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# INNOVATIVE POLICIES AND CHALLENGES IN ADVANCING SUSTAINABLE AFFORDALBE HOUSING IN THE EU

**BRIGITTE STEINHOFF**
*Alexandru Ioan Cuza University of Iaşi*
*Iaşi, Romania*
*steinhoff.brigitte@t-online.de*

**Abstract**
*Current policy innovations and socio-technical factors influence the provision of sustainable, affordable housing in the European Union. The issue of rising cost burdens, overcrowding, housing shortages and environmental needs, all of which have important social and economic impacts on lower and middle-income groups, is of particular concern. This article examines why affordability remains an enduring challenge despite the EU's commitment to reducing environmental impacts and social inequalities. This article draws on a mixed qualitative and quantitative approach, policy analysis, existing academic literature, and EU-wide statistical data to capture current housing trends. The theoretical framework uses sustainability concepts (environmental, social and, economic) and affordability benchmarks to evaluate how policy innovations and construction practices affect housing. Preliminary results show that effective policy measures such as targeted subsidies, inclusive land-use planning and advanced construction technologies can improve both the cost-effectiveness and environmental performance of affordable housing. Initial findings suggest that collaboration among stakeholders, including local communities and private developers, improves the implementation and long-term viability of projects. The incorporation of sustainable construction practices has been demonstrated to reduce carbon emissions whilst also promoting social equity and community resilience. Comprehensive policy reforms that incorporate multi-stakeholder collaboration and ongoing monitoring of affordability and sustainability targets represent a potential mechanism for effecting meaningful change. Future research will expand the empirical dataset to include diverse urban and rural areas, and test innovative construction techniques and financing models to develop evidence-based affordable and sustainable housing strategies.*
**Keywords:** affordable housing, sustainable development, European Union policy
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## 1. INTRODUCTION

The issue of affordable housing is a major challenge with extensive implications for the socio-economic well-being of communities around the world. In view of increasing urbanisation and stressed housing markets, there is an increasing urgency to ensure access to affordable, high-quality housing that is energy sustainable and climate neutral. The concept of affordable housing is

complex and multifaceted, encompassing a range of definitions and interpretations that vary by country and context. The essence of affordable housing is to provide access to appropriate housing for households without imposing an excessive financial burden, particularly on low-to-middle income households. In recent years, sustainability principles have been increasingly integrated into housing policy, reflecting the global commitment to sustainable development. This shift is reflected in the Sustainable Development Goals (SDGs) set out by the United Nations in 2015, which emphasise the need to make cities inclusive, safe, resilient, and sustainable (United Nations, 2015). The Digital Europe Programme is a programme funded by the European Union that was launched in 2021 and aims to support the integration of digital technologies in the economy, the population, and public administrations (European Commission, 2021a). The 2024 European Green Deal sets ambitious climate and sustainability targets, committing the construction industry to play a key role in reducing energy consumption and CO2 emissions with two main goals for the construction industry: all new buildings should be zero-emission by 2030, and all existing buildings should be climate-neutral by 2050 (European Commission, 2019). This initiative signifies the necessity of aligning housing policy with broader sustainability goals, as outlined in the SDGs (Fei *et al.*, 2021).

The creation of sustainable and affordable housing is challenging due to the integration of sustainability principles into housing policy. The implementation of innovative technologies and practices has the potential to improve sustainability, but the provision of affordable housing remains a significant challenge. This is due to the fact that the demand for sustainability is not only limited by financial factors, but also by social demands (Moghayedi *et al.*, 2021). Innovative approaches, such as lean construction methods and the incorporation of energy-efficient designs, are fundamental to reduce costs while improving housing quality (Khan and Fang, 2020). In regard to climate change, it is acknowledged that housing design must evolve to ensure resilience (Rañeses *et al*., 2021; Ruíz, 2023). The importance of government policy in promoting sustainable housing is a critical factor in this context. The implementation of subsidies and incentives for sustainable technologies is recommended as a strategy to encourage the adoption of green practices in affordable housing (Rodríguez-Reyes and Cortés Lara, 2023). In addition to political frameworks, the involvement of the private sector and community stakeholders is crucial to the promotion of sustainable and affordable housing. Collaborative community participation in housing project planning and execution facilitates the generation of customised solutions aligning with the distinct requirements of residents (Reid, 2023). Innovative financing mechanisms, such as low-interest loans and grants for sustainable housing projects, have also been identified as a means of achieving greater investment in affordable housing (Veleva, 2021). Acknowledging the challenges posed by regulatory restrictions and financial constraints, which hinder the adoption of

sustainable practices in affordable housing, there is an urgent need for concerted efforts to navigate these barriers and promote the sustainable and affordable housing sector (Hilber and Schöni, 2022).

This article examines the complexity of affordable housing and sustainability, focusing on the strategies and initiatives in Europe. It analyses the definitions and challenges of affordable housing, the principles of sustainable architecture and environmentally friendly design, and the role of IT services in promoting energy efficiency in affordable housing. By analysing strategies employed in various European Union countries and their applicability to other EU member states, this article aims to provide a nuanced understanding of how countries and cities can effectively address the issue of affordable housing while also advancing the EU's stated sustainability goals. The article emphasises prospective methodologies, including the enhancement of financial models, the simplification of regulatory frameworks and the development of capacity for sustainable practices. This systematic approach is recognised as being paramount for achieving long-term affordability and sustainability in housing (Akinsulire *et al*., 2024).

## 2. BACKGROUND KNOWLEDGE

### 2.1 Defining affordable housing

The concept of affordable housing is predicated on the necessity of accommodating households whose financial resources are insufficient to secure appropriate housing in the open market without external assistance (Milligan *et al*., 2004). Discussions concerning the social acceptance of affordable housing, are often complicated by the inherent ambiguity of the term itself. There is no universally accepted definition of affordable housing, as the concept encompasses a range of housing types, rent or price structures, and resident income requirements. The evolution of the term “affordable housing” as a contemporary replacement for various synonymous terminologies referring to housing designated for individuals unable to afford market rates is of particular interest (Koebel *et al*., 2004). Consequently, affordable housing is universally understood as providing accommodation for households with low-to-middle incomes, allowing them to access suitable living conditions without excessive financial burden (Milligan *et al*., 2004). In recent years, the terminology “affordable housing” has increasingly replaced terms such as “public”, “social”, or “low-cost” housing (Gabriel *et al*., 2005).

The definition of affordable housing is not uniform, being defined in a variety of ways, the common theme of which is the recognition of the difficulties of affordable housing. Comprehending the underlying causes of the affordable housing crisis is as sophisticated as the establishment and quantification of the income requirements for eligibility. As evidenced by ongoing debates on affordability, numerous conceptual and methodological challenges become apparent from conflicting interpretations of the issue. Households with a single

adult, lone-parent, or family with adults and children are often confronted with difficulties in reconciling high housing costs with their limited income levels, employment opportunities, commuting expenses, healthcare needs, and other essential expenses (Gabriel *et al*., 2005). In response to these challenges, the Australian government has adopted a working definition of affordable housing. "Affordable housing is housing that is appropriate for the needs of a range of low-to-middle income households and priced so that low-to-middle incomes are able to meet their other essential basic living costs" (Milligan *et al*., 2007, p. 26). In the United Kingdom, affordable housing is understood to encompass both traditional social housing, whether publicly owned or managed by housing associations, and newly developed below-market-rate housing available for purchase or rental. For instance, in the London Plan, affordable housing is defined as "housing designed to meet the needs of households whose incomes are not sufficient to allow them to access decent and appropriate housing in their borough. Affordable housing comprises social housing, intermediate housing and in some cases, low-cost market housing" (MOL, 2004, p. 60). In Germany, affordable housing, colloquially referred to as social housing, refers to newly constructed residential properties funded through direct subsidies from federal, state, and local governments (BMWSB, 2025). The legal framework governing this sector is established by the Social Housing Promotion Act (WoFG), which outlines the principles for affordable housing construction and identifies target populations, specifically households unable to independently secure housing in the private market. The financial and legal obligations pertaining to the provision of affordable housing are allocated to the federal states, obliging them to conform to both federal and state-level legal provisions (BMWSB, 2025). The allocation of public funding ensures that newly constructed properties are designated as affordable housing, with regulatory oversight provided by the Housing Commitment Act (WoBindG). Occupancy of these units is subject to an eligibility commitment, whereby qualification is contingent upon obtaining a housing entitlement certificate (Wohnberechtigungsschein), issued by relevant authorities based on income criteria. Rent control mechanisms further regulate the pricing of subsidised units, with rates varying according to the size of the municipality, its geographic location, and property characteristics. In Romania, the state provides and subsidises affordable housing in accordance with the provisions of the Housing Act No. 114/1996. This form of accommodation is designated for individuals or families whose financial constraints preclude them from purchasing or renting private-market housing. The maximum rental cost for such units is set at 10% of the monthly net income of the tenant, with rent subsidies being calculated on the basis of household earnings from the previous twelve months. Any shortfall between the actual rental price and the government subsidy is covered by the budget of the local administratively territorial unit (Alpopi, Iacoboaea and Stănescu, 2014). Explicit statutory definitions of affordable

housing are in existence primarily in Estonia, Poland, and Romania, where municipal housing is allocated to the most economically disadvantaged households. Conversely, in Czech Republic and several Eastern European nations, no standardised definition of affordable housing has been formally established (Lux, 2003).

A comparative international perspective underscores the inherent complexity of defining affordable housing, highlighting the impossibility of formulating a definition that is universally applicable. Instead, the concept is shaped by the distinct political, legislative, and programme contexts of individual countries. The primary challenge lies in identifying the specific policy needs within each jurisdiction and developing targeted measures that effectively address affordable housing concerns. This process consists of several stages, including the assessment of the extent and characteristics of the issue, the monitoring of housing market trends, the provision of information for the development of policy, and the provision of guidance to professionals in the building and construction industry (Gabriel *et al*., 2005).

## 2.2 The challenge of affordable housing

Across numerous countries worldwide, the provision of affordable housing is identified as a key policy priority, particularly in the context of housing costs rising more rapidly than overall inflation. A substantial proportion of the disposable income of low-income households, notably those headed by younger residents, is dedicated to housing expenses, resulting in a considerable financial imposition. In response to this challenge, many governments have implemented affordable housing programs, either on a nationwide basis or at the regional level, with the aim of providing subsidised accommodation for social groups whose housing needs are not met by the private market (Czischke and van Bortel, 2023; Hyde, 2022; Zheng *et al*., 2020). Despite the implementation of these interventions, there remains a discrepancy between demand and current sustainable affordable housing provision. Between 2015 and 2024, rents in the EU increase by 13.3%. The general trend of rising housing costs observed in many industrialised countries since the 1950s is mainly driven by rising land values rather than construction costs. Demand for housing has continued to rise due to urbanisation, population growth and social and cultural change, while the supply of housing is limited in many areas. As a result, affordability issues have intensified, particularly in cities. In 2023, 10.6% of urban residents in the EU were classified as cost-burdened, paying more than 40% of their disposable income, compared with 7% in rural areas. The highest urban rates were observed in Greece (31%) and Denmark (23.3%), and the lowest in Cyprus (3.4%) and Croatia (3.5%). Rural congestion rates were similarly high in Greece (24.7%) and Luxembourg (22.1%), but minimal in Cyprus (0.7%) and Slovenia (2.5%). In some EU member states, such as Denmark, the gap between urban and rural areas

is significant, while in Bulgaria and Romania the rural areas are more overcrowded (Özdemir and Koukoufikis, 2025). People who have recently entered the private rented market have considerably higher cost-to-income ratios than those who have been renting for longer, indicating growing affordability pressures for newer entrants, including younger people and those in transition. The growing financial strain on European households is reflected in the UK housing sector. Years of undersupply have intensified the problem, leading to the proposal of a major reform to build 340,000 new homes a year, of which 145,000 should be affordable. Affordability remains an ignored component of this initiative, leaving most local authorities unable to meet the growing demand for affordable housing (Wilson and Barton, 2023). The new homes being built are typically unaffordable for those on low-to-middle incomes, contributing to the limited supply of affordable housing in England. A 20-year forecast by the charity Shelter suggests that an additional 3.1 million affordable homes will be needed over that period (Shelter England, 2019). Scotland faces similar challenges in providing affordable housing. A 2020 report jointly commissioned by Shelter, the Chartered Institute of Housing Scotland and the Scottish Federation of Housing Associations concluded that housing in Scotland has become unaffordable for a sizeable proportion of the population. In addition, the country's national housing programmes are delivering only half of the projected need. The report suggests that up to 60,000 affordable homes need to be built over five years to meet demand. In response, the Scottish Government has set a target of building at least 53,000 new affordable homes by 2026 and at least 10,600 dwellings per annum (Shelter Scotland, 2020). In the United States, federal government research has similarly highlighted the prevalence of severe housing problems. Survey data from 2023 show that the number of households with worst case housing needs increased from 8.48 million households in 2011 to 8.53 million in 2021. These households are characterised by exceptionally low incomes, severely inadequate housing conditions or rental costs exceeding 50% of their total income. In addition, only half of these households currently have access to affordable housing. These statistics highlight the inadequacy of public housing policies to adequately address the needs of low-income residents (U.S. Department of Housing and Urban Development, 2023). While the situations described here relate primarily to Europe and the United States, they represent only a small part of a global phenomenon. Other regions, including Honk Kong, New Zealand, Canada, Mexico, and India also report significant deficits in affordable housing (Cooper, 2024).

Affordable housing has become increasingly important, but the academic literature still lacks a consensus on its precise measurement or definition (Stigler, 1954). Historical attempts to conceptualise affordable housing date back to the nineteenth century, when researchers and policymakers recognised the need for more explicit measures. Stigler observed that these early efforts, both theoretical

and empirical, resembled a comedy of errors. A practical rule of thumb that emerged in the United States, “a week's wages for a month's rent”, illustrates the longstanding preference for a simplifying measure of the relationship between income and housing costs. Similarly, Kenngott (1912) reported that at least twenty per cent of income was considered necessary for rent. These historical benchmarks anticipated the norms of the late twentieth century, which suggest that 25-30 per cent of income is the upper limit of affordable housing. These figures reflect assumptions about the average household without clarifying exactly which households are being referred to. Over time, empirical observations about what particular households spend on housing have often been transformed into prescriptive statements about what they “should” spend (Hulchanski, 1995). Within Europe, there is widespread agreement that affordable housing is under considerable pressure, but definitions of affordability vary between countries. Consequently, the definition of affordable housing requires consideration of the social, economic, and environmental factors that contribute to household well-being. Although it is generally accepted that households paying more than 30 per cent of their gross income for adequate and decent housing face affordability problems, this definition is not universally accepted (Pittini, 2012).

The complexity of affordability issues emphasises that no single measure can adequately capture their nature and extent. It is therefore imperative to identify the specific policy objectives related to these issues and to develop measures tailored to individual national contexts. Such approaches would allow more accurate assessments of housing market developments and better inform further policy development (Gabriel *et al*., 2005).

### 2.3 Definition of sustainable housing

Sustainable housing is a sophisticated concept that integrates environmental, economic, and social dimensions to create living spaces that are efficient and resilient, as well as equitable and culturally responsive. This definition aligns with the broader framework of sustainable development, which emphasises the necessity of balancing human needs with the integrity of the natural environment. The concept of sustainable housing encompasses ecological, social, and economic dimensions with the objective of formulating housing solutions that address the present requirements without compromising the needs of future generations (Moghayedi *et al*., 2021; Gbadegesin and Marais, 2020). Research indicates that sustainability considerations have often been overlooked in the case of affordable housing due to restrictive policies, cost concerns, and limited incentives for real estate developers (Moghayedi *et al*., 2021). In consequence, housing of substandard quality, with high long-term maintenance costs, remains prevalent, particularly in regions facing challenges such as rapid population growth, environmental disasters, and socio-political instabilities (Aliyari, 2024). According to the Brundtland Commission's definition, sustainability is defined as

the ability to meet present needs without compromising the ability of future generations to do the same (United Nations, 1987). In the context of housing, this mandate spans three interrelated dimensions: environmental, social, and economic (Aliyari, 2024). Environmentally sustainable housing is defined by the minimisation of the ecological footprint through the implementation of energy-efficient technologies, materials reuse (upcycling), and green construction practices that reduce waste (Akinlolu *et al*., 2022; Rekhi and Stern, 2022). Social sustainability is dependent on inclusive housing designs and policies that encourage cohesive communities, enhance social participation, and ensure the availability of affordable units in new developmental projects. From an economic perspective, sustainability in housing refers to cost-effectiveness in construction, reduced life-cycle expenditures for residents as in energy costs, and flexible building models such as modular housing and 3D printing to promote long-term affordability (Jacobus, 2015; Wakely and Riley, 2011).

Despite policy efforts in certain contexts, the widespread integration of sustainable building principles remains limited, often due to a combination of prohibitive initial costs and insufficient financial incentives (Du Plessis, 2007; Moghayedi *et al*., 2020). The construction of sustainable housing is dependent on an integrated model that balances multifunctional development, green building technologies and community-oriented designs (Friedmann, 2023). This comprehensive strategy has the potential to stimulate local economies, reduce carbon emissions, and enhance social well-being (Gbadegesin and Marais, 2020). Despite this potential, obstacles persist, including the absence of comprehensive policy frameworks, the excessive cost of sustainable technologies, and a shortage of skilled labour (Chan and Adabre, 2021). The reduction of the ecological footprint is a fundamental objective of sustainable housing, incorporating elements such as energy efficiency, the utilisation of sustainable materials, and the integration of innovative building technologies (Rañeses *et al*., 2021). The concept of sustainable housing is characterised by features such as zero-energy or low-carbon designs, resource-efficient usage, and socio-cultural considerations that align with the lifestyles of residents (Sanei *et al*., 2022). The viability of sustainable development in the affordable housing sector is dependent upon economic factors. The utilisation of green building materials and energy-efficient designs is instrumental in reducing long-term expenses for residents (Akinsulire *et al*., 2024). Sustainable housing models are characterised by a commitment to social equity, emphasising inclusivity and the common good (Ruiz, 2023). Resilient housing policies that prioritise safe land use and the adoption of alternative energy sources are imperative in fostering sustainable environments that can accommodate diverse populations. The integration of social equity principles into housing policy ensures that all members of the community have access to safe, affordable, and sustainable housing options. Incorporating sustainable housing policies into urban planning facilitates sustainable urban

development through community interaction and resource sharing, thereby promoting social equity and sense of community (Aliyari, 2024). There is a need to adopt lean construction methods alongside energy-efficient designs, particularly in the context of affordable housing, to meet broader sustainability targets across Europe (Khan and Fang, 2020). Technological innovation has been established as fundamental to the realisation of sustainable and affordable housing (Moghayedi *et al*., 2021). The integration of novel technologies in housing design has been demonstrated to improve the health and well-being of residents while maintaining affordability, emphasising the increasing necessity for technology-driven solutions in an era of rapid urbanisation and growing environmental concerns. The strategic allocation of subsidies to sustainable technologies offers a potential catalyst for the development of energy-efficient housing solutions, contingent upon the effective design of such measures to minimise inefficiencies. The effective implementation of sustainable housing initiatives, which must consider environmental, economic, and social imperatives, depends on the existence of policy frameworks that have been thought through well, and which are set by the EU (Rodríguez-Reyes and Cortés Lara, 2023).

### 2.4 Sustainable architecture and green design

Since the 1960s, concerns about resource exhaustion, pollution and ecological destruction have led to the development of design principles that prioritise environmental sustainability. This shift has led to the emergence of green and sustainable design, which aims to integrate human activities with the natural environment and establish a socially beneficial relationship. According to Yuan and Tang (2021), the aim is to enable the continued use of resources, improve ecological conditions and enhance the quality of life.

Sustainable architecture, alternatively designated “green architecture”, seeks to minimise the negative environmental impacts of buildings by utilising materials, energy, and space in a considered manner. This approach encompasses ecological conservation at every stage of design and construction, with the fundamental objective being to meet present-day needs without compromising the capacity of future generations to fulfil their own requirements. This framework is grounded in the core principles of sustainable development, including economic viability, environmental preservation, and social well-being. The social dimension of sustainability is of significant importance, as it highlights the necessity of ensuring justice for both current and future societies, as well as across diverse regions. It also has the capacity to encompass the safeguarding and promotion of cultural and geographical diversity, in addition to the ability to make decisions that recognise the interdependence among social, cultural, economic, and ecological phenomena (Chansomsak, 2008; Throsby, 2001).

The principles of sustainable architecture can be categorised into five key categories:

1. Energy use efficiency: The sustainable architecture approach aims to reduce reliance on artificial energy sources by optimising natural lighting and ventilation. Strategies include the use of solar energy, natural air conditioning methods, and rainwater harvesting. These measures minimise energy consumption and are adapted to specific climate needs.

2. Land use efficiency: Land use efficiency is enhanced by maximising green spaces and reducing building footprints. Approaches such as roof gardens, vertical gardens, and integrating vegetation into building design help to maintain ecological balance. Existing vegetation is preserved, and open spaces are included to encourage biodiversity.

3. Material use efficiency: This principal advocates for the use of sustainable, renewable, and recyclable materials in construction. Employing waste materials and repurposed building components reduces waste generation. The prioritisation of abundant and low-impact materials is aimed at minimising environmental harm.

4. Utilisation of innovative technologies and materials: Sustainable architecture is defined by its integration of technological advancements to leverage renewable energy resources, such as wind and solar power, and its exploration of novel sustainable materials, exemplified by rapidly renewable and environmentally sustainable options like bamboo, with the objective of reducing the ecological impact of construction and operation.

5. Waste management: The efficient management of waste is integral to sustainable architecture, as evidenced by the implementation of strategies such as the treatment and recycling of domestic waste, the use of biodegradable materials, and the integration of innovative waste decomposition systems. These initiatives are designed to minimise the overall environmental impact (Syam *et al*., 2023).

Contemporary sustainable architecture emphasises the revitalisation of green spaces, such as farmland and forests, in conjunction with the creation of comfortable built environments. In contrast to earlier architectural approaches, which frequently result in substantial environmental sacrifices, modern methods prioritise the reduction of ecological burdens through natural energy utilisation and long-term resource sustainability (Gissen, 2003). This increasing emphasis on sustainability is primarily attributable to the expanding human population and the resultant pressure on finite natural resources. Within the discipline of architectural planning and design, specific strategies have been identified which function as guiding principles in the realisation of sustainable development. For instance, in the context of a coastal region, a building might incorporate design elements reflective of the local marine environment, such as wave-like forms and wind-driven patterns. The optimal placement of openings and the maximisation of natural lighting are further enabled by the use of diagrams charting the solar trajectory, thereby enhancing energy efficiency. The integration of local cultural and environmental features into architectural design has been demonstrated to

facilitate the authentic representation of regional identity and the harmonisation of buildings with their surroundings (Syam *et al*., 2023). Green design, also entitled “design for the environment”, is a comprehensive set of methodologies focused on minimising a product's negative environmental impact while optimising resource efficiency throughout its lifecycle (Yuan and Tang, 2021). The conventional 3R-model (reduce, reuse, recycle) has expanded into a 10R-model, encompassing reduce, reuse, recycle, renew, refurbish, repair, remanufacture, replace, refine, and remove. Multifaceted in nature, green design seeks to reduce environmental harm by minimising waste, conserving natural resources, and curbing pollution. Achieving reduced dependence on fossil fuels and the promotion of sustainable energy usage is achieved through energy-efficient measures, such as the employment of renewable energy sources and the enhancement of building insulation and ventilation. The long-term benefits of these strategies include substantial cost savings by optimising resource utilisation and reducing operational costs, thereby increasing the economic viability of sustainable projects. The use of non-toxic materials, adequate ventilation, and natural light, collectively improve indoor environmental quality, promoting healthier and more comfortable spaces. Green design is an essential element of sustainable development, aiming to reconcile economic growth, environmental protection, and social equity. Green design has the capacity to drive innovation in materials, technologies, and processes across various industries, thereby establishing new standards for sustainable practices and facilitating their broader implementation (Faludi, 2017; McMahon and Bhamra, 2015).

As environmental consciousness grows, regulatory pressures and consumer preferences for sustainable products and buildings are increasing. Green design fulfils an instrumental role in addressing these demands, ensuring compliance with environmental regulations, and aligning with market expectations for ecologically sustainable solutions (Yuan and Tang, 2021).

### 2.5 The value chain for affordable housing supply

Providing affordable housing is a complex challenge that exists on a European and global scale, with inefficiencies present at every stage of the housing industry value chain, which in turn have a negative impact on the performance of the entire supply system (World Economic Forum, 2019). These challenges put the efforts of the United Nations to ensure universal access to adequate, safe, and affordable housing by 2030 at risk (United Nations, 2015). Despite a substantial body of literature addressing construction-related inefficiencies, for example workflow planning, collaborative working practices, and sustainability measures, there remains a lack of holistic analyses that specifically focus on affordable housing. Therefore, it is crucial to detect and document inefficiencies, as well as to communicate this information throughout the value chain to ensure that stakeholders are aware of the approaches that can

be taken to consider these areas for intervention and the mitigation measures to be implemented (Reid, 2023).

The term “value chain” refers to the network of actors whose collaboration and interaction enables the production of goods and services for a specific consumer group (Gereffi *et al*., 2006; Peppard and Rylander, 2006). In this article, the focus is on residential real estate for low-income groups. An examination of construction value chains reveals marked tendencies towards waste and inefficiency, highlighting the potential for logistical optimisation (Lönngren *et al*., 2010). It is evident from several studies that there have been attempts to ascertain the challenges hindering the supply of construction value chains and propose innovative approaches to reshape current practices. These studies have addressed topics such as the promotion of collaborative working environments, the improvement of workflow planning and project management, the introduction of modern construction techniques, the implementation of information technology, the initiation of health and safety reforms, the promotion of corporate social responsibility and the incorporation of principles of environmental sustainability into building design and construction, such as reusing building materials and adopting green building technologies (Akintoye *et al*., 2000; Eriksson *et al*., 2008; Hoonakker *et al*., 2010; Stewart *et al*., 2004; Häkkinen *et al*., 2011; Martek *et al*., 2019; Persson *et al*., 2015). Despite the focus on inefficiencies in the construction supply chain, there is a lack of research that provides a comprehensive understanding of the sector-specific barriers to the design and construction of affordable housing. Reid's study aims to broaden the scope of the investigation to provide a comprehensive overview of the systemic challenges facing the affordable housing sector (Reid, 2023). In accordance with the recommendations of the World Economic Forum (2019), Reid examines the multi-stage process of providing affordable housing from a six value-adding chain perspective (see Figure 1). The process starts with the formulation of national housing policy; whereby central governments set the required levels of affordable housing provision and introduce supportive programmes designed to achieve these targets. These national policies guide the multitude of stakeholders involved in the affordable housing value chain, while also forming the urban planning frameworks through which local authorities coordinate affordable housing activities at the urban and regional level. In accordance with federal and state regulations, local authorities work with private sector companies to identify and allocate appropriate land for affordable housing initiatives. Once the property acquisition has been completed, utilities and public service providers construct the public infrastructure and community assets needed to support and supplement affordable housing developments. These assets include utilities, transportation networks, educational facilities, green space, and community, health, and social services. housing developers then collaborate with their contracted partners to design and construct affordable housing, which is managed, maintained, and

operated by independent, non-profit organisations dedicated to providing housing for the population. These organisations are typically part of the housing association sector.

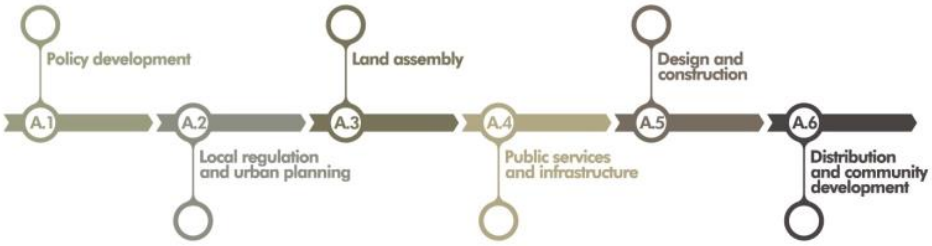


**Figure 1. The supply side of the affordable housing value chain**
Source: (Reid, 2023, p. 5)

## 3. METHODOLOGY

This article provides a qualitative framework, with the aim of collecting and analysing relevant data and information on sustainable and affordable housing and the possibility of new construction, to determine the state of housing in the context of political opportunities and challenges and to analyse models for sustainable housing that are applicable to the EU. The research focusses on the comparison of the statistical data available in the Eurostat database available statistical data on the construction industry and the stock and procurement of affordable housing for the European countries. During the documentation phase, specialised articles are consulted to familiarise with the importance of the European Union, the sustainability and sustainable affordable housing models, and to choose an approach that best serves the purpose of the study. This article extensively references previous research studies, academic articles, and publications by various authors to gather background information, theoretical frameworks, and empirical evidence related to sustainable affordable housing, EU policy, affordable housing policies in the European countries, and the impact of the SDGs on the housing industry across Europe. Qualitative analysis of policies, programmes, and housing trends in the European Union are conducted, examining the differences in legislative frameworks, government policies, and the impact on housing provision and affordability. Quantitative data is provided to support the discussion on various aspects of housing policies, policy programmes, and on the need of a resilient and sustainable construction industry, challenges in implementing sustainable policy demands, and opportunities for a more sustainable and technologically advanced construction sector for affordable housing.

These derived methods contribute to a more nuanced understanding of the complex dynamics at EU member state housing sectors that depend on affordable

and sustainable housing. They enable a socio-economic, legislative, and market-focused examination of the factors that influence housing policy and the housing industry. The study concentrates on the issue of housing. It is recommended that this study be expanded to include other types of projects, such as infrastructure or technology development, which would also contribute to the development of affordable and sustainable housing.

## 4. ANALYSIS

### 4.1 Policy innovations in sustainable affordable housing

The integration of sustainable development principles into affordable housing policies has gained significant emphasis in addressing European housing challenges while ensuring environmental sustainability and social equity.

The European Green Deal, initiated by the European Commission in 2019 (European Commission, 2019), signifies a critical political initiative aimed at fostering a climate-neutral, pollution-free, sustainable, circular, and inclusive economic model. This initiative constitutes the foundational element of a novel industrial strategy for Europe (European Commission, 2020), which advocates for the conscientious creation and production of materials and products. The overarching objectives of the European Green Deal can be summarised as follows: firstly, to minimise risks to human health and the environment; secondly, to enhance the safe utilisation of products without any adverse impacts on human health and the environment; thirdly, to augment the potential for reuse and recycling; and fourthly, to incorporate safety enhancements and extend the product's lifespan. A critical component of the European Green Deal is the promotion of affordable housing, a concept which is congruent with various sustainability initiatives. The European Green Deal emphasises the necessity for innovative and sustainable housing solutions that not only meet the growing demand for affordable housing but also meet environmental standards and contribute to social justice. It emphasises the pressing need to improve energy efficiency and affordability in the building sector, given that buildings account for 40% of energy consumption and renovation rates remain inadequate to meet climate and energy targets. Moreover, fifty million consumers in the EU are confronted with energy poverty. In response to these challenges, the EU has proposed a significant initiative termed the “renovation wave”, focusing on both public and private buildings. The primary objectives of this initiative are to increase renovation rates, reduce energy costs, and mitigate emissions. Key elements of the strategy include the European Commission's strict enforcement of building energy performance legislation and the exploration of the inclusion from buildings in European emissions trading. They conduct a review of the Construction Products Regulation, with a view to harmonising new and renovated buildings with the principles of the circular economy, digitalisation, and climate-proofing (European Parliament, 2011). A renovation initiative involves

stakeholders such as construction companies, architects, and local authorities, with a view to addressing renovation barriers. The initiative has also been designed to remove regulatory barriers, with a particular focus on the renovation of affordable housing, whilst improving energy efficiency (European Commission, 2019).

Another innovative instrument is InvestEU (European Parliament, 2021a), which focuses on the leveraging of public funds to attract private investment, a strategy that is particularly relevant in the context of affordable housing, where traditional financing models often prove insufficient. A key component of this innovative instrument is the European Fund for Strategic Investments (EFSI), which provides a €33.5 billion EU guarantee and attracts an additional €500 billion in investments between 2015 and 2020, including funding for affordable housing. The European Commission introduced InvestEU in 2018, with the objective of mobilising €1 trillion in investment between 2021 and 2027, supported by a €75 billion guarantee. Within InvestEU, €3.6 billion has been allocated to social investment and skills development, while €20 billion is earmarked for sustainable infrastructure projects, including housing renovation initiatives aimed at enhancing energy efficiency. By providing guarantees and risk-sharing mechanisms, InvestEU encourages private sector participation in projects that might otherwise be deemed too risky or unprofitable. The integration of innovative financing solutions is beneficial for the development of sustainable and affordable housing projects that meet environmental standards and social needs (Akinsulire *et al*., 2024; Reid, 2023). InvestEU acknowledges the community participation and stakeholder engagement as being essential to ensure economic viability and social integration (Winston, 2021; Rodríguez-Reyes and Cortés Lara, 2023). The alignment of InvestEU with the European Green Deal is evidence of its commitment to sustainability, as it supports investment in green technologies and sustainable practices. These are essential to achieving climate neutrality by 2050 (Moghayedi *et al*., 2021). Recent years have seen the affordable housing sector within the EU contend with considerable challenges, primarily marked by an escalating demand for housing in urban areas and a concurrent decline in investment (Palimariciuc, 2021). The demand for affordable housing has increased dramatically, with homelessness in the EU rising by 70% over the past decade, affecting approximately 700,000 individuals on any given night (Fondation Abbé Pierre, 2020). Housing cost overburden, defined as the proportion of disposable income allocated to housing that exceeds 40%, predominantly affects lower-income groups. A comparative analysis reveals that 35.4% of low-to-middle income households experience financial strain, in contrast to 9.4% of total households. The period between 2010 and 2019 saw housing cost burdens worsen for lower-income families (+1.7%), while the rest of the population experienced a decline (-6.3%), thereby underscoring market polarisation (Eurostat, 2025a). Additionally, energy poverty remains a concern,

with 18.2% of poorer households struggling to maintain adequate indoor temperatures (Eurostat, 2025b). Disparities in housing quality persist, as evidenced by the higher prevalence of overcrowding (29.1%) and the absence of essential infrastructure, such as indoor toilets, among lower income households (Eurostat, 2025c). On the supply side, public investment in affordable housing has declined by 27.8% between 2008 and 2018, decreasing from €29 billion to €21 billion (Eurostat, 2025d). The EU faces an annual investment gap of approximately €57 billion, which further accelerates the deterioration of the existing housing stock. High land prices, a shift in the perception of housing as an investment rather than a necessity, and rising construction costs deter private investors due to the low returns on investment. In addition, national disparities in housing-related public expenditure remain evident, with France and Ireland dedicating nearly 1% of GDP, while ten other member states contribute close to 0% (Omic, 2017).

The task force on affordable and decent housing solutions of the European Policy Centre (EPC) has formulated a set of recommendations for the optimised implementation of InvestEU, with the objective of guiding the EU institutions and member states in directing investments towards those most in need. The recommendations are designed to address the imbalance between supply and demand in the affordable housing sector, which is presented as a critical opportunity by InvestEU. EU member states must enhance public support for housing through innovative financial instruments that are capable of mitigating investment risks. It is recommended that member states enhance public support for housing through innovative financial instruments that mitigate investment risks, while the European Commission should provide clear regulatory guidelines (Palimariciuc, 2021). The Urban Agenda for the EU (UAEU) constitutes the EU's main voluntary commitment to the implementation of the United Nations (UN) New Urban Agenda (NUA) (European Commission, 2021b). The UAEU was established through the Treaty of Amsterdam in 2016, forming a platform to support the UN 2030 Agenda for Sustainable Development, particularly in advancing SDG 11. The objective is to design cities and settlements that are inclusive, safe, resilient, and sustainable (United Nations, 2015). The primary objective of the UAEU is to optimise the implementation and coherence of current policies, legislation and instruments relating to urban development. Rather than initiating new regulations, the UAEU functions as an informal framework that influences the design and revision of EU regulations, thereby ensuring greater responsiveness to urban needs, practices, and responsibilities. A key objective is to identify and eliminate potential administrative obstacles while minimising the administrative burden on city authorities. The UAEU seeks to achieve this by improving access to and integration of traditional and innovative sources of financing for urban areas, including funding from the EFSI. It does not advocate for an increase in EU funding or the creation of new financial allocations for urban

authorities. Instead, it focuses on making more effective use of existing funding mechanisms and on drawing lessons from EU policies and instruments, including EU cohesion policy. The UAEU's objectives also include the improvement of knowledge on urban affairs by means of the promotion of the collection of data, the exchange of good practices and the establishment of policymaking based upon evidence. Reliable data is of critical relevance in order to facilitate an understanding of the diverse structures and tasks of urban authorities and the development of tailored solutions to urban challenges. At national level, knowledge about the development of urban areas is fragmented and successful experiences are under-utilised. To address this, the UAEU is promoting large-scale, networked, and open data initiatives, while ensuring compliance with EU data protection rules and the reuse of public sector information. In answer to these challenges, a total of fourteen partnerships have been established to date, with a focus on a range of issues, including culture and cultural heritage, energy transition, housing, the integration of migrants and refugees, sustainable land use and nature-based solutions, and urban mobility (European Commission, 2025a).

The Affordable Housing Initiative (AHI) constitutes a further essential element of the European Commission's Renovation Strategy, the overarching objective of which is to promote energy-efficient building renovations and improvement in quality of life (European Commission, 2025b). The strategy aims to double the renovation rate in the EU by removing barriers to sustainable renovation, promoting reuse and recycling, and ensuring that thirty-five million buildings are renovated by 2030. The AHI is an integral component of the strategy, with the specific objective of ensuring that affordable housing facilities benefit from the proposed efforts. This is achieved by establishing one hundred flagship renovation and new development areas, employing a smart neighbourhood approach that prioritises energy efficiency, quality of life and innovation. These areas are designed to provide replicable blueprints for future projects. The AHI combines energy-efficient renovations with sustainable design principles, ensuring that buildings remain affordable, accessible, and liveable, while contributing to a just green transition. It seeks to mobilise cross-sectoral partnerships and link them with local actors such as social economy organisations, small and medium-sized enterprises (SMEs) in the construction and renewable energy sectors, local authorities, housing associations, investors and civil society organisations, as well as promoting the introduction of innovative renovation processes, including circular and modular construction, renewable energy generation and community engagement models to empower local populations (European Commission, 2025b). The AHI is built on the foundations laid by previous EU housing policies, including the UAEU (European Commission, 2021b), the Committee of Regions' opinions on housing, the European Economic and Social Committee's opinions on housing, the European Parliament's resolution on maximising the energy efficiency of EU buildings, the European Parliament's

resolution on decent and affordable housing for all (European Parliament, 2021b) and the European Commission recommendation on ensuring a fair transition towards climate neutrality (European Commission, 2021c).

These policy innovations are adapted within affordable housing frameworks by balancing financial constraints with performance objectives, often achieved through the use of locally sourced materials and cost-effective technologies (Akinsulire, 2024).

### 4.2 Challenges in implementing a resilient design of affordable housing

The implementation of resilient, affordable housing design confronts a triad of economic, social, and environmental challenges. As urban populations continue to exhibit growth, there is an increasing demand for affordable housing, requiring innovative solutions that also prioritise sustainability and resilience to climate change. Barriers to the integration of sustainable practices into affordable housing policy include financial constraints, building and regulatory hurdles, and the demand for community engagement.

A significant challenge to the implementation of resilient, affordable housing is the financial viability of new construction projects. Many affordable housing initiatives experience difficulties in securing adequate financing, a factor which is imperative for the integration of sustainable design features and technologies. The application of sustainable practices in affordable housing necessitates an initial investment that is not feasible with the constrained budgets typically available for affordable housing projects (Akinsulire *et al*., 2024). The inherent challenge with traditional financing models is their inefficiency in accommodating the costs associated with affordable housing projects. These projects are characterised by low investment returns and extended payback periods. Private investors are known to be reluctant to engage with this sector due to concerns over risk and limited profitability. Public investment in affordable housing has decreased significantly. It has halved since 2001 (Housing Europe, 2023). There is also a risk that reliance on public funding and subsidies may create a dependency that limits the adoption of sustainable practices and innovation (Reid, 2023). The financial constraints experienced by developers are further pronounced by the rising costs of building materials, raw materials, and labour, which can discourage the implementation of sustainable housing construction options (Hilber and Schöni, 2022).

Regulatory frameworks pose significant barriers to the implementation of resilient design in affordable housing. Many existing development plans and building codes are not aligned with innovative construction methods or sustainable materials, thus hindering the introduction of resilient housing construction concepts (Khan and Fang, 2020). Policy reforms are required to support sustainable practices in the affordable housing sector. The implementation of affordable, resilient housing is often hindered by outdated regulations and

complex administrative procedures. The lack of harmonised building regulations and energy performance standards across EU member states leads to discrepancies in the application of resilient construction principles (Khan and Fang, 2020). Current regulations often fail to encourage the use of energy-efficient construction methods and materials. The "renovation wave" is expected to enforce more stringent legislation on the energy efficiency of buildings. But the question of how to integrate the principles of the circular economy, digitalisation and climate-proofing into housing policy is yet to be answered (European Commission, 2019). Moreover, the bureaucratic processes associated with the procurement of permits and approvals have the potential to be both extensive and intricate, thereby discouraging investors and developers from pursuing sustainable options (Ruíz and Mack-Vergara, 2023). Numerous urban authorities encounter administrative impediments that prevent them from accessing EU structural and investment funds in an effective manner (Palimariciuc, 2021). This regulatory inertia has the capacity to inhibit creativity and limit the potential for transformative change in affordable housing design. Community engagement is another critical aspect influencing the success of projects for resilient, affordable housing (Reid, 2023). The lack of participation of local communities in the design and planning phase can result in developments that fail to meet the actual needs of residents (Winston, 2021). Participation by residents in decision-making processes remains limited, with many affordable housing initiatives lacking mechanisms for meaningful stakeholder engagement. The incorporation of residents in the design process has demonstrated an improvement in the social sensitivity of housing projects (Reid, 2023). Participation of low-income communities is often constrained by barriers, including limited access to information, financial education, and decision-making power in housing projects. AHI emphasises community involvement, but the practical implementation of this is inconsistent across geographies. Strategies such as co-housing models, participatory budgeting, and local energy cooperatives have the potential to increase resilience by empowering residents to take ownership of their communities.

The consequences of climate change are confronting planners and construction companies with massive difficulties, as evidenced by the increase and intensification of extreme weather events, including heavy rain and windstorms (Ruíz and Mack-Vergara, 2023). These events require the development of strategies and materials that can withstand the climatic conditions, a process that can be prohibitively expensive, especially in the context of affordable housing projects for low-income groups. This creates a paradoxical situation where the population demographics most exposed to the impacts of climate change are also the least able to access resilient housing solutions.

### 4.3 Opportunities for advancement

The integration of sustainable practices in new affordable housing construction has been demonstrated to improve quality of life for individuals, whilst simultaneously promoting economic growth and social equity (Fei *et al*., 2021). The construction sector aligns its projects with global needs and creates business solutions that contribute to the common good by implementing the SDGs. Entrepreneurship promotion proves to be an influential factor in encouraging sustainable lifestyles and practices. Grants, soft loans, and business start-ups have been shown to provide financial and advisory support for large-scale companies (Veleva, 2021) and also enable SMEs to innovate and implement sustainable practices. This support is paramount for encouraging an entrepreneurial ecosystem that prioritises sustainability, especially in construction and housing, where innovative solutions can lead to noteworthy progress in sustainability metrics. Partnerships between government agencies and non-profit organisations can raise awareness and promote initiatives for waste prevention and resource efficiency, which further contributes to the SDGs (Veleva, 2021). Building standards such as Passive House and Leadership in Environment and Energy Design (LEED) not only promote energy efficiency, but also contribute to a healthier living environment, thus improving the overall quality of life for residents. In addition, affordable housing programmes have a positive impact on social equity and economic development. Technological innovations contribute to greater sustainability (Moghayedi *et al*., 2023). By prioritising the needs and preferences of residents, housing initiatives encourage greater community engagement and satisfaction, improving the overall impact of sustainable housing projects.

## 5. DISCUSSION

The study shows that the implementation of policies such as subsidies for sustainable technologies, inclusive land-use planning, and advanced construction methods, combined with sustainable raw materials, can improve the cost-effectiveness and environmental performance of affordable housing. These factors enable the integration of energy-efficient and climate-resilient construction methods, which contributes to a reduction in CO2 emissions and long-term housing costs. The findings emphasise the value of stakeholder engagement, particularly the involvement of local communities, developers, and governmental authorities, in ensuring the resilience and sustainability of affordable housing. This cooperation helps to integrate local contexts and needs, enrich project design with contributions from residents, and strengthen social integration. The study reveals that, despite EU-wide commitments, affordability remains an issue due to financial and regulatory barriers. Restrictive planning frameworks, under–investment in affordable housing and rising land prices in cities are limiting the adoption of sustainable practices in new construction and renovations. These

findings emphasise the need for clarity and consistency in regulations across EU member states, as well as improved financing tools, particularly those that incentivise private sector participation. The findings of this study are consistent with those of other research emphasising the importance of technological and policy innovations in addressing the affordability-sustainability gap. Previous studies have identified strategies such as lean construction methods and renewable energy integration as potentially effective solutions to reduce operating costs for low-income residents while also reducing emissions. Similarly, previous research suggests that the introduction of innovative technologies must be accompanied by effective urban governance frameworks, implying a mutual reinforcement of incentives, regulations, and community-oriented planning. The generalisability of the findings is limited by the following factors. Firstly, the research is restricted to European Union countries and is based on a combination of secondary qualitative and quantitative data. This focus may result in the context-specific variables present in non-EU countries being disregarded, where national regulations, sociopolitical dynamics and funding opportunities may differ. Secondly, the study relies on existing policy frameworks and preliminary data for arguments, rather than large-scale empirical measurements, so the findings may reflect policy intentions rather than concrete outcomes. Thirdly, while the article discusses promising technological advances, including 3D printing, modular housing, and energy-efficient refurbishment, it does not provide detailed cost-benefit analyses for each individual innovation. Certain ambiguous outcomes concerning the most efficacious financing models and construction methodologies are plausibly attributable to the marked variations in EU member state conditions. The success rate of affordable housing projects is influenced by a variety of factors, including differing degrees of municipal autonomy, divergent housing market conditions illustrated by growing urban centres versus depopulated rural areas, and fluctuations in construction costs. This article further emphasises the importance of collaboration among stakeholders, yet the evidence on what type of partnership (public-private, community-driven, or cross-regional) achieves the best results is inconclusive. The realisation of sustainable and affordable housing can be achieved through policy innovations and targeted measures that consider local conditions, the regulatory environment and community engagement.

## 6. CONCLUSION AND FUTURE PROSPECTS

This article provides an analysis of the factors contributing to affordable housing challenges across the European Union, in the context of the EU's commitments to reducing environmental impacts and social inequalities. The article methodically examines EU policy instruments related to affordable and sustainable housing. The analysis of data and the evaluation of existing research confirm the finding that policy innovations, such as targeted subsidies and inclusive land-use planning, can improve the cost-effectiveness and

environmental performance of affordable housing subsidies. The study suggests that the combination of advanced construction technologies and stakeholder collaboration can lead to substantial reductions in carbon emissions, while concurrently strengthening community resilience. Despite the presence of ambitious EU-wide commitments, the research identifies regulatory and financial barriers at the local level, emphasising the necessity for more integrated policy frameworks and dedicated funding mechanisms. The findings of the study indicate that further research should be directed towards the exploration of specific technical solutions, such as the use of circular building materials and modular construction methods, with a focus on underserved urban and rural areas. Long-term studies are also recommended to assess the impact of diverse financing models, such as community-based revolving funds or green bonds, on affordability throughout the entire life cycle of buildings. Research into community engagement strategies can contribute to identifying effective practices for ensuring local acceptance and equitable outcomes. The findings emphasise the importance of a comprehensive strategy that integrates policy, finance, and community empowerment to achieve progress in the provision of affordable and sustainable housing. Addressing these issues is important well beyond academic circles. Ensuring that people across Europe have access to high-quality, energy-efficient homes can help strengthen economic resilience, reduce social inequalities, and mitigate climate change.

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