management.

The activity of the group subsidiaries touches on numerous societal issues:
  ➢ Aximo is active in the development and management of social housing units.
  ➢ L'Habitation Confortable specialises in the management of collective housing (accommodation establishments for the elderly and dependent elderly, social housing, young worker accommodations, and student residences).

Stakeholders involved: The City of Paris and its various administrative departments are key stakeholders. They work closely with Paris Habitat on urban planning, digitalisation, housing policies, and social welfare initiatives. Paris Habitat is also supervised by various state institutions like the Ministry of Territorial Cohesion and Relations with Local Authorities, and the Ministry of the Economy, Finance, and Recovery.

Objectives:
  ➢ Renewing city – buildings, renovating and maintaining its properties
       a. In line with the 2019–2028 strategic property plan, nearly 27,000 low-cost housing units will be subject to improvements, and 13,500 of them will undergo heavy renovation work;[125]
  ➢ Accepting the application of and housing low-income households;
  ➢ Improving community cohesion and neighbourliness.

Implementation process

PH was founded in 1914 and has been implementing its mission ever since. The Group is present in 54 municipalities across the central and extended Paris metropolitan area, housing 286,500 residents and managing a stock of 125,900 housing units.

Outcomes:
  ➢ **Paris Habitat relies on digital solutions including multi-site organisation, renovations, construction and rentals.** One of the outcomes of this approach is a digital platform designed for 1200 building supervisors to manage tenants through online solutions. The Salesforce platform includes inventory and lease signing. The App Gardiens, powered by Salesforce, features modules such as Fiche Net Sécurité for monthly safety inspections, Affaire Technique for reporting equipment breakdowns, Demande Régie for technical maintenance requests, and Fiche Constat Sûreté for reporting incidents. Visite de Courtoisie schedules and reports visits to new tenants. Future plans include integrating cleanliness monitoring into Salesforce for tenant complaints. The mobile application has been developed specifically for Paris Habitat needs such as tracking the security equipment controls, scheduling meetings with new tenants, and insurance management. As a result, building supervisors have a common space where they can find basic knowledge about the general management of the premises and can interact with the tenants.[126]
  ➢ When it comes to renovation, Paris Habitat is a partner of the CHARM project whose objective is to optimise (re)use of material and natural resources. Apart from saving 20 tonnes of raw material and 50 tonnes of increased material recovery,[127] Paris Habitat is co-developing a platform to exchange used materials during the renovation processes. As an outcome of this

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[125] Paris Habitat (n.d.). *About us – website.*
[126] Salesforce (n.d.). *Paris Habitat, the social landlord, successfully goes digital.*
[127] Interreg (n.d.). *Paris Habitat: 16 light renovations, 12 deep renovations (occupied) + 12 transformations.*

programme, Paris Habitat performed 16 light renovations, 12 deep renovations (occupied) and 12 transformations in cooperation with Ville de Paris and Backacia—a company linking sellers and buyers of reused building materials.

➢ Prioritisation of bio-sourced materials, dry construction methods and support the development of the recycled materials sector to encourage sustainable purchasing and circular flows of materials;

➢ In 2016, Paris Habitat received the ISO 50001 environmental certification for its actions in favour of energy efficiency. It manages 70,000 m² of built-up surfaces covered in vegetation, and 108 hectares of green spaces.[128]

Impact on affordable and sustainable housing:[129]

➢ **Habitability and comfort:** Paris Habitat focuses on improving the living environments of tenants through a comprehensive rehabilitation strategy that goes beyond basic housing and heating to include private and common areas, services, and neighbourhood integration. A key aspect is adapting housing for an aging population, with significant internal adaptations made to 1,500 units in 2023 and improved accessibility from streets to housing for 872 units. Currently, 32.8% of their housing is street-accessible, meeting Paris City commitments, while 8.2% is internally adapted. These digital modules centralise information, improving property management and tenant service, providing tenants with real-time updates on building activities, and allowing them to submit and track requests, and access their contracts and documents. It also offers convenient features like rent payment and personalised contact information for building managers. Additionally, tenants can securely store administrative documents using the integrated Digiposte. To bridge the digital divide, Paris Habitat maximises its proximity policy through 22 local agencies across Paris, where tenants can access administrative support, make requests, and receive social assistance. On-site building caretakers, one per 100 dwellings, serve as the primary contact between tenants and Paris Habitat. Partnerships with organisations promoting digital literacy are supported through premises and funding.

Well-maintained green spaces within housing complexes provide recreational areas, mitigate urban heat effects, and promote a healthy environment. Apartments are designed to be bright, functional, and comfortable, maximising space and enhancing resident satisfaction.

➢ **Community and connectivity:** Paris Habitat manages a diverse array of social housing units across different areas of the city, promoting integration among a wide spectrum of residents including young adults, the elderly, migrants, and refugees. Residents actively participate in community life through meetings, associations, and local events, fostering inclusivity and social cohesion. They play a crucial role in shaping their living environment and social dynamics within the housing estates of Paris Habitat, especially evident in collaborative efforts such as the rehabilitation projects at Alphonse Karr HBM, HBM Sthrau, and Tour des Poissonniers. From initial public meetings outlining project details and timelines, to active participation in design workshops where they propose ideas like layout modifications and temporary housing solutions, residents are empowered to influence decisions that impact their homes directly. Inclusive housing initiatives further enhance community bonds, particularly for elderly tenants who engage in social projects and activities aimed at improving their quality of life and maintaining independence.

➢ **Economic accessibility:** Paris Habitat enhances economic accessibility through a diverse range of housing options tailored to benefit vulnerable groups. Their portfolio includes standard social housing with three rent levels based on income, as well as residences designed for students, elderly individuals, young workers, and migrant workers. Paris Habitat further supports economic accessibility through transitional housing initiatives. They utilise vacant buildings for temporary housing in collaboration with emergency accommodation associations, effectively managing high demand and reducing risks like squatting. This effort includes robust social support services to

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[128] Paris Habitat (n.d.). *About us – website.*
[129] Own elaborations, *CASE based on interviews no.4, 5, 6 and 7.*

prepare residents for permanent housing, offering assistance with rights, healthcare, and administrative procedures.

Additionally, the digitalisation initiative (Saleforce platform) includes equipping all building caretakers with smartphones and deploying the App Gardiens for streamlined building management. Despite initial and ongoing costs, this digital transformation aims to centralise information, improve efficiency in managing properties and client interactions, and enhance overall service delivery – although not directly impacting reduced costs for habitants. One thing worth considering to improve this process is unifying the documentation required for each contract type and clarifying the eligibility criteria for applicants.

➢ **Resource efficiency and circularity:** Paris Habitat is committed to sustainability, prioritising the use of dry, bio-based materials throughout its projects. Aligned with the BoisBiosourcés Pact, Paris Habitat aims to achieve 40% of housing production using wood and bio-sourced materials by 2025, enhancing energy efficiency and seasonal comfort. The organisation promotes circular economy initiatives by recycling waste into resources and supporting local associations. Collaborating closely with the City of Paris, Paris Habitat reintegrates vegetation into urban spaces with low water-consumption plants and biodiversity-friendly gardening practices. Eco-friendly techniques like mulching replace phytosanitary products, alongside water-saving measures and the implementation of green roofs and rainwater recovery systems. Paris Habitat's investment plan for 2019–2028 allocates EUR 1.48 billion to rehabilitate 16,360 dwellings, focusing on enhancing energy efficiency, comfort, and residents' quality of life. This includes comprehensive thermal improvements aimed at meeting the goals of the City of Paris Climate Plan. Since 2014, over 9,000 units have been refurbished with a budget of EUR 305 million under the Climate Plan, targeting a 60% thermal gain through bio-based insulation, cellar and roof insulation, and installation of double-glazed windows to reduce energy consumption. These efforts not only lower energy bills but also modernise equipment, combating energy poverty. Paris Habitat's rehabilitation projects extend beyond individual units to encompass common areas, services, and integration within neighbourhoods, enhancing the environmental impact and resident well-being.

➢ **Resilience and adaptation to climate change:** The focus on sustainable construction and the adaptation of disused sites into new housing units increases the longevity and adaptability of housing infrastructure. This ensures long-term sustainability and resilience in the face of environmental challenges. Initiatives such as the CHARM project and the development of material exchange platforms demonstrate a commitment to circularity and environmental responsibility. Paris Habitat is actively addressing climate change by implementing "cold islands" across their properties to mitigate heat waves. This includes installing shade cloths and misting systems at 109 sites and initiating "cool roof" projects. Additionally, 104 sites are being transformed to improve water infiltration and create cooler environments through initiatives like grass-covered paving stones and permeable wood chips. These efforts aim to enhance tenant comfort by providing shade, calmness, and cooler living spaces while promoting environmental sustainability through demineralisation and green space expansion.[130]

Potential for scalability and replication in other EU Member States:
➢ Using digital applications and platforms to communicate with tenants, collaborate on initiatives, and address various issues, such as security, can be scaled and replicated. This approach enhances community engagement and streamlines management processes.
➢ This initiative has a strong potential for international application, especially as countries globally are seeking greener alternatives in construction to reduce environmental impact. The shift towards sustainable materials and construction methods can serve as a model for developing eco-friendly housing solutions worldwide.

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[130] Interview no. 7.

> ➤ The transformation of disused sites into new housing units is an innovative and efficient use of resources that addresses both the need for housing and the optimal use of urban spaces. This approach can be replicated in other countries, particularly those facing similar challenges with urban space utilisation and the need for housing. The idea of repurposing existing structures instead of always building new ones aligns with global trends towards sustainability and efficient resource use.
>
> ➤ The reuse of the materials during the CHARM project can pave the way for upcycling of the materials in the future by serving as proof that it is possible and cost-effective. The methods used during the project (such as the material exchange platform) can be developed further and scaled to enhance circular economy practices.
>
> ➤ The rental intermediation schemes used by Paris Habitat to provide permanent housing for vulnerable populations are highly scalable and replicable. The key to this initiative's success and potential spread to other countries lies in its collaborative model, working with associations to extend housing opportunities. This model can be adapted to various legal and social contexts, making it a versatile solution to global housing insecurity issues.

2.1.2.3 The Netherlands

Various measures and policies have been implemented to encourage and incorporate the utilisation of digital technologies in the Dutch economy. In 2018, the Dutch government released the Smart Industry Implementation Agenda (Implementatieagenda Smart Industry) covering the period from 2018 to 2021. The primary objective of this agenda was to enhance productivity, create employment opportunities, and address societal challenges by minimising raw material and energy consumption. This initiative extended beyond the manufacturing sector to include companies operating in the chemical and construction industries.[131] The Construction Agenda 2017–2021, comprising 11 roadmaps and six overarching themes, involved the collaboration of more than 50 representatives from diverse social groups, the government, and the construction sector. Focused on infrastructure, utility construction, and the housing market, this programme encourages collaboration between established companies and small to medium-sized enterprises (SMEs).

In June 2018, the Dutch government established the Construction and Innovation Centre (BTIC) to address sustainability challenges in the construction sector. The centre aims to establish long-term knowledge-sharing programmes for fostering innovation, connecting the private sector with policymakers and promoting bilateral communication. It actively contributes to the innovation goals outlined in the Dutch Construction Agenda.[132]

Additionally, the forward-thinking policy innovation of the Netherlands supports urban renewal and green building projects. With a target of achieving a fully circular economy by 2050, the country is working towards a 50% reduction in primary raw material use by 2030. The policy, Government-wide Programme for a Circular Dutch Economy by 2050,[133] also includes measures to enhance the sustainability of the building and construction sector (as one of the five highest priority sectors).

With regard to the digitalisation in housing industry:
> ➤ The BIM is coupled with their permit systems, allowing to have a fully automated process with 3D models.[134]
> ➤ **According to Eurostat database 7.4% of companies in the construction sector in Netherlands use at least one of the AI technologies in their activities.**[135] As per the survey

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[131] ESCO (2021). *European Construction Sector Observatory. Country profiles – Netherlands.*

[132] Ibidem.

[133] Dutch government (2023). *Nederland circulair in 2050. Rijksbreed programma Circulaire Economie.*

[134] ECSO (2021). *European Construction Sector Observatory*

[135] Eurostat database, ICT usage in enterprises (Artificial intelligence by NACE Rev.2 activity).

of EIB Group,[136] around 47.0% of the construction firms adopted drones in 2020. Similarly, the Internet of Things (IoT) and augmented or virtual reality were adopted by 44.0% and 38.0%, respectively, by the Dutch construction firms in 2020. Contrarily, only 19.0% of construction firms adopted 3-D printing.[137]

➢ **The data about building stock is kept in the Basic Registration of Building and Addresses (BAG).** The BAG is part of the government system of basic registrations. Municipalities are source holders of the BAG and are responsible for including the data in the system and for their quality. All municipalities make data on addresses and buildings centrally available via the National Supply (BAGLV). The Land Registry manages the BAGLV and makes the data available to the various customers. The BAG contains information on five object types: buildings, residences, number indications, public areas, and residences. The attributes are among other status, surface, geometry, x-y-coordinate, year of construction and purpose of use.[138] Furthermore, the 3D BAG is also available, containing 3D models at multiple levels of detail, which are generated fully automatically by combining two open data sets: the building data from the BAG and the height data from the AHN. The 3D BAG is updated regularly, keeping it up-to-date with the latest openly available building stock and elevation information.[139]

Case Study 3. Classification System for Buildings: Integral Energy Transition for Existing Buildings (IEBB)

The project supports the ambition of the Netherlands to renovate 300,000 homes per year in a manner that reduces GHG emissions and achieves a climate-neutral built environment.[140] The digitalisation programme of IEBB focuses on a far-reaching digital transformation of the buildings, design and engineering sector—a housing classification system and tendering mechanism for large-scale housing renovations to promote standardisation and industrialisation of the renovation industry.[141]

Institution implementing: IEBB consortium initiated by the BTIC and funded by the country's Ministry of Economic Affairs & Climate Policy as well as the Ministry of the Interior and Kingdom Relations.

Stakeholders involved: IEBB consists of more than 125 participating parties from research institutions, the construction industry, the technology and design sector, governments, homeowners and residents. This includes the Delft University of Technology, the Technical University Eindhoven, the Technical University Twente, the Wageningen University, and the Urban Energy Institute.[142]

Objectives:

The project's main objective is to enable feasible energy transition in existing residential building areas and to develop standards, and scalable processes for future use. Its main goal is to scale up to 300,000 renovations per year before 2030 in an effort to reduce greenhouse gas emissions and achieve a climate-neutral built environment. In order to achieve these goals and measure progress effectively, BTIC is divided into themes that pertain to different aspects of changing how the energy is used (Renovation concepts, Data-driven optimisation of renovation concepts, industrialisation, Digitalisation, Supported Energy Transition, assessment framework, Chain innovation and Heat storage).[143] Topics 1–4 focus on developing standardised ways to upgrade buildings by researching the current state of being, monitoring different aspects of energy use and getting insights and good practices from the market. Topics 5–7 concentrate on the implementation strategies to put

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[136] EIB (2020). *EIB Group survey on investment and investment finance 2020 -European Union Overview*.
[137] Ibidem.
[138] European data (n.d.). *Basic Registration Addresses and Buildings (BAG)*.
[139] TU Deft (n.d.). *Detailed 3D Building models Automatically Generated for very large areas (3D BAG)*.
[140] TKI Bouw en Techniek (n.d.). *IEBB-consortium*.
[141] Mohan A. (2022). *Scaling-up sustainable housing renovation: Designing a housing classification system and tendering mechanism to achieve standardization and industrialization*.
[142] TU Delft (n.d.). *Integrale Energietransitie Bestaande Bouw*.
[143] Ibidem.

observations and learnings into practice. The last topic focuses on advancing heating technology and storage.

Implementation process: 2020–2024

Outcomes:

➢ The housing classification system analysis was developed with input from industry specialists, including 48 distinct housing clusters and a product specification system. The clusters are categorised by roof shape, current insulation levels of the roof, facades, and windows, as well as house typology.[144]

➢ The tendering mechanism consisting of the details of the houses such as the key geometrical details, BAG-data, construction drawings, 3D scan of exterior and interior and energy label documentation will be very useful for the companies to provide a more accurate quote for renovation works.[145]

➢ Identification of minimum renovation requirements for comfortably heating homes using lower temperature heat from district heating.[146]

➢ An advanced framework to monitor and evaluate the impact of renovations of social housing associations.[147] The system gathers building characteristics of over 2.0 million dwellings of social housing associations, combining them with actual energy consumption, and building a model that is able to assess the effects of renovations on actual energy savings. However, housing characteristics and renovations vary considerably (25 characteristics with 90 parameters) which posed a significant challenge.

➢ An evaluation of machine learning models in building classification tasks.[148] The research confirmed which ML reads the features of homes best taking into consideration the heating system type, how many people live there, and the number of solar panels installed.

➢ Research on the possibility of mass production of standardised products through automation, robotics & 3D-printing as an alternative renovation model.[149]

Impact on affordable and sustainable housing:[150]

➢ **Habitability and comfort:** The main advantage of the project is its focus on improving the energy performance of the buildings, a critical issue in the Netherlands, especially since many low-energy-class flats are being rented. As energy-efficient renovations become more common, their benefits extend beyond individual buildings to include entire communities and cities. These benefits include improved energy infrastructure, increased property values, and enhanced quality of life. This holistic approach to energy efficiency, supported by policy initiatives, public awareness, and tailored solutions, presents a promising pathway towards a sustainable future for urban living.[151]

➢ **Community and connectivity:** The project's emphasis on streamlining processes and providing standardised solutions contributes to transparency. Having all planning documents in one place also allows citizens to access information on the same level. This centralised access is crucial for informed decision-making and coordinated responses, particularly in a country where a lot of territories are in danger of being flooded.

➢ **Economic accessibility:** The initiative does not consider end-user affordability as one of the outcomes. Its focus on the standardisation and industrialisation of the renovation industry may indirectly support economic development by streamlining processes and reducing costs. By

[144] Mohan A. (2022). *Scaling-up sustainable housing renovation: Designing a housing classification system and tendering mechanism to achieve standardization and industrialization*.

[145] BTIC, Eindhoven University of Technology (n.d.). *Digital tender*.

[146] Wahi P. et.al. (2022.). *Requirements for renovating residential buildings in the Netherlands towards lower temperature supply from district heating*.

[147] Van der Bent H. (2021). *Advanced monitoring and evaluation of social housing renovations*.

[148] Čurčić T. et. al. (2022). *Gaining insights into dwelling characteristics using machine learning for policy making on nearly zero-energy buildings with the use of smart meter and weather data*.

[149] BTIC, Eindhoven University of Technology (n.d.). *Digital tender*.

[150] Own elaborations, *CASE based on desk research and interviews no. 8, 9, and 10.*

[151] Interview no. 9

renovating buildings according to the same standards, people receive good-quality living conditions, without the need to heat and cool down poorly-insulated buildings. A poorly insulated building requires approximately twice as much thermal energy compared to an energy-efficient building of the same size (100 square metres).

➢ Most importantly, each building has assigned value which is based on its size and location. While this system incentivises homeowners to invest in renovations, further development is needed to accurately reflect the real market value of houses and ensure economic accessibility for all. A detailed and standardised dataset (key geometrical data, BAG-data, construction drawings, 3D scans of both exterior and interior, and energy label documentation), in the tendering mechanisms, allows for the provision of more accurate quotes for renovation projects. By incorporating such a mechanism, the renovation process becomes more transparent and efficient. This approach ensures that all relevant information is available upfront, which reduces uncertainties, enables precise planning, and facilitates large-scale housing renovations.

➢ **Resource efficiency and circularity:** By adopting a more targeted approach to resource allocation, the project can significantly reduce energy consumption and carbon footprints while simultaneously promoting the integration of renewable energy sources. The tailored strategy ensures that each household's unique needs are met efficiently and effectively. This approach can elevate buildings' energy performance through the implementation of passive design principles. As a result, energy consumption and costs are reduced, contributing to long-term sustainability. The classification of homes into large-scale clusters based on similar characteristics and renovation requirements offers the opportunity to minimise waste generation. By identifying commonalities among properties, we can streamline renovation processes and optimise resource utilisation, ultimately leading to a more environmentally conscious approach to housing renovation.

➢ **Resilience and adaptation to climate change:** Feasible energy transition in existing residential building areas is crucial for resource optimisation, especially when it comes to the heating and cooling of buildings. Providing better insulation can in effect reduce energy absorption, whereas collecting data plays an essential role in enhancing the accuracy and effectiveness of modelling and the development of frameworks. What is especially important is using the full potential of available data and using BIM models in administration as well.

Potential for scalability and replication in other EU Member States:

➢ The programme of BTIC exemplifies fostering innovation through public-private collaboration, aligning efforts in the construction and engineering sectors to tackle major social challenges on a large scale.

➢ The developed framework, categorising homes into clusters with similar characteristics—not focused at centralising solutions for all buildings but rather ensuring each building receives a tailored approach, considering its unique characteristics and needs—offers a tool for streamlining renovations, minimising waste, and promoting environmentally friendly practices. Once validated, it can serve as a universal template across Europe.

➢ Building similar, comprehensive datasets for the tendering mechanisms should include key geometrical data, BAG-data, construction drawings, 3D scans, and energy label documentation to allow precise planning and transparent renovation processes, reducing uncertainties. The main focus should be on tailoring these datasets to reflect regional market values and ensuring economic accessibility, thereby facilitating large-scale housing renovations.

➢ The integration of machine learning algorithms, particularly Long Short-Term Memory (LSTM) models, in predicting dwelling characteristics, demonstrates significant potential for scalability, as the model accurately predicts various target variables, achieving an accuracy of 96% for heating systems, 83% for the number of inhabitants, and 80% for the number of solar panels.[152]

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[152] Čurčić T. et. al. (2022). *Gaining insights into dwelling characteristics using machine learning for policy making on nearly zero-energy buildings with the use of smart meter and weather data.*

These highly accurate predictions can both inform and optimise policy decisions, allowing for tailored, data-driven approaches to housing renovations.

➢ Implementing regulations to increase the energy class of the buildings can incentivise homeowners invest in necessary renovations. Without such measures, and given the high demand for housing, homeowners might prefer to rent their properties without making improvements.

2.1.2.4 Comparative Analysis – Digitalisation and Innovation in the Housing Sector

The three case studies presented—Plandata.dk in Denmark, Paris Habitat in France, and the IEBB in the Netherlands—highlight diverse approaches to improving affordable and sustainable housing through digitalisation and innovative practices.

The following table presents a summary of how each initiative investigated in this chapter contributes to enhancing different aspects of affordable and sustainable housing:

Table 6. Impact Matrix: Digitalisation Initiatives and Affordable and Sustainable Housing

	Plandata.dk digital plan register (DK)	Paris Habitat (FR)	IEBB (NL)
Habitability and comfort	Enhanced by ensuring development projects comply with zoning regulations and environmental considerations through a **centralised planning data platform**.	Enhanced through comprehensive rehabilitation strategies, **digital solutions for property management**, and well-maintained green spaces.	Enhanced by improving the energy performance of buildings, crucial for many rented low-energy-class flats in the Netherlands.
Community and connectivity	Facilitated by **streamlined access to planning data, aiding efficient urban development, densification, and mixed-use development** while preventing conflicting plans in neighbouring areas.	Fostered through diverse housing locations, collective initiatives, and active tenant participation.	Strengthened through **streamlined processes and standardized solutions** that promote transparency and informed decision-making in flood-prone regions.
Economic accessibility	There is no evident direct impact on the affordability of housing; however, technological advancements enhance **transparency and legal compliance**.	Digital solutions and energy-efficient renovations **lower operational costs and energy bills**.	There is no evident direct impact on the affordability of housing; however, technological advancements enhance building efficiency as well as transparency and efficiency of the planning process.
Resource efficiency and circularity	Promoted by supporting **integrated planning efforts across administrative boundaries and enabling best practice**	Achieved through the prioritisation of bio-based materials, circular economy initiatives, and significant investments in	Advanced by **targeted resource allocation and clustering homes based on similar characteristics, minimizing waste and**

	learning and resource-efficient development initiatives.	energy-efficient refurbishments.	**integrating renewable energy**.
Resilience and adaptation to climate change	Supported by **comprehensive access to planning data**, helping stakeholders identify suitable areas for housing projects and enhancing resilience and climate adaptation efforts.	Supported by sustainable construction practices, adaptive reuse of sites, and climate mitigation measures ensure long-term infrastructure resilience.	Improved through **better insulation and effective use of data**, crucial for sustainable development and climate adaptation strategies.

Source: own elaboration, CASE

Overall, these initiatives underscore the transformative potential of integrating advanced technology into urban planning and living spaces, reshaping daily life around efficiency and convenience while preserving social bonds. Digitalisation plays a crucial role in improving accessibility and usability for everyone, including disabled individuals and the elderly, facilitating independent living through smart technologies and inclusive design features. Moreover, the digitalisation initiatives mentioned above align with the NEB, emphasising sustainability, aesthetics, and inclusiveness in housing policies across Europe, while promoting interdisciplinary collaboration and innovation in urban development. Integrating these digital innovations more comprehensively into urban planning can further enhance affordability, sustainability, and liveability in cities worldwide.

The three case studies also reveal distinct impacts on affordable and sustainable housing in the context of digitalisation, use AI and database establishment. Firstly, the digitalisation of planning, as seen with Denmark's Plandata.dk, enhances transparency and streamlines administrative processes, improving access to data and facilitating more efficient workflows. However, while Plandata.dk focuses on providing a centralised access point for planning documents across administrative boundaries, Paris Habitat integrates digital solutions to manage tenant interactions and property maintenance, indirectly supporting affordable housing through operational efficiency and impacting accessibility and usability for all residents, including the elderly. With regard to the use of AI techniques, the Dutch IEBB project leverages AI and machine learning to optimise renovation processes, predict building characteristics, and enhance energy efficiency, ultimately reducing building time and costs while promoting sustainability. However, initial assessments suggest that cost savings are marginal, as digitalisation is still partially reliant on paper-based systems and not yet fully implemented. This area warrants further research. The IEBB project stands out with its housing classification system, detailed tendering mechanism, and extensive data-driven approach to energy-efficient renovations.

Common strengths include their emphasis on digitalisation to enhance efficiency and transparency in housing and urban planning processes. Both Plandata.dk and Paris Habitat leverage digital platforms to improve accessibility to planning data and enhance community engagement, respectively. Moreover, IEBB benefits from standardisation in energy-efficient renovations, streamlining processes and fostering innovation across different city typologies. However, these initiatives also face a number of challenges such as initial high costs, regulatory complexities, and resistance to change from traditional practices. Opportunities abound in leveraging advanced technologies, influencing policy towards sustainability, and expanding markets for energy-efficient renovations, thereby promoting broader environmental and economic benefits.

A significant challenge shared by these projects is the complexity of integrating new technologies or systems within existing frameworks. For instance, the reliance on digital platforms like Plandata.dk in Denmark requires municipalities to manage and update data consistently, which can be resource-

intensive and prone to errors if not adequately supported. Similarly, Paris Habitat's efforts to promote digital initiatives and sustainable practices face resistance or scepticism from stakeholders unfamiliar with such approaches, particularly in communities where digital literacy is not widespread. Moreover, all three initiatives encounter regulatory hurdles and varying legislative frameworks that complicate scaling efforts beyond their initial regions. For IEBB, standardising energy-efficient renovations across different city typologies and European countries poses a challenge due to diverse regulatory environments and varying levels of public awareness and acceptance. Effective scaling of these initiatives will require addressing these barriers through enhanced stakeholder engagement, tailored educational campaigns, regulatory harmonisation, and sustained financial support to ensure long-term viability and impact.

In conclusion, the three case studies—Plandata.dk, Paris Habitat, and IEBB—showcase varied yet complementary approaches to advancing sustainable housing through digitalisation and innovative practices. While Plandata.dk excels in planning and documentation, thus providing essential data for informed urban development, Paris Habitat and IEBB focus more on concrete improvements in housing conditions. Paris Habitat enhances social cohesion and prioritises green urban spaces, whereas IEBB emphasises energy efficiency and standardised renovation processes. Each initiative uniquely contributes to resource efficiency and resilience, reflecting their distinct contexts and objectives and supporting the transformative potential of integrating advanced technology into urban planning.

3. The Role of the Social Economy as a Provider of Affordable Sustainable Housing

Structures and (legal) frameworks with regard to housing can differ considerably in different countries and have a strong impact on costs and the quality of housing. While the responsibility of the housing sector is shared between the national and local governments, there is a growing involvement of a variety of stakeholders—through collaborations between public and private entities, as well as social economy actors. Their involvement can greatly improve both the affordability and sustainability of housing.

The aim of this part of the study is to give an overview of the state of play of the presence (or absence) of initiatives concerning structures/frameworks and social economy initiatives (including the legal context and stakeholders involved) in the EU Member States, and assess their potential to contribute to affordable and sustainable housing.

After a brief analysis of the situation across the EU Member States, the study adopts a focused approach by examining the cases of Austria, Poland, and Spain (Catalonia) to provide a comprehensive investigation of the role of the social economy as a provider of affordable sustainable housing. This selection has been made based on their decentralised housing sectors and the presence of innovative practices in housing structures, property development that involves the social economy structures, ensuring a diverse approach to housing governance and showcasing promising initiatives that contribute to the ongoing debate surrounding affordable and sustainable housing solutions across the EU.

3.1.1 Overview of the Main Providers of Affordable Sustainable Housing Across the EU

The governance of the housing sector is, in general, shared between the national and local governments, with national entities usually responsible for setting the overall policy priorities and local governments taking on more responsibility for the output and budgeting decisions of social housing provision.[153] Over the past two decades, many national governments have implemented policy changes, which allowed local governments to assume a larger role in developing, coordinating, and implementing housing policies, including those focused on the social housing stock and affordability challenges.[154] Compared with other levels of government, local governments are more likely to directly interact with local communities and businesses and implement tailored policies that directly affect them. They are the major actor when deciding on the amount of social housing to be provided in their jurisdiction, and the criteria for the approval of new housing developments.[155]

In terms of the instruments and measures mentioned in Chapter 1, since 2009, there has been a notable shift in housing policy towards favouring demand-side measures over supply-side ones. Consequently, the traditional responsibility of the state has shifted not only to local governments, but also to the private sector, non-profit organisations, and housing associations. The diversity in housing markets has led the EU Member States to adopt varying models and degrees of public policies to tackle the shortage of affordable and high-quality rental housing. Two distinct rental system models emerge based on how countries manage the housing supply:[156]

> ➤ **The dualist rental system** predominantly relies on private markets and market-oriented policies in managing rental and housing sectors. This model features a free market and profit-driven housing and rental market alongside a state-controlled housing and rental sector, which operate independently without competing against each other. Social housing providers serve as

[153] Phillips. L. (2020). *Decentralisation and inter-governmental relations in the housing sector.*
[154] Ibidem.
[155] Ibidem.
[156] EP (2020). Policies to Ensure Access to Affordable Housing; Cooperative and Social Housing Brussels (2019). *The State of Housing in the EU 2019.*

a safety net for low-income households but do not directly compete with for-profit housing providers. Limited non-private housing options in this system tend to promote home ownership.[157] This model is commonly found in English-speaking nations and many Central and Eastern European countries that experienced rapid privatisation of housing stock in the 1990s.[158]

➢ **The unitary rental market**, also known as the social market, integrated rental system and or social model, is distinguished by a larger sector of non-profit or limited-profit housing organisations that primarily focus on rental accommodations. In this model, social or non-profit housing providers directly compete with private housing providers. These non-profit housing entities participate in the market with the aid of public subsidies, which may gradually decrease as landlords achieve financial stability. This system is advocated in Germanic and Nordic countries with a social market approach.[159]

There is also a new approach to the housing policy that has appeared with the aim of achieving a social mix in housing policy, where the policy becomes the tool for social inclusion and the prevention of segregation.[160] For example, in the municipality of Amsterdam in the Netherlands, young adult refugees and Dutch young adults are brought together in collaborative housing.[161]

According to the OECD, **social housing remains a crucial component of affordable sustainable housing solutions**, ensuring that those unable to access housing through the private market still have access to decent and affordable accommodations.[162] In the EU, the Renovation Wave underscores the importance of enhancing the quality of building stock, particularly for social housing, and mobilises cross-sectoral partnerships linking them to local actors, including from the social economy.

The concept of social housing differs across the Member States, and so do the tools used across the countries. There are historically significant differences in the supply of social housing across European countries in terms of size, financing, and entitlement conditions.[163] For example, large social housing sectors can be found in Austria and the Netherlands. The Netherlands is the only country where the social housing sector is much larger than the private rental sector but it is relatively untargeted and is not reaching those who need it the most due to long waiting times, which creates distortions to economic decision-making.[164] For the remaining countries, the stock of social housing is fairly limited and mostly decreasing over time. Central and Eastern European countries (Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia) have mostly privatised their public housing stock as part of the economic transition leading to low availability of social housing.[165]

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[157] Council of Europe Development Bank (2017). *Housing inequality in Europe: Tackling inequalities in Europe: the role of social investment.*
[158] EP (2020). *Policies to Ensure Access to Affordable Housing*; Housing Europe (2019). *The State of Housing in the EU 2019.*
[159] Ibidem.
[160] EP (2020). *Policies to Ensure Access to Affordable Housing,*
[161] Czischke D. (2018). *Collaborative housing and housing providers: towards an analytical framework of multi-stakeholder collaboration in housing co-production.*
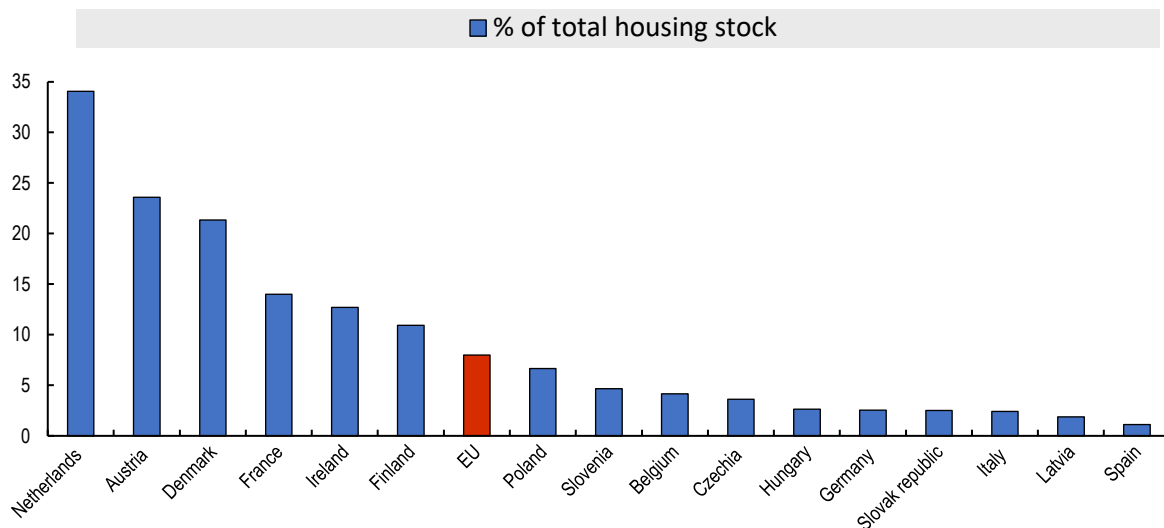[162] OECD (2020). *Social housing: A key part of past and future housing policy.*
[163] EC (2022). *Housing Market Developments in the Euro Area: Focus on Housing Affordability.*
[164] Ibidem.
[165] Ibidem.

Figure 3. Share of Social Rental Dwellings to the Total Number of Dwellings (%, 2022 or the latest year, available according to availability of data for the Member States)

Source: OECD (2024)., OECD Affordable Housing Database - indicator PH4.2. Social rental housing stock.

The social housing stock is predominantly publicly owned, directly by local governments or through municipal housing companies.[166] In Hungary, Latvia, Estonia, Slovakia, and Czechia, local government owns and controls 100% of the social housing stock, in Poland—79%. (Figure 4). Some countries, such as France, introduced temporary tax breaks with additional tax credits to private investors increasing the supply of new housing at controlled rents. In Italy and Spain, public policies supported the development of an affordable housing sector which is in between rented social housing and the private rental market.[167]

Although municipalities are gaining more roles in coordinating and implementing housing policies, the direction of the implementation of social housing provision is shifting away from heavy municipal engagement and towards a broader array of participants—particularly through collaborations between public and private entities, as well as social economy actors. Their involvement in housing, including social housing provisions is increasing due to limited government subsidies and funding constraints.[168]

The social economy comprises a diverse range of businesses, groups, and legal entities. Their common aim is to prioritise people, benefit local communities, and advance democratic governance and solidarity in a structured manner. These entities include non-profit associations, cooperatives, and mutual societies, as well as associations, foundations, and social enterprises. Social economy is a business model that aims to reinvest the majority of profits into the organisation or a social cause while adopting participatory or democratic governance structures. **Rooted in local communities, the social economy promotes values like solidarity, participation, and cooperation, aiming to enhance socio-economic cohesion.**[169]

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[166] Phillips. L. (2020). *Decentralisation and inter-governmental relations in the housing sector.*
[167] EC (2022). *Housing Market Developments in the Euro Area: Focus on Housing Affordability.*
[168] LSE (2017). *Social Housing in Europe.*
[169] EC (n.d.). *Internal Market, Industry, Entrepreneurship and SMEs - Social economy in the EU.*

Figure 4. Share of Total Social Rental Housing Stock by Type of Providers (%, 2022 or the latest year, available according to availability of data for the Member States)
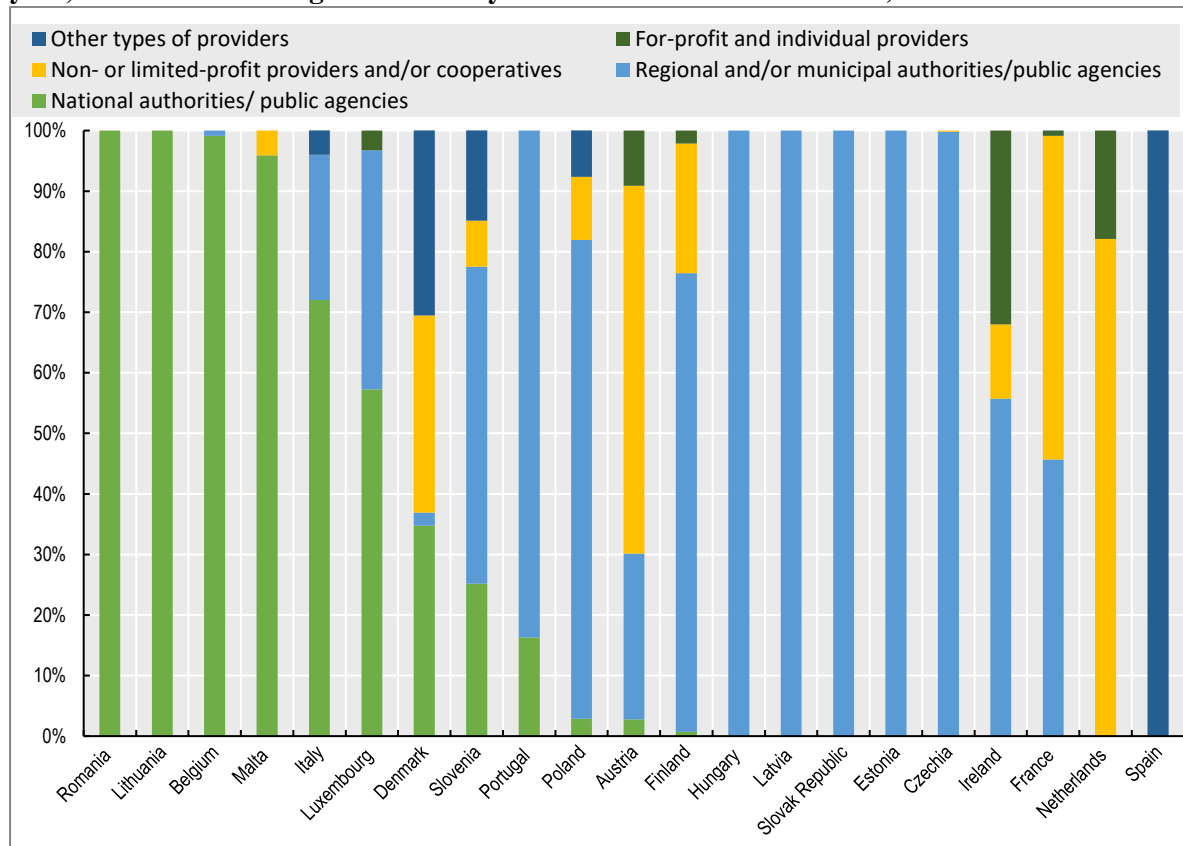
Source: OECD (2024). OECD Affordable Housing Database - indicator PH4.2. Social rental housing stock.

The following parts of the study (based on country-based case studies from Austria, Poland and Spain) assess whether the inclusion of social economy entities in housing provision (including, but not limited to, social housing), alongside public and private sector collaborations, can enhance housing affordability and sustainability across national contexts. Given different understandings and legal forms of social economy entities in the EU-27, the box below (Box 2) presents the definitions of social economy structures across countries under analysis.

Box 2. Social Economy Entities in Austria, Poland, and Spain

> In **Austria,** the social economy includes associations, private limited companies, and cooperatives.
>
> In **Poland,** the social economy comprises various types of organisations with different legal forms. These include social cooperatives, entrepreneurial non-profit organisations, non-profit companies, and professional activity establishments. Additionally, it encompasses other reintegration entities such as occupational therapy workshops, social integration clubs, cooperatives of persons with disabilities, and work cooperatives. The social economy also includes non-profit organisations and entities engaged in public benefit activities and volunteer work - Public Benefit Organisations (PBOs).
>
> In **Spain,** the social economy includes non-profit social entities, cooperatives, foundations, and mutual societies.

Source: EC (n.d.). EU Social Economy Gateway.

3.1.2 Country-Based Case Studies

3.1.1. Austria

Austria's housing policy takes a unitary approach, aiming to benefit the majority of the population with its measures. With a federal structure**, responsibilities are distributed between the federal government and its nine provinces**. The federal government is responsible for laws related to rent, condominiums, and limited-profit housing, while the provinces handle housing subsidy schemes, oversight of limited-profit housing associations, social welfare, regional planning, and building regulations.[170]

Austria possesses one of the most extensive social housing sectors in Europe, constituting 24% of its total national housing stock.[171] This achievement can be attributed to robust legal frameworks that provide clarity and support to housing providers, alongside a broad political consensus regarding the significance of ensuring access to decent and affordable housing for all citizens, not only for vulnerable populations. This housing model, often referred to as societal housing or housing for all, operates on a not-for-profit basis and serves a diverse spectrum of the population, including middle-income families, not just those with the lowest incomes. The approach can be traced back to its origins in the 19th-century cooperative movement, which prioritised self-reliance and community collaboration and bottom-up approaches over-reliance on social assistance.[172]

Social housing in Austria is provided by two primary entities. Firstly, there is the non-profit sector (non- and limited-profit housing Association—LPHA), which represents 17% of the total housing stock. Secondly, there is the smaller 'municipal' housing sector, which makes up 7% of the housing stock.[173] With such a framework in place, the federal provinces were able to set up a large and internationally acknowledged social rental housing sector where **non-profit housing plays a significant role, both in terms of new construction and in terms of the overall share of homes.**

There are 182 LPHAs in Austria, of which 97 are cooperatives, 75 limited liability companies, and 10 public limited companies.[174] On average, each LPHA manages about 5,000 homes, with considerable variation in size ranging from small organisations with less than 20 homes to large ones with up to 50,000 homes. Around a quarter of all households live in homes owned or managed by LPHA, that is regulated by the national Non-profit Housing Act (Wohnungsgemeinützigkeitsgesetz—WGG)[175] and is subject to the cost recovery principle (§ 13 Abs 1 WGG) and additional legislation.[176] While adhering to strict governance and auditing regulations outlined in the Act, the housing associations are exempt from corporation tax in their main and ancillary business areas. The key principles of the model include:

> ➢ **Cost-rent:** rents are calculated based on costs incurred in production, financing, and management of residential buildings, ensuring they neither exceed nor fall below these costs. **The average rent per square metre of housing provided by the LPHAs is EUR 7.3 (while**

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[170] IIBW (2016). Third *United Nations Conference on Housing and Sustainable Urban Development (HABITAT III) Case Study – The Austrian System of Social Housing.*

[171] Housing Europe (2021). *Cost-Based Social Rental Housing in Europe. The cases of Austria, Denmark, and Finland.*

[172] Interview no. 11

[173] Ibidem.

[174] The Austrian Federation of Limited-Profit Housing Associations – Audit Associations (n.d.). *Limited-Profit Housing Associations in Austria Overview;* Interview no. 9.

[175] Wohnungsgemeinnützigkeitsgesetz (Limited-Profit Housing Act).

[176] Including Gebarungsrichtlinienverordnung (GRVO) on the conduct of LPHAs, Entgeltrichtlinienverordnung (ERVO), on rules for cost calculation, Bilanzgliederungsverordnung (BGVO) on the setup of the balance sheet and the income statement, Prüfungsrichtlinienverordnung (PRVO) on the purpose and scope of annual audits.

provided by municipalities—EUR 6.9; private non-landlords—EUR 9.8).[177] Rented homes with paid-off financing loans are subject to permanent rent control, termed the Basic Rent.

➤ **Limitation of profits**—revenue-generating components of cost-covering prices are defined by the Act and supplementary regulations, with upper limits set for LPHAs.

➤ **Equity** is continually reinvested for limited-profit purposes, with profit distribution among owners restricted, and surpluses obligated to be reinvested regularly in housing construction. Shares in LPHAs can only be sold at their nominal value.

➤ **LPHAs** must maintain **independence from the construction industry** to prevent conflicts of interest, with salaries of functionaries regulated by the Act.

➤ LPHAs primarily engage in activities stipulated in the Act, such as construction, maintenance, and renovation of homes, in their own name. Other business activities like constructing business premises or garages are allowed but must be secondary in volume and may require regional government permission.

➤ All LPHAs must be **members of an auditing association** and undergo annual audits by independent entity to ensure compliance with the WGG, **efficient resource and capital use, and sound organisational managemen**t.[178]

In exchange for adherence to strict governance and auditing rules set by the law, the LPHA are exempt from corporation tax in their primary and ancillary business activities as a reward for their compliance.[179]

The solution yields significant benefits not only directly to tenants (resulting in approximately EUR 1.2 billion in annual savings for private households), but also exerts a broader influence on housing market dynamics through a price-dampening effect. Historical data from the past 50 years illustrate that the presence of limited-profit housing has consistently reduced private rents by an average of 5%. This effect is particularly notable when the market share of limited-profit housing reaches approximately 40% to 50%.[180] However, challenges have emerged; between 2009 and 2018, rents, including operating costs, increased by an average of 36.6%, impacting both non-profit and private sectors. Despite remaining relatively cheaper, non-profit housing affordability has faced pressures, influenced by economic crises and the growing financialisation of housing. Accessibility to the non-profit sector has become more restrictive due to certain requirements such as substantial upfront payments, contrasting with municipal housing where such barriers do not exist.[181]

In the capital city of Vienna, 58 LPHA are managing around 200,000 rental and cooperative flats. Annually, approximately 5,000 units are constructed by non- or limited-profit housing cooperatives, constituting 30% of Vienna's total housing production. Moreover, these developers invest approximately EUR 1.235 million in new dwelling construction and roughly 320 million EUR in the renovation and refurbishment of residential buildings.[182] With a substantial portion of municipal, cooperative, and publicly funded housing, the city experiences a downward pressure on prices, ensuring affordability for residents. This is further supported by regulations such as capped rents, rent control measures, and zoning laws that prioritise the production and renovation of social and affordable housing. Tenants benefit from strong protections, including indefinite rental contracts and mechanisms for

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[177] The Austrian Federation of Limited-Profit Housing Associations – Audit Associations (n.d.). *Limited-Profit Housing Associations in Austria Overview;* Interview no. 9.

[178] Cirec (2022). T*he Austrian model of limited-profit housing – an example for other sectors of the economy;* The Austrian Federation of Limited-Profit Housing Associations – Audit Associations (n.d.). *Limited-Profit Housing Associations in Austria Overview;* Interview no. *11.*

[179] The Austrian Federation of Limited-Profit Housing Associations – Audit Associations (n.d.). *Limited-Profit Housing Associations in Austria Overview;* Interview no. 11.

[180] Interview no. 11; WIFO (2023). *The Price-Dampening Effect of Non-profit Housing.*

[181] Interview no. 13.

[182] City of Vienna (n.d.). *Social Housing: Tools: Limited-Profit Housing Construction High-Quality Housing At Fair Prices.*

dispute resolution.[183] In addition to affordability, subsidised housing in Vienna generally offers higher quality compared to the private sector. This is partly due to developer competitions (Bauträgerwettbewerbe) that actively promote the availability of affordable and high-quality housing. Unlike conventional land sale processes, these competitions involve selecting projects based on specific criteria such as social impact, economic viability, architectural excellence, and ecological sustainability through a jury evaluation. The price for the land is predetermined beforehand, ensuring that quality rather than purely financial considerations drive the selection process.[184]

Case Study 4. Wohnpark Alt-Erlaa—Non-profit Housing in Vienna

The Wohnpark Alt-Erlaa in Vienna is a renowned example of a public housing complex—conceived as the largest non-municipal housing development in Austria in the late sixties as part of a new urban development area near the city limits. It was constructed with a comprehensive vision, drawing from a utilitarian happiness principle advocated by architect Harry Glück. This principle aimed to maximise the well-being of the greatest number of people through architectural design. The layout of the complex, including the tower blocks and extensive green spaces, was crafted based on this ethical model.[185]

Institution implementing: Non-profit housing association Wohnpark Alt-Erlaa (AEAG) —part of Non-profit housing and construction company (GESIBA)

Stakeholders involved: City of Vienna (managed by Wien Holding GmbH), Tenant's Advisory Board

Objectives:

The project was guided by the principle of "fair living"—affordable comfort and fair quality for everyone, aiming to create livable and sustainable living spaces for generations.[186]

Implementation process:

The Wohnpark Alt-Erlaa is akin to a self-contained city within Vienna. Its concrete tower blocks A, B, and C, reaching up to 85 meters and 27 floors high, were designed by architects Harry Glück, Kurt Hlaweniczka, Thomas Reinthaller, and Franz Requat and built between 1973 and 1985. Planned in 1968, the project was realised by the city-owned housing stock corporation GESIBA. These buildings, serving as council housing, have been owned and managed by GESIBA (through subsidiary companies) since their construction[187]—serving their functions till today. A tenants council represents the interests of residents in the cooperative being included in the supervisory board.

Outcomes:

➤ Housing complex consisting of 3,181 apartments, each with a balcony or loggia, along with numerous amenities such as health centres, kindergartens, schools, a public library, a gym, among others. The complex is like a self-contained micro-town, covering 240,000 square meters and housing around 11,000 residents. It offers various leisure facilities, including rooftop and indoor swimming pools, saunas, restaurants, and playgrounds, as well as office spaces.[188]

➤ Residential buildings consisting of repetitive modules divided and highlighted by vertical staircases with a rounded outer contour. A characteristic feature of the buildings is a line of terraces extending downward, running along the eastern and western elevations. The first 12

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[183] EESC Hybrid Conference "Affordable and Decent Housing in the EU" 6 July 2022, *Upscaling the Vienna Model of Social Housing to the EU level.*

[184] Interview 13.

[185] Vienna City Court of Audit (n.d.). *Gemeinnützige Wohnungsaktiengesellschaft Wohnpark Alt-Erlaa.*

[186] AEAG, Wohnpark Alterlaa – website.

[187] Ibidem.

[188] Ibidem; Interview no. 16.

residential floors contain apartments with private outdoor terraces, dotted with gutters designed for growing plants.[189]

➢ The residence also has its own two monthly newspapers and a television station, separate information on the activities within the complex.[190]

Impact on affordable and sustainable housing:[191]

➢ **Habitability and comfort:** The City of Vienna regularly conducts surveys on housing satisfaction, and Wohnpark Alt-Erlaa has consistently been ranked at the top for many years. [192]. Wohnpark Alt-Erlaa embodies the principle of "fair living", emphasising affordable comfort and fair quality for all residents. The layout and design of the complex prioritise the well-being of residents, with a variety of different sizes of apartments, floor plans, private open spaces, as well as extensive green spaces (that include a fruit forest and create park-alike environment), a church and social infrastructure at disposal in close proximity (e.g. recreational clubs), as well as medical centres, schools, kindergartens. The residential buildings are arranged so as to maximise the inflow of natural daylight and open up the views of the surrounding areas.

➢ **Community and connectivity:** The complex fosters a sense of community and connectivity with its self-contained micro-town setup, offering a wide range of amenities—promoting social interaction and cohesion among residents, creating a supportive and inclusive environment. The local residents' association often organises cultural events, sports competitions, and other social attractions, building the sense of belonging and camaraderie among residents and giving them interaction possibilities. The Tenant Advisory Council is the collegial co-determination body of the residents of Alt-Erlaa. It consists of independent members determined in an election by the residents, representing the residents in all interests concerning the residential park vis-à-vis AEAG. When it comes to the access to infrastructure, nearby underground station and city buses secures convenient access to public transport.

➢ **Economic accessibility:** The complex provides affordable and sustainable housing options for a large number of residents, with 3,181 apartments catering to a diverse range of households. This ensures economic accessibility and a fair quality of living for all residents. The rents (on average 29% cheaper compared to the market price) are calculated on a cost-basis ("cost-rent"), which is regulated by the WGG ensuring that the tenants are charged the actual cost to cover their expenses.

The rent covers the annual loan repayments of the housing provider and is distributed evenly among the tenants. After the loan is fully repaid, typically over 30 years, the rent is adjusted based on the annual price index, which is currently EUR 2.05 per square meter. Residents are required to make a one-time financial contribution upon moving in, which varies depending on specific circumstances and legal requirements. This contribution is distinct from rent and serves to lower the monthly rent amount. When residents eventually move out, typically after five years, they are eligible for a partial refund of their initial financial contribution. The refund amount decreases gradually over time, reducing by 1% per year.

In addition to the base rent, there is also a "contribution to conservation and improvement" fee. This fee starts at a lower rate when the building is new, as less maintenance and improvement work is needed. Initially, this fee is EUR 0.59 per square meter. As the building ages and requires

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[189] Śliwa A. (2022). *Relacje przestrzeni mieszkalnych z naturą na przykładzie osiedla Wohnpark Alt-Erlaa.*

[190] Vienna City Court of Audit (n.d.). *Gemeinnützige Wohnungsaktiengesellschaft Wohnpark Alt-Erlaa.*

[191] Own elaborations, CASE based on desk research and interviews no. 11, 12, 13, 14, 15, 16, and 20.

[192] Interview no. 15.

more upkeep, this fee increases, reaching a maximum of EUR 2.33 per square meter after 30 years. Operating costs, which cover essential utilities such as heating, water, electricity, and taxes are based on market prices.

However, access to housing units is limited - the complex is subject to lengthy waiting lists and strict entry criteria, making it difficult for potential tenants to secure accommodation. Entry is often contingent on having relatives already residing in the park, which restricts accessibility for those without such connections.

The project utilises architectural solutions that optimise living space—techniques such as prefabrication allow for reduced construction costs without compromising quality, and ensure long-term durability and low maintenance costs, resulting in lower operational expenses for residents. Modularity and repeatability enable the economical and efficient creation of similar blocks in the complex.

➢ **Resource efficiency and circularity**: Given that some buildings in the complex, constructed between 1973 and 1985, reflect the architectural and infrastructural standards of their time, which often include poor energy efficiency. The area still relies on 19 decentralised gas boilers, which are planned to be replaced within the next five years with heat pumps and geothermal energy through deep boreholes. Recent projects have included the installation of photovoltaic systems financed from the specific budget allocated for their upkeep. The systems have been installed on each of the three towers and the shopping area within the housing complex and collectively generate 780 kilowatts of energy.

The use of prefabricated materials minimised waste generation during the construction process.

➢ **Resilience and adaptation to climate change**: The complex encompasses the development of extensive green spaces, which help to mitigate the urban heat island effect, improve air quality, and manage stormwater runoff. Recent buildings include green roofs and facade plants, while older buildings rely on existing green spaces (123,000 square metres) and, approximately, 1,800 trees. The extensive green areas and thoughtful integration of natural elements in housing complexes like Alt-Erlaa significantly enhance the living conditions for residents, especially during hotter months.

Potential for scalability and replication in other EU Member States:

➢ Modern adaptations of such similar, large-scale projects should involve collaborative efforts among multiple housing providers. This approach would enable shared resources such as garages and recreational facilities across different buildings, optimising efficiency and community benefits.

➢ Ongoing assistance from national/regional/local authorities is key. In Austria, this support primarily takes the form of subsidies for specific building projects rather than direct funding to individuals. These subsidies often include low-interest loans or grants aimed at maintaining long-term affordability and preventing the rapid turnover of apartments into the private market.

➢ Use of modular and prefabricated techniques allows for the rapid and efficient construction of large residential structures. This approach enables easy adaptation of project size and scale to various locations and social needs (another example of such building is Vienna is a residential complex in Seestadt Aspern that also utilises prefabricated and modular techniques to create modern and affordable housing).

➢ Designing residential complexes with a full range of services such as shops, schools, medical facilities, and access to public transport provides residents with a convenient and self-sufficient environment. Such an integrated approach can be replicated in various urban neighbourhoods—

> also visible in The Nordbahnviertel project in Vienna where new residential complexes are built with full integration of public services and infrastructure, ensuring a comprehensive approach to urban planning. Location near major transportation hubs and integration with public transport is crucial for enhancing housing accessibility.

3.1.2. Poland

The Constitution of the Republic of Poland indicates, in Article 75, the need for public authorities to pursue a policy that promotes meeting the housing needs of citizens—in particular, preventing homelessness, supporting the development of social housing and supporting the activities of citizens aimed at obtaining their own housing.[193]

Housing policy in Poland can be described as dualist and is implemented at two levels. There is the central level, which is directed by the government, and the local level, which is implemented by municipalities in accordance with Article 7 of the Act of March 8, 1990, on municipal self-government "meeting the collective needs of the community is among the municipality's own tasks. In particular, its own tasks include matters of [...] communal housing construction".[194] It is the responsibility of the local authorities to accurately evaluate the housing conditions in their area and introduce tailored support measures to address any challenges that may arise. The state provides assistance and has a supervisory role to local governments through a combination of regulatory guidelines and financial aid to their endeavours.

With regard to national strategies, housing development along with its structure has been a marginal topic in public discussion until 2015, which can be considered as a turning point, with the introduction of various strategic projects by the government. Most importantly, the National Housing Programme (*Narodowy Program Mieszkaniowy—NPM*), adopted in 2016, has set out the main priorities of central housing policy until 2030, focusing on addressing the housing gaps and needs of low-income households:

1) To increase access to housing for people with incomes that preclude acquiring or renting housing on a commercial basis;
2) To increase opportunities to meet the basic housing needs of people at risk of social exclusion, due to low income or particularly difficult life situations;
3) To improve the housing conditions of the population, the technical condition of the housing stock and increase energy efficiency.[195]

The measures introduced by NPM include streamlining investment processes, revising regulations for rental markets and housing cooperatives, increasing moderately priced housing supply, launching social rental housing programmes, supporting systematic savings for housing, aiding less affluent households with housing expenses, and optimising housing stock for senior citizens with accompanying infrastructure improvement.[196]

As a general remark, Poland has a greatly underdeveloped rental housing sector (due to the massive privatisation of the housing stock starting in the early 1990s). In 2022, 87.2% of the housing stock was owned by private individuals.[197] Private rentals are rather rare, with only 3.5% of Poles living in market-priced rental properties and 9.5% renting flats at reduced rates or fees.[198] Moreover, only 4% of the total

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[193] Konstytucja Rzeczypospolitej Polskiej (Art. 75) (1997).
[194] Ustawa z dnia 8 marca 1990 r. o samorządzie gminnym.
[195] Ministerstwo Infrastruktury i Budownictwa (2016). *Narodowy Program Mieszkaniowy.*
[196] Ibidem.
[197] Eurostat database, *Distribution of Population by Tenure Status.*
[198] Ibidem.

housing stock is publicly owned and 126,400 thousand households were waiting to rent municipal resources (excluding replacement and temporary premises)[199]—**with an average waiting period for the allocation of social housing in Poland, in large cities, between 2–7 years, and in smaller cities up to 20 years.**

According to the NPM, 40% of Polish households (including 50% of those under 34), cannot afford to buy or rent a suitable multi-person family flat, falling into the "rent gap"; they earn too much to qualify for municipal housing but not enough to afford private market rentals or purchases.[200]

Following the strategic outline of the programme, key laws supporting its implementation include[201] the Act on Financial Support for Housing Projects[202] and the Act on Housing to Start,[203] as well as the amendment of the Law On Certain Forms Of Support For Housing[204] passed in 2021 by the Parliament of Poland, which provided the introduction of a **model of social rental agencies (SRA)** into the legal system. Since its adoption, municipalities can establish cooperation with SRAs (while SRA can be a municipal company or PBO[205]) and provide rental housing for those members of the local community who have difficulty obtaining housing on their own under market conditions. In practice, the authorities decide who will be the target group (e.g. refugees, single parents, low-income households).[206]

SRAs operate as non-profit intermediaries, bridging the gap between property owners and households in need of housing. They provide tenants with affordable, safe rent, good quality accommodation, ongoing support, debt management, and no fees. In return, tenants must pay rent on time, take care of the property and communicate with the intermediaries. For landlords, SRA guarantees rent payment, tenancy management, legal documentation, handyman services, and no fees. In exchange, landlords are expected to reduce rent by about 20%, offer quality properties (or renovate them), and be open to all potential tenants.[207]

The Ministry of Funds and Regional Policy is currently responsible for announcing a competition (under European Funds for Social Development for the years 2021–2027 co-financed from the funds of the European Social Fund Plus) for municipalities, while the Department of Housing in the Ministry of Development and Technology is overviewing the general legislation and corresponding interpretations The value of the project as specified in the budget of the grant application cannot be higher than PLN 10 million and the level of project co-financing (from EU and state budget funds) is 100%. **Currently, there are 11 municipalities cooperating with SRAs. In the 2024 edition of the competition (concluded on 19.04.2024), there are additional 11 projects referring to the second stage of quality assessment.[208]** The role of SRA—although supporting the housing policy—should not be seen as its core element. The projects have a complementary role to existing forms (such as municipal housing).[209]

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[199] Ibidem.

[200] Ibidem; Łaszek J. (et.al). *Real Estate at Exposure. New challenges and old problems.*

[201] Interview no. 10.

[202] Ustawa z dnia 8 grudnia 2006 r. o finansowym wsparciu niektórych przedsięwzięć mieszkaniowych.

[203] Ustawa z dnia 20 lipca 2018 r. o pomocy państwa w ponoszeniu wydatków mieszkaniowych w pierwszych latach najmu mieszkania.

[204] Ustawa z dnia 28 maja 2021 r. o zmianie ustawy o niektórych formach popierania budownictwa mieszkaniowego oraz niektórych innych ustaw.

[205] In Poland, PBO are non-governmental organisation1 or other establishment possessing equal rights to NGO, registered in the National Court Register. Such organisation performs public benefit work and can enjoy tax exemptions4 as well as privileges5 on the terms and conditions laid out in the Act on Public Benefit and Volunteer Work; Obwieszczenie Marszałka Sejmu Rzeczypospolitej Polskiej z dnia 29 maja 2020 r. w sprawie ogłoszenia jednolitego tekstu ustawy o działalności pożytku publicznego i o wolontariacie (Dz.U. 2020 poz. 1057).

[206] Ministerstwo Rozwoju i Technologii (n.d.). *Społeczne agencje najmu.*

[207] Łaszek J. (et.al). *Real Estate at Exposure. New challenges and old problems.*

[208] Portal Funduszy Europejskich (2024). *Społeczne Agencje Najmu – konkurs w ramach innowacji społecznych, Fundusze Europejskie dla Rozwoju Społecznego.*

[209] Interview no. 17, Interview no. 19.

This competition and the SRA model were widely promoted by the government in 2023 and one of the first implementations and the piloting of the solution is operated by Habitat for Humanity Poland Foundation (PBO) located in Dąbrowa Górnicza city (Case study 5). The foundation brought this model to Poland, researched and piloted various social rental solutions and advocated for appropriate legislation and central funding.

Case study 5. SRA in Dąbrowa Górnicza

SRA in Dąbrowa Górnicza was established on October 16, 2023 to **test a new solution on a national scale as well as** offer affordable fully equipped apartments for rent in the city for 12 months (with a possibility for extension) for residents of the municipality at risk of housing exclusion—Ukrainians who left their country due to the armed conflict, as well as Polish citizens and repatriates in a crisis of homelessness. SRA also offers ongoing support areas in finding jobs for adults, education for children and youth and cultural integration.[210]

Institution implementing: Dąbrowa Górnicza City Council, Habitat for Humanity Poland (social economy actor)

Stakeholders involved: The initiative is co-financed by the "Wzajemnie Potrzebni" (the Chancellery of the Prime Minister of Poland) and from funds of the Dąbrowa Górnicza City Council. There is also support from the private sector (through partnerships and grants):
- The renovations of two apartments are being carried out as part of the project "Empty Spaces – Filling the Gap. Using Vacant Land to Address Homelessness in Europe" funded by M&G Investments.
- Renovations of two apartments are being financed under a grant agreement with Saint Gobain Foundation Project N° FSG-2023-0017—Renovation of apartments for refugees in Dąbrowa Gornicza (Poland).
- Some of the SRA apartments have been furnished and equipped thanks to a partnership with IKEA and Geberit Sp. Z o.o.
- The programme has been also supported by Dentons (a law firm).[211]

Objectives:
- To expand the range of instruments available for Municipality as part of local housing policy with a tool that can reduce the number of people waiting for rental housing from municipal resources (while not requiring the municipality to take action on the construction of housing or increase the supply of housing);
- To expand the housing supply and promote the creation of friendly spaces for starting families and serve to reduce the demographic crisis and the exodus of young people to larger cities;
- To reduce the negative impact of the COVID-19 pandemic and the refugee crisis on the rental market;
- To fulfil the housing needs of people who do not meet the criteria for municipal housing or who also need support in areas other than housing.[212]

Implementation process:
The SRA was established as part of the government pilot programme: "Wzajemnie Potrzebni" (eng. Mutually Needed). The statutory model of SRA was applied, where the municipality plays an important role establishing criteria for potential tenants, preparing the cooperation agreement and

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[210] Habitat for Humanity Poland (n.d.). *Społeczna Agencja Najmu – Dąbrowa Górnicza.*
[211] Ibidem.
[212] Habitat for Humanity Poland (n.d.). *O społecznych agencjach najmu*

lease agreement, and determining the calls of applications. The establishment of SRA was preceded by a diagnosis of the needs and possibilities, consultations with local residents and potential operators, and analysis of the possibilities of cooperation with entities operating in the municipality (e.g., labour office, centres of social assistance). In September 2023, the City Council determined the rules and criteria for the rental units by an individual from the SRA resources. In October 2023, an opening agreement was signed and potential tenants started being recruited. A dedicated person from the City Council is responsible for coordinating the process—with permanent cooperation with the operator Habitat for Humanity Poland.[213]

Outcomes:

Thirty households (approx. 60 people) received housing support (affordable rental housing) for 12 months (with a possibility of extension) along with needed ancillary services (labour market support, educational and social services)[214] as a piloting programme. According to the resolution, SRA implements continuous recruitment, which means it is a five-year task. The model of SRA is currently being applied in different municipalities across the country, hence the total number of beneficiaries is difficult to assess.

Impact on affordable and sustainable housing:[215]

➢ **Habitability and Comfort:** The agency ensures that all apartments offered for rent are fully equipped and meet essential habitability standards, providing secure and dignified housing options. This initiative is particularly crucial for vulnerable populations at risk of housing exclusion, offering them a stable living environment conducive to their well-being. Beyond mere accommodation, the SRA integrates supportive services such as job placement for adults, educational support for children and youth, and cultural integration programmes. These efforts aim not only to meet housing needs but also to enhance the overall comfort and quality of life for tenants, fostering a stable and nurturing living environment.

➢ **Community and connectivity:** SRA promotes community integration and social inclusion by providing housing support alongside services such as job placement, education, and cultural integration. During the cooperation process with households, the managing agency carefully analyses their needs and adjusts our support to individual situations, with a goal to provide comprehensive care. Stakeholders involved in the initiative collaborate to address housing needs, fostering partnerships between the public sector, private sector, NGOs, and community members.

➢ **Economic accessibility:** A key aspect of SRA's impact is its provision of below-market rent, significantly enhancing economic accessibility to housing for local residents. The prices offered by SRA are approximately 30.55% lower on average compared to the average market rental prices in the area (the average monthly market rental price in Dąbrowa Górnicza is 1,656 PLN—approximately EUR 364.32, while SRA rent ranges from 700 PLN to 1,600 PLN—approximately EUR 154 to EUR 352, depending on the size of the apartment). This affordability not only reduces the financial burden on tenants but also supports their economic stability and allows them to allocate resources to other essential needs. Additionally, the agency maintains relatively low administrative rent and utilities charges based on actual consumption (market price – without additional fees and charges), further easing financial pressures on tenants and promoting sustainable housing affordability over the long term.

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[213] Stowarzyszenie Wspierania Aktywności "Bona Fides" (2023). *Formalne i praktyczne aspekty działalności Społecznych Agencji Najmu.*
[214] Habitat for Humanity Poland (n.d.). *Społeczna Agencja Najmu – Dąbrowa Górnicza.*
[215] Own elaborations, *CASE based on desk research and interview no.17, 18, 19 and 20.*

> ➢ **Resource efficiency and circularity**: SRA anticipates utilisation of existing infrastructure. To provide supply of housing stock, operators anticipated renovation and development of vacant buildings.
> ➢ **Resilience and adaptation to climate change:** SRA addresses the housing needs of vulnerable populations affected by the COVID-19 pandemic and refugee crisis, demonstrating resilience and adaptation to evolving social and economic challenges.

Potential for scalability and replication in other EU Member States:

The practice highlights the importance of utilising available, unused apartments and spaces with a gradual and systematic approach. This requires financial flexibility and a more comprehensive analysis from both the supply side of the spaces and prospect tenants—prior to action.[216]

> ➢ Replicating the initiative would require engaging relevant stakeholders to ensure comprehensive support and resources—government agencies, NGOs, private sector partners, and community members.
> ➢ Anticipating the space (type of apartment) needs of potential tenants, matching the supply of spaces to people, should be the desirable process.[217]
> ➢ It is also important to ensure adequate preparation of tenants with regard to budget management and life skills, so that they can cope with their housing situation independently in the future.[218]
> ➢ Understanding the unique challenges and demographics of different regions can inform the adaptation of the SRA model to suit local needs—especially by conducting thorough needs assessments and consultations with local communities.
> ➢ Stabilising the rental market and the increased demand for affordable housing attract investors to the residential construction sector. These investments can include both renovating existing buildings and constructing new ones, thereby increasing the number of available housing units.[219]

3.1.3. Spain

As a decentralised state, **Spain implements housing policies through a multi-level governance structure divided between central and regional governments—the regions are competent for housing matters**. In order to address the tension created in Spanish society around housing and respond to certain proposals, put forward by some parliamentary groups, the government has decided to regulate urgent measures in the field of housing and renting through Royal Decree-Law 21/2018.[220] These measures aim to increase the supply of rental housing, adjust the legal positions of landlords and tenants, and make renting more attractive than purchasing. Key reforms include modifications to the regulation of housing lease contracts, reforms to the horizontal property regime, changes to housing eviction procedures, and economic and fiscal measures—extending lease terms, limiting rent increases, obligating accessibility improvements in residential buildings, and introducing tax incentives to promote rental housing. The law also granted a mandate to the Ministry of Development to enhance the supply of rental housing.

In March 2018, the Spanish government approved the **State Housing Plan for 2018–2021** which was structured among ten programmes, e.g. aid for housing rental, aid to victims of gender-based violence, people who are evicted from their usual residence, homeless people and others particularly vulnerable. The regions were obligated to implement applicable actions until 31 December 2022.[221] Act 12/2023 of

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[216] Interview no. 19.
[217] Interview no. 19.
[218] Interview no. 19..
[219] Interview no. 20.
[220] Real Decreto-ley 21/2018, de 14 de diciembre, de medidas urgentes en materia de vivienda y alquiler.
[221] ECSO (2022). *Country Fact Sheet - Spain.*

24 May on the right to housing—the "Housing Act"—introduced amendments regarding social housing, including:

> ➤ Minimum percentages of social housing reserve land are increased from 30% to 40% in rural areas and from 10% to 20% in urban areas for new developments or renovation projects. Once land is classified as social housing reserve land, it cannot be changed except for special cases. Regions must allocate at least 50% of such land for lease.

> ➤ Housing built on reserve land will remain under a protection regime indefinitely, ensuring it remains as social housing. Other social housing will also be subject to a permanent protection regime, unless a just cause for disqualification is duly explained by the region. Disqualified housing may require refunding of subsidies. This does not apply to social housing qualified before the Housing Act's enforcement.

> ➤ In municipalities with "Stressed Zones",[222] land obtained through planning capacity assignments must primarily be used for constructing and managing social or public housing; Territorial and urban planning instruments can designate public housing as a compatible use for public use land.[223]

In **Spain, which can be considered to have a dualist approach to housing policy, owner-occupied stock constitutes 75.4% of the country's total housing supply, making it the dominant sector.** The rental market is comparatively small with other EU countries, comprising only 14.4% of the housing stock, and is mainly concentrated in major cities like Barcelona and Madrid.[224]

The government of Spain passed a law (12/2023, of May 24) for the right to housing ("Housing Act")[225]. The law introduced a rent-control system to be developed by regional authorities. This indicates a potential shift in the housing system, which historically has been based on homeownership (see Chapter 1). Despite the increasing interest in social housing since the late 1990s, social rental housing accounts for approximately only 1.1% of the total housing stock.[226]

Social housing is called *Vivienda de Protección Pública* (VPP—publicly protected housing) and prioritises access for vulnerable and low-income households through maximum income limits and specific criteria. **Spain's approach to social housing differs from most other EU countries in that most of it is provided for owner-occupation rather than rented.** The primary feature of protected housing involves the state providing subsidies in the form of reduced-interest loans to developers for construction, renovation, and purchasing. In return, the homes, which meet specific size and quality standards, are offered for sale or rent at prices below market rates to individuals with incomes below specified thresholds.[227]

The construction of social housing in Spain does not align with demand trends. Only a small portion (2.5%) of social housing with controlled rental prices exists, managed either publicly or privately. Most units are initially sold below market price but lose their protected status after a certain period, requiring constant reinvestment in new construction. Moreover, while over 4 million units of protected housing

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[222] Areas in which (a) the average burden of the cost of a mortgage or rent in the personal/family budget, plus basic expenses and supplies, exceeds 30% of the average household income, and/or (b) the purchase price or rent for housing has, in the 5 years prior to the declaration as a Stressed Zone

[223] Clifford Chance (2023). *Spanish Housing Act.*

[224] Housing Europe (2023). *The State of Housing in Europe 2023; Housing Europe - Country Profile, Social Housing in Europe -Spain (website).*

[225] Ley 12/2023, de 24 de mayo, por el derecho a la Vivienda.

[226] *ECD (2024), OECD Affordable Housing Database;* Housing Europe (2023). *The State of Housing in Europe 2023; Housing Europe - Country Profile, Social Housing in Europe -Spain (website).*

[227] Interview 22.

have been built in the last 40 years, the exact quantity of existing stock is unknown due to most units being transferred to the private sector after a set time.[228]

Regions have broad powers to develop their own policies and measures.[229] Allocation and occupancy rules of social housing vary across Autonomous Communities, leading to a lack of standardisation. Although intended for low-income households, eligibility criteria differ, with a large portion of Spanish households qualifying. Consequently, obtaining social housing has become a "lottery".[230]

In Catalonia, several planning and legislative instruments were published in 2018 and 2019, including the Sectoral Territorial Plan for Housing in Catalonia (PTSHC) and the Metropolitan Urban Development Master Plan, along with the decree law on urgent housing measures to deal with the shortage of social rental housing and to encourage price moderation in the private rental housing market. A rent control system has also been established to enhance affordability for vulnerable households – making Catalonia the only region that implemented it within the framework of the National Housing Act.[231]

Before the recent implementation of rent control, the regional government in Catalonia focused extensively on protecting vulnerable households – with a key legal tool involving a tax system targeting vacant properties, offering tax reductions to large landlords who met affordability criteria. This incentivised some private housing companies, particularly those associated with the banking sector following the crisis, to allocate a portion of their properties to social housing. Alternatively, these properties were temporarily transferred to the regional government for management as social housing. Another significant measure was the right of pre-emption, which required property owners affected by the mortgage crisis to notify the Catalan government of intended property transfers. The government then had the option to purchase these properties at the planned transaction price, leading to a slight increase in public housing availability. However, the focus on emergency responses has meant a lack of long-term perspective in housing policies. A comprehensive 20-year territorial housing plan for Catalonia has been drafted but is currently awaiting approval. The plan aims to overhaul the Catalan housing system, notably targeting a substantial increase in the share of social housing from 1.7% to 9%. Setting specific, quantified goals within the plan is crucial for effective implementation, addressing issues such as accountability and coherence between budget allocations, tools, and implementation strategies, which have often been lacking in housing planning.[232]

The need to increase the supply of affordable housing necessitates the development of innovative approaches to housing providers[233] such as cohousing, intergenerational living and co-operatives ruled by 'grant of use' and built on land designated for state-subsidised housing (Case study 6).

Case Study 6. La Borda Housing Cooperative

Initiated in 2012 (residents moved in 2018) within the broader Can Batlló industrial site recovery initiative which is a community-driven effort (a local community action group), La Borda owns its building on publicly owned land. The cooperative allocates residential right-of-use to its members, emphasising the use of the home over its market value to prevent market speculation. This model promotes collective ownership, community engagement, and a focus on housing as a fundamental

[228] Pareja-Eastaway M. (2017). *More social housing? A critical analysis of social housing provision in Spain.*
[229] ECSO (2022). *Country Fact Sheet - Spain.*
[230] Interview 22.
[231] Interview 23.
[232] Interview 23.
[233] Housing Europe (2023). *The State of Housing in Europe 2023.*

right rather than a commodity as a cooperative constitutes a typical example of a social economy. The cooperative's approach aims to create a more equitable and sustainable housing solution within the community.[234]

Institution implementing: Lacol architecture studio and cooperative

Stakeholders involved: Local residents (initiators of the project), Lacol architecture studio and cooperative (social economy actor), sustainability advisors, economic advisors, Coop57 (cooperative of financial services, providing a loan and collaborating with La Borda with the participatory titles issuance) as well as local government providing land.[235]

Objectives:

➢ To increase access to affordable housing in Barcelona;

➢ To create an equal, intergenerational community and provide an alternative to homeownership, the rental market and public housing;

➢ To foster a sense of community among residents;

➢ To find alternative ways to collective housing;[236]

➢ To establish a viable model for cooperative and sustainable housing development.[237]

Implementation process:

The initiative began in 2012 with neighbourhood residents identifying housing needs and partnering with Lacol and the Barcelona municipality. Together, they secured a lease and explored financing options. Residents actively participated in the design process, guided by Lacol's expertise (also overseeing the construction process that started in 2017 with regular updates to the residents). Since approximately 60 residents moved to 28 apartments in La Borda in 2018, the cooperative has been managing the development, fostering community engagement and ensuring ongoing maintenance, as well as supporting sustainable mobility principles.[238]

Outcomes:

➢ Secure and affordable housing options for members (approx. 60 residents) of the cooperative;

➢ Operating as a community building, cooperative based on social interaction and shared responsibility among residents, creating a bonded community with mutual support—members pay a monthly contribution to the cooperative, they do not own the property, but they are not tenants either.[239]

➢ La Borda, functioning as a passive building. Residents actively engage in monitoring and training to optimise the building's bioclimatic design and various energy and water-saving amenities. Consequently, the majority of apartments remained adequately warm during the previous winter season without the necessity for supplementary heating.[240]

➢ Significantly lower costs of living thanks to the common utilities (e.g. communal laundry room, and kitchen) and collective heating and boilers.[241]

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[234] Council on Urban Initiatives (2023). *Housing and the city. Case studies of integrated urban design.*

[235] Interview no. 21.

[236] Interview no. 21..

[237] Ibidem.

[238] UN Habitat, Word Habitat Awards: La Borda – website; Interview no. 21..

[239] UN Habitat, Word Habitat Awards: La Borda – website; Interview no. 21.

[240] Ibidem.

[241] Interview no. 21.

Impact on affordable and sustainable housing:[242]

➤ **Habitability and comfort:** La Borda provides secure and affordable housing options to its members, ensuring dignity and protection against evictions or displacement. Residents have entitlements to land and property within the cooperative. Through sustainable design and passive building features, La Borda promotes indoor environmental quality, enhancing occupants' mental and physical well-being. Residents actively engage in optimising factors such as air quality, light, and thermal comfort. The cooperative also prioritises access to green spaces, contributing to outdoor environmental quality and enhancing the overall living environment for residents. La Borda's design incorporates the use of cross-laminated timber (CLT) and recyclable materials, significantly reducing the carbon footprint and setting new standards for environmentally conscious building practices. Moreover, their focus on passive building design principles optimises insulation, ventilation, and solar gain, which inherently reduces energy consumption and improves indoor environmental quality.

➤ **Community and connectivity:** The cooperative model empowers residents to participate in decision-making processes, fostering inclusivity and accessibility. This collective approach has proven resilient, navigating challenges such as financing, permits, and construction hurdles. Their engagement with local stakeholders from the beginning created a robust network of support and collaboration, strengthening ties with the surrounding community and supporting local businesses through initiatives like providing ground floor space at below-market rent to a community cooperative distributing locally produced goods. La Borda adopts universal design principles to ensure accessibility for all residents, including those with disabilities. The location within the urban fabric of Barcelona provides access to quality infrastructure and vital community services, including public transportation, schools, healthcare facilities, and amenities.

➤ **Economic accessibility:** La Borda offers affordable housing options through cooperative ownership, ensuring upfront costs are manageable for residents. Residents' active involvement in daily building management contributes to lower maintenance costs compared to traditional rentals. Residents contribute to the cooperative's operation and maintenance costs, ensuring ongoing affordability and financial security for all income levels.

➤ **Resource efficiency and circularity:** La Borda's sustainable design, including passive building features and energy-saving amenities, contributes to resource efficiency and environmental sustainability. Despite challenges like financing models new to municipalities and economic fluctuations, the cooperative has managed to build cost-effectively, even engaging new stakeholders like cooperatives previously focused on industrial financing. Residents engage in monitoring and training to optimise the building's bioclimatic design, promoting environmentally friendly housing development and reducing the environmental footprint. La Borda's incorporation of solar panels and other energy-saving amenities highlights its commitment to long-term sustainability and renewable energy utilisation, despite the initial cost barriers. The cooperative's advocacy for sustainable policies, such as securing an exemption from on-site parking requirements, promotes sustainable mobility options and further reduces environmental impact.

➤ **Resilience and adaptation to climate change**: The passive design of the building reduces energy consumption and emissions, contributing to resilience and adaptation to climate change. The project's focus on sustainability and community support was particularly beneficial during the COVID-19 lockdown, highlighting the resilience of such communities. By easing energy poverty among residents and enhancing health outcomes, especially for children, La Borda demonstrates resilience to climate change impacts and promotes long-term sustainability. The cooperative's proactive approach in advocating for sustainable policies at the municipal level can inspire broader systemic changes, enhancing resilience and adaptation to climate change. By fostering a culture of community engagement and collaboration, La Borda ensures that sustainability efforts

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[242] Own elaborations, *CASE based on desk research and interview no.21, 22 and 23.*

align with the needs and preferences of the community, leading to greater buy-in and long-term success.

Potential for scalability and replication in other EU Member States:

➢ The project has already shown a replication potential as it was replicated by neighbouring areas, such as La Diversa and La Chalmeta. The cooperative model, emphasising collective management and long-term sustainability, has inspired many new projects in Barcelona and Catalonia, some of which have already secured land or completed construction.[243]

➢ For replication in other Member States the appropriate legislation needs to be introduced that provides for cooperatives or similar legal institutions. Such a legal entity would need to be based on equal cooperation of its members and have the right to ownership.

➢ In order to ensure actual affordability, legislation regulating the prices for e.g. post-industrial land to be restored in such a way or other public lands that could be used in similar projects, would ensure the availability of real estate at reasonable prices.

➢ Before any attempts at such a project is made in other Member States, the residents' engagement needs to be assessed. The project can be successful only in the areas where the residents are eager to participate in such a project and work on it. Without local participation, the cooperative cannot be successful. Campaigns raising awareness and motivating to engage in the local housing problems might be a beneficial first step.

➢ Since this approach requires upfront investment, its affordability and successful replication also require the availability of appropriate financing options, both public and private. It is unlikely that the members of the cooperative will be able to finance the entire project by themselves. Public and/or EU funding will be more reliable.

➢ In similar projects, based on the experience of La Borda, engaging professionals in team building, social cohesion of the group, helping to take common decisions and conflict solving.[244]

3.1.2.1 Comparative Analysis—Social Economy Initiatives in the Housing Sector

The case studies of Wohnpark Alterlaa in Vienna, SRA in Dąbrowa Górnicza, and La Borda Housing Cooperative in Barcelona exemplify the pivotal role of social economy initiatives in advancing affordable and sustainable housing solutions across Europe.

The following table presents a summary of how each initiative investigated in this chapter contributes to enhancing different aspects of affordable and sustainable housing:

Table 7. Impact Matrix: Social Economy Initiatives and Affordable and Sustainable Housing

	Wohnpark Alterlaa (AT)	SRA in Dąbrowa Górnicza (PL)	La Borda Housing Cooperative (ES)
Habitability and comfort	Enhanced by focusing on **optimising the layout and design of residential complexes** to maximise natural light, open views, and access to green spaces, ensuring a comfortable and	Enhanced by ensuring all rental apartments meet **essential habitability standards and integrating supportive services** like job placement and educational support,	Enhanced through **cooperative ownership**, ensuring secure, affordable housing with sustainable design principles that optimise indoor environmental

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[243] Interview no.23.
[244] Interview no. 18.

	sustainable living environment.	fostering a stable and nurturing environment for vulnerable populations.	quality and access to green spaces.
Community and connectivity	Fostered through a **self-contained micro-town setup with extensive amenities** that promote social interaction and inclusivity among residents, supported by active community organizations and convenient access to public transport.	Promoted through **comprehensive housing support alongside service**s such as job placement, education, and cultural integration, fostering community integration and social inclusion through collaboration between public sector, private sector, NGOs, and community members.	Fostered by **empowering residents in decision-making, building strong local networks, and ensuring accessibility through universal design principles** and proximity to essential services.
Economic accessibility	Provided through affordable **"cost-rent" housing options regulated** by WGG **(on average 29% cheaper compared to the market price),** ensuring fair pricing based on actual costs, including loan repayments and operational expenses, with provisions for financial contributions and potential refunds to residents.	Achieved by offering **below-market rent prices, approximately 30.55% lower than average market rates**, ensuring economic accessibility to housing and supporting tenants' financial stability while maintaining low administrative and utility charges based on consumption.	Offered through cooperative ownership, **minimising upfront costs and maintenance expenses** while ensuring financial security and affordability across income levels.
Resource efficiency and circularity	Achieved through **architectural solutions** that optimise living space, utilise prefabrication **techniques** to reduce construction waste, and incorporate renewable energy sources like photovoltaic systems and plans for transitioning to heat pumps and geothermal energy.	Demonstrated through the **renovation and development of existing infrastructure** to expand the housing stock efficiently and sustainably, anticipating future needs and utilising resources effectively.	Enhanced through **sustainable building practices**, incorporating passive design features and renewable energy solutions, thereby reducing environmental impact and promoting resident engagement in monitoring and optimising bioclimatic design.
Resilience and adaptation to climate change	Demonstrated by **extensive green spaces, green roofs, and facade plant**s that mitigate urban heat island effects,	Addressed by **responding to housing needs amidst challenges like the COVID-19 pandemic and refugee**	Achieved through its **passive building design**, which reduces energy consumption, enhances climate resilience,

enhance air quality, and manage stormwater runoff, contributing to improved living conditions and environmental sustainability.	**crises**, showcasing adaptability and resilience in supporting vulnerable populations through secure and dignified housing solutions.	supports community well-being, and underscores leadership in sustainability, advocating for systemic change at the municipal level.

Source: own elaboration, CASE

Common strengths include a strong emphasis on community well-being and quality of life, innovative design approaches that prioritise sustainability and energy efficiency, and diverse partnerships that support financial viability and operational success. Moreover, these projects demonstrate resilience and adaptability in addressing challenges such as bureaucratic hurdles and initial investment barriers. Opportunities lie in scaling these models to meet broader housing needs, leveraging community engagement to foster supportive local environments, and advancing sustainable practices through technological innovations and policy advocacy. Despite their strengths, challenges such as regulatory constraints, limited scalability of cooperative models, and financial sustainability remain significant considerations. By addressing these challenges and capitalising on opportunities for collaboration and innovation, these initiatives can continue to serve as valuable examples for addressing housing affordability and sustainability globally.

It is worth noting that these initiatives vary significantly in size and scale, ranging from Wohnpark Alterlaa in Vienna accommodating 11,000 residents to La Borda Housing Cooperative and SRA with approximately 60 residents. Additionally, they differ in their approach to target groups; while Poland's SRA initiative targets vulnerable demographics with strict eligibility criteria, Vienna's Wohnpark Alterlaa offers no-targeted housing solutions.

Comparatively, while Wohnpark Alterlaa excels in community-building and comprehensive infrastructure, SRA and La Borda showcase stronger commitments to resource efficiency and sustainability through their operational model/building design. Each initiative illustrates unique pathways towards affordable and sustainable housing, underscoring the diverse strategies and impacts of social economy-driven approaches across Europe. Efforts to replicate these models should consider local contexts, legislative support for cooperative housing, and robust strategies for climate resilience to maximise their broader impact and scalability in other EU Member States.

Conclusions and recommendations

Conclusions

While there is no universally accepted official, legal, or regulatory definition of **housing affordability** across the EU Member States, it generally refers to **the cost of housing relative to an individual's or household's disposable income**. Policymakers often advocate that housing costs should remain within 30–40% of income. However, 8.9 % of the population in the EU spends more than 40% of their disposable income on housing—this problem is particularly acute in Greece (28.5%) and Luxembourg (22.7%). This housing overburden rate in the EU appears to be significantly higher among the EU population at risk of poverty and low-income households.

Affordable housing is also shaped by a complex interplay of economic, regulatory, and demographic factors. High rental demand relative to supply drives up prices, while arrears on housing payments reduce supply and increase demand for affordable options. Homeownership support can enhance affordability but may also inflate prices. Regulatory measures, construction productivity, and digital innovations affect housing supply and costs. National policies and demographic changes significantly impact housing demand. Additionally, the rise of short-term rentals in popular tourist destinations reduces the availability of long-term rental units, further straining affordability.

Sustainability of housing encompasses environmental, social, cultural, and economic dimensions. Social sustainability involves creating affordable, inclusive, and adaptable residential spaces with quality infrastructure and essential community services. Economic sustainability emphasises the link between housing, employment, and access to education, highlighting the role of housing as both a capital asset and a home. Environmental sustainability focuses on minimising housing's ecological impact through energy efficiency, smart design, water and waste management, and resilience to environmental hazards. Collectively, these dimensions ensure that housing not only meets immediate needs, but also contributes to long-term community well-being and environmental health.

Taking into account both concepts—housing affordability and housing sustainability—affordable sustainable housing encompasses a number of factors that ought to be applied throughout every phase of the building and construction process, which can be clustered around five main themes:

(1) Habitability and comfort;
(2) Community and connectivity;
(3) Economic accessibility;
(4) Resource efficiency and circularity;
(5) Resilience and adaptation to climate change.

Ensuring affordable sustainable housing remains a European challenge. The EU, while lacking direct authority over housing policy, since it is a national competency, employs "soft power" strategies such as recommendations and guidelines to influence housing conditions, including its key initiative—NEB—that promotes inclusive and sustainable building designs. Despite the efforts of Member States, with national policies often targeting affordability and sustainability, the challenges related to housing supply remain significant.

As presented in this study, the development of new partnerships and structures—that include social economy entities, as well as the use of technological advancement (digital solutions) in the housing provision and supply sectors—bring opportunities that address these challenges, impacting affordability and sustainability of housing across the EU.

Digitalisation

Although there are several EU-wide initiatives (BSO, EUnet4DBP) **that promote digitalisation in the construction and housing industry, implementation continues to be a national and local competence and remains deficient.** The majority of EU-27 Member States have implemented policies addressing the digitalisation of the construction sector, through eight horizontal strategies that include construction as well as ten additional vertical strategies focused solely on the same goal. However, nine Member States still do not include the construction sector in their digitalisation policies, even though they may have advanced side initiatives.

The main barriers to the adoption of digital advancement include traditional stakeholder views, perceived low return on investment, high implementation costs, and lack of incentives, training, and regulations. The primary cost of non-digitisation lies in hiring and managing teams for document handling, prone to human errors. Currently, over 90% of construction industry data remain unprocessed, as confirmed by interviews. This inefficiency is compounded by the submission of advanced 3D site models as simplified 2D documentation to regulatory bodies, leading to decisions that may not fully utilise available data, thus losing potential benefits.

In the construction and housing industry, obtaining building permits is a critical, yet error-prone and time-consuming, process across many EU Member States. **This challenge stems from the lack of a robust legal framework supporting efficient automation in public administration, compounded by societal resistance to technological advancements**. As a result, some EU countries lack comprehensive, accessible planning portals and rely on analogue, paper-based systems. While the evolution towards Building Information Modelling (BIM) represents a significant advancement by enabling fully automated processes through 3D models, the sector must move beyond basic awareness and partial adoption of digital tools like BIM to achieve comprehensive implementation across all activities. Moreover, despite the launch of BSO and the Europe-wide initiative, widespread implementation of relevant databases across Member States remains limited, indicating gaps in national-level digitalised databases and portals.

  - ➤ **Denmark** is a pioneer in integrating digitalisation and green innovation within its construction sector, aligning closely with EU directives through substantial investments and supportive policies. Digital planning portals—such as Plandata.dk—serving as central hubs for locating, visualising, and supporting planning processes, can be a starting point in this process. When integrated with other tools and national/regional/local databases (e.g. on building preservation status, building energy data, and construction waste data), such portals establish a cohesive digital framework that enhances the efficiency of planning entities, ensuring transparency and legal compliance, which, in turn, integrate planning efforts and facilitate best practice learning in planning cases contributing to the creation of habitable and comfortable living environments.

AI adoption facilitates generative design techniques integrated into BIM software, enabling the exploration of diverse design possibilities while adhering to constraints set by designers and engineers. Machine learning further aids in detecting errors and inconsistencies in design variations but remains constrained to pilot projects within the construction and housing sectors. Luxembourg, Portugal, Finland, Denmark, Belgium, Germany, Malta, and the Netherlands exhibit the highest adoption rates of AI technologies among construction companies in the EU.

  - ➤ BTIC in the **Netherlands** fosters knowledge-sharing and innovation among private enterprises and policymakers and supports the country in the pursuit of ambitious goals for a circular economy, aiming for a 50% reduction in primary raw material use by 2030. The IEBB initiative leverages digital tools for feasible energy transitions in residential areas by developing a comprehensive machine learning-based housing classification system and detailed tendering

mechanisms, promoting standardisation and the renovation wave. The developed framework, categorising homes into clusters with similar characteristics—not focused on centralising solutions for all buildings, but rather ensuring each building receives a tailored approach that considers its unique characteristics and needs—offers a tool for streamlining renovations, minimising waste, and promoting environmentally friendly practices. **A detailed and standardised dataset of buildings (key geometrical data, BAG data, construction drawings, 3D scans of both exterior and interior, and energy label documentation), in the tendering mechanisms, allows for more accurate renovation quotes**. This mechanism makes the renovation process more transparent and efficient, ensuring that all relevant information is available upfront. By reducing uncertainties and enabling precise planning, it facilitates large-scale housing renovations.

However, it is worth mentioning that saved costs usually contribute to the investors' margin—a greater level of accuracy and trustworthiness, improved quality and standards, and the delivery of complex projects within budget and time,[245] instead of affecting the affordability of housing for end-users. Moreover, initial assessments indicate that these savings are currently minimal, as digitalisation remains partially dependent on paper-based systems and is not yet fully implemented. Further research is needed to quantify the cost reductions and explore how they could be redirected to improve housing affordability.

Digitalisation also plays a pivotal role in enhancing the proactive management of residential spaces and improving accessibility and usability for all residents, including the elderly – if well managed.

➢ Paris Habitat, France's largest public utility and social housing provider, utilises a specially developed mobile application and Salesforce platform for efficient communication, maintenance, and rental management. However, the case study highlights significant challenges in ensuring digital inclusiveness. Paris Habitat effectively bridges the digital divide by maintaining local agencies and on-site caretakers to offer physical support and direct assistance. They partner with organisations to promote digital literacy and ensure their digital platforms are user-friendly. By encouraging resident participation and adopting a phased approach to digital integration, Paris Habitat ensures that all residents, regardless of digital proficiency, benefit from enhanced service delivery. This inclusive strategy not only improves housing management, but also fosters social cohesion and resilience within the community.

Social economy in housing provision

Local authorities are increasingly involved in coordinating and implementing housing policies; however, the implementation of housing provision is shifting from a heavily municipal focus to a broader array of participants in many of the EU countries. This shift includes enhanced collaborations between public and private entities as well as the involvement of social economy actors. As the analysed case studies have shown, the involvement of social economy entities (LPHA, PBOs, and cooperatives) successfully addresses housing challenges, by providing cost-effective, well-designed housing solutions that foster community cohesion, reduce living costs, and promote long-term housing stability for vulnerable populations.

➢ Austria's extensive social housing sector, encompassing 24% of the national housing stock, is primarily driven by non- and limited-profit housing associations. **These social economy entities operate under strict governance and audit regulations, ensuring cost-based rents, reinvestment of profits into housing construction, and independence from the construction industry.** In Vienna, this model successfully keeps housing affordable through substantial

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[245] Perera S. et. Al. (2023). *Drivers And Barriers To Digitalisation: A Cross-Analysis Of The Views Of Designers And Builders In The Construction Industry.*

investments in new construction and renovations, alongside strong tenant protections thanks to regulatory measures. This approach also positively influences housing market dynamics by exerting a price-dampening effect. Wohnpark Alterlaa, a case study illustrating this approach that is rooted in the principle of "fair living", offers diverse, well-designed apartments amidst extensive green spaces and comprehensive access infrastructure (including social), while ensuring economic accessibility through regulated, cost-based rents. The use of prefabricated materials minimised waste generation during the construction process; however, given that some buildings in the complex, constructed between 1973 and 1985, reflect the architectural and infrastructural standards of their time, which often include poor energy efficiency, similar projects should prioritise maintenance and renovation efforts, focused on enhancing energy efficiency and incorporating circularity principles to ensure the buildings' longevity and functionality.

➢ In response to Poland's heavily privatised housing sector and limited social housing availability, significant policy interventions have been introduced since 2015. One key initiative is the introduction of the **SRA model, where non-profit organisations collaborate with municipalities to provide affordable and sustainable housing solutions to vulnerable groups.** The piloting of the SRA model in Dąbrowa Górnicza, managed by PBO, is currently offering below-rent, fully equipped (also anticipating the utilisation of existing infrastructure) apartments to vulnerable populations facing housing exclusion risks, including Ukrainian refugees in crisis. Supported by diverse public and private partnerships, this model not only meets immediate housing needs, but also integrates crucial services like job placement and education as well as emphasises tenant empowerment through financial and life skills training, promoting long-term housing stability and independence.

➢ Similarly, Spain is characterised by a small rental market at 14.4%, concentrated mainly in major cities. Social rental housing, representing only about 1.1% of the housing stock, is focused on low-income households through subsidies and income limits. Additionally, regional autonomy results in varying eligibility and allocation criteria, complicating access and creating disparities in social housing availability across different communities. **Innovative approaches, such as cooperatives, are emerging to address the demand for affordable housing**. La Borda Housing Cooperative, located in Barcelona's Can Batlló site, initiated and collectively owned by residents on public land, emphasises affordable housing and community cohesion over market speculation. The cooperative implements sustainable practices such as passive building design and cross-laminated timber construction, reducing environmental impact while fostering a resilient community through shared responsibilities and local engagement. The costs of living in the cooperative are significantly lowered through cooperative ownership, making upfront costs manageable for residents. The cooperative also promotes active resident involvement in building management and the leverage of shared utilities (communal laundry, shared hot water systems, etc.).

Based on the case studies, the involvement of social economy entities in housing provision yields several significant benefits. Firstly, these actors play a pivotal role in both maintaining and expanding affordable housing options, providing not only affordable apartments but also essential services. Simultaneously, they implement sustainable practices that reduce environmental impact and foster community resilience. Overall, the involvement of social economy actors enhances affordability, promotes community cohesion, and ensures sustainable housing solutions tailored to local needs, thereby illustrating the effectiveness and importance of bottom-up approaches in housing provision.

The study explored broad dimensions of housing sustainability and affordability, and the authors emphasised the need for future research to delve deeper into inclusive perspectives within urban planning, construction design, renovation, and housing provision. This expanded approach is essential

to equip policymakers with the knowledge needed to ensure housing accessibility across diverse segments of the population.

Additionally, the authors call for further exploration into the dynamic evolution of emerging technologies and new tools linked to AI and automation. Understanding the potential impacts – such as the actual costs saved - of these advancements in housing development and management will be crucial for the implementation of effective practices, built on well-working mechanisms adopted by private companies and the research development in the field.

Furthermore, given the diverse forms of social economy entities and the variety of housing policy approaches across the EU-27, future research, building on the current study's findings, could delve deeper into the specific contexts of other countries and outline other innovative approaches and mechanisms that positively impact housing affordability and sustainability.

Recommendations

Drawing on the conclusions provided from the literature review, but predominately all six case studies developed in this project, the following policy recommendations can be formulated.

Medium-term recommendations (up to 2030)

Overall approach to housing policies at the EU level

> **Creating a "New European Deal for Affordable Sustainable Social Housing"**

Although the EU institutions have in the past tackled housing affordability and sustainability via supporting policies such as the New European Bauhaus (NEB), with the recent election to the European Parliament, there is an impetus to prioritise housing on the overall EU policy agenda for the next five-year term. The Liège Declaration, which was agreed upon in March 2024 by housing ministers from all EU Member States, has two specific objectives: "1) proposing solutions to improve access to affordable and decent housing for all within the European Union through an EU housing platform; and 2) promoting access of social housing organizations to long-term European financing from the EIB and the EU Commission".[246] Additionally, it urges the institutions to make use of this renewed momentum.

> **Need for an EU Housing Directive**

Despite the varied and numerous instruments implemented by individual Member States, housing challenges persist across the EU. Therefore, it is imperative that the EU adopts a directive focused on addressing housing affordability and sustainability at a Union-wide level. An EU Housing Directive would ensure a coordinated and cohesive approach, leveraging best practices and providing a framework for Member States to follow. This directive should prioritise improving access to affordable and decent housing, promoting sustainable and energy-efficient construction, and facilitating long-term financing options for social housing organisations. By addressing these issues through a unified policy, the EU can tackle the housing crisis more effectively and ensure that all citizens have access to adequate and affordable housing.

> **Creating a Task Force (e.g. Led by One of the Commissioners) Responsible for Establishing Principles of Sustainable Affordable Housing for all EU Member States**

To increase the efficiency of the EU-level intervention, some guidelines on Sustainable Affordable Housing have to be put in place and depart from the principles such as affordability, sustainability,

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[246] Belgian Presidency of the Council of the European Union (2024). Liège Declaration: Towards affordable, decent, and sustainable housing for all (Press release).

quality, tenure security, and community development, among others. The Task Force could also be responsible for the organisation of practical matters such as the annual EU summit on sustainable affordable housing and creation of the EU-wide platform with the above-mentioned principles, guidelines and best practices to support national, regional and local housing strategies and their execution. Only then, new areas of EU housing policy intervention could be introduced.

Digitalisation

➢ **Interoperability and Flexibility of Solutions**

The main opportunities for enhancing the digitalisation of the building permit process include investing in interoperable digital platforms that can facilitate seamless communication and data exchange between different stakeholders involved in the process. Additionally, leveraging technologies such as BIM can enhance collaboration and **data-driven decision-making** throughout the project lifecycle. For all those already living, especially in the blocks of flats, a digital platform, where all the maintenance tools are connected (e.g. the bills, taxes, and notifications about things that need to be repaired), could ensure a **smooth process of communication** and less friction between habitats and building's management.

It is also crucial to maintain **flexibility in planning methods and tools** in order to avoid making the process and exact solutions too rigid.

➢ **Enhancing Twin Transition**

Energy efficiency plays a strategic role in building design, especially concerning sustainability and affordability in housing projects. Utilising databases like the BAG offers insights into exact building energy performance and characteristics and provides valuable insights into site conditions or zoning regulations. This information empowers decision makers in making strategic decisions that optimise energy usage, reduce carbon footprints, and enhance overall environmental sustainability. By **integrating digitalisation tools** and leveraging these databases effectively, not only the regulatory standards will be met, but innovation in climate-friendly architecture will also be driven. Moving forward, an even more prominent role for digitalisation in architectural practice, particularly in advancing energy-efficient design solutions that address the pressing challenges of climate change and contribute to creating healthier, more resilient communities can be envisioned.

Social economy and housing provision

➢ **Supporting New Models and Schemes**

Limited-profit housing model (Vienna's case study) and cooperatives (Barcelona's case study) prove to be effective in addressing the affordable housing challenge locally; hence, **it is imperative for public administrations to actively facilitate their growth**. This support should encompass a spectrum of measures, starting with providing land on long-term leases to cooperatives, which can serve as the foundation for their sustainable development. Additionally, creating **supportive legal and financial frameworks** is crucial to enable their operations efficiently, as existing frameworks may not always be conducive, often failing to ensure long-term affordability or by prioritising homeownership over rental solutions. It is also important to establish regulations to ensure that cooperatives remain aligned with their community-focused goals in the future. For instance, this could entail ensuring that public ownership of land is maintained and encouraging cooperatives to prioritise community interests over individual gains.

➢ **Ensuring Flexible Financial Support**

There is a risk associated with changes to subsidy programmes. Efficient housing programmes and models (such as the limited-profit housing model in Vienna) can function without subsidies. This trend, exemplified by the completion of up to 30% of housing projects in Vienna without subsidies, showcases

the model's adaptability and resilience. However, it also introduces new challenges, as the projects completed without subsidies tend to be more expensive. While the limited-profit housing model has demonstrated its ability to operate without significant reliance on subsidies, there is a recognition that **subsidies play a crucial role in ensuring the affordability of housing units**. As construction and financing costs continue to rise, there is a heightened need for subsidies to offset these expenses and maintain affordability for residents. However, changes to subsidy programmes or a shift in the understanding of social housing could pose a risk to the model's viability, potentially undermining its effectiveness in addressing housing needs.

Additionally, offering financial assistance in the form of **grants and initial funding** can significantly bolster efforts of cooperatives (e.g. La Borda). Facilitating **access to low-interest loans** is also important as it can empower cooperatives to navigate financial obstacles more effectively.

➢ **Creating Community Spaces**

As depicted from the results of all presented case studies, not only the quality of the dwelling itself, but also the **quality of the neighbourhood** matters so that social cohesion can be ensured, e.g. by the provision of green areas and opportunities or particular access to the labour market (see SRA's case study). Community spaces and inclusion in the life of the city and local community are especially important for the most vulnerable groups.

➢ **Establishment of a Framework of Exchange of Best Practices and the National and EU Level**

Such a platform is essential to facilitate the dissemination of successful models and financing instruments that effectively address local affordable housing challenges. This initiative aims to promote collaboration and learning among Member States and regions, enabling the adoption of piloted and proven strategies. By sharing experiences and insights, this framework will empower policymakers and housing providers to implement innovative approaches tailored to their respective contexts.

Long-term recommendations (up to 2050)

The overall approach to housing policies at the EU level

➢ **Looking at Housing Affordability and Sustainability from a Long-Term Perspective**

Because of its multidimensional character and the need for systemic, gradual changes, **housing affordability and sustainability cannot be approached** by policymakers **from a short- or medium-term perspective**. A potential solution enhancing this approach entails stronger inclusion of LRAs (e.g. city officials) in the decision-making process related to housing policies, not only in the top-down execution of projects but also in the planning and strategy creation. Thanks to focusing on approaches that tackle specific, local problems, officials will be keener to introduce ambitious, long-term reforms in the housing sector. This would also entail comprehensive monitoring and evaluation processes of the housing provision. Effectively, the gathering of detailed city/region-specific data will be ensured.

Digitalisation

➢ **Digitalisation as a Standard Practice**

To ensure that cost savings translate into broader societal benefits, **digitalisation must be mandated as a standard practice supported by legislation and implemented through circular approaches**—bank loans tied to the circularity of buildings, rental incentives based on the energy efficiency of buildings, and grassroots initiatives like financing for necessary improvements through additional floor construction offer promising solutions.

This entails moving beyond initial awareness and selective adoption of tools like BIM to achieve comprehensive integration of digital technologies across all operational aspects. Embracing technological advancements in construction and housing will bring numerous benefits, including improved cost estimation accuracy, predictive capabilities, enhanced planning processes, and superior project management. Moreover, digitalisation promises significant time savings, promotes building sustainability, reduces environmental footprints, and fosters the dissemination of best practices in affordable and sustainable housing across the EU. Therefore, policymakers should prioritise and incentivise the widespread adoption of digital solutions to drive efficiency and affordability in the housing sector.

> ➤ **User Involvement**

Involving users—whether they are planners, agency staff, or citizens—in the development process of digital tools and methods is of the utmost importance **to ensure they meet practical needs**. In the beginning, the implementation of digital tools should be incremental and involve only interested municipalities and then gradually make it obligatory based on practical benefits. If these new functions and methods prove effective, they can be mainstreamed to all. **This step-by-step participative approach ensures that digital tools are both practical and widely accepted** as the Danish case study proves.

Social economy and housing provision

> ➤ **Changing the Narrative**

In general, it is important to foster the understanding that "social housing" is not limited to housing for the most vulnerable groups. In Austria, especially in the city of Vienna, it is understood rather as **"societal housing"**, which is "not for the profit" but for the people. This model allows to address a broad segment of the population, including middle-income families, rather than just the lowest-income groups, as the focus should be placed on achieving a social mix in the residential areas to prevent gentrification. One of the reasons why this model works is that it is rooting the cooperative movement of the 19th century, which centred on self-help and community collaboration rather than social assistance. People pooled their resources to construct housing together, which made it cheaper.

To replicate Vienna's model, policymakers should focus on creating a system based on mutual self-help and community involvement, supported by state subsidies that encourage non-profit housing development. This approach can gradually change the stigma associated with social housing and provide sustainable, affordable housing for a wider population.

> ➤ **Holistic Approach to Housing Stock**

It is important to not only focus on building new and renovating already existing housing stock, but also **utilise available unused buildings for housing purposes**. It is also important to anticipate who will inhabit these apartments and what their needs will be. In Poland, lack of social housing also stems from the economic status of individuals, who often struggle financially. Actions are needed to adapt existing buildings to the needs of residents. It is also important to ensure adequate preparation of people using social housing so that they can cope with their housing situation independently in the future. Although it may be an expensive process, in the long run, it can yield the desired effects; a gradual and systematic approach is important but decisive.

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List of abbreviations

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AEC	Architecture, Engineering, and Construction
AI	Artificial Intelligence
BAG	Basic Registration of Building and Addresses
BBR	Main Danish Building and Dwelling Register
BI	Business Intelligence
BIM	Building Information Modelling
BSO	Building Stock Observatory
BTIC	Construction and Innovation Centre
DESI	Digital Economy and Society Index
ECSO	European Construction Sector Observatory
EESC	European Economic and Social Committee
EGD	European Green Deal
EIB	European Investment Bank
EOL	End-Of-Life
EPBD	Energy Performance of Buildings Directive
EPSR	European Pillar of Social Rights
EU	European Union
EUnet4DBP	European Network for Digital Building Permits
GHG	Greenhouse Gas
IEBB	Integral Energy Transition for Existing Buildings
IWU	*Institut Wohnen und Umwelt GmbH*, Institute for Housing and the Environment
LPHA	Limited-profit Housing Association
LRA	Local and Regional Authority
LSTM	Long Short-Term Memory
NEB	New European Bauhaus
NGO	Non-Governmental Organization
NPM	*Narodowy Program Mieszkaniowy*, National Housing Programme
NRRP	National Resilience and Recovery Plan
OECD	Organisation for Economic Cooperation and Development
PBO	Public Benefit Organisation
PTNB	Digital Transition Plan in the Building
PTSHC	Sectoral Territorial Plan for Housing in Catalonia
R&D	Research and Development
RES	Renewable Energy Sources
RRP	Recovery and Resilience Plan
SCF	Social Climate Fund
SMEs	Small and Medium-Sized Enterprises
SRA	Social Rental Agency
SWOT	Strengths, Weaknesses, Opportunities and Threats
The BDNB	National Buildings Database
UN-Habitat	United Nations Human Settlements Programme
VPP	*Vivienda de Protección Pública,* Publicly Protected Housing
WGG	*Wohnungsgemeinützigkeitsgesetz*, Non-profit Housing Act

Annex I. Factors Affecting Housing Affordability and Housing Sustainability

Housing affordability

The concept of affordable housing involves a diverse array of elements underscoring the interplay of economic, regulatory, and demographic forces present in a country, including:

➢ **Housing cost overburden**, which constitutes the percentage of the population living in households where the total housing costs represent more than 40% of disposable income.[247] Most importantly, the overburden rate is one of the most pressing issues within the EU's housing sector, with the highest rates in 2022 observed in Greece (26.7%), Luxembourg (15.2%), Bulgaria (15.1%,) and Denmark (14.7%), while the lowest in Cyprus and Slovakia (2,5%), Malta (2.9%), Lithuania (3.5%), Croatia (3.8%) and Ireland (3.9%).[248] However, housing cost overburden does not account for the differences between countries (incomes, taxes, prices, and housing market) and does not allow for in-depth comparisons within the Member States. The overburden rate in the EU appears to be significantly higher among the EU population at risk of poverty and low-income households. However, housing cost overburden does not fully account for the significant variations within countries or regions, where disparities in income, taxes, housing prices, and market conditions can lead to substantial differences in affordability.

Figure 5. Percentage of Persons Having Cost Overburden Rate (EU-27, 2022)
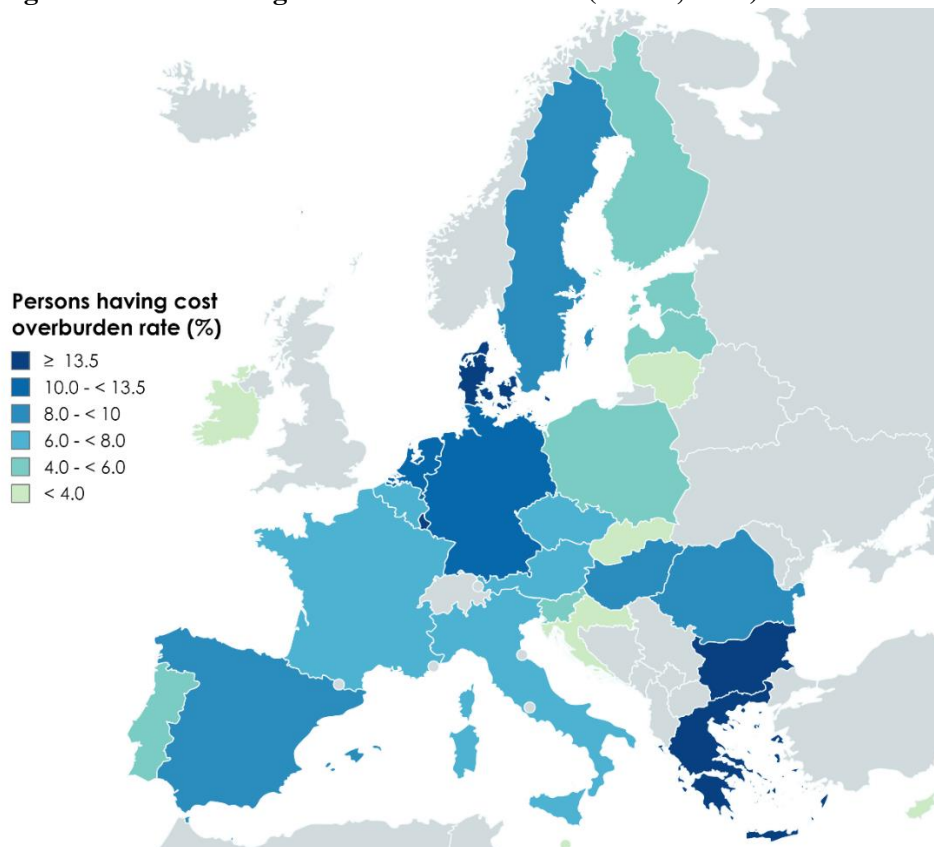
Source: *own elaboration, CASE based on Eurostat database, Housing cost overburden rate by age, sex and poverty status - EU-SILC survey.*

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[247] Eurostat (n.d.). *Glossary: Housing cost overburden rate* - website.
[248] *Eurostat database, Housing cost overburden rate by age, sex, and poverty status - EU-SILC survey.*

> ➢ The rental market reflects the current supply and demand for housing in a given area. When there is a high demand for rental properties relative to supply, rental prices tend to increase, making housing less affordable for renters. The **size of the rental market and its structure** can contribute to housing accessibility and affordability as the proportion of the population participating in the rental market can influence the availability of rental units – bridging or widening the gap between the demand for and supply of affordable rentals.[249]

> ➢ **The share of the population in arrears** (with their mortgage, rent or other items, such as utility bills or hire purchase payments, which are typically paid as monthly instalments) with outstanding debts and delayed payments[250] can also be considered an important factor in the affordability of housing. When a significant portion of the population is in arrears, it can lead to a decrease in the supply of housing and a higher demand for affordable housing options. This increased demand can drive up prices for lower-cost housing units, making it more difficult for those in vulnerable positions.

> ➢ **The share and provision support for homeownership and homeowners**[251] is directly linked to housing affordability. Affordable homeownership initiatives are specifically designed to assist first-time homebuyers and individuals who lack a sizable deposit or collateral for a traditional mortgage, usually young families or those situated in the lower to middle-income brackets. However, while making mortgages more accessible can spur demand for homeownership, it also has the potential to inflate housing prices.[252] Regulating and stimulating self-built housing and housing improvements,[253] as well as housing allowances, involving income-based assistance to homeowners or renters for various housing expenses, and subsidies aimed at fostering affordable housing development through grants, tax relief, or subsidised land provision to developers, also including rental housing, "shared ownership", and "rent-to-buy" schemes can constitute long-term impact policy-based opportunity.

> ➢ **Rental market regulations** (rent controls or ceilings; minimum quality regulations for rental dwellings, as well as measures to regulate short-term holiday rentals) **ease of registering property, and quality of land administration** are key regulations that affect the responsiveness of the housing supply—the more restrictive rent regulations are, the less responsive the housing supply is.[254] On the other hand, **the fiscal measures for rental policies** can also impact housing affordability, boosting the rental supply—with rent control or stabilisation policies contributing to making price formation transparent and comparable.[255]

> ➢ **Productivity of the construction sector, including the rate of housing construction and planning restrictions (as well as relationship between building costs and standardisation requirements).** A more productive construction sector can complete (new and/or renovation) projects more quickly and cost-effectively, which can help lower the overall cost of housing. Furthermore, the ease of property registration processes, management of building permits, and the effectiveness of land administration systems all contribute to the flexibility of housing supply.[256] The integration of digitalisation and new solutions within the construction industry offers the potential for heightened productivity and subsequently lower construction expenses.[257]

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[249] Harvard Joint Center for Housing Studies (2013). *America's Rental Housing: Evolving Markets and Needs.*
[250] Eurostat (2018). *One in ten Europeans in arrears with payments – website.*
[251] Also connected to environmental sustainability.
[252] ECSO (2019). *Housing affordability and sustainability in the EU.*
[253] UN Habitat (2012). *Sustainable Housing for Sustainable Cities, A policy framework for developing countries.*
[254] World Bank (2018). *Living and leaving. Housing, Mobility and Welfare in the European Union.*
[255] Urban Agenda for the EU (2018). *The Housing Partnership Action Plan.*
[256] ECSO (2019). *Housing affordability and sustainability in the EU.*
[257] Ibidem.

➢ As housing (non)affordability is a growing issue across the EU, **the presence of targeted national policies related to investments in social infrastructure**[258] **and support to finance housing improvements** (such as grants, loans, and tax reliefs) to promote the improvement and regeneration of existing residential dwellings and renovation programmes concerning energy efficiency upgrades, repairs, accessibility upgrades, and dwelling expansions[259] can have a significant impact on the affordability of housing—similarly, in the case of support for the **direct provision of social rental housing as a % of the country's gross domestic product** that typically consists of transfers to the local authorities that own and manage the stock or supply-side subsidies for non-government providers.[260]

➢ Moreover, **population change** can also be directly correlated to a changing demand for housing and its affordability. Growth, particularly in the number of households, leads to a growth in housing demand. Similarly, population decline might lead to a decrease in housing demand – with the latter only happening in the long run, after not only the number of people but also the number of households starts to decline. The danger of population decline is greatest in remote rural areas and in areas with lower-quality housing.[261]

➢ The proliferation of short-term rentals has significantly impacted housing markets in many cities, leading to an increase in rental prices and reducing the availability of long-term rental units. This trend is particularly pronounced in popular tourist destinations and major cities, where property owners may find it more lucrative to rent out their properties on a short-term basis rather than to long-term tenants. The highest number of guests in 2022 (booked by four biggest online platforms: Airbnb, Booking, Expedia Group, and Tripadvisor) was recorded in Paris (13.5 million guests) followed by Barcelona and Lisbon with over 8.5 million guests each and Rome with over 8 million guests.[262]

Housing sustainability

Sustainable housing should be seen as a comprehensive process that takes into account social, economic, and environmental issues. While it is important for it to be focused on the use of the sustainable materials and construction methods, it should also be affordable, located near to employment services and connected to a well-functioning infrastructure and networks.[263] Similarly, with the definitions of housing affordability, housing sustainability can be considered as a set of factors, divided into three categories:

1) **Social sustainability** in housing involves the development of affordable, quality, inclusive, and diverse residential spaces that cater to different income levels and tenure types. These spaces should ensure security, health, and integration into broader urban and national socio-spatial contexts.[264] The following factors should be taken into account when defining socially sustainable housing:[265]

➢ **The affordability, dignity, and resilience** of housing are essential factors that intertwine with non-housing consumption and the adaptability of housing to present and future needs. Ensuring affordable housing not only facilitates the sustainability of day-to-day living costs, but also contributes to maintaining socially accepted standards of living and fostering social cohesion within communities. Additionally, adaptable housing designs that can accommodate evolving

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[258] Ibidem.

[259] OECD (n.d.). *OECD Affordable Housing Database, Measures To Finance Housing Improvements And Regeneration*.

[260] OECD (n.d.). *OECD Affordable Housing Database, Public Spending On Support To Social Rental Housing*.

[261] Mulder C. M. (n.d.) *The relationship between population and housing*.

[262] EP (2023). *New EU rules aim to bring more transparency to short-term rentals in the EU and promote a more sustainable tourism*.

[263] Ibidem.

[264] Ibidem.

[265] Ibidem.

needs over time play a crucial role in enhancing the resilience of individuals and communities in the face of changing circumstances. [266]

➢ **Quality infrastructure** and fostering opportunities for an inclusive urban environment[267] and supportive social and cultural atmosphere. The sustainability of residential areas depends on the presence of reliable infrastructure such as public transportation, water, energy sources, and public spaces, as well as the accessibility of vital community services including schools, shops, healthcare facilities, and amenities for families and children. It is crucial to provide essential social facilities early on in the development of new communities to prevent residents from needing to commute for access and to encourage a sense of attachment to their surroundings. Additionally, public facilities should ensure that individuals are not dependent on cars or otherwise excluded, but have convenient access to areas where jobs and urban services are located, as well as provide access to green spaces.[268]

➢ **Foreseeing empowerment, participation, and inclusion measures** – especially when it comes to accessibility issues for persons with disabilities, adopting the universal design[269] principles. With this regard, housing should:

   o Be useful and relevant to a wide group of tenants, accommodating a wide range of individual preferences and abilities;
   o Be designed in an easily understandable manner, regardless of the knowledge, experience, language skills, or concentration level of the tenants;
   o Be based on effective communication of information to the tenant regardless of the ambient condition or the sensory abilities;
   o Minimise the hazards and adverse consequences of unintended actions of the user;
   o Allow ease of use with a minimum of fatigue;
   o Use the size and space for approach — reach, manipulation and use should be appropriate regardless of the body.[270]

2) **The economic aspect of housing sustainability,** apart from the affordability that has been already discussed, includes the strong connection with **employment and provision of access to quality education and professional development** for residents. Housing is a capital asset and an important part of household and public expenditure. Construction, services, and real estate markets are some of the key economic and employment activities, including home-based activities and entrepreneurship.[271] An essential distinction can be drawn between seeing housing primarily an economic matter, focusing on residential investments and market dynamics, and recognising that sustainable housing is more than a mere structure – but can also be called home.[272]

3) **Environmental sustainability** in housing focuses on understanding and mitigating the effects of housing on the environment and climate change, while also considering how environmental factors impact housing. There are primary relationships between housing and the environment, particularly concerning the construction and operation of housing. These relationships necessitate the use of environmental resources such as building materials, water, energy, and land. Residential activities within communities have direct ecological impacts, contributing to issues such as air and water pollution, waste generation, and harm to natural ecosystems. Housing and their inhabitants face various environmental risks, stemming from human activities (such as pollution and sanitation

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[266] Ibidem.
[267] ESCO (2019). *Housing affordability and sustainability in the EU.*
[268] UN-Habitat (2012). *Sustainable Housing for Sustainable Cities. A policy framework for developing countries.*
[269] UN OHCHR (20016). *Convention on the Rights of Persons with Disabilities*
[270] UN Habitat (2014). *Accessibility of Housing. A Handbook of Inclusive Affordable Housing Solutions for Persons with Disabilities and Older Persons.*
[271] Ibidem.
[272] ECSO (2019). *Housing affordability and sustainability in the EU.*

issues), natural occurrences (like landslides or diseases), or a combination of both.[273] According to these relationships, the following issues can be considered to have an impact on the environmental sustainability of housing:

➢ As the contemporary housing sector consumes large amounts of energy, materials and other resources in its construction, maintenance and use, **ensuring energy efficiency and microgeneration while considering the whole lifecycle of residential buildings** is pivotal.

➢ Building design and internal facilities should involve the possibility of **installation of smart home appliances and other digital functionalities and installing energy-efficient appliances for heating, cooling, cooking, lighting, and ventilation.**.[274]

➢ **Effective water and waste management** practices require prevention measures that should be adopted already during the construction phase that impact both water quantity and quality.

➢ During the planning and design phase of residential projects, **thorough consideration of contextual environmental hazards, such as floods, landslides, and earthquakes, is essential for implementing resilient housing strategies**. Incorporating a well-developed network of green spaces within neighbourhoods not only mitigates environmental risks, but also enhances biodiversity and promotes the health and quality of life of residents.[275]

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[273] Ibidem.
[274] UN-Habitat (2012). *Sustainable Housing for Sustainable Cities. A policy framework for developing countries*.
[275] Ibidem.

Annex II. SWOT Analysis — Danish Digital Plan Register

SWOT Analysis: Easy Access to Public Plans — Danish Digital Plan Register [276]

Strengths

➢ Plandata.dk ensures easy access to public plans at local, municipal, and national levels, including data from the Construction and Housing Authority, enhancing transparency and decision-making processes; by providing a single platform for accessing planning data, it streamlines the process for individuals, developers, and policymakers to access necessary information. This can reduce the time and effort required to gather data from disparate sources, making it easier for stakeholders to understand the regulatory environment and plan accordingly.

➢ Assigning geography to all plans with precise boundaries can help ensure that development projects are aligned with zoning regulations and environmental considerations.

➢ The system is quite open in terms of methods, which allows for flexibility in how plans are developed and zones are defined.

➢ The initiative complies with the Danish Law on planning, ensuring that all plans and decisions mandated by law are digitised and accessible through the platform, demonstrating adherence to regulatory requirements.

➢ The platform simplifies the submission of plans to the state, facilitating municipal workflows and reducing bureaucratic barriers, leading to increased efficiency in administrative processes.

➢ The platform's data is publicly accessible and regularly used by universities for research, enhancing its utility as a statistical and analytical tool.

Weaknesses

➢ The platform primarily serves as a documentation tool rather than a development or planning tool, and thus does not necessarily correlate with the affordability or sustainability of housing projects.

➢ The initial registration of planning data required significant effort from the managing authority, indicating a high initial workload which might be challenging for replication in other contexts.

➢ Plandata.dk does not include a public participation portal where users could interact directly with the plan, marking areas or adding comments.

Opportunities

➢ Continued advancements in technology, such as geospatial analysis, data visualisation, and artificial intelligence, provide opportunities to enhance the functionalities of Plandata.dk. Integrating new technologies could improve data accuracy, user experience, and decision support capabilities, making the platform even more valuable to stakeholders.

➢ Plandata.dk could be leveraged to support a broader range of applications beyond urban planning, such as disaster management, environmental conservation, and infrastructure development.

➢ Access to comprehensive planning data enables stakeholders to identify areas suitable for housing initiatives. This can include mapping out areas with favourable zoning regulations, access to public transportation, and proximity to amenities.

➢ Public accessibility of existing data and its use in academic research suggest opportunities for developing more advanced analytical tools and applications that could further aid urban planning and policy-making.

➢ Insights from Denmark's implementation, including legislative support and centralised data conversion, can guide other countries or regions in developing similar systems. In Denmark, the process often starts voluntarily, with some municipalities acting as front-runners. If these new

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[276] *Source: own elaboration, CASE based on desk research and interviews no.1, 2 and 3.*

functions and methods prove effective, they are then mainstreamed to all. This step-by-step approach ensures that digital tools are both practical and widely accepted.

Threats

➢ Reliance on non-legally binding digital plan data increases the risk of incorrect decision-making by municipalities.

➢ Difficulties in deciphering which data are legally binding may lead to a preference for analogue versions.

➢ The success of Plandata.dk hinges significantly on supporting legislation. Without similar legislative frameworks, other regions may struggle to replicate its success.

➢ The initial and ongoing workload for municipalities to keep the data updated can be a significant burden, potentially leading to inconsistencies or incomplete data if not adequately managed.

Annex III. SWOT Analysis — Paris Habitat

SWOT Analysis: Digitalisation of Social Housing—Paris Habitat [277]

Strengths

➢ Diverse housing options with affordable rents based on income levels, including support for students, elderly, and vulnerable populations.

➢ Use of disused sites like offices, garages, and former military barracks by turning them into new housing units, using innovative processes based on digital solutions—a way to close the loop and renovate inefficient utilities at the same time.

➢ Paris Habitat works with various associations to extend its acts of solidarity by offering permanent housing to people who are socially or economically vulnerable through rental intermediation schemes that are calculated based on various factors. Offering permanent housing solutions is a sustainable approach to solving housing insecurity and has a long-term positive impact on individuals, families, and the broader community, which is a fundamental basis for integrating into society and accessing opportunities.

➢ Resource optimisation, waste and environmental footprint reduction.

➢ Including tenants in decision-making processes regarding their immediate surroundings (e.g. well-maintained, secure green spaces)[278] through digitised processes and in-app communication.

➢ Management of properties through a specially developed app streamlining the work of 1200 supervisors overlooking the security, hygiene and rental of the houses—thanks to that communication is more efficient and needs are addressed more properly.

➢ Paris Habitat social housings are spread across the city, which prevents the minority groups from creating ghettos and closing in their communities.[279]

➢ Paris Habitat recognises the limitation of technology in certain groups, such as the elderly, who receive information on paper along with their monthly rent receipt and through posters at the bottom of the stairs. Additionally, services are offered to assist them in case of elevator breakdowns (including help with shopping and mobility).[280]

➢ Community engagement is actively promoted through tenant meetings, associations, and neighbourhood parties, ensuring residents are involved in decision-making processes and fostering a strong sense of community.

Weaknesses

➢ Initial high costs for sustainable materials and the adaptation of disused sites may impact budget allocations.

➢ Relying on bio-sourced and recycled materials might face supply chain limitations and availability issues.

➢ Navigating the regulatory landscape for innovative building techniques and materials reuse.

➢ Elderly residents may face challenges in adopting digital technologies due to a lack of familiarity or access to digital devices. This can result in a digital divide where certain demographic groups, particularly older adults, are unable to fully utilise digital platforms for communication, access to services, or community engagement.

➢ Some residents may find digital platforms or applications too complex or overwhelming to use effectively.

➢ Lack of unified documentation requirements and unclear eligibility criteria.[281]

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[277] *Source: own elaboration, CASE based on desk research and interviews no.4, 5, 6 and 7.*
[278] Interview no. 5
[279] Interview no. 4
[280] Interview no. 5
[281] Interview no. 4

Opportunities

➢ The development of a material exchange platform as a part of CHARM project for use with external partners in procurement processes can turn it into a standard practice in renovation projects, thus leading to a potential reduction of downcycling of at least 1,370 tonnes of materials on an annual basis[282] which equals to 365,000 standard-sized bricks from which one could build three 32-unit blocks of flats.

➢ Potential for attracting investment and partnerships with organisations aligned with sustainability and social impact goals.

➢ Initiatives to promote digital literacy among residents can enhance community engagement and ensure broader access to digital services.

➢ Policy influence: Paris Habitat could influence local and national policies towards more sustainable and inclusive housing standards.

➢ Choosing building and renovation materials according to their durability in order to prevent unnecessary renovation works.[283]

➢ Fixed prices for rent for housing and business units, providing small, local business owners with a competitive edge against larger companies.[284] With reliable and precise information on materials, costs, carbon weight, etc., it is possible to better evaluate projects and meet both financial and environmental objectives.[285]

Threats

➢ Bad condition of reused materials or damages during demolition.

➢ Economic downturns could affect funding, investment, and demand for new housing projects.

➢ While innovative, some digital initiatives may face scepticism or resistance from potential residents or stakeholders unfamiliar with the benefits of such approaches.

➢ In the event of technical issues or system failures, residents who rely heavily on digital platforms for essential services or communication may be disproportionately affected. This dependency on digital infrastructure could pose risks to their well-being and safety, particularly if alternative means of support or communication are not readily available.

➢ A heavy reliance on digital platforms for communication or access to services may inadvertently exclude elderly residents who are not digitally literate or comfortable with technology. This could exacerbate feelings of social isolation and marginalisation among this demographic, as they may struggle to connect with neighbours or participate in community activities facilitated through digital means.

➢ Language can be the biggest barrier preventing people from applying for social housing, especially migrants and refugees who do not speak French. This issue continues on the level of integration with local communities.[286]

➢ Lack of regulations clarifying sharing space by different businesses (office rental, co-living, etc.).[287]

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[282] Interreg (n.d.). *Paris Habitat: 16 light renovations, 12 deep renovations (occupied) + 12 transformations*.
[283] Interview no. 4
[284] Interview no. 4
[285] Interview no. 6
[286] Interview no. 4
[287] Interview no. 4

Annex IV. SWOT Analysis — Integral Energy Transition for Existing Buildings

SWOT Analysis — Classification System for Buildings: IEBB [288]

Strengths

➢ Standardisation allows for streamlined processes, reducing time and costs associated with custom solutions.

➢ A uniform framework can foster innovation, as solutions can be developed for a broad range of applications, encouraging more sustainable and technologically advanced renovations.

➢ By meticulously gathering a wide range of data, researchers and professionals create more detailed and predictive models that reflect real-world conditions more closely.

➢ Automated process to optimise and manufacture building components enabling passive design.

➢ Enabling targeted energy efficiency improvements, optimising the use of renewable energy, and facilitating customised sustainability strategies.

➢ By classifying homes into large-scale clusters with similar characteristics and renovation needs, the Netherlands can approach renovations more efficiently and sustainably. This strategy enables the application of uniform solutions across numerous homes, reducing waste and increasing the use of environmentally friendly practices.

➢ Including demontability as one of the factors in obtaining financing for the buildings, thus helping to close the loop from the start of the construction process.

➢ Each building is assigned a value by standard criteria like location and square footage.

➢ One-stop shops simplify the renovation process by offering personalised solutions, addressing both the technical aspects of renovations and public awareness. This ensures that standardisation does not lead to a one-size-fits-all approach but rather facilitates tailored solutions for each building.

➢ Infrastructure upgrades, such as integrating geothermal heating, enhancing energy efficiency and reducing long-term costs, demonstrating the broader benefits of energy transformations.

➢ Detailed and standardised dataset (key geometrical data, BAG-data, construction drawings, 3D scans of both exterior and interior, and energy label documentation) in the tendering mechanisms allows the provision of more accurate quotes for renovation projects.

Weaknesses

➢ The existing market for housing renovations, characterised by conventional practices, continues to be limited in size. It is also highly segmented, and costly.

➢ For the application of a standardised system, availability of data in a national scale is required.

➢ Failing to identify the main housing characteristics that should govern the large-scale clustering of similar houses to facilitate and promote standardisation.

➢ The diversity of housing issues may be oversimplified, resulting in solutions that might not address all problems effectively; housing characteristics and renovations vary a lot.

➢ Stakeholders accustomed to traditional, bespoke renovation methods may resist standardised approaches.

➢ The value assigned to the building is often not precise enough and, in most cases, varies significantly from the market price.[289]

➢ In the Netherlands and Flanders, there is a lack of sufficient digital resource centers.[290]

➢ Information availability is crucial. One of the biggest challenges is enabling the cooperation and participation of society, policymakers, and the industry. To address this, there needs to be a greater

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[288] *Source: own elaboration, CASE based on desk research and interviews no.8, 9 and 10.*
[289] Interview no. 8
[290] Interview no. 9

emphasis on digitalisation, data, and AI to facilitate better communication and collaboration among stakeholders.[291]

➢ The transferability of expertise and the effective use of transferred knowledge, within both the Member States and across regions with varying situations, are essential. Tools and platforms are needed to help stakeholders disseminate and apply knowledge effectively, ensuring that best practices can be adapted to local conditions.[292]

Opportunities

➢ Customisation, improved quality control, and facilitation of the scalability of energy-efficient renovations across more buildings, supporting broader sustainability and energy transition goals;

➢ This approach can open up new markets by making renovations accessible to a broader audience, including lower-income households.

➢ Policymakers might support standardisation for its potential to meet housing and environmental targets, leading to incentives or subsidies.

➢ Establishing a European database of building materials, which could be beneficial for both municipalities and certifying institutions, as well as for small producers for whom acquiring certification is too expensive, therefore they cannot be used in building applying for BREEM certification or else.[293]

➢ In order to stimulate renovations and investments in the thermal parameters of the buildings, banks do not provide loans to buildings with poor insulation. Additionally, they provide a list of recommendations on what can be done to achieve a higher energy class.[294]

➢ Dependence of rental possibilities from the energy class of the flat/building as a way to raise the energy efficiency of the immovables.

➢ Efficiently targeting resources by focusing on early adopters who are most in need and willing to renovate, ensuring impactful and timely renovations.

➢ Finding standardised, replicable solutions for different city typologies can enhance the affordability and scalability of renovations, facilitating broader application across European countries.

➢ The economic pressure from rising energy costs has heightened public awareness and demand for energy-efficient renovations, creating an opportunity for municipalities and organisations to promote and implement energy-saving measures and renovations.

➢ Policy changes that reduce the complexity of the decision-making process, such as lowering the required majority for renovation approvals, can significantly increase the adoption of energy-efficient renovations.

➢ Improved insulation and higher energy classifications make housing more affordable by reducing energy costs, thereby increasing the overall economic accessibility of energy-efficient homes.

➢ Working with municipalities to reach out to homeowners in cities, providing them with the right information to accelerate such energy transitions for buildings.[295]

➢ Cooperation on international level with both public and private organisations; TU Delft works with partners from Flanders, Belgium, and northwest France, like the Paris Agency for Climate (APC).[296]

➢ Diversifying the project with different city sizes' needs—Antwerp (a large city), Methane (a medium-sized city), and Ostend (a smaller city). The research team aims to find solutions for every typology, which can be replicated in other European countries later.[297]

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[291] Interview no. 10
[292] Interview no. 10
[293] Interview no. 8
[294] Interview no. 8
[295] Interview no. 9
[296] Interview no. 9
[297] Interview no. 9

➢ Climate agencies in Europe are promoting the concept of one-stop-shops with physical offices in several cities around Europe to promote energy transitions in the housing sector, especially helping homeowners.[298]

➢ Energy transformations can significantly enhance infrastructure quality. In Delft, for example, companies are working on the city's heat grid, integrating geothermal heating from nearby cities like the Hague. This ongoing infrastructure upgrade promises better energy efficiency and reduced costs in the long run.[299]

➢ Rising energy bills have increased public awareness, prompting investments in energy-efficient renovations. Such improvements, like better insulation and higher energy classifications, enhance the economic accessibility of housing. In the Netherlands, the value of buildings is partly determined by their energy labels, with higher energy-efficient buildings selling at higher prices. This trend motivates homeowners to invest in renovations, adding value to their properties.[300]

Threats

➢ Standardisation may lead to a reliance on a limited number of suppliers for materials and solutions.

➢ Reluctance towards change from the present customised way of renovating a house to a collaborative way of renovating on a large scale.

➢ Providing correct quotes by the renovation companies.

➢ The legalisation of the new tendering mechanism is based on a new housing classification system.

➢ Policy changes are necessary to reduce the complexity of renovations. For instance, in the Netherlands, two-thirds of homeowners must vote in favour of renovations, compared to a simple majority in other countries. In Austria, unanimity is required, meaning even a single dissenting homeowner can halt a renovation project. Simplifying these policies could facilitate more widespread adoption of energy renovations.[301]

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[298] Interview no. 9
[299] Interview no. 9
[300] Interview no. 9
[301] Interview no. 9

Annex V. SWOT Analysis – Wohnpark Alt-Erlaa

SWOT Analysis: Wohnpark Alt-Erlaa – Non-profit Housing in Vienna [302]

Strengths

➢ The project was built with a strong ethical principle of "fair living", emphasising affordable comfort and fair quality for all residents, which contributed to its success.

➢ The layout and design of the complex, including tower blocks and extensive green spaces, were crafted to maximise the well-being of the residents.

➢ The installation of photovoltaic systems across Wohnpark Alt-Erlaa's buildings and shopping areas collectively generates 780 kilowatts of energy, contributing to reduced reliance on traditional energy sources. While there are initial costs associated with installing photovoltaic systems, they offer long-term financial benefits through reduced energy bills and potential income generation from surplus energy sold back to the grid.[303]

➢ A wide range of amenities such as health centres, kindergartens, a church, schools, a public library, a gym, swimming pools, saunas, restaurants, and playgrounds, shopping park enhancing the quality of life for residents.

➢ Proximity to major transportation hubs and public transit ensures residents have easy access to central Vienna and other parts of the city.

➢ Wohnpark Alt-Erlaa provides 3,181 apartments that are priced on a "cost-rent" basis regulated by the WGG (Austrian Housing Act). This pricing model ensures that tenants are charged rent based on the actual cost to cover expenses, making housing more affordable compared to market rates. On average, rents are 29% cheaper than market prices, which enhances economic accessibility for residents.[304]

Rent structure includes an annual adjustment based on the price index, ensuring that rent increases are aligned with inflation rather than market speculation. This stability in housing costs provides financial predictability for tenants and prevents rapid increases that could lead to housing affordability crises.[305]

➢ Residents make a one-time financial contribution upon moving in (varying depending on specific circumstances of a habitant and legal requirements) which directly lowers the monthly rent by offsetting some of the costs. This contribution is distinct from rent and is refundable to a certain extent upon moving out.[306] This mechanism can lower the financial barriers to accessing housing, particularly for those who might struggle with higher ongoing costs.

➢ By offering a large number of affordable apartments through cost-rent pricing, Wohnpark Alt-Erlaa contributes to mitigate housing market pressures in Vienna. The availability of affordable housing options reduces the demand for private rental housing in the city, dampening rent increases in the broader housing market.

Weaknesses

➢ Some of the buildings in the complex were constructed between 1973 and 1985 and reflect the architectural and infrastructural standards of its time (including questionable energy efficiency)—

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[302] *Source: own elaboration, CASE based on desk research and interviews no.11, 12, 13, 14, 15, 16, and 20.*
[303] Interview no. 16.
[304] Interview no. 16.
[305] Ibidem.
[306] Ibidem.

the complex requires ongoing maintenance and renovation to ensure their longevity and functionality.

➢ Upgrading from gas boilers to more sustainable heating solutions, such as heat pumps and geothermal energy through deep boreholes, requires significant capital investment and technical expertise.

➢ Access to rent: lengthy waiting lists and strict criteria for entry; tenants can only gain entry if they have relatives residing in the park.

➢ Maintaining numerous amenities, such as pools and recreational centres, can generate high operating costs.

➢ The project relied on funds from the City of Vienna and other government subsidies, which may pose challenges for scalability and sustainability in the long term.

Opportunities
➢ Introducing new, more efficient construction and energy technologies can further reduce operating costs and enhance the sustainability of the complex.

➢ The experience gained from the construction and management of the Wohnpark Alt-Erlaa complex could be leveraged to replicate similar projects on a larger scale or to expand existing complexes to accommodate more residents.

➢ Such projects can stimulate the development of local urban infrastructure, contributing to better connectivity and an improved quality of life throughout the entire neighbourhood.

➢ Affordable housing provided by LPHA reduces the need for public expenditure on social welfare programmes related to housing. This alleviates the strain on public resources and allows for their reallocation to other essential services.

➢ Ongoing support from national and local authorities through subsidies and incentives for sustainable housing projects can facilitate expansion and enhance affordability across different regions.

➢ Collaborating with other housing corporations, Non-Governmental Organisations (NGOs), and private developers could help access additional resources and expertise to support the replication and expansion of the model.

Threats
➢ Large, monumental buildings may not appeal to all residents, especially those who prefer a more intimate and less crowded environment.

➢ Increasing climate-related risks such as extreme weather events could require additional investments in resilience measures, potentially increasing operational costs.

➢ Changes in regulations related to housing, urban planning, and construction standards could impact the feasibility and cost-effectiveness of future projects based on the Wohnpark Alt-Erlaa model.

Annex VI. SWOT Analysis – Social Rental Agency in Dąbrowa Górnicza

SWOT Analysis: SRA in Dąbrowa Górnicza SWOT Analysis [307]

Strengths
- Introduction of a new tool to local social housing policy, supporting access to affordable housing (additional to municipal housing, which is not easily accessible).
- Combining housing support and the provision services of tenants that can be used for solving local problems.
- Flexible solutions for different target groups.
- Affordable, below-market rent. With an average monthly market rental price of PLN 1,656, SRA offers housing ranging from PLN 700 PLN to PLN 1,600 (depending on size) and relatively low administrative rent and utilities according to consumption.
- Financially supported by multiple sources, including government programmes, private sector partnerships, grants, and collaborations with various organisations.
- Partnerships with construction companies and other stakeholders provide resources for property renovations and operational support.
- Tenants are educated about their rights and responsibilities as renters, ensuring they understand their legal protections and obligations. This empowerment through education helps tenants advocate for themselves, as well as prepare for the future — independent living, secure alternative housing if needed, and access ongoing support services beyond their tenure with the agency.

Weaknesses
- The housing support provided by the initiative is limited to 12 months, which may not fully address long-term housing needs, potentially leading to disruptions for beneficiaries if extensions are not granted.
- Potential exclusion of certain vulnerable groups or individuals who do not meet the eligibility criteria, limiting access to those most in need of housing support.
- Building new housing and increasing access to housing is a key objective of the national policy – SRA can be one of the tools to serve this purpose, but should not be considered as the main means to achieve this goal.
- Long and bureaucratic process from municipality resolution to operational launch.
- Acquiring suitable housing units, particularly in attractive neighbourhoods or larger sizes; Dąbrowa Górnicza faces a constrained real estate market. The existing housing stock, in some cases, does not adequately meet the varied needs of potential tenants, such as families requiring larger units or accessible housing for individuals with disabilities.
- Many available properties require significant renovation or do not meet the size and quality standards necessary for housing provision purposes. This mismatch between available properties and tenant needs further restricts the agency's flexibility in matching housing units to applicants.
- Some private property owners may be hesitant to participate in the SRA programme due to concerns about rental market dynamics, potential tenant behaviour, or uncertainty about property management responsibilities under the agency's guidelines. They may prefer traditional rental

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[307] *Source: own elaboration, CASE based on desk research and interviews no. 17, 18, 19, and 20.*

arrangements or are discouraged by the bureaucratic complexities associated with social housing programmes.

➢ Property owners may perceive limited control over tenant selection and management processes under the SRA framework, which could deter their willingness to engage with the programme. They may prefer more autonomy in selecting tenants and managing their properties.

➢ Property owners might prioritise maximising rental income or avoiding potential financial risks associated with non-payment of rent or property damage. The fixed rental rates offered by the SRA, though stable, may not always align with market expectations or owners' financial goals.

Opportunities

➢ There is potential to expand the range of services offered by the initiative beyond housing support, such as healthcare or skills training, to address additional needs of beneficiaries and enhance impact.

➢ The model presents an opportunity for replication in other regions facing similar housing challenges, potentially addressing housing needs on a broader scale.

➢ Educating property owners about the benefits of participating in social housing initiatives, such as stable rental income and community support, while addressing their concerns about tenant management and programme administration, can help overcome reluctance and increase its acceptance.

Threats

➢ Resistance from local communities or stakeholders opposed to hosting vulnerable populations, posing challenges to expansion, potentially leading to public backlash or opposition.

➢ Rising costs of building materials and labour can limit the feasibility of new residential projects.

➢ The pressing priorities at the local or national level, such as healthcare or infrastructure, may divert attention and resources away from housing initiatives, limiting support and resources available for implementation.

➢ The emergence of other housing initiatives and programmes can compete with agencies, limiting their reach and influence.

Annex VII. SWOT Analysis – La Borda Housing Cooperative

SWOT Analysis: La Borda Housing Cooperative [308]

Strengths
- ➢ The project began with a group of motivated individuals in the neighbourhood, demonstrating a strong sense of community involvement and initiative.
- ➢ Affordable living costs.
- ➢ Proven replicability.
- ➢ Sustainable design, water and energy savings contributing to long-term affordability of living and low material consumption.
- ➢ Passive building boast a decreased environmental footprint with lower energy consumption (66.37 kwh/m2 annually, compared to the average of 87.49). It also emits less CO_2 during construction and throughout its lifespan.
- ➢ Features like communal laundry and shared hot water systems reduce costs and environmental impact.
- ➢ The project's design and community structure proved resilient and supportive during events like the COVID-19 pandemic.
- ➢ Strong community engagement, with residents having a central role in decision-making processes, which leads to a more responsive and customised living environment.[309]
- ➢ The cooperative model incentivises long-term investments in sustainability, as residents are invested in the success of the cooperative.
- ➢ Engagement of local stakeholders from the beginning, creating a network of support and collaboration, which strengthens ties with the surrounding community.[310]
- ➢ Use of cross-laminated timber and recyclable materials significantly reduces the carbon footprint and sets new standards for environmentally conscious building practices.

Weaknesses
- ➢ Securing suitable land for the project required negotiations with landowners and municipal authorities due to availability and affordability of land. Property, particularly in big cities, has high value and might not be available to cooperatives.
- ➢ Obtaining necessary permits and adhering to regulatory requirements presented logistical challenges and delays.
- ➢ Members' investment, without external funding, excludes low-income residents at the beginning of the project.
- ➢ Engaging stakeholders unfamiliar with housing projects, such as the cooperative, required extensive communication and coordination efforts to align interests and expectations.
- ➢ Small-scale – cooperatives are only effective in limited size.
- ➢ Reliance on support from architectural cooperatives or associations or developers.
- ➢ Securing suitable land and obtaining necessary permits presented significant challenges and delays.
- ➢ The bottom-up approach limits the scalability of cooperatives, making them effective only in limited sizes.[311]

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[308] *Source: own elaboration, CASE based on desk research and interviews no. 21, 22 and 23.*
[309] Interview no. 23.
[310] Interview no. 23.
[311] Interview no. 23.

➢ Without external funding, the cooperative model can exclude low-income residents at the beginning of the project.[312]

<u>Opportunities</u>
➢ Further replicability.
➢ Potential involvement of public authorities by supportive policies and giving access to public land, ensuring affordability.
➢ Current trends in funding innovative sustainable solutions.
➢ Raising awareness about cooperative housing models can attract more interest and support.
➢ Incorporating new sustainable technologies can further reduce costs and environmental impact.
➢ Creating a community hub for the neighbourhood, e.g. for the NGOs to use.[313]
➢ Increasing involvement of public authorities by supportive policies and providing access to public land can ensure affordability and enhance replicability.[314]
➢ La Borda's proactive approach in advocating for sustainable policies at the municipal level can inspire broader systemic changes.[315]
➢ By offering community spaces and supporting local businesses, La Borda can further enhance its role as a community hub, contributing to local economic development and social cohesion.[316]

<u>Threats</u>
➢ Small community interest in local involvement.
➢ Small awareness of cooperative housing models and opportunities.
➢ Individual approach to ownership of the potential residents (difficulties in finding interested members of the cooperative).
➢ Extensive bureaucracy.
➢ High upfront costs of land and construction.
➢ Strict and inflexible regulations can limit the ability to innovate and implement sustainable practices effectively.

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[312] Interview no. 23.
[313] Interview no. 21.
[314] Interview no. 23.
[315] Interview no. 23.
[316] Interview no. 23.

Annex VIII. List of the Interviewees

Chapter 2. Digitalisation as a Pathway to Affordable Sustainable Housing

Case Study 1. Denmark—Easy Access to Public Plans: Danish Digital Plan Register
- ➢ Interviewee 1. Representative of The Danish Agency for Planning and Rural Development, Plandata.dk.
- ➢ Interviewee 2. Christian Fertner, associate professor in urban and regional planning, University of Copenhagen.
- ➢ Interviewees 3. Julia Owczarek & Henrik Trier Olsen, architectural technology and construction management professionals.

Case Study 2. France—Digitalisation of Social Housing: Paris Habitat
- ➢ Interviewee 4. Paola Balduzzi, Cultural Designer & Social Innovation Strategist, and Founder @Inesto.
- ➢ Interviewee 5. Jeane Focard, Paris Habitat Resident.
- ➢ Interviewee 6. Olivier Celnik, architect at Z.STUDIO, lecturer at Ecole des Ponts ParisTech and Paris Val-de-Seine, a BIM-CIM expert, elected to the CNOA—National Council of Architects.
- ➢ Interviewee 7. Lucie Lescudé-Plaa, International Relations Project Manager at Paris Habitat.

Case Study 3. The Netherlands—Classification System for Buildings: Integral Energy Transition for Existing Buildings (IEBB)
- ➢ Interviewee 8. Olga Gumienna, Urban Climate Architects.
- ➢ Interviewee 9. Ragy Elgendy, Delft University of Technology.
- ➢ Interviewee 10. Anonymous researcher in the field of energy transition in the built environment, Delft University of Technology.

Chapter 3. The Role of the Social Economy as a Provider of Affordable Sustainable Housing

Case Study 4. Austria—Wohnpark Alterlaa—Limited-profit Housing in Vienna
- ➢ Interviewee 11. Gerlinde Gutheil-Knopp-Kirchwald, Department of Housing Economics and Research, Austrian Federation of Limited Profit Housing Associations.
- ➢ Interviewee 12. Veronika Iwanowski, International Relations Department at City of Vienna—Wiener Wohnen.
- ➢ Interview 13. Eva-Maria Kehrer, political scientist and expert on inclusive urban development and real estate at UIV Urban Innovation Vienna GmbH.
- ➢ Interview 14. Richard Pfeifer, qualitative urban researcher—housing policy & politics of dwelling, TU Vienna.
- ➢ Interview 15. Kurt Hofstetter, Head of Unit at Strategic Projects and International Affairs, City of Vienna.
- ➢ Interview 16. Representative of GESIBA-Gemeinnützige Siedlungs- und Bauaktiengesellschaft.

Case Study 5. Poland – Social Rental Agency in Dąbrowa Górnicza
- ➢ Interviewee 17. Juliusz Tetzlaff, Director of the Department of Housing, Ministry of Development and Technology.
- ➢ Interviewee 18. Mateusz Piegza, architect, architectural researcher on innovative housing solutions and building adaptations, Head of Field Office at Fundacja Habitat for Humanity Poland, Oddział Śląsk.
- ➢ Interviewee 19. Anna Kolasińska, Social Rental Specialist and Head of Housing Programmes, Fundacja Habitat for Humanity Poland, Oddział Śląsk.

➢ Interviewee 20.[317] Paweł Skowron, architect, R&D.

Case Study 6. Spain – La Borda Housing Cooperative
➢ Interviewee 21. Carles Baiges, Lacol Arquitectura Cooperativa
➢ Interviewee 22. Anonymous researcher in the field of housing, Polytechnic University of Catalonia.
➢ Interviewee 23. Eduard Cabré Romans, political scientist-urbanist, Housing Policy Consultant at Barcelona City Council & Urban Planning and Housing Policy Consultant at Girona City.

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[317] Contributing to Case Study 4 & Case Study 5.

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