

Greener housing, but affordable ?

A study of synergies and conflicts between environmental policy instruments and access to housing

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Contents

1. Introduction	2
1.1 Importance of the topic	2
1.2 Aims and research questions	3
1.3. Literature Review	4
1.4. Environmental policies and affordable housing	7
1.5 Research Gaps.....	13
2. Analytical framework	14
2.1. The importance of context for policy integration	14
2.2. Environmental policies and multilevel governance.....	17
2.3. Housing systems and multi-level governance	19
2.4. Housing affordability.....	27
2.5. Interpreting the multifaceted relationship between environmental policy instruments and housing affordability	29
3. Grounding the framework: case studies and comparison	31
3.1. Milan	32
3.2. Oslo	48
3.3 Vienna	62
3.4. A comparative gesture: synthesis of results across cases	78
4. Concluding Remarks	88
Acknowledgements and attributions	92
References	92

1. Introduction

1.1 Importance of the topic

As the reader may notice, the title of this report resonates with the title of Katrin Grossman's paper "*Energy efficiency for whom? A conceptual view on retrofitting, residential segregation and the housing market*". Her paper is concerned with the social impacts of retrofitting measures for households, neighbourhoods, and on a city-wide level and has been an inspiration for this study. In a similar way, the topic at the centre of this work is the multifaceted relationship between environmental policies in the building sector – namely urban densification, ecological retrofitting of the existing housing stock and rules for buildings' energy efficiency in new construction – and access to affordable housing in attractive cities. By exploring this complex relationship, the present study engages in a critical discussion about the possible effects that environmental policy instruments might have on access to affordable housing in relation to contextual housing systems and governance settings. In such a way, we do not build an argument against the mentioned environmental policies, but we question how they are planned, what goals are prioritized in their implementation and why, in relation to the effects that they might have on the ability of people to afford housing. The need to take this critical stand is based on various considerations.

First, by 2015 the construction and operation of buildings were responsible for 38% of global energy-related CO₂ emissions and, thus, crucial contributors to the climate crisis (UN Environmental Programme, 2021). While the COVID pandemic brought down the emissions temporarily, in the long run decarbonization still poses considerable challenges.

Second, many cities around the world must cope with increasing urbanization and housing shortages (UN 2019), which combined exacerbate a chronic lack of access to affordable housing and worsening social inequalities (Aitken et al., 2019; Maloutas et al., 2020; Wetzstein, 2017).

Third, concerning the housing sector, especially, the renovation wave and the revision of the European Energy Efficiency and Performance of Buildings Directive will continue impacting the social and physical landscape of European cities in more substantial ways. Furthermore, the extreme increase in energy costs due to the consequences of the Russia-Ukraine war, once again highlight the social implications of energy dependency as it has hit the poorest sections of the

population much harder. As a consequence of these challenges, eco-social considerations are increasingly integrated within policy frameworks. At the European level, for example, the European Green Deal highlights the need to ensure a ‘just transition’ (European Commission, 2019). However, despite its ambition to reconcile economic and environmental objectives, it is still primarily an economic strategy fostering growth.

Against the backdrop of such ‘wicked problems’ (Head & Alford, 2015), there is a growing need for research and policy frameworks that are able to integrate both environmental and social considerations. The present study adopts a comparative case studies approach to “ground” the study of the relation between environmental policies on the building sector and housing affordability on different real-world situations. The comparative perspective aims to distil the influence of the city’s contextual institutional characteristics, such as the combined effect of urban housing systems (Arbaci, 2007) *vis-à-vis* the influence of different multilevel governance arrangements and territorial settings on the social orientation of selected environmental policies (Kazepov, 2010). Especially, the comparative approach aims to disentangle processes, mechanisms and green transition policies that might have differentiated impacts on housing inequalities in different contexts. In doing so, we believe, comparing Milan, Oslo and Vienna forms an interesting background for grounding the analytical framework on a European scale. Further research beyond the aims of the present study would be needed to extend the study to non-European contexts.

1.2 Aims and research questions

The overarching aim of this study is to disentangle synergies and conflicts between environmental policies that target limiting building emissions (environmental dimension) and access to affordable housing (social dimension) from a critical sustainability perspective. Our main argument is that in order to disentangle such synergies and conflicts, it is crucial to employ a *context-sensitive* approach, meaning that the potential impacts of environmental policies on access to affordable housing are dependent on a complex set of factors that operate differently in different contexts. Specifically, we focus our theoretical reflections and empirical analysis on contextual filtering mechanisms, with particular attention to housing systems and governance

settings. Against this background and to address the overarching aim, the study draws upon the following two research questions:

RQ1 What are the synergies and conflicts between environmental policies for 1) retrofitting of the housing stock; 2) densification of the built environment; 3) increased energy-efficiency standards of new residential construction; and access to affordable housing?

RQ2 Which contextual factors shape synergies and conflicts between environmental policies (1,2,3) and access to affordable housing?

Research question 1 is addressed through a review of the existing literature, while research question 2 is addressed through a comparative analysis of three empirical cases, the municipalities of Milan, Oslo and Vienna. Based on the empirical material from the case studies we also grounded the elaborations of research question 1.

1.3. Literature Review

This study explores synergies and conflicts between the above-mentioned environmental policies and access to affordable housing. In this section, we first briefly describe the relevant environmental policies we focus on: urban densification, ecological retrofitting of the existing housing stock and standards for energy efficiency in new construction. Second, we discuss the state of knowledge, theories and approaches in order to understand their relationship to access to affordable housing.

Urban densification.

Urban densification is often considered to be the best strategy for achieving sustainability goals in urban contexts (Hofstad, 2012; OECD, 2012), especially after the Brundtland Report (WCED, 1987). The main principle of densification is to counter urban sprawl by concentrating new development within already built-up areas, such as through infill operations or redevelopment of brownfields (Bibby et al., 2021). As such, urban densification is considered to bring about several environmental advantages compared to low density development. First, it allows for more efficient land use, saving natural and agricultural land (OECD, 2012). Second, by increasing proximity among different urban functions, densification allows for the creation of efficient

transport solutions by discouraging private vehicle trips and associated emissions (Næss et al., 2011).

While primarily linked to environmental sustainability, urban densification is also supported for its potential economic benefits: 1) it is associated with lower urban costs compared to low-density developments (Wolff et al., 2018); 2) it can have positive outcomes in terms of productivity, innovation and service accessibility (Jenks & Jones, 2009); and 3) it attracts investments and creative industries to desirable urban locations (Rice et al., 2020).

Therefore, it is increasingly being adopted in entrepreneurial policy approaches to accelerate urban economic growth. In this respect, the main argument in support of densification strategies is deeply rooted in ecological modernization ideology, which has become dominant in urban planning and policies (Næss & Saglie, 2019). The core of this ideology is that the solution to environmental degradation can be found within the capitalist system, provided that capitalism undergoes a process of transformation. This transformation would consist in decoupling economic growth from environmental degradation, which is supposed to be achieved via the combination of the environmental and economic benefits of urban densification (Xue et al., 2016). Scholars have claimed that the political neutrality of such narratives has contributed to making densification a tool for pro-growth agendas through, for instance, growth machines (Tretter, 2013) and urban entrepreneurialism (Andersen & Skrede, 2017). The OECD, for example, explicitly references the compact city as enhancing environmental and economic performances of cities (OECD, 2012). Furthermore, the compact city is expected to “play a role in addressing Green Growth, which [...] is about fostering economic growth and development while ensuring that natural assets continue to provide the resources and ecosystem services on which our well-being relies” (OECD, 2011).

Ecological retrofitting of the existing housing stock and rules for buildings' energy efficiency in new construction.

As mentioned before, the construction and operation of buildings play a large role (38% by 2015) in the global energy-related CO₂ emissions and are major contributors to the climate crisis (UN

Environmental Programme, 2021). Therefore, in recent decades, various policies have been implemented to increase the energy efficiency of the residential housing stock at various levels. Lately, with the European Green Deal in 2019, the EU has been paying more attention to increasing the energy efficiency of housing stock. Included in the initiative was the “Renovation Wave for Europe – Greening our buildings, creating jobs, improving lives”, which sought to boost housing renovation, tackle energy poverty, reduce emissions, enhance the quality of life for building-users, and create additional green jobs in the construction sector. However, the initiative contains at least two major caveats: 1) The EU framework is proposing one-fits-all initiatives at the risk of underestimating the different European countries’ particularities in terms of governance, legislation and policy capacity to answer to EU requirements in the matter of green transition initiatives. This is likely to create unequal effects in different country contexts and at different scales within each country; and 2) The EU does not have direct control over the social dimensions of housing policies, affordability, and other dimensions of housing inequalities. The EU can intervene in a compulsory way only through energy-related renovation policies, but cannot issue compulsory directives on programs, policies, or financial mechanisms supporting affordable housing or protecting the poor. Indeed, while EU initiatives such as the Renovation Wave¹ and the revision of the Energy Performance of Buildings Directive² are meant to improve buildings’ energy efficiency, tackle energy poverty, and produce new green jobs, they also impact the social and physical landscape of European cities and regions in substantial ways. This might counteract the EU's 'Urban Agenda' which points to increasing segregation through greening and ‘energy-related’ policies as a potential threat to sustainable urban development.

For the environmental policies described above, a large bulk of the literature focuses on technical aspects and environmental outcomes. This is particularly evident in the case of urban densification, for which the systematic opposition to urban sprawl has contributed to the creation of an-apolitical debate (Charmes & Keil, 2015; McFarlane, 2016), where densification is frequently heralded as the indisputable solution for both environmental protection and

¹ https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en

² https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

economic growth (OECD 2012). Also, for what concerns buildings' energy performances, many contributions have a rather technical stance on defining sustainability performances and the technical measures to reach it (e.g.; Niskanen, Rohrer, 2022; Koebel et al., 2015; Kamand et al., 2014) and often include the technical reflections with economic sustainability aspects (e.g.: Franz, Assan, 2015; Guardigli et al., 2018; Fregonara et al., 2016).

However, the academic and policy debates become much more blurred when it comes to the possible social implications of environmental policies. Claims of social benefits of densification, for instance, are not always supported by evidence (Teller, 2021). Increasingly, scholars are taking critical stances by questioning environmental policy instruments from social sustainability and social justice perspectives in which the provision of, and access to, affordable housing plays a central role. In the following sub-section, we summarize theoretical approaches to the possible social implications of environmental policies and we focus on the contributions that question the social sustainability dimension of environmental policies, with particular attention on housing affordability.

1.4. Environmental policies and affordable housing

The connections between environmental policies and affordable housing have been extensively researched, sometimes with controversial results. In this section, we explore the state of the knowledge for each environmental policy.

Urban Densification.

In some contexts, the argument that urban densification might contribute to better housing affordability condition is used as a political support for the implementation of the strategy (Churchman, 1999; Debrunner & Hartmann, 2020; Giddings & Rogerson, 2021; Westerink et al., 2013). In reality, however, the link between densification and the accessibility of the housing market is complex. The predominance of contributions looking at the relationship between densification, housing accessibility and affordability comes from the housing and urban studies traditions, where issues of rising housing prices are mainly framed by quantitative approaches and hedonic price models, using density or urban growth boundaries as explanatory variables (Aurand, 2010).

In this review, we will focus on three main aspects to exemplify the complex links between densification and housing affordability.

1. Urban land: availability, value and ownership. The question of land value is crucial to understand how urban development and housing values (and consequently housing affordability) are related. Indeed, as stressed in Peverini & Cavicchia (2022), housing affordability is ontologically spatial. Housing occupies space; its value (both use and exchange) and the opportunities it produces are linked to and inseparable from location and space, and thus to land rent. Typically, the primary environmental goal of urban densification is efficient land-use. The concentration of urban development to avoid natural land consumption can be actively pursued through both the adoption of densification policies as well as ancillary through sectoral preservation policies aimed at protecting areas such as natural reserves, agricultural land or areas of cultural heritage (Addison et al., 2013; Idt & Pellegrino, 2021). In these cases, so-called “urban growth boundaries” are established and dictate that densification must concentrate in specific areas such as brownfields and already built-up areas. Because of these land-use restrictions, developable land becomes scarce, and consequently more valuable (Addison et al. 2013). Due to land being the highest contributor to housing value (Knoll et al., 2017), it is evident that such restrictions on land use might be related to lower housing affordability. Additionally, further pressure on land value is applied by the intensification of land use through densification, which increases the competition between various functions to find developable space. Such pressure often results in exclusionary outcomes that push vulnerable social groups out from the greenest, “sustainable,” and best-located urban areas (Garcia-Lamarca et al., 2021). When discussing the importance of the “land factor” in the relationship between densification and housing affordability, two further aspects should be considered.

The first important aspect is location. In several contexts (Cavicchia, 2021; Giddings & Rogerson, 2021), densification is primarily developed in central areas and in proximity to public transportation (OECD 2012), where land is supposedly more costly. In this debate, also the redevelopment of centrally located brownfields plays a crucial role because they

are often optimal locations for densification (Rérat, 2012; Rousseau, 2015). According to Debrunner et al. (2020), the potential rent gap (Smith, 1987) and value extraction from brownfield development might be highly profitable for developers and landowners. This could lead to speculative dynamics with severe exclusionary repercussions. Brownfield redevelopment in connection to densification strategies has been investigated by gentrification scholars in connection to issues of both direct and indirect displacement (Davidson & Lees, 2005, 2010; Rérat, 2012; Rérat et al., 2010). For example, scholars have discussed how densification areas, which are frequently targeted for more affluent individuals, can be seen as examples of new-build gentrification with the potential to generate “exclusionary pressure” in the nearby areas due to spill-over effects (Cavicchia, 2022).

The second aspect to consider is land ownership. Whether land is privately or publicly owned is a major determinant for the inclusion of affordable housing programs in new compact developments. Public land ownership can give municipalities more power to negotiate with private developers (in some contexts the de facto protagonists of urban transformation) for the provision of fixed amounts of affordable housing units and to make a more active use of land use policies (Debrunner & Hartmann, 2020; Nordahl, 2014).

Both these aspects are crucial to better understand that the relationships between densification and housing affordability depend on a variety of complex and contextual aspects (political, spatial, socio-economical) rather than solely on densification.

2. Housing supply. Increasing housing supply as a means to increase housing affordability is one of the primary arguments used to support the implementation of urban densification. This argument is brought forward in particular by developers for whom the more units they can fit into a lot, the lower the sale or rental prices for those units can be (Dalton, 2016). However, the fact that many compact cities have significant affordability issues (Cavicchia, 2021; Dalton, 2016; Tretter, 2013) suggests that the relationship between densification and affordability is not straightforward.

Two main points should be stressed here. The first concerns the relationship between housing supply and housing affordability. Housing supply is price inelastic (because it takes time to build housing, to regulate land, to develop planning processes) and therefore there might be a significant time lag before any effect on prices can occur. (Hinton 2003). It is therefore difficult to estimate the extent to which increasing housing supply can impact housing affordability (Rodríguez-Pose and Storper, 2020). The second point concerns the characteristics of the housing supply created through urban densification. If, for instance, the housing supplied through densification is limited to well-located and attractive areas of the city and to market-rate housing, or if it privileges specific social groups (Kern 2007), then vulnerable households might continue to have difficulty in finding affordable solutions.

3. Green branding. Another aspect investigated by critical sustainability scholars to explain the relationship between densification and low housing affordability levels concerns the promotion of “climate friendliness” by local governments and “green branding” of densification areas by developers and investors (Quastel et al., 2012). Such a branding activity responds to the residential demands of middle- and upper-income urban residents – a “eco-conscious elite” - to live near public transit and in higher-density mixed-use areas (Rice et al., 2020). For example, as previously discussed (Cavicchia & Cucca, 2020), “car-free areas and walkability are particularly valued factors driving residential choice, as well as powerful elements for branding densification areas as sustainable”.

Energy efficiency in buildings.

While the literature concerning energy efficiency retrofits is generally focused on technical and financial perspectives (Bouzarovski et al., 2018), various authors have started to study the potential trade-offs between environmental and social goals associated with energy efficiency policies in the housing sector. In essence, energetic retrofitting is costly and investment costs place a proportionately greater burden on the housing costs of low-income households. Actions to improve the energy efficiency of the building stock through ecological retrofitting and digital solutions for energy saving technologies have been shown to be linked to rising housing prices

(Grossmann & Huning, 2015), with strong implications for increasing inequalities due to gentrification, displacement, and uneven wealth distribution (Bouzarovski et al., 2018).

The study of Schleich (2019) showed for Italy, Poland, Romania, Spain and Sweden that homeowners of the lowest income quartile have a statistically significant lower willingness to retrofit than homeowners belonging to the highest income quartile, which is clearly related to their limited financial capabilities. While for housing contexts where home-ownership dominates, affordability is connected largely to household income, rental-dominated housing contexts face the challenge of what is known as the “split-incentive dilemma” or “tenant/landlord dilemma”. The split-incentive dilemma refers to the fact, that the person/or landlord who is making the investment to increase energy efficiency is not the same person who benefits from it by reduced energy costs, which is the tenant (Seebauer et al., 2019; Weber & Wolff, 2018; Chegut et al., 2016; Copiello, 2015). Literature emphasizes that this dilemma acts in some contexts as a barrier to energy efficient upgrading of the housing stock. On one hand, this is related to the uncertainty concerning who bears the costs and who benefits from retrofitting. This seems to be particularly true for affordable and social housing (Chegut et al., 2016; Copiello, 2015). Yet, according to Power (2010) policies of demolition and reconstruction of social housing stock for improving energy performance are questionable. She claims that it is rare for a demolition plan to deliver replacement housing in a useful time frame. On the other hand, investment costs are often handed over to the tenants by raising their rents, while it is assumed that their savings in energy expenses compensate for increasing rents. This assumption is challenged by studies that found that rent increases were not compensated by expected energy savings (Broers et al., 2022). Furthermore, it is assumed that, as a re-bound effect, tenants may consume more energy after retrofits bringing low-income tenants out of self-restriction in energy use (Schneider, 2003). In addition, it seems crucial to disentangle the relationship between energy requirements for the building stock and rent regulation. Holm (2011) and Grossmann’s (2019b) work on German cities, illustrates that a combination of legally required energetic retrofits and the allowance of passing over costs for retrofits (in absence of specific rent control measures) led directly to substantial rent increases in the private rental market – decreasing the amount of affordable housing.

The above-mentioned dynamics clearly have spatial implications. According to Grossmann and Huning's (2015) study, low-income residents frequently relocate when retrofitting measures are announced. Low-income households are therefore forced to relocate to less insulated housing stock (Grossmann 2019a). This trend could even be found in social housing, but much weaker compared to relocations in retrofitted private rental housing. Another study that highlights the spatial implications is Bouzarovski's et al. (2018) study on low-carbon gentrification and the risk of displacement through renovation ("renoviction"). Their definition of low-carbon gentrification is closely related to retrofitting. For them, low-carbon gentrification implies renoviction based on a series of environmentally friendly measures, such as changes to internal infrastructure components of the housing stock, especially changes in the provisioning of energy services and the circulation of heat, and is justified by the need to improve energy performance of the housing stock and reduce air pollution.

In contrast to the increasing literature on affordability implications of retrofitting, literature on the effects on the effect of affordability and accessibility of housing is scarce. However, it seems that similar mechanisms apply. First, stricter rules for buildings' energy efficiency in new construction might penalise lower-income groups through higher housing prices and less provision of (newly built) social housing (Hagbert and Femenias, 2016). Second, market housing development, can result in green buildings that may only be affordable for the wealthy (Rice et al. 2019). The latter is also particularly relevant for densification, hence when densification mainly relies on market housing development predominantly enclaves for the wealthy are rather likely (Rèrat, 2009).

The present research only focuses on the effects of environmental policies on housing affordability in attractive cities. In Table 1, we summarize the main implications discussed in the reviewed literature.

Table 1: Possible effects of environmental policies on housing affordability and accessibility

	Environmental policies (selection)		
	Standards on new construction	Energetic retrofitting	Land use policies for densification
Effects on housing affordability in attractive cities	Increase in standards of new constructions can lead to further increase skyrocketing housing costs in the newly built housing and make the creation of new public and social housing too costly (Hagbert and Femenias, 2016) and green buildings for the wealthy (Rice et al., 2019)	Energy upgrading of buildings and green buildings might lead to proportionally higher financial burdens for low-income groups (Schleich, 2019), increased rental prices after retrofits (Grossmann, 2019), low-carbon gentrification (Bouzarovski et al., 2018)	Densifying (especially centrally located) urban areas might be connected to lack of affordable housing provision. In addition, urban densification has been shown to be linked to gentrification through brownfield cleanup, unequal regeneration and spill-over effects (Ali et al., 2020)

1.5 Research Gaps

As shown in this review, the relationship between environmental policies and housing affordability is complex and requires drawing on different disciplines and theoretical perspectives. In general, theoretical and empirical investigations are a relatively new avenue for the social sciences and there are important gaps and missing links that need to be addressed. We stress here two main aspects that emerged from the review:

1. Studies that explore the links between environmental policies and housing affordability in a relational way (and thus, considering environmental policies in relation to wider policy frameworks, housing systems and governance settings) are scant. For example, in the densification literature, studies tend to focus more on quantitative approaches based on hedonic price models (Addison et al., 2013; Liu et al., 2017). While this gives important insights on the effects of urban redevelopment on housing prices, there remains a need for a deeper engagement with qualitative analysis that addresses legal and policy limitations for achieving sustainability in densifying cities. Indeed, as noted by Dalton (2016), there is a need to understand how policies of densification coordinate with

policies promoting and protecting housing accessibility. To address this gap, this project delineates from an analytical point of view how the multiple synergies and conflicts between environmental policies and housing affordability are related to one another. By doing so it will provide a methodological and comparative approach that will explore relations between policy instruments for green transition and housing affordability vis-à-vis to different housing, welfare and energy policies.

2. Most existing studies that explore the relationship between policies and interventions oriented toward green transition, climate adaptation and housing affordability are based on a few local case analyses (Cucca et al. 2023). As a result, there is a lack of comparative studies that, as we argue, are necessary to disentangle how contextual filtering mechanisms may determine differentiated implications of environmental policies for housing affordability.

2. Analytical framework

2.1. The importance of context for policy integration

The main aim of this project is to disentangle synergies and conflicts between environmental policies and access to affordable housing through a context-sensitive approach. Therefore, it is crucial to define context.

The importance of context is stated by plenty of urban scholars and social scientists, and it is at the centre of the complex attempt of explaining social phenomena. Contextual factors are not always easy to identify as they belong to what we usually consider to be “background conditions”. However, contextual factors have a crucial causal power in the way they concur with generative mechanisms to produce certain effects. This also means that same mechanisms acting in different contexts can produce different effects. In this respect, Danermark et al., (2019) stated that causality, as the tendency of certain mechanisms to produce certain effects (Mumford & Anjum, 2011), is a contextual concept. Explanations require that causal mechanisms should be studied in their context, thus meaning that external as well as internal causal factors should be considered, since they can change, intensify or weaken the final effects (Bergene, 2007). The concept of mechanisms (that we also refer to as “filtering mechanisms” to explain the power of

context to differently shape the relationships between environmental policies and access to affordable housing) is here crucial to explain our ontological position. Following Næss (2015), we argue that to explain empirical phenomena, it is crucial to go beyond the empirical sphere and detect those generative mechanisms that are not empirically visible. In this view, reality is not conceived as transparent, we cannot know about it and just passively register what we observe. We need to look at what is under the observable surface, investigating causal powers and generative mechanisms of the events and how contextual factors operate in such respect.

Against this background, we follow Maloutas (2018, p. 251) in defining context as “the interrelated assortment of specific parameters in a local setting that may lead a particular process to produce importantly different outcomes from those theoretically expected”. Important for our study are the policy instruments deployed that may produce different outcomes. In the literature they have been described as those tools or devices that enable policy makers to reach their goals. For example, Jordan et al. (2013, p. 3) define environmental policy instruments as “the tools and mechanisms used to achieve environmental objectives and address sustainability challenges”. However, it is crucial to understand that they also represent a form of power. Hence, instruments are not neutral devices and they might produce unintended consequences that deviate from the ‘intended’ policy goals as they are influenced by contextual factors (Le Galès 2011).

In a nutshell, multilevel governance – which we understand as a contextual element - is a concept that refers to the distribution of authority, decision-making power, and responsibilities across multiple levels of government and across the relationship of governmental and non-governmental stakeholders. Following Benz (2021), two integrated dimensions of multi-level governance perspectives can be identified. The first focuses on the interactions of governmental actors across territorial levels (from local, over regional and national to supranational), hereby referred to as vertical dimension. The second, referred to as horizontal dimension, accounts for the relationships between both different governmental actors or sectoral policies, but also between non-governmental actors, such as private actors, non-profit organisations or civil society groups at various governance levels.

In relation to the vertical dimension, recent research into multi-level institutional structures suggested two important analytical dimensions for investigating the role of the local level (e.g. a municipality, a city): policy autonomy and policy capacity.

Policy autonomy, on the one hand, is again characterized by two main aspects. According to Cucca & Ranci (2020), the degree of regulatory autonomy granted to local and regional levels through legislations is as important as the autonomy of financial resources. Cucca and Ranci (2021) argue that there are mainly four typologies of multi-level institutional governance arrangement, as in Table 2: they differ according to a normative criterion – the degree of independence of local decision makes – and a functional criterion – the actual room for autonomous financing and expenditure actions left to local authorities.

Table 2. Typology of multilevel institutional governance arrangements. Source: Adapted from Cucca and Ranci, 2021: table 1.

Financial support from the central state	Degree of regulatory autonomy (urban, metropolitan, regional level)	
	High	low
Weak	<i>Unsupported localism</i>	<i>Constrained localism</i>
Strong	<i>Supported localism</i>	<i>Centralism</i>

Hence, the notion of policy autonomy is also closely related to the “sovereignty a state has in defining its own policies and the territorial level to which they apply” (Kazepov et al. 2022, p. 3). This regulatory institutional context develops in combination with the cultural and political context such as values, beliefs, and ideologies – as another analytical element – fuels the policy instruments as “precise mechanisms that also tend to produce specific outputs” (Kazepov et al. 2022, p. 3).

However, these mechanisms are always context specific. In relation to housing affordability, the socio-economic context is especially crucial. Factors such as income inequality, poverty rates, employment patterns, and demographic characteristics shape urban dynamics and the formulation or responses of housing policies. Understanding the socio-economic context helps

to identify the specific challenges and opportunities faced by urban areas and informs the design of targeted policies via different policy instruments.

However, as policy instruments are located at different levels, vertical policy mixes emerge in shaping specific policy outputs and outcomes at the very local level. This is particularly relevant in housing and environmental policies where single policy instruments are implemented, regulated, financed and coordinated at and across various levels – forming potential synergies and conflicts between environmental policies and housing affordability at local levels, though in differentiated ways across cities.

In that regard, we consider the notion of policy capacity helpful. While policy capacity is a rather elusive term which has been defined and interpreted in several ways (Wu et al. 2015), we refer here to the ability and willingness of local governments to steer policy integration amongst environmental policies and (social) housing policies which are further complicated by complex multi-level governance arrangements characterizing housing and environmental policies. Similarly to Howlett et al. (2017, 74), we aim to understand synergies and contradictions in environmental policies and housing affordability through policy integration which “involves adopting policy tools capable of overcoming or avoiding conflicts and contradictions in a policy mix”, while our policy mix entails environmental and affordable (or non-affordable) housing policies.

2.2. Environmental policies and multilevel governance

Cities are considered key sites to address global environmental challenges – especially in relation to climate change. While cities have been often viewed as sites influenced by higher-level tier policies – either forced through different policy instruments or by formulating goals, also the environmental orientation of the local came to be more important (Anguelovski and Carmin, 2011). Over the years, more and more studies have highlighted that a narrow focus on policies implemented only by cities is too limiting and the governing of environmental challenges needs to consider the embeddedness of cities in multi-level governance arrangements (Bulkeley & Betsill (2005).

Starting from the role of local governments, Hickmann (2021) emphasizes the potential of local authorities to foster green transition initiatives, but the agency of local governments is overestimated and heavily contingent on support and regulations from upper-tier levels. Apart from this vertical dimension, also the horizontal integration poses considerable possibilities for synergies and conflicts in achieving sustainable outcomes. Local governments are crucially dependent on private actors to carry out effective environmental actions. Hence, the involvement of private actors also brings the danger that these groups are lobbying for their individual interest instead of the public good.

Closely related to environmental governance literature which focuses on the role of cities, there has also been considerable academic work that focuses on policy instrumentation and 'new' environmental policy instruments fostered by European policies. This literature has produced a rich categorization of instruments since the 1990s. Moore et al. (2021: 300), for instance, suggest four main categories of instruments used in environmental governance, 1) regulatory instruments using targets and punitive sanctions; 2) market-based instruments such as eco-taxes or emission trading; 3) informational instruments seeking to change the behavior of actors and 4) voluntary instruments such as agreements between policy makers and public and private actors.

The following presents a more detailed summary of some of the key policy instruments discussed in the literature aiming to promote sustainable development:

- Planning and Regulation: Planning and regulation instruments include zoning regulations, land-use planning, and building codes. These instruments shape the physical development of cities, ensuring compatibility, and managing the use of urban space. They help control urban sprawl, protect the environment, and promote sustainable urban design.
- Economic Instruments: Economic instruments aim to influence behavior and achieve policy goals through financial incentives and disincentives. Examples include taxes, subsidies, and fees. For instance, congestion pricing is an economic instrument used to

reduce traffic congestion in urban areas by charging vehicles for entering congested zones.

- Public Investment: Public investment refers to the allocation of public funds to infrastructure projects, public services, and urban development initiatives. It includes investments in transportation networks, schools, healthcare facilities, and social housing. Public investment can shape the physical and social fabric of cities and contribute to economic growth and social welfare.
- Information-based Instruments: These instruments encompass various non-regulatory approaches that aim to influence behaviour through communication and capacity-building. These include awareness campaigns, educational programs, and community engagement initiatives. Information-based instruments can also be used to promote sustainable lifestyles, raise environmental awareness, and foster social cohesion.
- Collaborative Governance: Collaborative governance involves partnerships between various stakeholders, including governments, communities, businesses, and civil society organizations. This approach promotes cooperation and shared decision-making in addressing urban challenges. Collaborative governance can enhance policy effectiveness, encourage participation, and generate innovative solutions.
- Place-Based Policies: Place-based policies are tailored to specific neighbourhoods or regions, considering their unique characteristics, challenges, and potentials. These policies focus on local needs, aspirations, and assets to foster sustainable development and community well-being. Place-based policies often involve grassroots participation and local empowerment.

2.3. Housing systems and multi-level governance

Very often, research on housing-related social issues relies on two relevant concepts: housing system and housing regime. Housing system is “a typically vague but convenient shorthand expression to encompass the full range of inter-relationships between all the actors (individual and corporate), housing units and institutions involved in the production, consumption and

regulation of housing” (Bourne, 1981: 26). Any local context's physical and intangible components that surround housing are acknowledged by scholars as a "system"—a setting where individuals and institutions are limited in their actions and where results are somehow determined by the elements which constitute the system. In addition, the effects and results of environmental policies – this is our hypothesis – are determined and guided by the characteristics of the national and local housing system where they are implemented. A simple example: if subsidies for retrofitting are targeted to social housing – which embeds rent control rules – they are likely to not determine a rise in final rents charged to tenants, whereas they would likely do so if targeted to stock rented out by private landlords.

Housing regime is a concept inspired by the notion of welfare regime introduced by Esping-Andersen (1987) that aims at capturing a broader idea of the provision of welfare than social policies alone. It is different from the idea of system in that “regime” refers to some order in the elements. In the wake of the success of the welfare regime literature, the concept of housing regime has been widely applied in the comparative analysis of the ways of access to housing in different countries, but these analyses required analytical and conceptual categories different from those applied in welfare regimes.

Jim Kemeny considered the tenure systems as the central element of housing regimes. Kemeny focused on the distinction between nations/regimes where homeownership predominates and those where renting predominates (Kemeny, 1981). Since housing is so firmly ingrained in the social and cultural fabric of society, renting is seen by Kemeny as an essential component of the housing regime. The type of rental market system—dual, integrated, or unitary—is yet another important characteristic that distinguishes housing regimes. In general, nations where homeownership is the norm have a dual rental market, which is made up of a (often smaller) public rental sector with affordable rents and access requirements for people with lower incomes combined with a (often larger) private rental sector with relatively lax regulations and a profit-driven business model. Instead, there is less separation between the two kinds of rental markets—regulated and liberalized—in nations with integrated rental markets. This is frequently because there is a sizable public/non-profit driven and regulated rental sector (e.g., housing cooperatives, housing associations, limited-profit housing developers). Ruonavaara expanded

this idea and defined housing regime “as the set of fundamental principles according to which housing provision is operating in some defined area (municipality, region, state) at a particular point in time” (2020: 10). It is significant to remember that housing regimes can (and frequently do) change; path-change is also frequently present, despite obvious path-dependencies. According to Clapham (2019), there are indications that various housing regimes are beginning to take on characteristics of the so-called "neoliberal regime," which is defined by little government interference, market support, and privatization as guiding principles. In the context of neoliberalization, the related phenomenon of housing financialization has been growing. A significant amount of literature has focused on the role of housing (Aalbers, 2016; Garca-Lamarca, 2020) and land financialization (Kaika and Ruggiero, 2016), i.e., the dependence of housing and land prices not only on the local housing demand and market but also on global financial trends. We can learn a few key principles about how to frame the present housing issue from this information. First, the increasing gap between use and market value of housing and the (re)emerging significance of "housing affordability" are confirmed by the fact that housing prices and rentals have not kept pace with costs of production and earnings. Second, that the growth of housing prices must be linked to the locational character of housing (Haffner and Hulse, 2021). Recently, some authors have contributed to a re-emergence of the affordability topic which is mainly related to the concentration of capital and people in attractive cities and to the processes of financialization of land and housing (Haffner and Hulse, 2021; Lawson and Ruonavaraa, 2020). The position of cities within a rescaling of the territorial organization of the economy and of the state, which tends to favour certain urban agglomerations over the rest of the territories, can be connected to the attractiveness of people and capitals that produces affordability problems, intertwined with a very contradictory political-economic role of housing in a highly financialized capitalism (Aalbers, 2016). The process of housing financialization, which tightens ties between the housing market and financial institutions and increases the centrality of the exchange value of housing by connecting it to international financial markets and actors, has exacerbated the dynamics of commodification (Aalbers, 2016). The expansion of "non-housing" uses for the housing stock is also a consequence of financialization: second homes (Gallent, Tewdwr-Jones, 2000), short-term rentals related to the tourism sector (Cocola-Gant, Gago, 2021), housing that

is "not for housing" (Doling, Ronald, 2019), and vacant homes used as investments (Tulumello, Dagkouli-Kyriakoglou, 2021).

European Countries since the 1980s have also been facing trends of retrenchment of the welfare states, in which withdrawal from social and public housing provision was a key feature. Social housing has incurred into a crisis almost everywhere, implying reduction of available social housing stock in favour of homeownership and market housing, rent deregulation and decline or disappearance of public providers and developers (Scanlon and Whitehead, 2008; Poggio and Whitehead, 2017). By the time, propensity for regulating the rental market has declined in most Western countries and liberalization was favoured as a way to incentivize housing construction and renovation. According to Stephens (2020), some researchers argued that neoliberalisation trends in European countries lead to converging housing systems that are stronger commodified, marketized and rely on individual property rights. Arbaci (2019, p. 307), instead, argues that within the framework of retrenchment, "local housing regimes" have become more fragmented and important key mechanism producing differentiated housing-tenure systems and furthermore, also different patterns of segregation. She notices, however, that the most important trends throughout European countries are still: the withdrawal of public authorities in providing new social housing stock and decline in funding for non-profit housing actors, privatization of social and public housing and a re-orientation to demand-size subsidies and homeownership incentives (Arbaci 2019, p. 27). Almost anywhere in Europe, disinvestment on public housing happened simultaneously to the devolution of housing policies to regional and local levels of government. This phase of devolution, however, was in many cases not accompanied by a shift of funding and funding sources, e.g. in Italy. This parallel devolution and defunding can be described as a process of "passive subsidiarization": devolution of competence was not followed by devolution of funding sources (Kazepov, 2010). The corresponding decline in social housing provision, right-to-buy schemes and targeting of social housing to low income residents (also known as residualisation), in line with the concentration of the remaining social housing stock in peripheral parts of the cities, led to increased levels of socio-spatial segregation (Tammaru et al., 2016). In some countries the social housing sectors remained relevant: main examples are France, the Netherlands and Austria. This, however, came with a caveat: the 'social'

orientation among those countries got increasingly fragmented with powerful housing associations in the Netherlands and an increasing middle-class focus in Austria and France (Lévy-Vroelant, Reinprecht, Robertson, and Wassenberg 2014). Similarly, Bengtsson and Ruonavaara (2011), argue that crucial differences within the Nordic Housing Regime exist and that they are shaped by path-dependent actors' arrangements historically rooted. In particular, austerity measure enforced more strongly on some countries than on others, had a relevant impact on housing policies (and of state action in general). For example, Adisson and Artioli (2019), highlight how austerity policies in a context of devolution forced local administrations to sell out public land properties in France and Italy. This is extremely relevant, as housing policies highly depend on budgetary constraints – especially in the absence of dedicated tax revenues – and on the availability of developable land by local governments.

However, hardly such an ordered way of doing things can be found in the field of housing as a the result of multiple “push and pull” factors from different sectors and orientations, especially the commodification of housing. It is no accident that housing has been labelled the “wobbly pillar” of welfare (Torgensen, 1987). Therefore, we prefer the concept of “housing system”, which gives the idea of interrelation among different factors, actors and policy sectors without conveying the idea of some order. Institutionally, housing systems can be usefully described by three interrelated components (Kadi, 2014):

- housing policy, which refers to the way in which the government intervenes in the housing market;
- housing market structures, which refer to the supply, type and tenure of housing that is provided and available;
- and housing outcomes, which refers to how various social groups are catered to in accordance with criteria like affordability.

There are numerous ways in which housing policy influence the housing system. Organizing housing policy tools according to several criteria enables pinpointing the precise contours of housing systems. Based on Doling (1997), Donner (2000), and Kunnert and Baumgartner (2012) we identify three relevant criteria:

- 1) First, housing policies might focus on either new building and/or the existing housing stock. Housing is built to last, therefore new building is minimal in comparison to the stock, especially in cities with relatively low expansion.
- 2) Second, land and building policy, as well as housing provision, subsidies and policy, all have an impact on housing systems. As a result, while examining the determination of the institutional makeup of the housing system, it is essential to incorporate all three housing policy sectors. Building and land policies are closely related since they both control where and what can be built, while housing policy controls how housing is used and marketed, and subsidies have an impact on how it is financed.
- 3) Third, there are many other forms of intervention: the rights and obligations of participants in the housing system are outlined through regulatory instruments (such as legislation). Financial tools, such as subsidies, enable influencing behaviour by offering monetary incentives. Additionally, the development and distribution of housing is directly influenced by the state. Additionally, operative tools like information agencies work to alter the way that different players in the current housing system relate to one another in terms of power.

This functional grouping of housing policy tools demonstrates how intricate and multifaceted the field of housing policy is. On the one hand, there are numerous methods for various state institutions to affect housing. On the other, because housing is never only about how it is delivered, it is linked to other policy areas. Social, economic, and family policy are all aspects of housing policy, as are regional, local, and environmental concerns. As a result, housing policy frequently pursues multiple objectives at once, with varying weights for each nation (Matznetter 2002).

In particular, we are looking at the following housing policy instruments:

- Rent control: rent control is mainly intended as a form of regulation on the existing housing stock to reach socio-political objectives of affordability and protect tenants by excessive market rents. Currently, propensity for regulating the rental market has declined in most developed countries as liberalization was favoured as a way to incentivize housing construction and renovation. Commodification has been one of the core-aims of the strategies pursued during the

neoliberal turn, for example through the privatization of public housing stock and the liberalization of rent control on the private rental sector;

- Social housing: social housing refers to the broad aim of supply-side policies aiming at increasing the supply of housing with a certain social orientation. This means that there are often some advantages in terms of market price or rent, and some eligibility and/or allocation criteria, as well as some rules of management and re-sale. However, it is a broad domain and can be split into two sub-parts, as done by Czischke and van Bortel (2018):

- public housing: is the public rental sector, which is owned and rented out by public authorities, often allocated based on means-tested eligibility criteria prioritizing low-income households and on the basis of a waiting list, often with types of leases that are very protective to tenants.
- affordable housing: a much broader segment between public housing and market housing, which often has below-market rules of price and rent determination and less strict eligibility criteria than public housing (often linked to solvability issues), working based on a cost-rent and limited-profit business model.

-Supply-side subsidies: monetary support in form of grants or loans to the builder/developer/manager of housing; subsidies are often targeted to social housing schemes, but also home-ownership has received considerable subsidization.

- Demand-side subsidies: monetary support in form of grants or loans targeted to households; subsidies are often targeted to low-income tenants but home-ownership – also in this case – has received considerable subsidization (e.g. in the form of discounts on mortgages; Doling, 2006).

- Land use and planning: land use and planning instruments have often been used as a pivotal policy tool to promote affordable housing, in the form of inclusionary zoning requirements, direct land provision to suppliers (land subsidies), or in other forms (e.g. land tax) (Lawson, Ruonavaara, 2020);

- Building code: in most cases, housing construction is regulated by building codes which, by providing morphological or functional prescriptions, have a direct impact on housing production.

In the terms of social policy research, the concept of housing system/regime has traditionally been linked to the national level. However, housing markets, actors, policies and laws can differ per state within a federal state system (Ruonaavara, 2020: 11) or due to different applications of the same principle in a multilevel system, or simply because the socio-economic fabric (or even the geography or history) of areas within a nation can differ. Company towns are a good example of this. One main aim of the case study is to understand how the housing systems of three attractive cities, Oslo, Milan and Vienna, determine affordability outcomes of environmental policies applied to the building sector. Therefore, this study embraces a new emerging approach in Housing Studies that tries to shift away the attention from national housing systems toward more local – urban or regional – ones.

In this sense, it is useful to introduce the concept of local housing system, or “the configuration of actors and institutions that is responsible for the provision, regulation, allocation, and consumption of housing in a particular administrative entity (a city or a region)” (Hoekstra, 2020: 79). The idea of a local housing system turns into a crucial analytical lens for comparing the three cities of Oslo, Milan and Vienna, each of which has unique national dynamics and a significant position in the world's city networks. They tend to have dynamics that are more similar to those of other global cities than to the rest of their national territory. When examining local housing systems, it is important to comprehend the relative relevance and flexibility that the “local” scale—whose definition is inherently debatable, as we shall see—has in comparison to other scales. “Local housing regimes are largely subject to similar external forces, but they have some degree of freedom in choosing a response to these forces)” (Hoekstra, 2020: 81). It is crucial to consider the scale(s) at which affordability issues are addressed while talking about how cities fit into a multilevel framework and the requirements and abilities to implement policies that promote housing affordability (or “policy capacity”). While the multilevel administrative arrangement is in many cases given and hard to modify, Purcell argues that “scales are not independent entities with pre-given characteristics. Instead, they are socially constructed strategies to achieve particular ends. Therefore, any scale or scalar strategy can result in any outcome. [...] All depends on the agenda of those empowered by a given scalar strategy” (Purcell, 2006: 1-2). The question of scale plays a significant role in the development of the case studies

and the analytical framework, and special emphasis is placed on how each scale performs in the multilevel arrangement.

2.4. Housing affordability

In general, housing affordability links the housing situation of households (such as tenure, adequacy, distress, exclusion) to their economic situation (such as income, savings, access to credit, debt) and refers to the conditions of access to housing and to the role of housing in determining conditions of poverty or wealth. Housing affordability has a double nature: on one side, it is an analytical indicator and part of the housing outcomes, a “set of indicators that describe the housing situation in a particular area” (Hoekstra, 2020, 80); on the other, it is a policy framework related to social and political assumption, such as the right to (afford) housing (Peverini, 2022). This is particularly relevant, since our analysis of environmental policies includes consideration on whether (and to what extent) they include housing affordability and accessibility within their aims and instruments. In both its natures of outcome and policy framework, when it comes to translating the notion into metrics, housing affordability becomes contestable and require new ways of conceptualizing it depending on the societal conditions. A useful review of academic and grey literature provided by Peverini (2022) found six main conceptualizations of housing affordability, and relative operational metrics according to which housing is affordable:

1. when prices and rents are below the market price of a particular share (*below market*);
2. when they are the mere sums of the production costs (*cost rent*);
3. for a specific household, when the share of its disposable income spent on housing is below a certain share (*cost to income*);
4. in a certain housing market, considering how many dwellings are cost-to-income affordable for certain categories (*housing accessibility*);
5. for a specific household, when the residual income after housing costs is above a minimum (*minimum residual income*);

6. for a specific household, in a specific place, when the share of its disposable income spent on housing and transportation is below a certain share (*housing+transportation*) or, more generally, considering other location-related expenditures (*location affordability*).

A concept that is particularly relevant for this work is “housing accessibility”, which refers to the ability of certain households (usually defined based on income ranges, wealth, or even specific jobs) to access affordable housing within a certain market (Sendi, 2014). While we could argue that affordability broadly refers to the economic sustainability of housing (and related) costs for all people and households, “accessibility refers to the ability of households to enter the housing market” (Kadi, 2014: 85). Accessibility looks at the *quantity* of housing that is affordable for households with certain incomes. Neuteboom and Brounen (2011) define accessibility as a notion covering simultaneously the demand side, characterized by a quantity of households with a certain economic capacity, and the supply side, characterized by a quantity of dwellings (a stock) and a certain price distribution. Many scholars have embraced housing accessibility as a better alternative to focus on the problem of access.

The conclusion of the review is that housing affordability should not only be intended as a mere part of the supply (which and how much housing is affordable?), but rather as a multidimensional outcome produced by the housing market and the local housing regime which needs to be contextualized for specific income profiles, spatialized with relevant geographical factor and connected to other welfare measures (Peverini, 2022). Operationally, housing affordability can be considered to be an assessment of the capacity of a broad range of individuals and households (especially low-income ones) to access and maintain housing, within a housing system (usually a city), characterized by good quality and accessible locations and paying a sum that leaves enough residual income to live a decent life (*ibidem*). From this perspective, “affordability” is a measurable and relative character of housing of any kind (being it public, social, or private) connected to its quality and location as well as to the local socio-economic structure (*ibidem*).

This study does not aim to provide a measure of the effects of environmental policies on housing affordability, which would require a strong selection of factors to investigate. Instead, it aims at shedding light on synergies and conflicts between environmental policies and access to affordable housing, and understanding which contextual factors shape those synergies and

conflicts. To do so, it applies a conceptual framework – result of the present literature review – to some real-world cases and operates a mild comparison (see the dedicated chapters in this study). Our use of the concept of housing affordability is coherent with the fact that affordability has become a commonly used term for summarising the nature of the housing difficulty (Hulchanski, 1995). Operatively, we adopt a definition of affordability that does not only consider the sustainability of housing costs to incomes, which has the shortcoming of underestimating the problems of access of newcomers, but also the issue connected to access to housing – or housing accessibility. In other words, following the literature, in our study we mainly look at synergies and conflicts generated by environmental policies in the access to housing that is affordable in relation to local economic capacity (i.e. mainly incomes). Mainly, we try to look at whether greener and more energy-efficient housing (e.g. new housing with good standards, retrofitted housing, housing in densified neighbourhoods) is available, accessible and affordable, labelling those for the sake of synthesis as “affordability”. Then, given that we hypothesize that environmental policies have similar aims and operative mechanisms, we try to understand which contextual factors determine those characters.

2.5. Interpreting the multifaceted relationship between environmental policy instruments and housing affordability

In this section, our attempt is to elaborate a model to interpret our multiple case-study analysis and building a comparative ground.

The aim of our analysis is not to produce empirical generalization, but analytical ones, meaning that what we can generalize from our analysis is how environmental policies tend to exercise influence on housing affordability, and not the empirically observed situations. It is also important to be aware that the form that such relationships take is dependent on the interplay between multiple factors and filtering mechanisms, as explored in the previous section. The theoretical approach used in this study suggests that a fundamental relationship should be considered, i.e. the integration or, on the contrary, the separation of environmental and social sustainability when planning and implementing environmental policies. This relationship is

fundamentally shaped by housing systems, actors involved in planning and housing provision, and governance settings.

In Table 2, we have exemplified our assumption, which is that the relationships between environmental policies and housing affordability can be characterized by various synergies and conflicts that will either tend to better combine environmental and social goals (High orientation towards affordable housing) or on the contrary to prioritize environmental goals underestimating social ones (low orientation towards housing affordability).

Table 2. Table of interpretation of the orientation of environmental policies towards housing affordability. Made by the authors.

	Low orientation towards housing affordability	High orientation towards housing affordability
Densification policies	<p>If only focus on home-ownership / private market rental</p> <ul style="list-style-type: none"> • Prioritization of environmental goals. • Tendency towards socio-spatially exclusionary outcomes (housing inaccessibility and exclusionary pressure). • Anti-sprawl/housing inaccessibility spatial trade-off 	<p>If mixed with public housing, subsidized housing</p> <ul style="list-style-type: none"> • Combination of environmentally sustainable and socially inclusive outcomes • Policies of densification are strongly oriented towards spatial containment and are accompanied by affordability programs.
Retrofitting	<ul style="list-style-type: none"> • Prioritization of technical solutions to retrofitting the housing stock. • No regulations on housing cost increases • Developers hand over investments costs in rental segments 	<ul style="list-style-type: none"> • Combination of retrofits and subsidies or regulations that limit rents to allow sustainable and socially inclusive outcomes
Standards in new construction	<ul style="list-style-type: none"> • Prioritization of environmental standards. • Tendency towards increased final cost for dwellers. • Energy-efficient/housing affordability trade-off • Energy efficient housing only for the more affluent 	<ul style="list-style-type: none"> • High environmental standards for new construction are accompanied by affordability requirements and programs.

In the first column of the table, we exemplify the outcomes, in term of housing affordability, that the different analysed environmental policies tend to produce when there is little or low consideration for the provision of affordable housing, both in the policy vision as well as in the tools to implement it. In the second column, we exemplify potential outcomes that derive from a stronger integration between environmental and housing affordability goals.

3. Grounding the framework: case studies and comparison

In grounding our framework, we took inspiration from what Robinson (2011) coined a “comparative gesture” (Robinson, 2011). While her thinking is strongly rooted in a post-colonial perspective, we are sympathetic to her perspective and took inspiration to compare three European cities. The main motivation was to highlight differentiation of outcomes through “thinking cities/the urban through elsewhere (another case, a wider context, existing theoretical imaginations derived from other contexts, connections to other places), in order to better understand outcomes and to contribute to broader conceptualizations and conversations about (aspects of) the urban.” (Robinson 2016, p. 5).

In doing so, we also diverge from the idea of comparing relatively similar cities – our cases yield similarities and differences to better understand how synergies and conflicts between environmental policies and access to affordable housing are shaped by contextual factors. We do this by focusing on three environmental policy fields that affect the access to affordable housing: 1) densification and land use policy, 2) retrofitting policies and 3) standards in new housing construction. In comparing the potential effects in terms of synergies and conflicts we consider the housing system and different environmental orientations (expressed through the use of environmental policy instruments) within in a multi-level governance arrangement as crucial factors. In doing so, we focus on three cities which share similar features like their economic position as a main economic hub within their respective countries which have exposed them to a considerable amount of housing market pressures (see Table 3). Within the wider economic restructuring, all three cities witnessed population growth over recent decades.

Table 3. Introduction to the cities of Milan, Oslo and Vienna. Made by the authors on multiple sources.

	Milan	Oslo	Vienna
Economy	main economic hub	main economic hub	main economic hub
Market dynamics	strong pressure	Strong pressure	strong pressure
Administrative position	Municipality (Metro area, Region, Repub.)	County municipality	Federal State + Municipality (Federal Republic)
Population (municipality)	1.4 million inhab.	~ 700,000 inhabitants	1.9 million inhabitants
Population dynamics	Growing moderately (+ 7% / +100,000 between 2008-2018)	Growing strongly (+ 16 % / +110,000 between 2008-2018)	Growing strongly (+ 10 % / +200,000 between 2008-2018)
Population (Metropolitan or city region)	province 3.2 million inhab. Eurostat FUA: 5 million inhab.	Region: 1.5 million Eurostat FUA: ~ 1 million	Province = municipality Eurostat FUA: 2.85 million inhab.

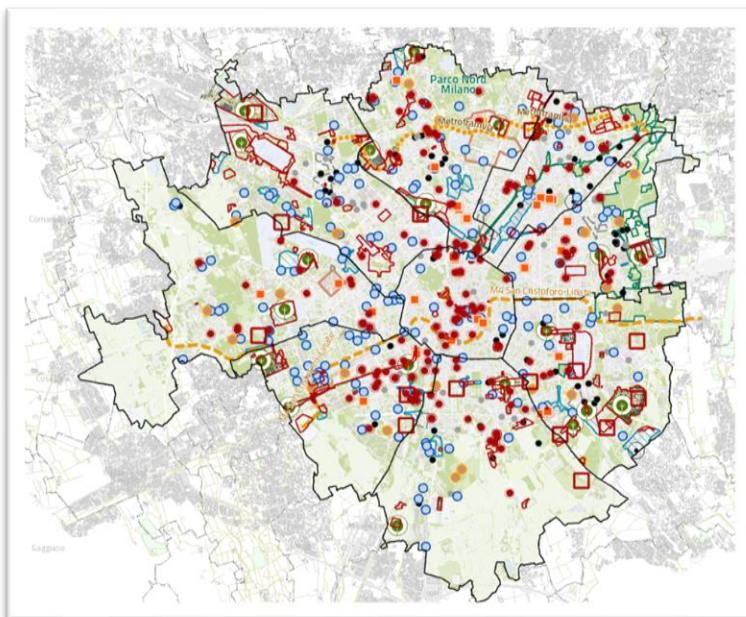
However, they also have differences, such as their position within the wider multi-level governance arrangements. While Milan and Oslo are both municipalities, Vienna is a federal state and a municipality at once, which allows for a greater capacity to formulate local policies. Furthermore, Milan and Vienna are shaped directly through EU policies as Italy and Austria are EU member states, while Norway, hence Oslo, are not. Based on this embeddedness also housing systems and environmental policy instruments differ, therefore, as we will show, also the effects in terms of synergies and conflicts between environmental policies and access to affordable housing differs.

3.1. Milan

Milan is the capital city of the northern Italian region of Lombardy. The Municipality of Milan has 1.357.673 inhabitants (2023 data) and a surface area of around 181 km². It is part of the Metropolitan Area of Milan (Città Metropolitana di Milano), an administrative level which puts together 133 municipalities for a total of 3 223 507 inhabitants and 1.620 km² (2023 data). Given the small area of the core municipality, the Municipality of Milan highly depends on a vast hinterland for the localization of functions (e.g. residential, productive, commercial) which

encompasses a larger urban region than even the Metropolitan Area of Milan (see Balducci, 2016). The most intense population and housing stock growth of Milan occurred during the post-WWII period, when reconstruction of the heavily bombed housing stock happened together with intense new expansion and housing construction and an important role of the city as hub of industrial and service companies. The city's industrial sector began to decline in the 1970s, when factories began to relocate. A substantial number of Milanese relocated to the hinterland, mainly in search of larger housing and of safer, quieter, and greener living environments. In two decades, the core municipality "lost" almost half a million inhabitants, mostly to the suburbs. With many factories relocating out of Milan, a growing tertiary sector and increasing housing prices due to financialization trends, redeveloping brownfields and vacant industrial sites became an important topic. In recent years, the city of Milan has experienced a new period of growth due to international repositioning during the 2010s, especially following the International Exposition *Expo 2015*. In the past decade, the urban agglomeration of Milan has become increasingly attractive for people and capital, especially due to the new roles of tourism and real estate, which complemented finance and tertiary sectors (Camagni, 2020). In this context, several public and private regeneration and transformation processes have been activated in the recent years throughout the whole municipal territory (figure 1).

Figure 1. Urban regeneration and transformation processes in Milan. Source: Municipality of Milan.



In the Italian public administration system, the main levels of government are municipalities, provinces, regions, then central government. Municipalities are responsible for urban planning, based on prescriptions from the state and region. Regions oversee important competences and have a central role in housing policies, though resources are provided by the central state. Provinces, on the contrary, were gradually hollowed out, and the reform that established the Metropolitan Areas left many issues unsolved (Balducci, et al., 2016; Camagni et al., 2021). The Law 56/2014 introduced a new administrative level, the *Città Metropolitana* (hereafter, Metropolitan Area), that substituted the previous Provincial level in fourteen Italian agglomerations (counting for roughly one third of the total Italian population). However, this level of government has a very low amount of competence, especially regarding housing, and despite the importance of this scale no specific housing area is present in the organogram of the Metropolitan Area of Milan. However, transportation and some general issues of coordination in urban planning and welfare are. The European Union mainly disciplines the “state aid” funding and, as we shall see, is indirectly responsible for energy standards but has no role in housing promotion.

Housing system and affordability trends

The housing regime of Milan has followed a specific trajectory that is related to the national one, mediated by its local specificities. In the post-WWII period, private housing construction, though prevalent, was complemented by various public housing programs that account for between 9% and 18% of the yearly housing production. Parallely, the city developed large social and mobility infrastructure programs. Additionally, in the 1960s the national government introduced a land policy tool for public and affordable housing, based on compulsory purchase of plots at below market price (*Piani di Edilizia Economica e Popolare*, known as PEEP). In this period, the private rental sector still accounted for the largest part of the housing stock (with tenants accounting for over 50% of tenures until the 1990s) and was heavily rent regulated to prevent excessive social unrest (Padovani, 1996). However, following new public governance and neoliberalism, a powerful process of tenure restructuring has taken place since the end of the 1980s, in which public housing has gone towards residualization and right-to-buy schemes and only lower income and disadvantaged households remained in the rental sector. Meanwhile, homeowners grew

significantly thanks to the generous policies that have been fostering home-buying and a huge growth of mortgage lending. Despite not being renowned for its housing policies, Milan still has a remarkably high share of public housing: around 10% of the total stock in the core municipality is publicly owned and rented out on a social rent basis – compared to the Italian average of 4% and even lower shares in other Southern European cities (Housing Europe, 2019; Peverini, 2023).

Figure 2. The tenure structure of Milan. Made by the authors on various sources.



The consequences of social exclusion provoked by polarized conditions of access to housing were exacerbated by the financial crisis and the application of neoliberal policy recipes imposed during the crisis and the unleashed housing need in the aftermath of the crisis (Maloutas et al., 2020). Currently, the city of Milan is considered the hottest real estate market in Italy, in line with other attractive global cities. This is connected to increasingly critical affordability problems. Centro Studi PIM (2019) estimated that households with the average working-class income (around 25.000 € per year, gross) cannot afford the mean rental dwelling within the core municipality, while NOMISMA (2021) highlights the lack of rental stock in the range of 50 to 80 €/m²*year – which corresponds to 4 to 6,6 €/m² per month – that would be affordable for households with income ranged between 1.000 and 1.500 €/month (around 20% of all households). Average rent for a one-bedroom apartment is higher than monthly median equivalized income of persons aged 18-24 (Fondation Abbé Pierre - FEANTSA, 2021, p. 28). Milan has a very high incidence of housing

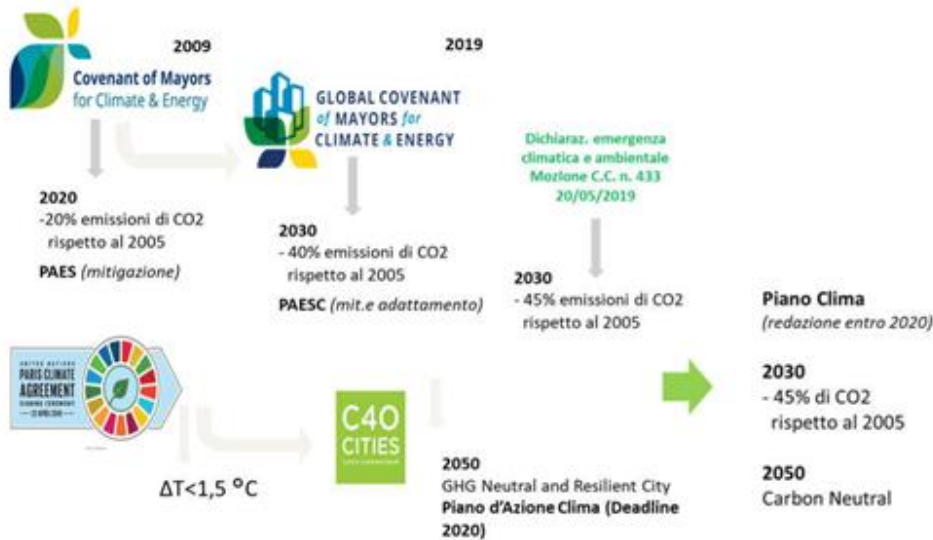
costs on the income of a nurse for acquiring a typical flat in homeownership with mortgage (59%) and for paying rent in the free market (76%) (Collettivo per l'Economia Fondamentale, 2022).

Environmental policy instruments

The issue of energy efficiency of the housing system is a critical one in a country in which housing is connected strongly to cultural and political meanings and in which individual real estate property is considered a main pillar of society. The reaction to the news about the coming EU directive on energy efficiency of building by the head of the political group in the parliament of Fratelli D'Italia (far-right wing party, ruling the current coalition that governs Italy), is quite revealing: "The house is sacred and cannot be touched". Environmental goals have been assuming an extremely relevant role in the local government of Milan, ruled for the last 15 years by mayors connected to Partito Democratico (center-left wing party). The Air and Climate Plan is an instrument launched in 2019 and approved by the municipal government led by mayor Giuseppe Sala in 2020, aiming to "protect health and environment, to reduce air pollution and respond to the climate emergency". The Plan aims to: fall within the limit values of concentrations of atmospheric pollutants PM10 and NOx (particulate matter and nitrogen oxides), set by Directive 2008/50/EC (implemented by Legislative Decree 155/2010 as amended) to protect public health; reduce CO2 emissions by 45% by 2030 and become a Carbon Neutral City by 2050; contribute to containing the local temperature increase to 2050 within 2°C, through urban cooling actions and reducing the heat island phenomenon in the city. The Air and Climate Plan finds roots in the documents released by the Global Covenant of Mayors for Climate & Energy and by the C40 cities network, and in the Paris Climate Agreement promoted by the United Nation (figure 3).

According to the Air and Climate Plan, "heating of buildings and domestic energy uses" in 2017 accounted for 58% of total energy consumption (whereas tertiary and productive uses for 24% and transportation for 17%) and for 52% of total CO2 emissions (whereas tertiary and productive uses for 30% and transportation for 18%). Heating of buildings accounts for most of this figure. Retrofitting and energy-efficiency standards of buildings play then a central role in the national and local climate strategy.

Figure 3: Commitments undertaken by the Municipality of Milan to mitigate climate-changing emissions (source: extract from the Air and Climate Plan, attachment 4, p. 3)



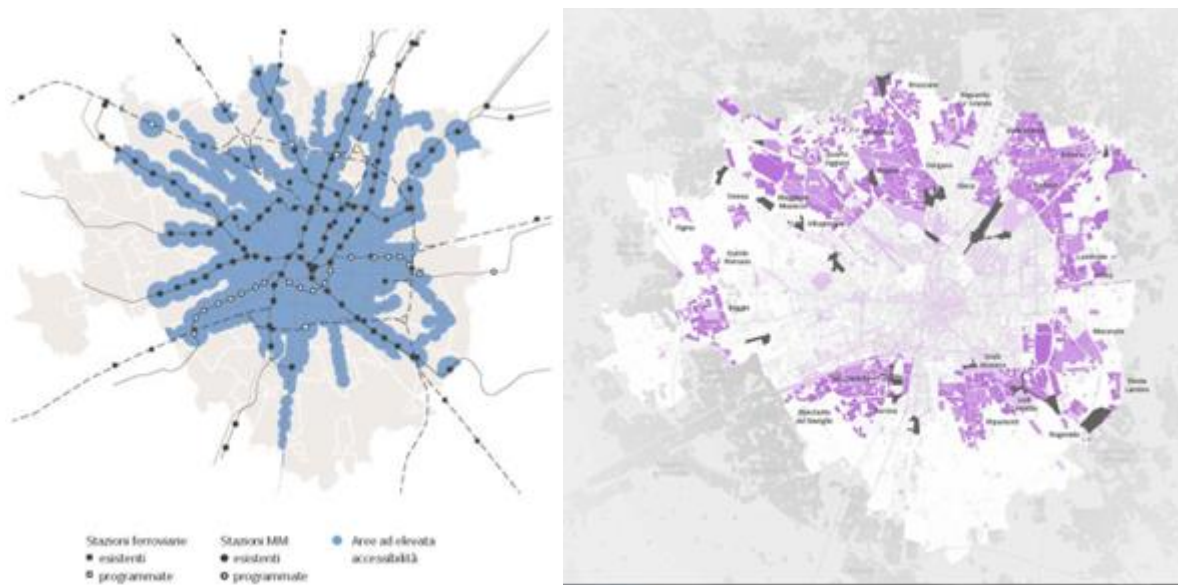
Densification

The Territorial Government Plan (TGP) is the official instrument that dictates land use and density in any municipality in Italy. The TGP is structured in the form of a zoning plan which indicates the conditions and density for urban redevelopment initiatives but not for strictly regulating urban functions. The latest edition (approved in 2019) imposes the principle of urban densification in various ways. An important action of densification exists in the nodes of the public transport infrastructure network. The TGP identifies areas characterized by high levels of accessibility defined by areas of:

- 500 metres from existing and existing and under construction railway stations and stations planned by the Railway Yards Agreement (“AdP Scali”) stations along the railway belt;
- 250 metres from trolleybus and tram stops, representative of the likely distance that public transport users tend to walk to reach the nearest station.

In these areas, the density allowed is raised from 0,7 to 1 sqm of buildable GFA for every sqm of territorial surface of the plot (+42% density). As visible in figure 5, this encompasses an important part of the built-up area of the city.

Figure 5: extracts from the last TGP of Milan with zoning in which rules for densification (left) and for regeneration (right) apply.



As for inclusionary zoning, the latest TGP includes significant requirements for affordable housing on new developments: 20% of affordable housing for sale, with capped sale prices and limits to resale within the first period (depending on the agreement); 20% of affordable housing for rent, with rents capped at 5% the sale price of affordable housing for sale; 5% of public housing (this figure can in any case be avoided by paying a fixed sum). These requirements apply to urban transformations above 10.000sqm of GFA, while requirements can change if contractual planning instruments are employed. Additional figures of affordable housing on top of the requirements are excluded from the density limit. Additionally, municipalities in Italy can raise development fees (*oneri di urbanizzazione*) to invest on urban infrastructures and – on a smaller scale – on housing policy (mainly on the renovation of the public housing stock). Despite a general lack of data, evidence show that the amount of development fee collected in Italy is often as low as 5% of the final development value (Camagni, 2019).

Parallely to densification, the new TGP includes a policy for the “regeneration” of parts of the existing urban fabric that are deemed in need of intervention, with a zoning which includes most parts of the peripheral neighbourhoods of the municipality (largely complementary to the densification one, see figure 5) in which a number of planning incentives apply to urban

transformations and developments, among which: a 40% discount on the surface requirement for services; the possibility to pay a sum instead of fulfilling inclusionary zoning requirements of quotas of affordable housing. Additionally, large new development areas (such as the former railway yards) have specific planning agreements, which can modify the shares of affordable housing and have a locally higher density. Indeed, the local administration has recently introduced tradable development rights (so-called “perequazione”) in the TGP, meaning that each plot of land has a theoretical buildable density of 0,35sqm of GFA per each sqm of surface, and developers can buy these surface allowances from any plot and “transfer” it anywhere within the municipal boundary: this often means that building rights are transferred to areas with higher land prices, where therefore density is maximized.

Retrofitting

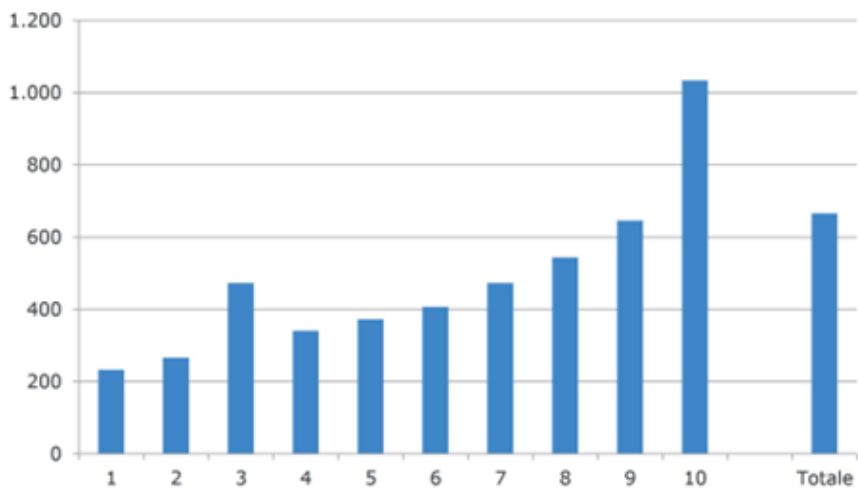
Around 70% of the residential buildings in Italy were built before the introduction of any law for energy efficiency, and the typical building from that time has an energy need of 150-300 thermal kWh/(m² year), while retrofitting of the envelope can reduce this quantity of about 80/90% (Erba and Pagliano, 2021). Regarding retrofitting, the Air and Climate Plan of Milan reports that “On the building envelope insulation front, the number of deep renovation interventions is very low, but the evolution of the market (economic and financial operators proposing to carry out works and investments, also making use of the credit transfer instruments for the tax deductions for energy efficiency measures) and the maturity achieved in materials (and in reducing installation costs) allow a leap in scale (without which it would be unthinkable to reach 2050 goals), accompanying the process” (extract from the Air and Climate Plan, attachment 4, p. 34, own translation). Concretely, the retrofitting objectives are included in Scope 3, objectives 3.2.1 “Plan for the retrofitting of the Municipal stock” to be completed by 2040 with a 0,4% reduction of total CO₂ emissions on 2005, 3.3.1 “Energy efficiency strategies for private building heritage” to be completed by 2025 with a 1,4% reduction of total CO₂ emissions compared to 2005.

The Air and Climate Plan acknowledges the existence of social and equity issues related to retrofitting and encourages “the energy requalification of residential buildings in suburbs and areas with a high presence of low-income households, tackling energy poverty in a structural

approach to the problem of energy poverty and avoiding gentrification” (attachment 2. P. 89, own translation). The Plan, also invests 0,25mln€ on informative actions “in order to accelerate the energy efficiency of the private building stock and acts to stimulate redevelopment intervention in two main areas: - large real estate assets [...]; requalification; - diffuse property [small landlords]” (p. 46). Within this framework, the same plan invests 0,1mln€ on an action for “Equitable Incentives” that “aims at defining economic and social equity criteria, to be included in calls for financing and incentive instruments of the municipality, for interventions aimed at reducing air pollution and combating climate change” (p. 48). However, these are rather small actions compared to other subsidies for general physical renovation of the housing stock. Most policy instruments for retrofitting in Italy depend on national laws. Since 1998, tax reliefs have been introduced to encourage the retrofitting of the building stock in the Italian law. The benefits have been impacted by variations that have changed the deductible expenditure quotas, the maximum expenditure limits, the categories of interventions that can be facilitated, and have been subject to numerous extensions over the years until 1 January 2012. The reliefs were finally stabilized by Decree-Law No. 201/2011, converted into Law No. 214/2011. From 2017 to 2020, the government granted fiscal deduction for up to 65% of the total cost and up to 96.000€ per housing unit on the whole Italian territory. In 2021, the sum of Ecobonus and Superbonus subsidies – the two main sources of public subsidies for housing renovation financed through tax discounts on households and companies – amounted to around 10bln€ (ENEA, 2022: 45-46). A study by the Italian Revenue Agency (Agenzia delle Entrate, 2017) on the implementation of tax reliefs for the retrofitting of the building stock showed how the distribution of economic benefits through tax reliefs has been clearly regressive and that the likelihood of retrofitting increased with taxable income and non-food consumption (which identify a condition of greater household affluence): “The tax measure seems to have incentivized especially taxpayers who are older, retired, with higher taxable and real estate incomes and with a high economic capacity to sustain non-durable non-food consumption. On the contrary, it seems that the policy had no significant effect on the probability of restructuring of the 'inactive' and people with a relatively high share of expenditure on foodstuffs, i.e. the category of less affluent people.” (Agenzia delle Entrate, 2017: 219, translation by the authors). According to an estimation by CRESME, a research center

of the building sector, a refurbished dwelling increases its real estate value by about 28% (CRESME, 2017). According to a survey by ENEA, the Italian National Agency for New Technologies, Energy and Sustainable Economic Development, 39,2% of real estate agents think that incentives made housing prices “grow relevantly” (ENEA, 2022: 101).

Figure 4: Average amount of tax deductions for building renovation and energy refurbishment, by class of equivalent income, for 2017 (source: Agenzia Delle Entrate, 2017).



The introduction of the new measure “Superbonus 110%” in the framework of the policies to recover from the Covid-19 pandemic-induced recession has relevantly changed the picture in many ways. In particular, a new architecture of tax discounts allows landlords to pass the tax credit directly to financial or industrial/service companies, such as banks and insurances but also multiutilities etc., which can immediately get it back from the state in the form of discount from due taxes. Retrofitting expenses with the Superbonus 110% can then be detracted on taxes by households, but also (most of the time) by contracting companies in the form of the tax credit transfer, which is then transferred directly to bank or to the State. The amount of expenses that can be detracted is raised up to 110% of the cost of retrofitting (both for insulation and the heating/air conditioning system), which is capped to: 80.000€/unit in the case of single-family units; 60.000€/unit in the case of multi-family condominiums until 8 dwellings; 45.000€/unit in the case of multi-family condominiums with more than 8 dwellings. Additional incentives are provided for solar panels. A study commissioned by the Chamber of Deputies states that “the entry onto the scene of the financial sector has given rise to further changes due to the certainty

that this sector must have on the collectability of credit” (Camera dei Deputati, 2021: 30; translation by the authors). The tax credit transfer theoretically eases housing access to homeowners with lower incomes (who would not be able to fully discount retrofitting expenses from low-income taxes), but there is yet no specific evidence for this. At the national level, around 15% of the total expenditures have been dedicated to single-family dwellings, in Lombardy this figure goes up to 29% (ENEA, 2022). Neither of these retrofitting subsidies is accessible by public housing, and initially even co-ownership models (e.g. rental housing cooperatives) were excluded. After lobbying activities by the national federations of public housing providers (FEDERCASA) and housing cooperative associations (mainly Confcooperative Habitat and Legacoop Abitanti), the Superbonus 110% was extended to cooperative housing and an additional public fund was reserved to public housing providers (“Fondo Complementare”). According to estimates, in the municipality of Milan around 3.000 residential buildings were retrofitted through the Superbonus. Considering that roughly Italian condominiums contain around 20 housing units on average (elaboration by the authors on data by ANACI, the National Association of Condominium Managers), the hypothetical total number of units that faced retrofitting via the Superbonus in the municipality of Milan could be roughly estimated to be 60.000 housing units (around 7% of the stock)³. The average sales price for refurbished units is above 4.000 € per sqm, around 30% more than for unrefurbished units – that however saw a more relevant growth in prices, connected to expectation of profit from refurbishment. This price is out of reach for a significant part of the population. This means that probably all these units refurbished through public subsidies increased their value of around 30%, thereby contributing to the ongoing rise in housing prices in the city. Moreover, there is qualitative evidence that previously rented flats could be taken away from existing leases⁴ for refurbishment and turned to the sales market or rented on short- and medium-term rental market for higher prices.

Regarding the public housing sector, in May 2021 one of the two main public housing providers (ALER Milan) has released a call for the retrofitting of 15.290 of units (estimating a cost of 30.000€/dwelling) (Camera dei Deputati, 2021). Additionally, the Air and Climate Plan foresees

³ This figure is highly prudential, as condominium buildings in large cities tend to have more units.

⁴ According to Italian rental laws, leases can be interrupted in case of relevant works on the dwelling.

an action for the retrofitting of the municipal housing stock, for which the estimated cost is 480mln€. In these cases, this would not produce any significant raise in rents, since rents are linked to the income of tenants (Peverini, 2023). However, they could reduce condominium expenses, which constitute the largest share of housing costs for many public housing tenants (Polis Lombardia, 2021).

As for assisting tenants with energy costs, the national governments provides electricity and gas allowance (so-called “Bonus Energia”, which provides for a contribution granted in the form of a discount on the bill of electricity and natural gas, means-tested on the basis of income proof (ISEE, the adopted national income indicator which also weights number of people in the household and presence of disables, must be below 15.000€). This is a relevant target measure subsidizing demand, which also includes low-income tenants as the subsidy is not linked to tax levels.

Standards on new construction

Standards of energy efficiency of the building sectors are mainly regulated by national laws – which, in turn, are in most cases national translation of EU directives – while the regional government only disciplines the rules for performing “energy certification” of buildings. The local government has a limited role on setting standards on energy efficiency, but has a relevant margin to change standards within the local building code (e.g. room surface requirements, minimum height, parking requirements) thereby influencing construction costs. “Most of the buildings constructed between the 1950s and 1990s, based on of a mistaken impression of infinite energy availability and 'environmental space' on which to unload the effects of its use, have 'thermal energy needs' in the order of 150-300 thermal kWh/(m² year)” (Erba and Pagliano, 2021, own translation). In Italy, the first law for energy efficiency of buildings was approved in 1976 (L. 373/1976, implemented right after the oil crisis of the early 1970s), which introduced criteria for heating systems design and thermal insulation of envelopes, and limit of energy dispersion of buildings. Around 70% of the residential buildings in Italy were built before the introduction of the law, meaning that only 30% of the stock had some energy efficiency standard to comply with at the moment of construction. Important changes in the legislation of energy

efficiency standards on new construction were introduced during the 1990s (especially the Law 10/1991), which translated the EU directive 1993/76/CE, rising the requirements for insulation and thermal system efficiency. More recent development in the legislation (again translating EU directives 2002/91/UE, 2010/31/UE, 2012/27/UE, 2018/844/UE) increased energy efficiency standards in Italy, and Regional legislation makes complementary actions to incentivize adherence to new standards (also in form of density bonuses). In Lombardy, a regional law grants 30% bonus in terms of buildable volume in case of demolition and reconstruction if the new buildings have 30% lower energy needs than the demolished ones.

Milan is living a very peculiar situation: it has real estate dynamics that are more similar to other attractive European cities than to the rest of Italy and is one of the very few Italian cities that is growing. Nevertheless, the current population of ~1,4mln inhabitants is still below the historical peak of over 1,7mln inhabitants in 1970. As a result, the number of housing units in Milan is yet higher than the number of household residents (854.000 vs 760.000 respectively), and the residential space available to every Milanese resident is as high as 52smq. No official estimate for non-resident inhabitants is available. Despite this, residential construction has increased significantly, especially in the last years after 2015, when over 5% of all the new residential permits in Italy were issued in the municipality of Milan. New residential constructions in Italy follows a much higher energy efficiency standard than older housing allowing for a much lower energy need, but new residential units tend to reach very high prices and rents. The estimated energy consumption of new residential buildings built in Milan in the last decade is 47 KWH/m² year, significantly lower than the previous production (figure 6). However, the cost of new buildings has gone up significantly and, given the low amount of new affordable housing, the market has become increasingly inaccessible. New residential units are put on the market with an average price of more than 5.000 € per sqm in the municipality of Milan (excluding the city center), and the price has gone up 23% only in the last 7 years (figure 7). Overall, between 2011 and 2021 building permits for 26.816 new housing units were granted (~2.400/year) in the municipality of Milan, but only ~6.200 in the framework of affordable housing requirements – of which ~2.200 for rent and the rest in homeownership (Nomisma, 2021). This means that most of

the new (and energy-efficient) housing production is largely out of reach for low- and middle-income households that cannot count on parental help or inheritance.

Figure 6: average estimated energy consumption of new residential buildings in Milan (KWH/m² year) per year 2011-2021 and average. Own elaboration of data by the Municipality of Milan

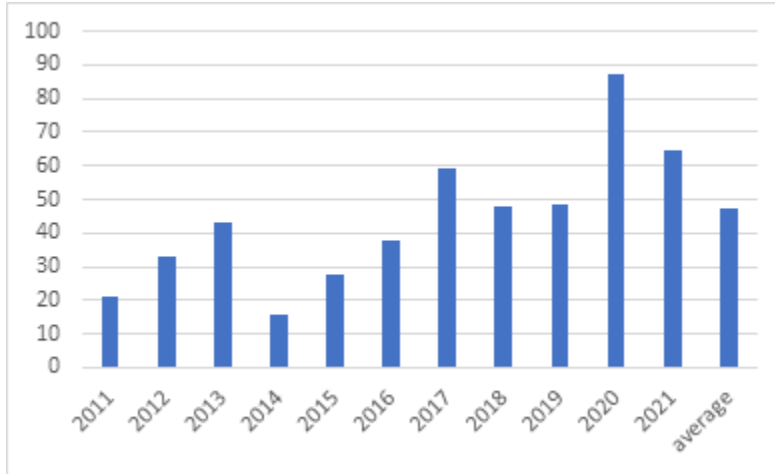
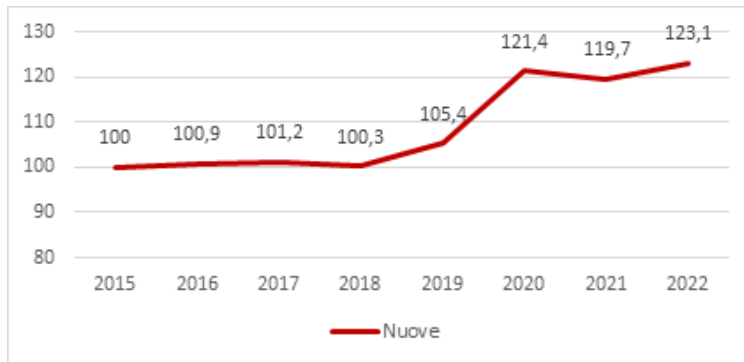


Figure 7: Housing price index for new built housing - 2015-2022, City of Milan (2015=100). Authors' elaboration on Istat



Even in the case of the few realized affordable rental housing units, which comply with recent energy efficiency standards, rents are around 80 to 120€/sqm per year (6,6 to 10€/sqm per month), an amount that is not affordable for the significant number of household that earn less than 1.500€/month – a typical wage for key workers (Nomisma, 2021).

Results: synergies and conflicts between environmental policies and housing affordability

As a result of policy instruments activated at different levels, environmental policy goals have been introduced extensively in the building sector in Milan. Most policy instruments for

retrofitting and new construction are decided at the national level, as translations of EU directives. Instead, land use policies and planning instruments (including density incentives for energy efficient buildings) are mainly a responsibility of the municipal and regional level. Similarly, funding for housing policy comes mainly from national funding allocations and by development taxes collected locally by the municipality, based on regional and local regulations.

In Milan, policy measures for improving the energy efficiency of the building sector tend to target landlords with incentives, subsidies and grants for retrofitting without including any form of cap to the housing cost or protection of existing tenants. There is no extensive study on the impact of retrofitting on housing prices and rents, but there is large agreement that this is the case and estimates by real estate think tanks and estimates on housing price databases by the authors suggest that retrofitting a dwelling could increase its value of between 30% and 40%. Indeed, housing prices and rents are growing rapidly in Milan and, though retrofitting is most probably not the only reason of this growth, in the absence of any measure to cap rents and prices it can be “a fuel to the fire” of affordable housing. Somehow, the old and non-retrofitted private housing stock – especially the one located in peripheral areas – has long been the reservoir of cheaper housing for low-income households, who had to face high energy bills or energy poverty but could still access a roof: increasing retrofitting is compressing the amount of this “accessible” stock with relevant consequences for poorer households. Subsidies for retrofitting in Italy tend to benefit more landlords than tenants, since the latter are charged high rents for a retrofitted dwelling. Moreover, also within homeowners – with Italy being characterized by a high share of those in the population – subsidies for retrofitting tend to have a regressive distribution: a higher sum goes to higher income homeowners. This issue is connected to the national legislation, which does not foresee any diversification of subsidies according to income or wealth.

Energy efficiency standards for new construction achieved a much more efficient new residential development, which however tends to be so expensive to price out a large part of the income earners. New residential units are much more energy-efficient than old ones thanks to increased standards, but are put on the market with an average price of more than 5.000 € per sqm in the municipality of Milan (excluding the city centre), meaning that approximately 80% of the working population would not be able to afford buying one unit without parental help, previous savings

or inheritance. The average price for a refurbished unit is above 4.000 € per sqm (excluding the city centre), around 30% more than non-refurbished units – that however saw a more relevant growth in prices, connected to expectation of profit from refurbishment. In other words, while insiders – i.e. people who own a dwelling – can profit from refurbishing, selling or renting their property or even simply registering an increase in value of the residential asset (largely not taxed), outsiders – i.e., tenants, newcomers, young people without parental help – are largely disadvantaged.

From the point of view of densification and land use, Milan – like many other European cities – can be considered a rather compact city, in which density was always considered to be a primary goal. Nevertheless, urban expansion has shaped the city and almost filled its municipal territory. Today, almost all redevelopment happens in brownfield transformation and densification actions. The most recent planning instruments grant relevant density bonuses to big parts of the city – linked to a zoning of proximity to public transport nodes or regeneration of peripheral areas. The local government, which since the end of the 1970s has not had an active land policy for the provision of affordable housing, has only recently introduced significant inclusionary zoning requirements of 40% affordable housing in new developments. However, those requirements are not due for redevelopments below 10.000sqm of GFA, which is the case in many redevelopments especially in high-valued areas. Overall, between 2011 and 2021 only around 23% of all building permits for new housing units granted in the municipality of Milan were in the framework of affordable housing (Nomisma, 2021). Additionally, requirements for public housing (which currently are set at 5% of the new housing production) can be avoided by paying a fixed amount and in fact public housing production in the decade has been 0%, despite the long waiting list of households with the very tight eligibility criteria for public housing – often corresponding to a desperate housing situation. On top of this, energy retrofitting of the public housing stock still lags.

Table 4. Orientation of environmental policy measures towards affordable housing

Environmental policy measure	Low orientation towards affordable housing	High orientation towards affordable housing
Retrofitting	Retrofitting in Milan tends to favor homeowners over tenants (who pay the cost with higher rents), insiders over outsiders, higher income over lower incomes. Retrofitting is estimated to increase the value of a dwelling of 30 to 40%, thereby reducing the amount of housing that is affordable. Limited rental contracts and possibility to are exposing tenants to incre	electricity and gas allowance means-tested on the basis of income proof
Densification	Densification policies are meant to provide more residential units close to public transport nodes (but also in peripheral areas), but no inclusionary zoning on small-medium transformations	Inclusionary zoning requirements 40% affordable housing in large developments (over 10.000sqm GFA)
Standard on new construction	New construction is more energy efficient but predominantly for profit, and price for new units is largely out of reach for low- and middle-incomes. Volumetric incentives are granted to efficient buildings without any affordability requirement	between ¼ and 1/3 of new units is price and rent capped for some years

3.2. Oslo

Oslo, the capital of Norway, is a county municipality with a population – within the municipal borders - of 709.037 people as of January 2023 (Oslo Statistikkbanken, 2023). The municipality of Oslo includes two thirds of the population of the morphological city – *Tettsted* – and nearly one half of the population of the functional urban region – *Stor Oslo Regionen* – where 46 municipalities are located, with a total population of 1.545.706 people.

Since the early 2000s, Oslo has experienced substantial population growth (about 33% increase between 2004 and 2021- Oslo Statistikkbanken 2021 – with a population projection of more than 800.000 inhabitants by 2030). Such rapid growth has made Oslo one of the fastest growing cities in Europe (Torstensen and Roszbach, 2019). With its increasing attractiveness (Andersen and Røe, 2017) nationally and internationally – evidenced by its competitive position in international city rankings for sustainability and quality of life indicators – Oslo has become an attractive hub for business investment, and it is today the most important economic area of Norway. When it comes to socio-economic conditions, unemployment in Oslo is, in a European context, quite low.

The share of fully unemployed is 1,9% against a national average of 1,6% (NAV, 2022). The medium household after tax income in 2021 was 513000 norwegian kroner – about 50.000 euros (Oslo Statistikkbanken, 2021) . Despite these aspects, inequalities have been on the rising with growing patterns of socio-spatial segregation and polarization (Wessel, 2015).

From a governance perspective, Norway is a unitary state with three levels of government; the national level, 11 counties and 356 municipalities. When it comes to planning, the Ministry of Local Government and Modernization is the national planning authority and is responsible for the national Planning Act, but it has few direct responsibilities. Counties supervise planning of local governments and prepare regional plans (which mainly focus on transport, land-use, mountain, outdoor recreational and coastal planning). Spatial planning is managed locally, with municipalities being the main planning authorities. They prepare and approve municipal and zoning plans, even though zoning plans (about the 90%) are increasingly prepared by private developers and then submitted to municipalities for political approval.

The Ministry of Local Government and Modernization is also the national housing authority and responsible for the national housing policy, which sets the political line of homeownership (*eierlinje* in Norwegian) and has features that will be further explored in the next section. While spatial planning is mainly locally managed, housing is substantially influenced by the national level. Municipalities can prepare local housing policies and recommendations, for example aiming to increase housing affordability (Oslo Kommune, 2018), but specific land-use and housing regulations at the national level are binding and substantially limit local policy capacity.

Housing system and housing affordability trends

The Norwegian national housing policy is characterized by: 1) promotion of homeownership; 2) lack of price regulations across the different housing sectors; 3) lack of a third housing sector; 4) a political focus on “well-functioning housing markets” in which the housing supply is controlled by the market and property developers (Sørvoll, 2018); and 5) a strongly means-tested public housing sector.

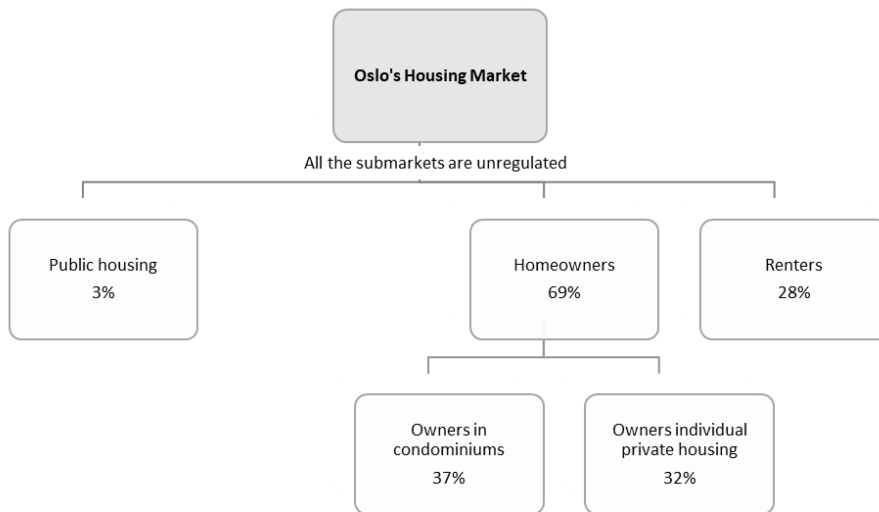
The Norwegian housing system has faced substantial changes over the years. In the post-war period, Norway developed a so-called “social homeownership model”, where a strong

cooperation between municipalities – as land providers – the State Housing Bank – as the financing actor – and a non-profit national housing company (OBOS) - as housing builder – led to the creation of a vast affordable and price-regulated housing stock. In this model, the promotion of homeownership has been the main political line and something that, as mentioned, is still predominant in the Norwegian national housing policy (Cavicchia, 2023). Housing cooperatives (*borettslag* in Norwegian), a result of the social homeownership model, answered the increasing housing demand of the population, creating the conditions for approximately 80% of Norwegians to become homeowners since the 80s. However, a sweeping reform in 1983–1986 removed most of the regulations previously present at the national level and started a gradual withdrawal of supply-side measures for housing affordability. As a consequence of these changes, Norway is today an example of a dualist housing system (Arbaci, 2007), with liberal traits within a democratic welfare state. In Figure 8, the characteristics of the current housing market in Oslo are represented (Cavicchia, 2022).

- The biggest submarket is represented by homeowners (69% of households own their dwellings against about 80% at the national level). Homeownership is supported in different ways: 1) young people (until 35 years old) get financial support from the banks to save money for the down payment (which is 15% of the total housing price); 2) the loan interest is deducible from the taxable income; 3) homeowners can rent up to 50% of the flat where they live without being taxed.
- The rental sector (circa 28 %) is exclusively private. The national rental law (the tenant act, ref) establishes that in an ongoing tenancy, there are only two lawful ways to increase the rental charges: 1. Index-linked increase in rental charges. The rent level can be increase maximum once a year and the change must be in line with the consumer price index (Landlord & Tenant Act § 4-2). 2. Adapting the rent with prevailing rent levels (Landlord & Tenant Act § 4-3). This option is possible only if the tenancy agreement has been running for 2 years and 6 months and it is both possible that the landlord requires and increase as well as that the tenant requires a decrease, in case the paid rent is higher than that of a comparable accommodation.

- The public sector (circa 3%) is very limited and concentrated in specific areas of the city, where there are often issues of poor dwelling quality, low housing stability and strong segregation dynamics (Nordahl, 2020). It should be noted that the public sector itself is not price regulated. Rent level follows the market and the Norwegian State Housing Bank, through the local welfare offices, provide subsidies that are strongly means-tested.

Figure 8. The tenure structure of Oslo (Student housing is an exception. The price is below the market price and corresponds to the construction costs). Made by the authors on various sources.



With the above-mentioned reforms, radical changes came into place also at the local level (and in particular in Oslo where the housing market is mostly under pressure), with important consequences not only for housing affordability but also for the actors involved in the provision of housing.

First, at present in Oslo there is no third housing sector. It is only with the municipal plan of 2018, the first elaborated under a red-green coalition after more than 30 years of conservative city administration, that housing development is associated with principles of social sustainability related to affordable housing (Oslo Kommune, 2018b, p.47). The plan also presents the first proposal in Oslo of a third housing sector, which should be characterized by two main aspects: first, housing allocation and price settings should not follow the premises of the commercial market (Oslo Kommune, 2018a); second, the municipality shall act strategically through a more active land use policy. Furthermore, in 2019 the city government launched a policy plan with set

of strategies to provide affordable solutions for in-between income groups, such as rent-to-own (Oslo Byråd, 2019a) and a housing strategy for the period 2019–2023 has been established with the following goals: (1) 1000 new homes within the third housing sector by the end of 2023 in cooperation with private and non-commercial actors; and (2) in the long term (but without any time specification) at least 20 per cent of housing in Oslo shall be affordable housing' (Oslo Byråd, 2019b). Despite the importance of this political attention on housing accessibility and on the necessity of public action on the supply side of the housing market, the third housing sector strategy still lacks a comprehensive approach that goes further from the proposal of some pilot projects (Cavicchia, 2023). Indeed, newly constructed densification interventions in Oslo still mostly follow commercial market premises.

Second, the municipality of Oslo is economically limited from the perspective of land ownership. Indeed, one of the consequences of the neoliberal reforms from the 80s has been that several municipal plots were sold or leased (Oslo Kommune, 2018a). As pointed out in Cavicchia (2023), the legacies of these actions have been multiple: 1) the municipality today owns approximately 30% of the land within the municipal borders, but the 75% of this land is mostly located in the forest belt, which is protected by a national law that does not allow construction (Markaloven); 2) the municipality's remaining expandable land resources and development areas mainly constitute properties that for various reasons are demanding to prepare for development, and which have therefore not been sold (Oslo Kommune, 2018a); 3) the municipality has lost its historical role of land acquirer and provider (land acquisition and assembly is today in the hands of developers (Eika, 2020). This has important consequences for affordability as with poor land ownership, the municipality is unable to dictate conditions for private housing construction on buildable plots (Barlindhaug et al., 2018, p. 25).

Third, housing provision is almost completely in the hands of private developers. As mentioned above, private developers are very powerful actors in Oslo's spatial planning, being the main actors proposing zoning plans. In addition, private actors play a crucial role in land supply (as a consequence of the described huge losses of land during the 1980s, the municipality lost its role as main land supplier). These aspects make private developers the main, and almost only, housing providers in Oslo (Andersen et al., 2021).

Against this background, housing affordability conditions in Oslo have worsened, with an increasing gap between housing prices (which grew approximately 200% between 2004 and 2018) and wages, which increased by 75% in the same period. As noted in previous studies (Cavicchia 2021;2022;2023), due to Oslo being a prevalent homeownership context with increasingly high housing prices (in 2021 the average price/sm was approximately 86000 norwegian kroner- Bydelsfakta, 2021), the main issue is represented by housing accessibility, which indicates the conditions of entering the housing market for housing market outsiders. Indeed, there are two fundamental requirements to become a homeowner in Norway. One concerns income, as the maximum loan that banks can provide is equal to five times the household gross yearly income. The second, and most important, is represented by personal financial assets, for to get a bank loan one must have 15% of the total housing price as down payment. This requirement represents an important bottleneck and increasingly shapes the divide between those who have financial assets (which for the 40% of young people in Oslo depend on “parent banking”) and those who do not. An interesting indicator to monitor housing accessibility conditions in Oslo and in other Norwegian cities is represented by the so-called “nurse index”, which is elaborated by Eiendom Norge, an organization of Norwegian real estate agencies. The index assesses the share of housing units sold in a specific year that a nurse can afford to buy. Nurses are chosen as target group for the index as they are representative of medium income level in Norway. The calculations are done on a single nurse, being single households (with low-medium income) entering the housing market those in the most challenging situation (Cavicchia, 2021). According to the index, in 2013, a single person with a medium income could buy 13 out of 100 homes sold in Oslo. In 2022, the proportion was reduced to 1.5 per cent. While the index offers relevant information, it is also important to point out that it is likely to offer a better picture of the actual current situation. The index only considers income and not the financial assets necessary for the down payment, meaning that those having the “income requirement” to get a high enough home loan, might not have the financial assets for the down payment.

When it comes to the rental market, about 28% of Oslo’s population is represented by tenants. Research on the affordability conditions of the rental market is very limited, mainly due to lack

of fine-grained data. Even though at the municipal level, rental prices have increased far less than housing prices (90% vs. 146% in the period 2005–2018), they are still prohibitive for many. In 2022, the average monthly rent for a one room flat (about 35 square meter) in Oslo was more 12770 Norwegian kroner – about 1.300 euros (Statistics Norway, 2022), corresponding to the 36% of the average income of a single person (higher than the threshold that Eurostat considers as housing price overburden, i.e. 33% of the household income).

Environmental policies

The municipality of Oslo has been committed to environmental sustainability in planning for forty years, also as a legacy of the Brundtland's government and the attention devoted to sustainable development since then. While part of various networks and initiatives oriented towards climate neutrality (e.g. C40, Future Built, SmartOslo), the most comprehensive policy at the local level to set climate goals and actions to implement is the *Climate Strategy for Oslo towards 2030*, which is a climate action plan compatible with the Paris Agreement. The strategy is guided by data on the city's biggest emissions sources and to tackle them the climate and energy strategy has set 16 target areas with the aim for building and construction work to be fossil-free, then zero emissions by 2030. With densification and transport planning being the central arenas for sustainable planning, Oslo's Climate Strategy has set an ambitious vision for climate neutrality and various initiatives (which include buildings, transportation, energy use, recycling, water management and so on) have been planned and implemented in order to reduce Oslo's greenhouse gas emissions in 2030 by 95 per cent compared with 2009 levels (Oslo Kommune, 2020). The Climate Strategy is guided by data on the city's biggest emissions sources and to tackle them the climate and energy strategy has set 16 target areas with the aim for Building and construction work to be fossil-free, then zero emissions by 2030. The main tool used at the municipal level to track emissions in different sectors and to set the measures to implement is represented by the Oslo Climate Budget, introduced for the first time in 2017 and a pioneering experience for the city. The concept at the basis of the climate budget is that every year, the city of Oslo calculates how much emission-producing activity will contribute to greenhouse gases, then implements a carbon budget to keep those levels low. The budget is locally managed by the Vice Mayor for Finance, in cooperation with the municipal department of environment and

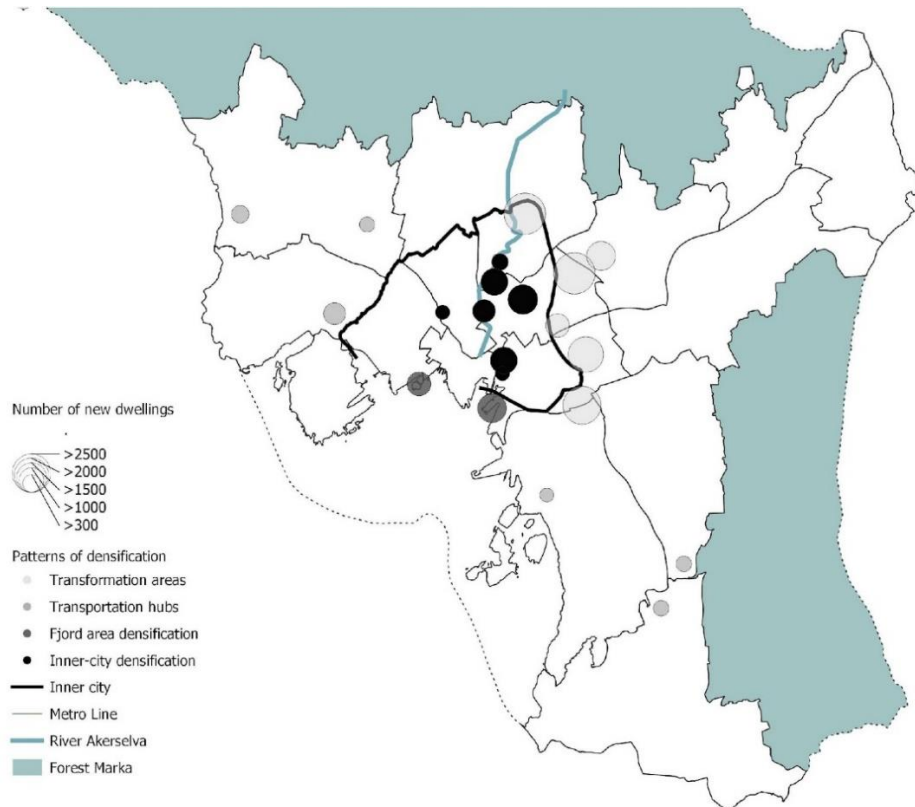
transport and the municipal climate agency. As noted in Oslo Kommune (2021), in order to achieve the set climate goals at the local level, it is also crucial that some instruments are enhanced at the national level and in particular “removing barriers to the municipalities such as introducing zero-emissions zones for climate reasons or to require private-sector workplaces to charge for parking, as well as an adequate level of road tolls, and the possibility of using the Planning and Building Act to set climate requirements”. As will be further explored in the next sections, the climate budget also sets specific conditions and subsidy schemes concerning the building sector, new constructions and the retrofitting of the existing housing stock.

Densification

Oslo’s fight against urban sprawl, through densification, has a longstanding tradition. Since the late 1980s, and after a long period of suburban expansion, the urban development of the whole Oslo Metropolitan Area has been compact and concentrated. Since the municipal plan in 1984, urban densification has been introduced as the main development strategy for Oslo. In those years, densification was nationally emphasized as the most sustainable way of developing cities, in particular under the government lead by Gro Harlem Brundtland, when discourses on sustainable development were at the centre of political debates. In those years, the Ministry of Environment was in charge of planning and both national policies and local plans were markedly oriented towards environmental goals. Municipal plans and governmental documents pointed at the links between densification and smaller traffic volumes, less energy for building heating, protection of agricultural and natural areas, protection of biodiversity, and contiguous outdoor areas (Miljøverndepartementet, 1998; Oslo Kommune, 1991). Following a densification development pattern, in the period between the mid-80s and today, the greatest increase in population and building density in Oslo was experienced within the municipal borders, especially in the inner city (Tiitu et al., 2021), where about 60.000 new housing units have been built between 2004 and 2018 (ref to aftenposten article) - see figure 9. This has been a result of the strong local pursuit of anti-sprawl goals carried out through two main spatial development strategies: (1) densifying from the inner to the outer city and (2) densifying around the transportation hubs (Oslo Kommune, 2018) while privileging the redevelopment of brownfields (City of Oslo, 2011). Geographically, densification has disproportionately developed in the east side

of Oslo. Here, indeed, the deindustrialization processes of the 1980s left a sizeable legacy of former industrial areas that have represented a fertile ground for redevelopment. As contended by Andersen and Skrede (2017), such a geographical imbalance might have contributed to producing uneven geographies and exacerbating existing dynamics of social and spatial polarization between the more affluent west and less wealthy east of the city.

Figure 9. Densification areas in Oslo. Authors' elaboration on data from Oslo Statistikkbanken



The major densification interventions have been concentrated in: (1) the fjord area, with its targeted redevelopment plan (ref), where new dwellings, businesses and an iconic waterfront redevelopment have been realized; (2) transportation hubs, which are areas set for multifunctional urban development and high density; (3) the inner-city, especially along the river Akerselva, which cross the city from north to south; and (4) large transformation areas, through brownfield redevelopment, mainly located in the inner-east of the city (see Figure 9). Especially since the early 2000s, low density development outside the continuous urbanized area of Oslo

has been drastically reduced and a stricter inward settlement development has been enforced (Tiitu et al., 2021). Oslo is a significant example of a densification trend⁵, that has characterized several quickly growing urban areas in Europe⁶ since the 1990s, against a general European trend where de-densification has been dominant (Wolff et al., 2018).

Retrofitting

In December 2021, the EU commission proposed to align the rules for the energy performance of buildings with the European Green Deal and decarbonise the EU's building stock by 2050. The proposal, with the Renovation Wave strategy, has been translated into concrete legislative actions to which also Norway has to comply. Norway's government has announced that it will cut energy use in buildings by 10 terawatt hours by 2030. The plan is to be included in the climate budget for 2023. The EU's directive will be able to require the owners of more than 200,000 Norwegian homes to take cost-saving measures until 2030 (Hovland, 2022). In addition, there will be the requirement that all buildings with energy class G have upgraded by 2030. Furthermore, by 2033, buildings in energy class F must also be upgraded, at which point even more households will have to act.

So far, the directive has not been translated in a law in Norway. As of today, most expenses for housing retrofitting are still handled by homeowners, but different kinds of support schemes are available. The main comprehensive initiatives concerning the housing stock are part of the Climate Budget, which, as mentioned, is a government fund with the purpose of reducing greenhouse gas emissions, promoting energy efficiency, and an environmentally friendly restructuring of energy use and production. The fund manager is Enova SF, a company owned by the Ministry of Climate and Environment. There is an agreement, running between the 1st of January 2021 and 31st of December 2024, between the Climate and Energy Fund and Enova SF to contribute with about 3 billion Norwegian kroner (approximately 3 mln euros) per year (see, https://snl.no/Klima- og_energifondet). The Climate Fund provides grants for climate and

⁵ The population's average distance from dwelling place to the city centre of Oslo has remained nearly constant at about 16.0 km between 2000 and 2018 (Tiitu et al., 2021)

⁶ In particular in Norway and Sweden, as well as in Belgium, the UK, Switzerland or Northern Italy (Wolff et al., 2018, p.12)

energy measures in housing associations and condominiums, businesses and private homes and it is indicated as a fundamental tool also to boost growth and climate-friendly technology.

There are different support schemes that can be granted to both housing cooperatives as well as private owners, and the entity of the support changes according to the typology of intervention to implement. The main schemes for private homes concern replacement of doors and windows, insulation of the building envelope, systems for water management and use of wind energy. For condominiums, the main support schemes concern the installation of solar energy systems and interventions on the building finishes (windows, doors and envelope insulation). Differently from the Italian context, where subsidies cover up to 100% of the expenses, the grants from Enova SF have specific thresholds for each kind of interventions and, in the case of condominiums, depend on the number of housing units.

In addition, the State Housing Bank (Husbanken) can provide loans for upgrading projects that contribute significantly to a more energy-efficient and accessible housing stock. Generally, Husbanken requires that the project does not only include energy efficiency measures but also intervention to increase the physical accessibility of housing. Husbanken can provide loans for upgrading external roofs and loans for upgrading external walls, including windows and doors. The loan is not means-tested and those projects that meet support from Enova SF for housing upgrade energy level 3 or better (for privately owned homes) and energy class 2 or better (for housing associations), will automatically meet Husbanken's energy criteria for loans for upgrading.

Standards for new constructions.

Energy and climate requirements for new buildings are mainly regulated at the national level through building codes (TEK 17), which describe the minimum characteristics a building must have in order to be legally constructed in Norway.

At the local level, further requirements are adopted within the framework of the above-mentioned Oslo's Climate Budget. The City of Oslo is primarily focusing on tackling emissions from municipal construction projects, which represent roughly 20% of the city's construction market. As a first step, these municipal projects have used sustainable biofuels since 2017,

reducing Oslo's total construction sector emissions by close to 20%. However, while biofuels are fossil-fuel-free, they are a scarce resource and do not help to reduce local pollution or noise. As a result, the city is now focused on transitioning to electric (zero-emission) construction technologies. Starting with the Oslo Climate Budget for 2021, a new vision concerning specific requirements also for private constructions realized by developers has been introduced. These requirements comprise fossil-free building and construction sites and, gradually, requirements for zero-emissions building and construction sites in new zoning plans, in dialogue with the pollution control authorities. These new requirements are crucial as four out of five building sites are state owned or private sector. Preliminary rough estimates suggest that the City Government's proposed requirements could cover approximately 40–80% of building activity by as early as 2024 and increase further leading up to 2030. Consequently, this instrument is expected to significantly reduce emissions from building and construction sites within just a few years.

Results: synergies and conflicts between environmental policies and housing affordability

Oslo is well known to be a city with a strong political commitment towards environmental sustainability and, in the latest years, to energy efficiency and climate neutrality. While ecological retrofitting and energy efficiency standards on new construction are mainly regulated at the national level (even though since 2017 the Oslo Climate Budget has introduced stricter local requirements), densification is predominantly regulated at the local level (while complying with the national vision present in the Planning and Building Act). As mentioned, indeed, municipalities in Norway are the main planning authority and responsible for spatial planning.

In light of how the explored environmental policies are implemented and of the characteristics of the Norwegian housing system, important conflicts between environmental policies and the provision of affordable housing come into play. As can be seen in Table 5, the case of Oslo can be mostly exemplified as an example of green growth outcome, meaning that the orientation towards reaching environmentally sustainable goals has been accompanied by a very poor orientation towards housing affordability. It is important to point out that the considerations that will be done in the next paragraphs are mainly based on that affordability and accessibility of the

homeownership stock, as data on the rental stock in Oslo exist only per macro-areas and therefore do not allow for detailed analysis.

When it comes to densification, a combination of developer-dominated planning, concentration of new constructions in attractive and expensive areas of the city, and lack of housing regulations have produced a housing stock that is increasingly difficult to access, especially for first time buyers (Cavicchia, 2021). In addition, research has shown that densification is associated with prohibitively priced housing markets that spill over into surrounding neighbourhoods, generating exclusionary pressure, which might indicate emerging gentrification dynamics (Cavicchia, 2023). In the context of Oslo, urban areas adjacent to newly developed densification areas have shown not only very significant housing price appreciation between 2005 and 2018, but also substantial change in their residents' composition (with significant increasing levels of income and education). Oslo being a prevalent homeownership context, where, thus, issues of direct displacement hardly happen, such change in the socio-economic composition of the surroundings of densification areas can be associated with strong housing speculation dynamics (Cavicchia, 2022). In densification's adjacent areas, housing transactions were shown to be characterized by very high buying-selling volumes with some of the units sold up to 3-4 times in a 15-year time span. The consequence was that dwellings were sold at increasingly high prices and, thus, that the people moving in needed to have a higher economic condition compared to incumbent residents. While more research is needed on the topic, the hypothesis is that developing densification in a completely uncontrolled housing market as in Oslo might trigger such dynamics.

Concerning the ecological retrofitting of the existing housing stock, one of the emerging aspects is that it tends to favour homeowners in Oslo, for two main reasons. The first is that national subsidies are only for homeowners. The second is that retrofitting might lead to increase rental prices for tenants. Indeed, while the national Norwegian Tenant Act does not allow landlords to increase rental price more than the increase of the Consumer Price Index once a year, this rule does not apply if there is a change of tenants. Further research should thus explore if retrofitted units tend to be associated with shorter tenancy contracts.

Finally, considerations about potential conflicts between standards for new construction can be aligned with what has been discussed in relation to densification as newly built housing in Oslo is prevalently part of densification projects.

Table 5. Environmental policies and orientation towards affordable housing in Oslo

Environmental Policy measure	Low orientation towards affordable housing	High orientation towards affordable housing
Retrofitting	Retrofitting in Oslo tends to favour homeowners who are those that can benefit of the national (non means-tested) subsidy scheme. Research on the topic has not been conducted yet but there might be a tendency of retrofitting actions to further stimulate housing speculation in Oslo. As far as the rental market is concerned, risks linked to short-term contracts (which allow for uncontrolled price charges) should be considered.	No targeted measures for different income ranges, no tenant protection.
Densification	Densification in Oslo is supposed to be a sustainable way to meet the increasing housing demand, due to remarkable population growth. The almost complete lack of affordability initiatives in connection with densification interventions, makes it hardly affordable, especially for single households and for those lacking enough financial assets. The choice of mainly densifying in central areas and around transport hubs, where land is more expensive, further contributes to low levels of housing affordability within the densification stock.	In the past few years, the major housing developer in Norway (OBOS) has developed two initiatives aiming at promoting housing affordability in newly built housing. The first is about selling a selection of units at 20% lower than the market price. The second promotes a solution of rent to own.
Standard on new construction	New housing developed privately has not been subjected by the stricter energy efficiency requirement that, until 2021, applied only to public construction. Even though new construction is more energy efficient compared to existing buildings, almost all the new stock is sold at market level price, exacerbating the housing market accessibility issues. Implications for housing affordability in this case might go hand in hand with those of urban densification, being the majority of new constructions part of densification interventions.	

In order to explain the conflicts between environmental policies and the orientation towards affordable housing, at least three contextual filtering mechanisms should be considered:

- 1) The Norwegian housing system with its lack of price regulations, promotion of homeownership and low tenant protection
- 2) A strongly market-oriented planning approach where private developers have the power to choose where to build and are the main housing providers
- 3) Land-use related limitations: at the national level the Planning and Building Act states that in the planning agreements between municipalities and developers, for the latter there might be requirements about 'the number of dwellings in an area, largest and smallest dwelling size, and further requirements for accessibility and the design of the dwelling where it is appropriate for special needs' (Plan- og bygningsloven – pbl 2008, § 12.7). Municipalities, however, are not allowed to ask private developers to introduce affordable housing units and/or rental units in their projects. Decisions regarding the number of dwellings and their typology are the main tools that might be used to create a diverse housing offer.

3.3 Vienna

As a capital city, Vienna is in many ways exceptional for the Republic of Austria. Being historically the cultural and financial capital of the former Habsburg monarchy, it remains by far the largest and most prosperous city in the Republic of Austria. Today it has about 1,98 million inhabitants (2023), which is a bit more than one fifth of Austria's population. However, this was not always the case. The era after World War II was marked by stagnation, population loss and the location at the edge of Western Europe near the iron curtain. The fall of the Iron Curtain changed the geopolitical situation of Vienna becoming a major hub towards Eastern European countries (see Hatz, 2008 for more details). Following the accession of Austria to the European Union in 1995, the late 1990s saw Vienna returning to population growth again after the population stagnated in the mid-1990s. The expansions of the EU towards the East from 2004 onwards further intensified population growth. Since 2015, Vienna has also recorded a substantial refugee migration from Syria and Afghanistan. Between 1995 and 2020 Vienna grew by about 370,000 persons (Boztepe et al., 2020).

Vienna has also an exceptional role within the overall multilevel governance arrangements. It combines both the authority of a federal state and the municipality of the federal Republic of

Austria. Although many issues are assigned to the federal government, Austrian federal states are key players in the multilevel governance arrangements and cannot be reduced to administrative sub-units implementing federal policies (Steurer and Clar, 2015). Both the federation and the federal states have their own legislation, law enforcement and their financial budgets. Federal states are in general allowed to levy their own taxes, but most of the taxes are collected at the federation which are distributed through the fiscal equalisation scheme to the states. Federal states also have the sole responsibility in legislation over certain policy fields, e.g. building laws, housing subsidies, regional planning, nature preservation and landscape protection to name a few. According to Steurer & Clar (2015) the federal ministries try to avoid pressuring federal states, but rather seek cooperation through so-called article 15a agreements which are binding for both levels according to the federal constitution of Austria. While municipalities have sovereignty over local zoning and building inspection for instance. Furthermore, since 1995, when Austria joined the European Union, European legislation plays another central role.

In terms of political context, it is remarkable that the social-democratic party has constantly ruled over Vienna since 1919, except for the Austrofascist and Nazi period between 1934 and 1945. According to Mocca and Friesenecker (2022) this great stability at the local level is remarkable, as especially in recent years other European cities have witnessed political change. Nevertheless, the electoral landscape in Vienna also changed in recent years and the social-democratic party (SPÖ) were forced to form coalitions for the city government. Between 1996 and 2001 the social-democrats coalitioned with the conservative party (ÖVP) between 2010 and 2020 Vienna with the Green Party and since 2020 with the NEOS (The New Austria and Liberal Forum). While the ÖVP and the Green Party held competences over planning competences, the NEOS are in charge of education. Being embedded in a federal republic, Vienna has been characterised to continue being a “Red Island” in conservative sea (Mocca and Friesenecker 2022), and actually Vienna’s politics often clash with those on national levels, especially when conservative or right-wing governments without the SPÖ as a coalition partner were in place – such as between 2000 and 2006, as well as between 2017 and 2019.

In terms of socio-economic context, Vienna is characterized similarities and differences regarding recent developments in social stratification and socio-spatial shifts. In general, an occupational

shift towards an expansion of professionals and managers as in other European Cities is reported for the last two decades (Riederer et al., 2019). This trend is also reflected in a substantial increase of citizens with tertiary education, while those with compulsory education have declined in absolute number since 1991 (Friesenecker and Kazepov, 2021). Nevertheless, employment in lower-class jobs have increased due to expansion of jobs in routine service and sales jobs, whereas middle-class jobs have declined. Hence, as showed by Riederer et al. (2019) the income stratification is characterized by a polarisation trend characterised by declining middle class and growing shares of lower classes. At-risk-of-poverty and unemployment in Vienna has clearly increased in the recent decades. According to different definitions the at-risk of poverty increase to 17 and 30% in 2018, whereas the unemployment rate increased from 5 to 10% between 1995 and 2018. (Verwiebe et al. 2020).

While labour market changes had an impact, also the massive immigration since 1991, in combination with educational-related factors, impacted the social stratification of the city (Riederer et al. 2019). Social stratification patterns are very much characterised by variegations between native and non-native born Austrians and within immigrant groups. While the middle-classes of non-native born Austrians shrunk in general more substantially than those of native-born Austrians, migrants from the EU15 are better positioned because of better labour market integration as well as better educational and language skills (Riederer et al. 2019; Boztepe et al. 2020). In turn, the income position of households with a migration background from countries that have joined the EU after 2004 and from third-party countries are weaker, predominantly of those with lower educational qualifications (Boztepe et al. 2020).

Housing System and Affordability Trends

Characteristic of a federal republic, Vienna – as a regional state and a municipality – is embedded in a complex multi-level arrangement system of housing regulations ranging from the European, national, and regional level down to the municipal level. As previously mentioned, the European Union has no formal responsibility in housing but influences Austria's and Vienna's housing policies through the competition law and the convergence criteria of the Maastricht criteria, e.g. in terms of budgetary constraints and state aid regulations, since 1995.

The general responsibility for housing lies at the federal level, but the regional level is of considerable importance too and responsibilities are sometimes blurred. The federal constitution law (Art. 11) defines that the legislation for the Volkswohnungswesen (social housing affairs⁷) falls within the competence of the Federation, except for housing promotion of the domestic housing construction and retrofits. These social housing affairs at the national level are legislated through the Limited-Profit Housing Act [WGG] (IIBW 2008). Other important legislations at the national level are the Residential property law [WEG] and the Tenancy law [MRG].

Federal states, such as Vienna, hold the legal responsibility for housing promotion and subsidies, for building and planning laws. The legislation over housing promotion and subsidies has been delegated to the federal states in 1989. The City of Vienna regulates housing subsidies within the Vienna residential construction and renovation act [WWFSG]. The granting of subsidies for new construction or rehabilitation allows the city to intervene in rent-setting, thereby overruling the federal law (tenancy law) for the duration of the subsidy. Housing subsidies stem from two financial resources: reflows from outstanding loans and funds from the budgets of the federal states (IIBW & FV Steine-Keramik, 2022). Usually, the reflows from outstanding loans are higher and highlight the self-sustaining financial cycle of the housing subsidy system. The latter – funds from budgets of the federal states - stem from the so-called housing subsidy contribution (Wohnbauförderungsbeitrag), which is a 1% payroll tax on wages equally paid by employers and employees (Marquardt and Glaser, 2020). Since 2017 the full autonomy over this taxation, but also over the collection, is located at the federal state level directly. This means that the federal states can also decide upon the height of the housing subsidy related payroll tax, but no federal state has used to this autonomy to either raise or lower the amount of the tax (IIBW & FV Steine-Keramik, 2022).

To complete the picture on Vienna's embeddedness in the multi-level arrangement, federal states are hold responsibilities to formulate spatial planning and building laws legislation, while municipalities are responsibilities to issue zoning and land development plans. Vienna, being

⁷ according to the translation used here: https://www.ris.bka.gv.at/Dokumente/Erv/ERV_1930_1/ERV_1930_1.html

both a federal state and a municipality, regulates regional planning, land use and zoning within the Building Code of Vienna [BO]. Through these competencies, municipalities are able, sometimes even required by federal state legislation, to support subsidized housing by providing affordable land. Municipal building inspection, which is important for decisions about demolishing buildings, but also competences in public housing are located at the municipal level. Therefore, public housing in Austria is usually called municipal housing and municipalities are allowed to apply for housing subsidies. Finally, urban renewal falls within the responsibilities of municipalities, for which they are allowed to request subsidies (IIBW, 2008).

Having outlined the multi-level entanglements in housing policy, we now take a closer look what is regulated by the legislations and how changes in policy instruments at higher tier levels affected Vienna's housing system on the one hand. On the other hand, we now have a closer look how Vienna uses the policy instruments at 'hand' to foster social and affordable housing.

For more than a century (with an interruption during the Nazi regime), Vienna's urban policy and planning has focused on improving the quality of life of its residents. Starting from the enormous health problems and dilapidated housing conditions caused by industrialisation and urbanisation of the late 19th century, Vienna developed a strong municipal position on urban planning and housing policy at the beginning 20th century (see Suitner, 2021; Kadi and Suitner 2019 for more details). The victory of the social-democratic party in the local elections of 1919 marked the beginning of an era targeted towards social infrastructure and the creation of the famous municipal housing of Red Vienna.

When Vienna became a federal state in 1922, the institutional arrangements for the remarkable municipal housing project of Red Vienna, as federal states have the right to tax. The substantial 60,000 municipal housing units were built via the housing tax between 1922 and 1934. After WWII, municipal housing entered mass production, which peaked during the 1980s (Matznetter, 2002). While the production of municipal housing was already declining during the 1990s, construction completely ceased in 2004 due to austerity measures imposed by the EU (Friesenecker and Kazepov, 2021). However, by outsourcing the maintenance, management and allocation of the municipal housing stock into the form of municipal enterprise in 2001, the

largely decommodified stock of 220,000 units was preserved. Keeping public control of municipal housing is possible, since Wiener Wohnen, the housing provider as a municipal undertaking, is legally part of the City of Vienna, but manages its budget apart from the official budget of the City of Vienna (Rechnungshofbericht, 2021, p. 78).

The share of municipal housing currently still accounts for around 22% of the total housing stock (see Figure 10). While the share has been declining since 1991 according to Litschauer and Friesenecker (2022), it has been the re-orientation of the Viennese social housing policy that has kept the amount of social housing stable over the years. The share of limited-profit housing nearly doubled since 1991 to 22% of the total housing stock (Litschauer and Friesenecker, 2022). When things started to shift towards limited-profit housing as early as the 1990s, this segment became the main driver of social housing provision. Their social orientation is set in the national Limited-Profit Housing Act, which stipulates that housing associations can only charge a cost rent, which covers land, construction, administrative and financing costs of the respective buildings. Furthermore, limited-profit housing associations are freed from the corporate income tax of 25%, but are required by law to reinvest their profits into new projects, land acquisition, maintenance and retrofitting. The Viennese administration strategically supported the construction of limited-profit housing units since the 1990s through a policy mix of: a) developer competitions (Bauträgerwettbewerbe), b) housing subsidies and c) an active land policy in place since the mid-1980s. In a nutshell, developer competitions are not competitions that favour cheap bidders but are instead competitions of high construction quality in combination with providing low rents therefore favouring limited-profit housing associations (see Friesenecker and Litschauer, 2022 for more details).

In contrast to the social housing segment, the private rental sector – as the second largest tenure – commodification tendencies became mainstream in recent decades. While growing in absolute terms, the share of this tenure has been stable since the 1990s and currently amounts to about 33% (see Figure 11 and Litschauer and Friesenecker, 2022). The sector is still largely regulated as tenancy law applies to multi-storey buildings erected before 1953, which mostly applies to the private rental housing stock that was built before WWI when Vienna saw major urbanisation in the late 19th century and is currently the dominant housing form in the central areas of the city.

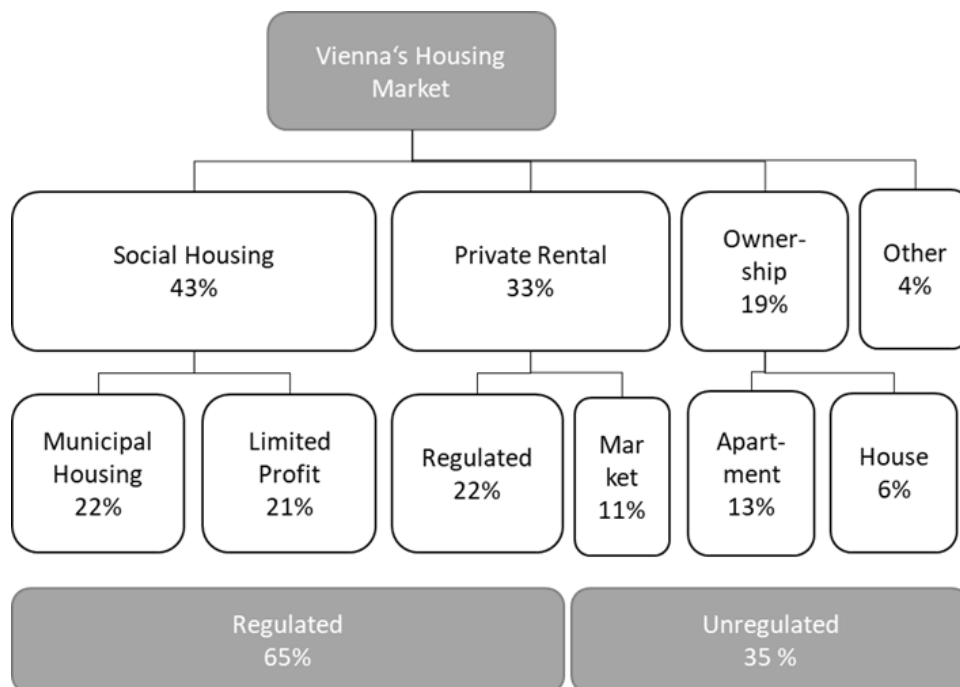
Although the sector is de jure still regulated, rent regulation has been de facto considerably weakened because of major de-regulation of the national tenancy law in 1994 and some further amendments in the early 2000s. As written elsewhere private rental contracts signed after 1994 are affected by this reform, in which a reference value rent system and the possibility for time-limited contracts for 3, 5 and 10 years have been introduced (Litschauer and Friesenecker, 2022; Friesenecker and Kazepov, 2021). Furthermore, attic conversions as well as rentals in detached and semi-detached were excluded from rental regulation in the national tenancy law in 2001 under a conservative government.

These reforms paved the way for commodification tendencies in the following years, which have been further aggravated by the impact of the global and financial crisis. The deregulation of the Tenancy Law introduced the possibility of adding surcharges on top of the reference value rent. Legislation allowed the calculation of higher rents based on the location of each dwelling in the building, the equipment of the dwelling, the quality of the building (such as the existence of an elevator) and the residential environment of the house, known as location surcharge. According to the local Tenant Association, the location surcharge is based on the property costs and whether the property costs are above or below average (Mietervereinigung, 2023). Even though the private market rental remained protected, location introduced market-principles, e.g. by raising rents to free market levels in locations with higher property prices in inner-city locations (Kadi and Matznetter, 2022). Re-negotiating rents or even the non-renewal of contracts to obtain vacant buildings, e.g. for renovation or demolition, became easier by allowing time-limited contracts. In practice, time-limited contracts in the private rental segment increased from 11% to 40% of the contracts (Litschauer and Friesenecker, 2022).

Due to these deregulations, private investors have discovered the private rental market for investments, also witnessed by a changing ownership of rented buildings. While for decades buildings were owned by private owners (e.g. families) now commercial ownership is increasing including international investors discovering Vienna (Kadi and Matznetter, 2002). The rent-regulated housing stock of the pre-war era, therefore, became an asset class for investors (Musil et al., 2022). In doing so, according to Musil et al. (2022) the demolition of buildings and reconstruction of new buildings, falling out of rent-regulation became one strategy, whereas the

legal conversion on building owner renting out apartments into condominiums, each of it into one property, plus the construction of an additional penthouse attic became a second dominant strategy. While ownership, especially apartment ownership, through this mechanism amongst others is increasing, ownership plays in general less important role in Vienna (see Figure 11).

Figure 11. Vienna's rental structure. Elaboration by the authors based on STATcube - Statistische Datenbank von Statistik Austria.



The robust institutional setting described above including its housing regulation is also the reason why the tenure system of Vienna is remarkably stable, including the great stability of social rental housing (Kadi and Lilius, 2022). Nevertheless, mainly due the deregulation of the private rental sector, steep rent increases within this segment are observable. Litschauer and Friesenecker (2022) have shown that free-market rents doubled since 2005 and amounted to around 12 €/m² including utility costs in 2018, similar to the average rental price when time-limited contracts were issued. Private rents in rent-controlled units generally rose slightly less than in the free market which indicates that rent-controlled still dampened price increases. Average rents in limited-profit housing (7,6 €/m²) and municipal housing (6,8 €/m²) are relatively the most affordable housing sectors in 2018. For limited-profit housing usually capital contributions in the form of one-time payments for construction and land costs are required, especially if newly-built.

For low-income households this has become a crucial barrier upon which a diversified funding scheme that required a certain number of apartments with capped capital contributions was launched (see Litschauer and Friesenecker, 2022 for details).

Regarding housing affordability, the housing cost burden rate shows that about 44% of the Viennese households pay more than 25% and about 18% pay more than 40% of their incomes for rents – which is compared to other European cities considerably low (Baron et al., 2021). However, there is a considerable divide between insiders and outsiders and especially young households, residents you recently migrated to Vienna and low-income residents witness higher housing cost burdens. Hence, there is also growing divide between residents of different migrant background. While Vienna also uses a substantial amount of its housing subsidies for housing allowances and can be considered an important strategy to counteract soaring rental prices (see Peverini, 2021 for more details), this also challenges the housing system of Vienna because poverty rates are on the rise and housing allowances are a complex matter (Mundt and Amann, 2015).

Environmental Policy Instruments

In Austria – and Vienna - the tenure structure as a pre-condition is recognised to be immensely important for the working of environmental policy instruments (IIBW 2019, p. 4). The authors state that the approach to achieve a decarbonisation across all housing segments with one instrument (e.g. housing subsidies) failed and that policy mixes for every tenant segment are needed. That is another reason why the tenant structure will also guide the next section on environmental policy instruments in housing and planning.

Densification

Originally the densification of already built-up central areas aimed to ease the pressures of population growth. These areas are largely dominated by private rental housing of the pre-war area which are subject to rent regulation under the national tenancy law. Under the conservative/right-wing ÖVP-FPÖ government detached and semi-detached dwellings were excluded from the Tenancy Law regulation, implying that neither rent regulation nor regulation of contracts (like protection against dismissal) applied in 2001. Furthermore, this amendment to

the tenancy law also excluded attic conversions, thereby effectively abolishing rent controls. This exclusion was extended to other conversions and extensions in 2006 (Friesenecker and Kazepov, 2021). In practice, this means that if a ground floor apartment is newly built or new living space is created by an attic conversion, these dwellings do not fall under the regulation of the Tenancy Law, while the old, existing stock within this building continues to be subject to rent-setting and other tenant protection regulations. Hence, these reforms made it nearly impossible to build affordable housing into already existing residential areas and affordable densification was not an option. Furthermore, the demolition of existing pre-war buildings, usually of lower height, and the construction of newly built private rental or homeownership units were increasingly reported (see Kadi and Matznetter, 2022; Musil et al., 2022 for instance).

However, due to the rapid increase in population (around 450,000 since 1990) and increasing housing prizes in the private housing market, the construction of affordable housing has been a primary goal of the City Government in recent decades. To ensure the production of affordable housing, the key mechanism used is the continuous construction of new apartments across the city (Friesenecker and Litschauer, 2022). Although, the City tries to (re-)use brownfield sites, increasing land prices has forced the city to construct new affordable housing on greenfield sites as well (Friesenecker and Litschauer, 2022). For large greenfield site developments, the administration regulates the construction of new green spaces via land zoning, developer competitions and general urban planning guidelines, e.g. how large parks shall be, which features green spaces should have, etc. The Viennese administration has strategically supported the construction of limited-profit housing units since the 1990s through a policy mix of: a) developer competitions (Bauträgerwettbewerbe), b) housing subsidies and c) an active land policy in place since the mid-1980s. In brief, developer competitions are not competitions that favour cheap bidders, but are competitions on high construction quality in combination with providing low rents therefore favouring limited-profit housing associations (see Friesenecker and Litschauer, 2022 for more details).

Assessing the spatiality of new urban developments since 2005, most of these new large-residential building areas have been developed on the outskirts of the city or on previous brownfield areas distributed across the city. For example, outskirt projects included developments for more than 25,000 citizens are located mainly in the Seestadt (22th district),

Oberlaa (10th district) or in southern parts of Vienna (23th district). Most of these areas were developed at previous sites with other green space uses – such as gardens or former air-field sites. Usually, a proportion of the land has been owned by the city itself allowing for the subsidized production of affordable housing. Therefore, the land price was below the usual market-price and the production of large amounts of subsidized, affordable housing through limited profit housing associations is the main aim for these areas.

At the same time, Viennese housing projects also include the use of large brownfield projects within the city Centre. This usually occurred at different previous railways and train stations, such as Nordbahngelände (2nd district), Nordwestbahngelände (20th district) or Sonnwendviertel (10th district), or previous industrial production facilities. These areas are usually characterised by a mixed approach to housing including subsidized social housing by limited-profit housing associations, but also freely financed housing and ownership models.

In sum, the Viennese housing policy include a strong focus to build new and more residential buildings within existing urban areas. The largest advantages of the Viennese housing policy are to provide a strong instrument for integrating social and ecological aspects under the banner of liveability. While the new residential developments include the main effort to provide a minimum limit of green space for the new citizens, this came at the trade-off to improve the overall green space within the city, especially in areas where historically dense urban built-up structures lead to problems with urban heat waves and biodiversity loss. Viennese policy shows a potential to counteract the increasing socio-spatial inequalities, which can be observed in most urban areas across the globe.

Retrofitting

In general housing subsidies are considered one of the key policy instruments to ensure and implement high environmental standards in housing (IIBW & FV Steine-Keramik, 2022). This characterises the Austrian way in which rather than implementing stricter regulations, economic incentives are granted. Housing subsidies have been increasingly coupled with demanding ecological standards, e.g. of the building hull. In this light, different agreements between the federal government and the federal states (Art. 15a B-VG agreements) that also influence

housing, mostly for building regulation are important too. Since the use of housing subsidies was entirely given to the federal states, an Art. 15a B-VG agreement between the federal states and the federal government specifies common environmental quality standards for housing subsidies. This followed an earlier agreement on the reduction of emissions between the federal government and its states that already geared housing subsidies towards environmental goals (Amann and Mundt, 2021). Here, the influence of EU regulation becomes apparent as directives regarding the energy performance of buildings had to be translated into national law and via these agreements has been handed down to the federal states.

In Vienna, the use of housing subsidies for retrofitting is organised via the “Soft Urban Renewal” (Sanfte Stadterneuerung) programme. The origins of this programme date back to the 1970s with the aim to subsidise the renovation of pre-WWII private rental units while at the same time minimising negative impacts for the existing tenants (see Franz, 2015, p. 175ff). If private landlords use public loans for renewal within this programme, they must comply with certain regulations, e.g. they are not allowed to convert rental flats into condominiums and must observe a rent freeze for the duration of the subsidies - usually for 15 years. Managed by the “wohnfonds_wien” which distributes renewal subsidies in the form of loans and non-repayable grants, the programme includes several types of renewal and retrofitting. On the one hand, singular measures, e.g. dwelling improvements, improvements for liveability (shading systems, greening, etc.), but also subsidies for adding attics are subsidized. Most common, however, are the so-called base renewal (Sockelsanierung) where renewal of the building but also the dwellings are done either with tenant’s present upon their agreement, or their relocation including a financial compensation or the denial of tenants in having their apartments renewed (see Hatz, 2021 for more details). A so-called total renewal, on the other side, is done in vacant buildings and can include the demolition, new-construction or addition of storeys. In the years prior to the global financial crisis of 2008, subsidies granted to private owners, hence, the effectiveness and popularity of the instrument decreased. According to Gruber and Franz (2019, p. 390), reasons can be found in the high administrative efforts of subsidized renewals vis-à-vis an increased inflow of international investments capital and low interest rates.

According to Hatz (2021), political priorities also shifted towards environmental and climate protection efforts and subsidized energetic retrofits (Thewosan – Thermisch-energetische Wohnhaussanierung), which since its introduction in 2000 has become more important. The funding regulation stipulates that a full energetic retrofit requires the improvement of at least 3 parts of the building hull and/or heating system: replacing windows and outer doors, insulation of roof or top floor ceiling, façades, basement ceiling, or improvements in relation to the heating and hot water provision (Wohnfonds_Wien, 2023). Furthermore, they must comply with minimum requirements regarding heating and energetic standards according to the housing renovation ordinance which have been introduced in 2008 (Sanierungsverordnung). In contrast to renewal subsidies, energetic retrofits were to a large degree applied to municipal housing estates because retrofitting the building hull can be applied in occupied buildings as well (Hatz, 2021). A report of the Austrian Court of Audit, however, identified a lagging behind of retrofitting activities in recent years. Based on the assumption that a 30-year renovation cycle is the most cost-efficient, around 7,000 units should be retrofitted every year, while in between 2013 and 2023 only about 45% were undergoing retrofits or were being planned to be retrofitted (Rechnungshof Österreich, 2021). However, according to that report, Wiener Wohnen introduced a retrofitting strategy in which it identified 9% of its stock be in an insufficient energetic and building condition and to become the primary target for retrofitting.

An example that seeks to ensure long-term affordability and energy-efficient housing is the so-called ‘refurbishment scheme’ of the Austrian ‘limited-profit’ housing sector (Amann and Mundt 2021). The scheme is based on the sector’s strict regulation on the national level. Rent is controlled according to the cost-based rent principle, which means that rents are set in such a way that it covers the maintenance of the buildings and allow only for a limited amount of profit (Friesenecker and Litschauer, 2021). Based on this principle, the collection of a maintenance and improvement contributions (Erhaltungs- und Verbesserungsbeitrag - EVB) is key for retrofitting the buildings in a socially fair way. These mandatory contributions depend on the building age in such a way that contributions are lower in new buildings and higher in older ones, but are regulated so that they do not exceed a certain amount. According to Amann and Mundt (2021), regulation stipulates that these funds are used only for the house in question and are only spent

for defined maintenance works and deep retrofits. As such, limited-profit housing providers adopt long-term strategies to maintain their buildings and preserve the value of their properties whilst still providing affordable housing which might be even further supported by housing subsidies (Amann and Mundt, 2021).

Currently the main challenge is in changing the heating systems. This is not only valid for Austria as a nation, but for Vienna in particular, because around 500.000 units are still powered by gas heaters. This amounts to nearly one half of the total dwelling stock (Klimafahrplan - Stadt Wien 2022). Again, this is to be subsidised, hence, economic incentives are the main policy instruments, but are also coupled with large informational campaigns – fuelled by the energy crisis of 2022/2023. Consequently, a varied system of subsidies at the national level emerged among longer ongoing funding initiatives. Among such initiatives are “Raus aus Öl und Gas” or “Sauber Heizen für Alle”, which focus on low-income households and subsidize the change of the heating system with 100%. Although specific funding programs have been developed for multi-storey / multi-ownership buildings, most national subsidies are still targeted at single family houses.

Standards for new construction

The implementation of buildings standards to increase energy efficiency in Vienna have been influenced by the directives of the European Union and the peculiar and complicated ways in which these directives have been translated into laws and standards in a federalist republic like Austria. The federal setting slowed down the implementation in the early 2000s, hence the decarbonization of the building sector, and were even subject to an EU infringement proceeding in 2006 (see Steurer and Clar, 2015 for details). According to them a) skeptical actors on the federal state level only implementing what was required by EU policies and federal §15 agreements, whereas b) the latter was subject to federalist politics including “turf wars, power struggles and resource allocations conflicts not even related to climate issues” (Steurer and Clar, 2015, p. 99).

After the ‘warning notice’ of the EU, energetic standards were integrated into the housing and building policies of the federal states in two ways: via the housing subsidy laws or directives and via the building codes of the federal states (Amann and Mundt 2021; Steurer and Clar 2015).

During the 2000s the standards of the EU directive on the energy performance of buildings were mostly integrated in housing subsidy schemes of the federal states. Whereas, according to Amann and Mundt (2021), a mandatory standard similar to the current “nearly zero-energy buildings” standard was introduced in 2012. With some lag, the building codes of the federal states were adopted via an established association named OIB – Austrian Institute of Construction Engineering (Österreichisches Institut für Bautechnik), which harmonized the energetic building regulations over all the federal states in Austria coming in effect in all federal states in 2011. Since then all Energy Performance of Buildings Directives from the EU have been implemented with considerable time lag. The 2018s directive, for instance, has been implemented in Vienna in 2020. With this implementation standards for housing subsidies are the same unsubsidized buildings and follow the nearly zero-energy buildings” standard of the EU since 2021 (Rechnungshof Österreich, 2021).

The reform of the building code in 2018 also introduced the possibility to declare areas where it is no longer permitted to use fossil fuels for heating in new build houses per state ordinance (*Energieraumpläne*). The ordinances define so-called climate protection areas, where the installation of highly-efficient heating systems is required (Erker et al. 2021). Highly-efficient heating systems– are further defined as decentralised heating systems based on renewable energies, heat pumps, combined heat and power plants, district heating or cooling in the building code. The latter should be powered at least partly with renewable sources or coming from highly efficient combined heat and power plants.

Results: synergies and conflicts between environmental policies and housing affordability

Trade-Offs in Vienna – as shown in Table 6 – depend very much on the housing segment and location within the city.

Table 6. Environmental policies and orientation towards affordable housing in Vienna

Policy measure	Low orientation towards affordable housing	High orientation towards affordable housing
Retrofitting	<p>Main instrument: Subsidizing the retrofit of private rental. Subsidized renovations have declined in recent years because of influx of investment capital and low interest rates, which made the bureaucratic instrument, that requires the freezing of the rent level for the funding period, unpopular.</p> <p>Voluntary funds for retrofits are a common practice in multi-apartment ownership-buildings. If these buildings are rented out, owners need to pay retrofits and costs cannot be passed on to renters – which usually implies trade-offs in terms of higher rents.</p>	<p>While municipal housing guarantees the lowest rents in Vienna, the fact that Wiener Wohnen as the housing provider in the form of municipal undertaking is required to act within its own budget, poses barriers to a fast retrofit of the housing stock. Especially fuel switches are more complicated because it usually cannot be done when renters still live in the buildings.</p> <p>Strict regulation of LPHA sector is key for high retrofitting rates and high environmental standards. A ‘maintenance and improvement contribution’ paid by residents in combination with a cost-based rent principle to keep rents affordable and enable renovations. The contribution can only be used for the building and for day-to day repairs and for periodic deep renovations.</p>
Densification	<p>Densification in the parts of the City characterised by rent-regulated private rental units of the pre-war era, is undermined due to rent regulation settings leading to higher densities but also higher rents and housing prices.</p>	<p>Densification and land use policies focus mainly on brownfield developments and are meant to achieve compact neighbourhoods through land use regulations, accessible neighbourhoods in relation to good public-transport connection, mixed-use neighbourhoods by fostering the co-existence of businesses and housing, and – finally, mixed-income neighbourhoods by fostering the co-existence of different forms of subsidized, social rented housing amongst free-financed private rental and ownership units.</p>
Standards in new construction	<p>New construction becomes more energy-efficient, but unregulated rental and home-ownership units get less affordable for low- and middle income groups.</p> <p>Translation of European standards was considerably slowed down by the federal state architecture.</p>	<p>If subsidized and regulated, such as limited-profit housing associations, trade-offs in terms of housing affordability for low- and middle income groups are lower.</p>

3.4. A comparative gesture: synthesis of results across cases

Housing systems in comparison

The case studies allow to draw a comparison of the three local housing systems, which constitute the first building block of our comparison of how contextual factors generate synergies and conflicts between environmental policies and access to affordable housing. The three cities have the same economic role in their respective countries and all are within the group of attractive global cities with similar demographic trends, but they are very different in terms of housing system. The tenure system clearly highlights these differences. Vienna is a city of tenants, while Milan and Oslo are predominantly inhabited by homeowners, but these two cities are quite different as well: Milan has a much higher percentage of public housing compared to Oslo. It must be noted that the rental sector in Vienna is strongly characterized by social housing produced out of a stable local social democratic political orientation which has the capabilities to oppose national trends towards homeownership. This is the reason why it was possible to avoid the problems of rent inflation that happened in other more liberalized rental cities (e.g. Berlin).

The high percentage of homeowners in Milan and Oslo is the result of socio-political pathways of their countries. The “social homeownership” model applied by Norway and Italy in the post-war era has driven high portions of the working- and middle-classes to invest in home-ownership as a means to progress up the social ladder. This model has been progressively dismantled, making those countries opt for the path of a dualist housing system and leave most of the housing stock to commodification, asset-based welfare or profit-based investment by individuals, households and companies and financialization. The city of Vienna has clearly taken a different pathway, characterized by a more unitary rental sector, meaning that a large portion of tenants are comparatively much less exposed to increases of rents and prices.

Among our three cities, Vienna can be considered the most socially oriented housing system – despite the effects of higher-tier deregulation of the private rental sector. Average rents per month in the limited-profit housing (7,6 €/m²) and municipal housing (6,8 €/m²) sectors of Vienna are considerably lower than market rents – average rents in the private rental market range between 8,5€/m² and 11€/m², with peaks at 25€/m², depending on the type of contract

which are differently regulated (Tockner 2017; Friesenecker and Kazepov 2021). In Milan, the public housing sector feature rents calculated as a fixed share of tenants' income (from 14% to 25% depending on tenant's income bracket) and given the very low income eligibility and allocation criteria, it is on average 0,9 €/m² per month, while average rents in the market reach almost 15€/m². Public rental housing instead follows market rules with strongly mean-tested eligibility criteria.

We therefore can say that the public sector in Milan constitutes *de facto* a different tenure to the rest of the rental sector, due not only to eligibility and allocation criteria but also to high differences in rents and tenure security in comparison to the private market. This is what keeps Milan inhabitable to the high proportion of individuals with annual incomes below 15.000€ (around 30%). In both Milan and Oslo, public housing tends to be concentrated in specific areas of the city, often with poor dwelling quality and strong segregation dynamics. However, we notice a relevant difference in size and social orientation of public housing, making Milan's housing system rather more socially-oriented than Oslo's, but only for insiders (since public housing is practically negligible in terms of new housing provision and access of newcomers). Vienna, on the other hand, serves again as a contrasting example where municipal housing is spread all over the city. Yet most of the largest municipal housing estates are located on the outskirts of the city. Due to allocation rules, parts of the social housing sector in Vienna also pose a barrier for newcomers, which is why newcomers to the City are dependent on the private rental sector.

Rent control on the private rental sector in Vienna, despite gradual deregulation over time, creates a large below market segment that tends to be quite affordable for sitting tenants, also thanks to unlimited contracts. After full liberalization in 1998, the only form of rent control on the private sector in Milan, the agreed rent (*canone concordato*), is based on local agreements among various stakeholders which generally result in a below market segment; however, it is on a voluntary basis and at present in Milan it has a negligible quantitative impact (less than 5% of new yearly contracts). In the case of Oslo, the only form of rent control is represented by the possibility to increase the rent level maximum once a year and of a sum corresponding to the change of the consumer price index (Landlord & Tenant Act § 4-2).

All systems include some housing allowances as a politically more feasible policy instrument to mitigate affordability problems in the private rental sector. It is a demand side policy situated at the border between housing policies and social policies, even though the connection between the two policy domains is stronger in Vienna – where it is coordinated to other housing and social welfare measures – than in Milan and Oslo.

In Vienna, land policy is managed by the public agency *wohnfonds_wien*, which has the mandate to procure land and to organize the development of publicly owned land (and, since the new inclusionary zoning rule, also of part of privately-owned land) with social housing objectives. It does so by exercising direct and indirect powers: land procurement is done via a range of actors (private, public, and limited-profit housing developers) in the land market, the city is able to intervene in big development areas thanks to the connection in using housing subsidies and inclusionary zoning rule which guarantees the provision of a certain amount of affordable housing.

Both in Oslo and Milan the land regime is strongly targeted to increase market development and newly constructed housing, especially in densifying areas, mostly follow commercial market premises. In Milan and Oslo land procurements, which used to be practiced in the post-war era, are now substituted by land privatization, implemented via mandatory budget constraints and with urban development goals and not prioritizing (in the case of Milan) or not at all including (in Oslo) affordable housing requirements. Large scale public-led development on banked land in Vienna is programmatically linked to investment on the public transit network. By contrast, public-led land development is negligible in Oslo, while in Milan either it takes place on marginal plots far from infrastructure lines, or it takes the form of market-led public-private partnership (as in the case of the former Expo area).

Concerning housing accessibility, or the number of units that are available for lower income households, we can identify some similarities and differences. Planning and housing policies in Vienna strongly intervene with regard to rent levels but also to guarantee the provision of new subsidized dwellings which aims to provide affordable housing in times of substantial immigration. Indeed, Vienna is experiencing more immigration than Milan, while Oslo has similar patterns of strong demographic pressure. In addition, in Milan and Oslo there is a relatively new

production of housing units, but this is mainly (in Milan) or fully (in Oslo) driven by market actors, thereby featuring very high buying prices or rents that are even higher in the case of energy-efficient units. The cost-rent business model in Vienna – which applies in the relevant limited-profit housing sector – protects tenants from the upward pressure of housing prices and allows lower-income households to access dense and energy-efficient housing.

Table 7: A glimpse on the local housing systems our case studies

	Milan	Oslo	Vienna
Main tenure	Mainly homeown. (~70%)	Mainly homeown. (~70%)	Mainly rental (~80%)
Housing regime	Dual (~10% public + 1% cooperative housing)	Dual (~4% public)	Integrated (~22% public + 20% social)
Main level of social housing provision	Rent regulation and housing subsidies mainly at national level but subject to passive devolution. Land policy and direct provision mainly at the local level	Housing subsidies are strongly means-tested and provided by the State Housing Bank through the municipal Welfare office. Marginal rent regulation at the national level.	Regulation of limited-profit housing as one pillar of social/affordable housing at national level Housing subsidies at regional levels including Vienna as a federal state. Land policy and direct provision of social housing at the local level

Environmental policy instruments in comparison

Comparing environmental policy instruments for retrofitting we can observe for all three cities that economic incentives, usually in the form of subsidies, are implemented to retrofit private rentals and owned homes. In Vienna, legislation of housing subsidies in combination with the social orientation of the local government produces the policy capacity to account for or integrate both ecological standards and countermeasures to ensure affordable rents via the “Soft Urban Renewal” program. However, this program has been increasingly weakened as private

developers do not use it because of macro-economic conditions (low interest rates and increasing international investors)

Hence, using economic incentives to foster retrofitting which are usually deployed at national level – as done in all cases - seem to rather produce conflicts regarding housing affordability. Subsidizing retrofits in the private housing stock tends to put “fuel on the fire” of already increasing housing prices. On the contrary, public/municipal housing, which are at least in the cases of Milan and Vienna also dependent on subsidies, leads to tenants being protected from increases in rent. But low rents do not incentivize retrofitting and with the low funding and capacity of public housing providers retrofitting tends to be slow.

When comparing the cases, Vienna’s regulation of the limited housing profit association proved to be a differing and yet very effective example to retrofit housing in a socially fair manner. The strict regulation of LPHAs requires the formation of an “internal” financial circuit for funding retrofits. While small contributions by tenants are necessary, their use is strictly regulated in such a way that they are only used for maintaining and retrofitting, which leads to an outstanding energy-efficient building stock throughout the whole segment.

Comparing instruments for densification, strategic planning, local zoning and land use plans are key instruments in all cases. In all three cases the policy capacity is located at the local level, although property rights and land ownership regimes as well as historic urbanization patterns create variegated outcomes in terms of housing affordability through densification.

In Oslo, central areas are likely to densify, because they are much more profitable for private developers. Such market orientation goes hand in hand with environmental and green goals because mainly already built-up areas are used and the city is densified from the inner to the peripheral.

In Milan, densification depends on the specific zoning policy, but is practically allowed everywhere, and development rights are tradable, therefore market developers tend to practice densification in areas where housing prices grow more, producing a rather expensive housing market. Anyhow, given the small municipal area, a large part of the new housing supply (especially the cheap one) takes place in hinterland municipalities, where prices are lower, but

also density is lower and connection to public transportation is not comparable to Milan: in absence of strategic metropolitan coordination, housing development in the hinterland tends to increase car dependency and sprawl.

Through the policy mix of housing subsidies, land ownership and zoning, Vienna strategically develops brownfields also for affordable housing units. However, due to higher land costs in the centre, the city is forced to build also in the outskirts, where it nevertheless follows the paradigm of compact neighbourhoods. Through the specific vertical policy mix of deregulated private rental housing, the city has only limited capacity to steer the densification of the built-up structure which is in the hands of private developers/investors. Therefore, also the integration of environmental and affordable housing policies is limited.

Coming now to comparing energy-efficiency strategies in new construction, standards in building codes apply in all three cases. While strict mandatory regulations coming from the EU shape the building codes in Vienna and Milan, this is not the case in Oslo. While in Oslo the building code is a national matter, stricter requirements are fostered by voluntary agreements and information-based tools which aim to influence the behaviour of developers to use certain fuels and heating systems, for instance. The construction of buildings in Milan also needs to adhere to national rules, which are translated from EU directives. These regulate most aspects connected to energy efficiency, while local building codes have some margins to adjust those. While some standards are set mandatorily (i.e., on envelope transmittance, on efficiency of the heating system), there are substantial incentives and subsidies for new buildings which demonstrate higher efficiency. For Vienna, the fact that Austria is a federal republic, complicates the translation of EU directives into national law and implementation. Based on a national directive and paragraph 15 agreements, energy-efficiency was long tied to housing subsidies following stricter rules than be regulations in the regional building codes, whereas in recent standards in building codes and housing subsidy legislations have been harmonized.

Table 8: A glimpse on environmental policy instruments.

	Milan	Oslo	Vienna
Environmental policies	Densification in consolidated and peripheral areas. Energetic retrofitting of existing (both public and private) residential stock, since 2020 with public coverage of 110% of the costs. Increased energy efficiency standards by law on new construction	Densification in inner city and around transport hubs. Retrofitting of existing stock (including a large single-family homes stock in the inner suburban areas).	Densification in central areas and dense new urban developments on brownfields. Subsidized energetic retrofitting of existing stock (private and social rental, single-family homes) with tools from different policy levels
Main levels of environmental policy decision-making	-For retrofitting: EU directives translated by national laws -For densification: mainly local level based on regional directives -For new construction: EU directives translated by national laws	-For retrofitting: national level -For densification: mainly local level but national level sets the Urban Growth Boundary -For new construction: national building codes and local climate budgets	-For retrofitting: regional and national levels, yet heavily pushed by EU policies -For densification: local level -For new construction: translation of EU directives into regional/local building codes

Comparing synergies and conflicts between environmental policies and housing affordability

The analysis of the three cases has shown relevant differences and similarities concerning synergies and conflicts between environmental policies and housing accessibility.

As already addressed, Oslo and Milan present some relevant similarities in terms of housing systems and this is reflected in the fact that in both cities the norm is that environmental policies are accompanied by a low orientation towards the provision of affordable housing (even though with important nuances that will be addressed). On the other hand, Vienna can count on stronger

political commitment, legal position and policy capacity for the provision of affordable housing, which is reflected in a higher integration between environmental and social goals.

Concerning retrofitting and standards on new construction, requirements are often decided at higher levels of government. Local governments can introduce additional measures to increase the social orientation, e.g. allowances or additional requirements, up to certain levels. The contextual tenure structure is relevant to decide who will appropriate the advantages of subsidies for retrofitting and who will pay the cost. In the case of Oslo and Milan, for example, retrofitting tends to favour homeowners and to trigger speculative dynamics both in the homeownership market (particularly evident in Oslo) as well as in the rental market where the combination of increased housing values due to retrofitting and short-term rental contract risk to expose tenants to great housing cost overburden and even displacement. While a general trade-off between the aim of increasing the building's energy efficiency and housing affordability is in general evident for housing retrofitting (as also found in the literature review), in Vienna, in particular in low-profit housing association sector, there are instruments that aim to combat this trend. Retrofitting in Vienna, tends to put pressure on private tenants, but less on social renters where solutions to enable renovations and keep the rent stable are possible. It rather pressures the existing model of social and subsidized housing provision as financial resources have to be provided other than through rents.

As for densification, the multi-case analysis has shown that land-use is primarily decided at the local level, and the local arena – often reflecting the hierarchy of market or political actors – is very important in the decision-making process. While generally accompanied by a strong political support linked to environmental and green rhetoric, densification is also highly supported by private developers, for the possibility it gives for maximizing the exploitation of land rent. A crucial point emerging from the analysis is that the spatiality of urban densification plays an important role in the possible housing affordability outcomes and has different features in the three cities.

While Oslo's approach is relatively strict in promoting densification in central and semi-central urban areas, in Milan and Vienna densification is also implemented in suburban areas. This has different implications for housing affordability because, as explained above, land location is a

crucial factor in determining land value and, consequently, housing prices. In the case of Oslo, for example, the national Planning and Building Act does not allow for inclusionary zoning, and the municipality has no legal tools in that respect. This, together with a situation of market-led planning, developer-dependent housing provision, lack of housing regulations and poor public land ownership has led to a situation where densification is strongly linked with the provision of unaffordable housing, creating a crucial socio-environmental trade-off: while densification aims at containing urban development inward, people increasingly risk to be pushed out because of exclusionary housing markets. In Vienna and to some extent in Milan (where this concerns only large developments over 10000 square meters) inclusionary zoning further allows the creation of mixed-income densification areas through the coexistence of a variety of tenure forms (subsidized, social rented, private rental and owner-occupied units). By means of tools such as inclusionary zoning and by allowing densification in less central and costly areas, Vienna shows not only a higher orientation towards affordable housing compared to the other two contexts, but also a higher integration between environmental and social goals.

To sum up, governance settings and local policy capacity to adopt and implement tools for housing affordability (in addition to contextual housing systems) play a crucial role in shaping environmentally and socially sustainable outcomes. Though all being part of European countries, Milan, Oslo and Vienna are embedded in three very different multi-level arrangements. Coming back to Cucca and Ranci's (2021) typology of multi-level institutional governance arrangement, the positions of cities differ according to the degree of independence of local decision makers and the actual room for autonomous financing and expenditure actions left to local authorities. Based on these criteria Cucca and Ranci (2021) have defined four positions: unsupported localism, supported localism, constrained localism and centralism.

While a common tendency observed in relation to the standards on energy efficiency for new construction is that while new housing is more energy efficient, it is also largely for-profit and seldom affordable for low- and middle-income residents. This trade-off is lower in Vienna than in the case of subsidized and regulated housing, such as low-profit housing organizations. Vienna responds well to the typology of "supported localism", being a city state in a federal country, with considerable decisional and fiscal autonomy. This means being able to enact housing policies

even though most competences for housing still are located at the national level – which is true for both Austria and Italy (rental laws are a prominent example).

Milan, on the contrary, can be considered a case of “unsupported localism” at the municipal level due to a very limited presence of funding and relatively less decentralized funding responsibility (Cucca and Ranci, 2021). Similar to Milan, Oslo can also be considered a case of “unsupported localism”. Indeed, while the national focus on climate, environment, and sustainability has increased the emphasis on densification and energy efficiency at the local level (for example through the Oslo Climate Budget), the same does not apply to housing affordability. There are national expectations for regional and municipal planning for the provision of adequate, varied and social housing (Ministry of Local Government and Modernisation, 2019). While these expectations are largely delegated to the responsibility of municipalities, they are, however, left with poor tools for providing affordable housing at the local level.

Before moving to our concluding remarks a few limitations should be acknowledged here. The present study only looks at orientations of policies without really measuring effects directly (even though, where secondary sources exist, we tried to provide some evidence). For this reason, we addressed the conflict with “affordable housing” provision instead considering housing affordability trends which is way harder to investigate (e.g. it is harder to find information on new leases and new sales rather than on old existing contracts). While this made the comparison easier, more cities should be studied using a qualitative methodology of policy analysis, including comparing orientations qualitatively and where possible also compare effects quantitatively. Furthermore, our pool of types of housing systems did not include cities with a big rental segment that are not unitary (e.g. Berlin) and we concentrated only on three specific families of policies – 1) retrofitting of the housing stock; 2) densification of the built environment; 3) increased energy-efficiency standards of new residential construction – excluding many others, e.g. urban greening. Further research could expand the selection of cases and policies and include a quantitative comparison of effects.

4. Concluding Remarks: synergies and conflicts between environmental policy instruments and access to housing

This study addressed the knowledge gaps presented in the introductory chapter, providing new theoretical and empirical knowledge on the possible synergies and conflicts between environmental policies for improving the energy efficiency of the building sector and housing affordability. The main argument put forward in this research concerns the importance of embracing a relational approach by understanding how such synergies and conflicts occur and are shaped by contextual aspects. Understanding contextual conditions as causal powers, in a nondeterministic way, we have discussed several mechanisms that, within the contexts of Milan, Oslo and Vienna, operate together with the implementation of environmental policies and contribute to create exclusionary outcomes.

In answering the first RQ (*What are the synergies and conflicts between environmental policies for 1) retrofitting of the housing stock; 2) densification of the built environment; 3) increased energy-efficiency standards of new residential construction; and access to affordable housing?*), the literature review has shown a tendency of the analysed environmental policy fields to a decrease in overall housing affordability. In addition to the link between improving environmental sustainability in cities and rising housing prices (Lamarca et al., 2019), there is also an issue with losing the existing affordable housing stock due to spillover effects and consequent gentrification (Rerat, 2009; Bouzarovski et al. 2018; Ali et al., 2020). This issue emerges especially in attractive cities where housing markets are particularly under pressure and where environmental policies are often used as tools for fostering green growth (Tretter, 2013). Our case study analysis showed, indeed, that the more market-oriented are the approaches to environmental sustainability and the housing system (see, for example, in Oslo), the higher the conflicts between the implementation of environmental policies and the accessibility to affordable housing. Such is the case in a context where market logics and environmental strategies overlap. This confirms findings of previous studies that stress how the creation of environmentally sustainable, attractive and liveable urban areas without sufficient attention to

equity aspects, especially on the housing markets, may lead to the exclusion of low- and moderate-income residents (Dale and Newman 2009; Anguelovski et al. 2018).

Regarding the second RQ (*Which contextual factors shape synergies and conflicts between environmental policies (1,2,3) and access to affordable housing?*), empirical evidence from our case study comparison shows that there are at least three main contextual factors shaping synergies and conflicts between environmental policies (1,2,3) and access to affordable housing. They are the following in no particular order:

- a. Local housing system (e.g., tenure structure, land regime)
- b. Policy capacity to implement social housing policies
- c. Socio-political orientation (e.g., social-democratic, neoliberal)

Regarding local housing systems (a), our analysis confirms that housing systems play a crucial role in shaping synergies and conflicts between environmental policies and access to affordable housing. Since environmental policies for the building sector are often sectoral and do not directly consider social objectives, their “social orientation” concerning access to affordable housing largely depends on contextual elements of housing system (i.e., tenure, share of social housing, housing allowances, etc.). The more the housing system is dual with a small proportion of regulated, affordable and social housing, the more environmental policies seem to produce a polarization of effects between homeowners or landlords and tenants. If, instead, the housing system is unitary, such as having a strong public housing or not-for-profit stock, the relation becomes less conflictual due to the regulated business model of cost-rent landlords. This also depends to large degree on the political orientation of local governments in lobbying for keeping rents low.

Of course, the situation is more complex in the cases of rent-controlled housing in private ownership (as in Vienna) and residualised public housing with rents tied to income, where conflict takes more complicated shapes:

- in the former case, which applies only to existing (often old) housing, private landlords are not incentivized to renovate, unless rent control is lifted or mitigated after renovation.

This determines a direct conflict between renovation and erosion of the affordable housing supply.

- in the latter case, social landlords have no direct incentive to renovate because the investment would not be repaid by (already low) rents. So, in this case, the law protects the affordable housing supply while hindering renovation (as well as new social housing construction).

For those particular cases where the existing affordable housing stock is still in place, this requires *ad hoc* policies to avoid conflicting environmental and social arguments. While social housing often benefits from renovation subsidies, these are usually quite slow in implementation – especially in the case of residualised social housing in dual housing systems, where the business model of public housing providers makes it a highly under-financed and under-equipped sector.

However, when we think of densification and the provision of new affordable housing the issue of under-financed and under-equipped sector becomes even more complex. In this respect, we can state that a synergic or conflicting relation among environmental aim of increased density and access to affordable housing largely depends on the land regime, i.e.: public or private land ownership, for profit or non-profit development, inclusionary or growth-oriented zoning. Such synergic or conflicting relation depends largely on the policy capacity and socio-political orientation at local levels.

Even though the “social orientation” of environmental policies concerning access to affordable housing largely depends on the local housing system (i.e., tenure, share of social housing, housing allowances, etc.), it is important to consider that the policy capacity (b) of different levels to contribute to the implementation of social housing policies is of utmost importance. Because of the multilevel nature of housing policies, a multilevel governance perspective that investigates the position of the “local level” within other levels of administration is crucial to unravel conflicting orientations located at different levels. While the EU is following a market ideology aiming to minimise state interventions and relying on market interventions on the field of housing (Matznetter and Stephens, 1998), the policy capacity of the national and local levels to (potentially) counter this market-oriented heteronomy highly depends on socio-political and

contextual path-dependencies and path-changes. Our study brings additional evidence to the statement by Tosics & Tulumello (2020, p. 252) that the “new financial instruments, introduced in the course of the 2010s and planned to be expanded after 2020, might have several positive impacts – for instance, in energy efficiency – but not in social housing for the poorest”.

While the “housing policy by stealth” enacted by the EU has increased its social orientation⁸ the main direction of social orientation of environmental policies is established at lower (national, regional, local) levels. New policies introduced to tackle climate change and to reduce the environmental impact of housing are filtered through this highly fragmented panorama of local housing systems, probably producing a differentiated effect on the access to housing depending on the degree of policy-capacity and socio-political orientations at national, regional and local levels.

Additionally, the socio-political orientation (c) of the city (and of the local housing system) is another critical factor in shaping synergies and conflicts between environmental and social goals in the building sector. While the housing system is the main contextual factor in shaping synergies and conflicts and the policy capacity sets the margins of movement to implement synergic actions and mitigate conflicting effects, the socio-political orientation of local governments is the trigger to any of those adjustments⁹.

Therefore, we conclude that the current state of environmental policymaking through promoting energy-efficiency and densification in the housing sector tends to create rather conflicting effects regarding access to affordable housing. Yet, this general conflict can be worsened, mitigated, or reversed into a synergic relation, depending on contextual factors at the national, regional and local level. In a nutshell it depends on path-dependent formation of local housing systems which

⁸ E.g. with the 2017 European Pillar of Social Rights, EU Urban Agenda aimed at fostering affordable housing, etc.

⁹ Ultimately, mitigating or enhancing the conflicting effects of environmental policies or even turning them into synergies depends mainly on the socio-political orientation of local governments vis-à-vis their policy capacity obviously. However, the orientation of local governments depends on the set of interests electing and driving them and this, in turn, is highly related to the composition of the local housing system. The complex set of path-dependencies and path-changes that created the current dual/unitary housing system in cities creates a relevant inertia and strong constraints in the possible orientations of local governments to mitigate negative impacts of environmental policies.

are produced relationally through the complex interplay of policy capacity and socio-political orientations at different levels.

It seems that these complex relational interdependences make a change in the orientation of local and national policies hard to reach, especially in dual housing systems with little social and regulated housing. However, inspired by European examples of bottom-up push driven by the affordability crisis (e.g., in Berlin) or of new municipalism (e.g., in Barcelona) and by the insights of our study, we consider it necessary that environmental policies must engage stronger with the challenge of increasing (or at least maintaining) affordable housing provisions while continuing the promoting energy-efficiency and densification.

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References

Aalbers M. B. (2016), *The Financialization of Housing. A political Economy Approach*, New York: Routledge.

Adan, H., Fuerst, F. (2015). Modelling energy retrofit investments in the UK housing market: A microeconomic approach. *Smart and Sustainable Built Environment*, 4(3), 251–267.

<https://doi.org/10.1108/SASBE-03-2013-0016>

Adisson F., Artioli F. (2019), “Four Types of Urban Austerity. Public Land Privatizations in French and Italian Cities”, *Urban Studies*.

- Addison, C., Zhang, S., Coomes, B. (2013). Smart Growth and Housing Affordability: A Review of Regulatory Mechanisms and Planning Practices. *Journal of Planning Literature*, 28(3), 215–257. <https://doi.org/10.1177/0885412212471563>
- Agenzia Delle Entrate (2017). Agevolazioni fiscali per la ristrutturazione edilizia e la riqualificazione energetica del patrimonio immobiliare italiano. Available online (retrieved 06/06/2023): https://www.agenziaentrate.gov.it/portale/documents/20143/233691/capitolo+5+immobili2017_Capitolo5.pdf/46404310-f6f3-41f0-c353-4aae23be3ef5
- Aitken, Z., Baker, E., Badland, H., Mason, K., Bentley, R., Beer, A., Kavanagh, A. M. (2019). Precariously placed: Housing affordability, quality and satisfaction of Australians with disabilities. *Disability & Society*, 34(1), 121–142. <https://doi.org/10.1080/09687599.2018.1521333>
- Alwan, Z., Jones, P. and Holgate, P. (2017). 'Strategic sustainable development in the UK construction industry, through the framework for strategic sustainable development, using Building Information Modelling'. *Journal of Cleaner Production*. (Systematic Leadership towards Sustainability), 140, pp. 349–358. doi: 10.1016/j.jclepro.2015.12.085.
- Amann, B. W., Mundt, A. (2021) Innovation in housing decarbonisation: Austria. *HOUSING FINANCE*, 27.
- Andersen, B., Røe, P. G. (2017). The social context and politics of large scale urban architecture: Investigating the design of Barcode, Oslo. *European Urban and Regional Studies*, 24(3), 304–317. <https://doi.org/10.1177/0969776416643751>
- Anguelovski, I., Carmin, J. (2011a). Something borrowed, everything new: Innovation and institutionalization in urban climate governance. *Current Opinion in Environmental Sustainability*, 3(3), 169–175. <https://doi.org/10.1016/j.cosust.2010.12.017>
- Arbaci, S. (2007). Ethnic Segregation, Housing Systems and Welfare Regimes in Europe. *European Journal of Housing Policy*, 7(4), 401–433. <https://doi.org/10.1080/14616710701650443>
- Ärlemalm, J. (2013). Resisting renovation: The neoliberal city, space and urban social movements. <http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-219260>
- Aurand, A. (2010). Density, Housing Types and Mixed Land Use: Smart Tools for Affordable Housing? *Urban Studies*, 47(5), 1015–1036. <https://doi.org/10.1177/0042098009353076>
- Baeten, G., Westin, S., Pull, E., Molina, I. (2017). Pressure and violence: Housing renovation and displacement in Sweden. *Environment and Planning A: Economy and Space*, 49(3), 631–651. <https://doi.org/10.1177/0308518X16676271>
- Banfill, P. F. G. and Peacock, A. D. (2007). 'Energy-efficient new housing – the UK reaches for sustainability'. *Building Research & Information*. Routledge, 35 (4), pp. 426–436. doi: 10.1080/09613210701339454.
- Barlindhaug, R., Nordahl, B. I. (2018). Developers' price setting behaviour in urban residential redevelopment projects. *Journal of European Real Estate Research*, 11(1), 71–86. <https://doi.org/10.1108/JERER-03-2017-0014>
- Belotti, E., & Arbaci, S. (2021). From right to good, and to asset: The state-led financialisation of the social rented housing in Italy. *Politics and Space*, 39(2), 414–433.
- Benz, A. (2021). *Policy Change and Innovation in Multilevel Governance*. Edward Elgar Publishing.

Bergene, A. (2007). Towards A Critical Realist Comparative Methodology: Context-Sensitive Theoretical Comparison. *Journal of Critical Realism*, 6(1), 5–27. <https://doi.org/10.1558/jocr.v6i1.5>

Bibby, P., Henneberry, J., Halleux, J.-M. (2021). Incremental residential densification and urban spatial justice: The case of England between 2001 and 2011. *Urban Studies*, 58(10), 2117–2138. <https://doi.org/10.1177/0042098020936967>

Bouzarovski, S., Frankowski, J., Tirado Herrero, S. (2018), Low-Carbon Gentrification: When Climate Change Encounters Residential Displacement. *Int. J. Urban Reg. Res.*, 42: 845-863. <https://doi.org/10.1111/1468-2427.12634>

Bouzarovski, S., Frankowski, J., Tirado Herrero, S. (2018). Low-Carbon Gentrification: When Climate Change Encounters Residential Displacement. *INTERNATIONAL JOURNAL OF URBAN AND REGIONAL RESEARCH*, 42(5), 845–863. <https://doi.org/10.1111/1468-2427.12634>

Boztepe, K., Hammer, P., Luger, K., König, K., Gächter, A., Akagündüz-Binder, B., Häberlin, U., Ganal, U., Remmel, W., Bartik, H., Suitner, J. (2020). *Integrations-& Diversitätsmonitor Wien 2020*. Stadt Wien – Integration und Diversität. <https://www.digital.wienbibliothek.at/download/pdf/3668514?name=Englische%20Kurzfassung>

Bramley, G., Power, S. (2009). Urban form and social sustainability: The role of density and housing type. *Environment and Planning B: Planning and Design*, 36(1), 30–48. <https://doi.org/10.1068/b33129>

Bricocoli M., Peverini M., Munson L.M. (2023). Milan: a city for whom? Housing affordability and accessibility in the Metropolitan Area of Milan after the 2015 International Exposition, paper presented at the ENHR 2023 conference in Lodz.

Broers, W., Kemp, R., Vasseur, V., Abujidi, N., Vroon, Z. (2022). Justice in social housing: Towards a people-centred energy renovation process. *Energy Research & Social Science*, 88, 102527.

Bulkeley, H., Betsill, M. (2005). Rethinking sustainable cities: Multilevel governance and the 'urban' politics of climate change. *Environmental politics*, 14(1), 42-63.

Camagni R. (2019), “Redistribuzione della rendita urbana: teoria e attualità”, in: M. Baioni, G. Caudo e N. Vazzoler (eds.)(2019), *Rendita urbana e redistribuzione*, NU3-Note di UrbanisticaTre, Università di Roma 3, Roma.

Camera dei Deputati (2021). Il recupero e la riqualificazione energetica del patrimonio edilizio: una stima dell'impatto delle misure di incentivazione. Available online (retrieved 06/06/2023): <https://temi.camera.it/leg18/dossier/OCD18-16007/il-recupero-e-riqualificazione-energetica-del-patrimonio-edilizio-stima-impatto-misure-incentivazione-dati-aggiornati-al-2021.html>

Cavicchia, R. (2021). Are Green, dense cities more inclusive? Densification and housing accessibility in Oslo. *Local Environment*, 26(10), 1250–1266. <https://doi.org/10.1080/13549839.2021.1973394>

Cavicchia, R. (2022). Urban densification and exclusionary pressure: Emerging patterns of gentrification in Oslo. *Urban Geography*, 1–23. <https://doi.org/10.1080/02723638.2022.2100174>

Cavicchia, R. (2023). Housing accessibility in densifying cities: Entangled housing and land use policy limitations and insights from Oslo. *Land Use Policy*, 127, 106580. <https://doi.org/10.1016/j.landusepol.2023.106580>

- Cavicchia, R., Cucca, R. (2020). Densification and School Segregation: The Case of Oslo. *Urban Planning*, 5(3), 217–229. <https://doi.org/10.17645/up.v5i3.3215>
- Centro Studi PIM (2019). *Abitare a Milano*, presentation during a workshop held in Milan 09/07/2019.
- Charmes, E., Keil, R. (2015). The Politics of Post-Suburban Densification in Canada and France: DEBATES & DEVELOPMENTS. *International Journal of Urban and Regional Research*, 39(3), 581–602. <https://doi.org/10.1111/1468-2427.12194>
- Chegut, A., Eichholtz, P., Holtermans, R. (2016). Energy efficiency and economic value in affordable housing. *Energy Policy*, 97, 39–49. <https://doi.org/10.1016/j.enpol.2016.06.043>
- Churchman, A. (1999). Disentangling the Concept of Density. *Journal of Planning Literature*, 13(4), 389–411. <https://doi.org/10.1177/08854129922092478>
- Clapham, D. (2019), *Remaking housing policy: An international study*. Routledge: New York.
- Cocola-Gant, A., Gago, A. (2021). Airbnb, buy-to-let investment and tourism-driven displacement: A case study in Lisbon. *Environment and Planning A: Economy and Space*, 53(7), 1671–1688. <https://doi.org/10.1177/0308518X19869012>
- Collettivo per l’Economia Fondamentale (2022). *Prima i fondamentali. L’economia della vita quotidiana tra profitto e benessere*, Feltrinelli, Milano. <https://fondazionefeltrinelli.it/schede/prima-i-fondamentali/>
- Copiello, S. (2015). Achieving affordable housing through energy efficiency strategy. *Energy Policy*, 85, 288–298. <https://doi.org/10.1016/j.enpol.2015.06.017>
- CRESME (2017). Una nuova edilizia contro la crisi. I quaderni di Symbola. Available online (retrieved 06/06/2023): <http://www.cresme.it/doc/rapporti/rapporto-cresme-symbola-2017.pdf>
- Cucca, R., Ranci, C. (2022). Urban policy in times of crisis: The policy capacity of European cities and the role of multi-level governance. *Urban Affairs Review*, 58(6), 1493-1522.
- Czischke, D., G.van Bortel (2018). “An exploration of concepts and policies on ‘affordable housing’ in England, Italy, Poland and The Netherlands”, *Journal of Housing and the Built Environment*.
- Dalton, M. (2016). *Does planning acknowledge the cost of redevelopment on housing affordability?*
- Danermark, B., Ekström, M., & Karlsson, J. C. (2019). *Explaining Society Critical Realism in the Social Sciences*. Routledge.
- Davidson, M., Lees, L. (2005). New-Build ‘Gentrification’ and London’s Riverside Renaissance. *Environment and Planning A: Economy and Space*, 37(7), 1165–1190. <https://doi.org/10.1068/a3739>
- Davidson, M., Lees, L. (2010). New-build gentrification: Its histories, trajectories, and critical geographies: Critical Geographies of New-Build Gentrification. *Population, Space and Place*, 16(5), 395–411. <https://doi.org/10.1002/psp.584>
- Debrunner, G., Hartmann, T. (2020). Strategic use of land policy instruments for affordable housing – Coping with social challenges under scarce land conditions in Swiss cities. *Land Use Policy*, 99, 104993. <https://doi.org/10.1016/j.landusepol.2020.104993>
- Doling J. (1987). *Comparative Housing Policy. Government and Housing in Advanced Industrialized Countries*. London: Springer.

- Doling J., Ronald R. (2019). “‘Not for Housing’ Housing: Widening the Scope of Housing Studies”, *Critical Housing Analysis* 6(1): 22-31.
- Donner C. (2000). *Housing Policies in the European Union: Theory and Practice*. Vienna.
- Eika, A. (2020). *Cooperation and competition in urban redevelopment*. Ph.D Dissertation. Ås: Norwegian University of Life Sciences, Department of Property and Law
- ENEA (2022). *Rapporto Annuale sull'efficienza energetica 2022*. Available online (retrieved 06/06/2023): <https://www.energiaenergetica.enea.it/pubblicazioni/raee-rapporto-annuale-sull-efficienza-energetica/rapporto-annuale-sull-efficienza-energetica-2022.html>
- Erba S, Pagliano L. (2021). Combining Sufficiency, Efficiency and Flexibility to Achieve Positive Energy Districts Targets. *Energies* 14, no. 15: 4697. <https://doi.org/10.3390/en14154697>
- Erker, S., Kinsperger, A., Hemis, H., Vogl, B. (2021). Energieraumpläne – ein Meilenstein am Weg zur nachhaltigen Energiezukunft Wiens. In R. Giffinger, M. Berger, K. Weninger, & S. Zech (Eds.), *Energieraumplanung - ein zentraler Faktor zum Gelingen der Energiewende* (pp. 28–37). <https://doi.org/10.34726/1022>
- Esping-Andersen, G. (1987), “The Comparison of Policy Regimes: An Introduction.” in M. Rein, G. Esping-Andersen, L. Rainwater (eds.) *Stagnation and renewal in Social Policy. The Rise and Fall of Policy Regimes*. Armonk, New York: 3-12.
- European Commission. (2016). *FUTURE BRIEF: No net land take by 2050?*
- Franz, Y. (2015). *Gentrification in neighbourhood development: case studies from New York City, Berlin and Vienna*. V&R unipress GmbH.
- Friesenecker, M., Kazepov, Y. (2021). Housing Vienna: The Socio-Spatial Effects of Inclusionary and Exclusionary Mechanisms of Housing Provision. *Social Inclusion*. 9 (2). pp.77-90. <https://doi.org/10.17645/si.v9i2.3837>
- Friesenecker, M. & Litschauer, K. (2022). Innovating social housing? Tracing the social in social housing construction. In Y. Kazepov & R. Verwiebe (Eds.), *Vienna: Still a Just City? (pp. 68-82)*. Routledge: London and New York.
- Gallent N., Tewdwr-Jones M. (2000). *Rural Second Homes in Europe: Examining Housing Supply and Planning Control* (1st ed.). Routledge. <https://doi.org/10.4324/9781315201979>
- García-Lamarca, M. (2020) “Real estate crisis resolution regimes and residential REITs: emerging socio-spatial impacts in Barcelona”, *Housing Studies*: 1-20.
- García-Lamarca, M., Anguelovski, I., Cole, H., Connolly, J. J., Argüelles, L., Baró, F., Loveless, S., Pérez Del Pulgar Frowein, C., Shokry, G. (2021). Urban green boosterism and city affordability: For whom is the ‘branded’ green city? *Urban Studies*, 58(1), 90–112. <https://doi.org/10.1177/0042098019885330>
- Giddings, B., Rogerson, R. (2021). Compacting the city centre: Densification in two Newcastles. *Buildings and Cities*, 2(1), 185–202. <https://doi.org/10.5334/bc.74>
- Grossmann, K. (2019a). Energy efficiency for whom? A conceptual view on retrofitting, residential segregation and the housing market. *SOCIOLOGIA URBANA E RURALE*, 78–95. <https://doi.org/10.3280/SUR2019-119006>

- Grossmann, K. (2019b). "Using conflicts to uncover injustices in energy transitions: The case of social impacts of energy efficiency policies in the housing sector in Germany." *Global Transitions* 1: 148-156.
- Grossmann, K. and Huning, S. (2015) Energy-efficient retrofitting and affordable housing: Open questions for urban research and practice. Paper presented at the RC21 International Conference on „The Ideal City: between myth and reality. Representations, policies, contradictions and challenges for tomorrow’s urban life“ Urbino (Italy).
- Guardigli, L., Bragadin, M. A., Della Fornace, F., Mazzoli, C. and Prati, D. (2018). ‘Energy retrofit alternatives and cost-optimal analysis for large public housing stocks’. *Energy and Buildings*, 166, pp. 48–59. doi: 10.1016/j.enbuild.2018.02.003.
- Hagbert, P., Femenías, P. (2016). Sustainable homes, or simply energy-efficient buildings?. *J Hous and the Built Environ* **31**, 1–17. <https://doi.org/10.1007/s10901-015-9440-y>
- Hagbert, P., Mangold, M., Femenías, P. (2013). ‘Paradoxes and Possibilities for a “Green” Housing Sector: A Swedish Case’. *Sustainability. Multidisciplinary Digital Publishing Institute*, 5 (5), pp. 2018–2035. doi: 10.3390/su5052018.
- Hatz, G. (2008). Vienna. *Cities*, 25(5), 310-322.
- Hatz, G. (2021). Can public subsidized urban renewal solve the gentrification issue? Dissecting the Viennese example. *Cities*, 115, 103218. <https://doi.org/10.1016/j.cities.2021.103218>
- Head, B. W., Alford, J. (2015). Wicked Problems: Implications for Public Policy and Management. *Administration & Society*, 47(6), 711–739. <https://doi.org/10.1177/0095399713481601>
- Hickmann, T. (2021). Locating cities and their governments in multi-level sustainability governance. *Politics and Governance*, 9(1), 211-220.
- Hoekstra J. (2020), “Comparing Local Instead of National Housing Regimes? Towards International Comparative Housing Research 2.0”, *Critical Housing Analysis*, 7(1): 74-85.
- Hofstad, H. (2012). *Compact city development: High ideals and emerging practices*. 1–23.
- Holm, A. (2011). Ein Ökosoziales Paradox. Stadtumbau und Gentrifizierung. *Politische Ökologie* 124: 45–52.
- Housing Europe (2019). *The State of Housing in the EU 2019. Decoding the New Housing Reality*, report available at (retrieved 09/12/2021): <https://www.housingeurope.eu/resource-1323/the-state-of-housing-in-the-eu-2019>
- Hovland, K.M. (2022). Mener over 200.000 hus må renoveres innen 2030: Huseierne krever statlig milliardstøtte. <https://e24.no/energi-og-klima/i/rEyyl/mener-over-200000-hus-maa-renoveres-innen-2030-huseierne-krever-statlig-milliardstoette>
- Howlett, M., Vince, J., Del Río, P. (2017). Policy Integration and Multi-Level Governance: Dealing with the Vertical Dimension of Policy Mix Designs. *Politics and Governance*, 5(2), 69–78. <https://doi.org/10.17645/pag.v5i2.928>
- Hulchanski J.D. (1995), “The Concept of Housing Affordability: Six Contemporary Uses of the Housing Expenditure-to-Income Ratio”, *Housing Studies* 10(4): 471-491.

- Hyland, M., Lyons, R. C., Lyons, S. (2013). The value of domestic building energy efficiency—Evidence from Ireland. *Energy Economics*, 40, 943–952. <https://doi.org/10.1016/j.eneco.2013.07.020>
- Idt, J., Pellegrino, M. (2021). From the ostensible objectives of public policies to the reality of changes: Local orders of densification in the urban regions of Paris and Rome. *Land Use Policy*, 107, 105470. <https://doi.org/10.1016/j.landusepol.2021.105470>
- IIBW (2008). Kompetenzgefüge im österreichischen Wohnungswesen *Vienna: IIBW*.
- IIBW (2019). Maßnahmenpaket Dekarbonisierung des Wohnungssektors. Vienna: IIBW.
- IIBW & Steine-Keramik (2022). Wohnbauförderung in Österreich 2021. *Vienna: IIBW*.
- Jenks, M., Jones, C. (2009). *Dimensions of the sustainable city* (Vol. 2): Springer Science & Business Media.
- Jensen, J. O., Jørgensen, M. S., Elle, M., Lauridsen, E. H. (2012). ‘Has social sustainability left the building? The recent conceptualization of “sustainability” in Danish buildings’. *Sustainability: Science, Practice and Policy*. Taylor & Francis, 8 (1), pp. 94–105. doi: 10.1080/15487733.2012.11908088.
- Kadi J. (2014), *The neo-liberal restructuring of urban housing markets and the housing conditions of lowincome households: An international comparison*, Ph.D. thesis conducted at the Amsterdam Institute for Social Science Research (AISSR). Available online (retrieved 16/02/2022): <https://hdl.handle.net/11245/1.432579>
- Kadi, J., Suitner, J. (2019). Red Vienna, 1919–1934. *The Wiley Blackwell encyclopedia of urban and regional studies*, 1-5.
- Kadi, J., Matznetter, W. (2022). The long history of gentrification in Vienna, 1890–2020. *City*, 26(2-3), 450-472.
- Kadi, J., Lilius, J. (2022). The remarkable stability of social housing in Vienna and Helsinki: A multi-dimensional analysis. *Housing Studies*, 0(0), 1–25. <https://doi.org/10.1080/02673037.2022.2135170>
- Kaika M., Ruggiero L. (2016), “Land Financialization as a ‘lived’ process: The transformation of Milan’s Bicocca by Pirelli”, *European Urban and Regional Studies*, Vol. 23(1): 3-22.
- Kain, J.-H., Adelfio, M., Stenberg, J., Thuvander, L. (2022). Towards a systemic understanding of compact city qualities. *Journal of Urban Design*, 27(1), 130–147. <https://doi.org/10.1080/13574809.2021.1941825>
- Kazepov, Y., Barberis, E., Cucca, R., Mocca, E. (2022). Introduction to the Handbook on Urban Social Policies: International Perspectives on Multilevel Governance and Local Welfare. In *Handbook on Urban Social Policies* (pp. 2-22). Edward Elgar Publishing.
- Keil, R. (2003). Urban Political Ecology ¹. *Urban Geography*, 24(8), 723–738. <https://doi.org/10.2747/0272-3638.24.8.723>
- Kemeny, J. (1981). *The Myth of Home-Ownership: Private Versus Public Choices in Housing Tenure*, Routledge & Kegan Paul: London.
- Kemeny J. (1995). *From public housing to the social market. Rental policy strategies in comparative perspective*, Routledge: London.

- Kern, L. (2007). Reshaping the Boundaries of Public and Private Life: Gender, Condominium Development, and the Neoliberalization of Urban Living. *Urban Geography*, 28(7), 657–681. <https://doi.org/10.2747/0272-3638.28.7.657>
- Knoll, K., Schularick, M., Steger, T. (2017). No Price Like Home: Global House Prices, 1870–2012. *American Economic Review*, 107(2), 331–353. <https://doi.org/10.1257/aer.20150501>
- Koebel, C. T., McCoy, A. P., Sanderford, A. R., Franck, C. T. and Keefe, M. J. (2015). ‘Diffusion of green building technologies in new housing construction’. *Energy and Buildings*, 97, pp. 175–185. doi: 10.1016/j.enbuild.2015.03.037.
- Kunnert A., Baumgartner J. (2012). Instrumente und Wirkungen der österreichischen Wohnungspolitik. in WIFO Studies. Available online (retrieved 16/02/2022): <https://econpapers.repec.org/bookchap/wfowstudy/45878.htm>
- Lawson J., H. Ruonavaara (2020). *Land policy for affordable and inclusive housing. An international review*, report for Smartland.
- Le Galès, P. (2011). Policy instruments and governance. *The SAGE handbook of governance*, 142-159.
- Liu, Y., Tang, S., Geertman, S., Lin, Y., Van Oort, F. (2017). The chain effects of property-led redevelopment in Shenzhen: Price-shadowing and indirect displacement. *Cities*, 67, 31–42. <https://doi.org/10.1016/j.cities.2017.04.017>
- Litschauer K. Friesenecker M. (2022). Affordable housing for all? Challenging the legacy of Red Vienna. In Y. Kazepov & R. Verwiebe (Eds.), *Vienna: Still a Just City? (pp. 53-67)*. Routledge: London and New York.,
- Magnani, N., Carrosio, G., Osti, G. (2020). Energy retrofitting of urban buildings: A socio-spatial analysis of three mid-sized Italian cities. *Energy Policy*, 139, 111341. <https://doi.org/10.1016/j.enpol.2020.111341>
- Maloutas, T. (2018). Travelling concepts and universal particularisms: A reappraisal of gentrification’s global reach. *European Urban and Regional Studies*, 25(3), 250–265. <https://doi.org/10.1177/0969776417709547>
- Maloutas, T., Siatitsa, D., Balampanidis, D. (2020). Access to Housing and Social Inclusion in a Post-Crisis Era: Contextualizing Recent Trends in the City of Athens. *Social Inclusion*, 8(3), 5–15. <https://doi.org/10.17645/si.v8i3.2778>
- Manganelli, B., Morano, P., Tajani, F., Salvo, F. (2019). Affordability Assessment of Energy-Efficient Building Construction in Italy. *Sustainability*, 11(1), 1. <https://doi.org/10.3390/su11010249>
- Matznetter, W. (2002) “Social Housing Policy in a Conservative Welfare State: Austria as an Example”, *Urban Studies*, 39(2): 265-282.
- McCabe, A., Pojani, D., van Groenou, A. B. (2018). The application of renewable energy to social housing: A systematic review. *Energy Policy*, 114, 549–557. <https://doi.org/10.1016/j.enpol.2017.12.031>
- McFarlane, C. (2016). The geographies of urban density: Topology, politics and the city. *Progress in Human Geography*, 40(5), 629–648. <https://doi.org/10.1177/0309132515608694>
- McFarlane, C. (2020). De/re-densification: A relational geography of urban density. *City*, 24(1–2), 314–324. <https://doi.org/10.1080/13604813.2020.1739911>

- Mietervereinigung (2023). *Zuschläge und Abschlüsse im Mietrecht*. (o. J.). Abgerufen 5. Juni 2023, von <https://mietervereinigung.at/4891/Zuschlaege-und-Abschlaege-im-Mietrecht>
- Mocca, E. Friesenecker, M. (2022). Still a red island? Vienna's electoral geography between stability and change. In Y. Kazepov & R. Verwiebe (Eds.), *Vienna: Still a Just City?* (pp. 19-34). Routledge: London and New York.
- Moroni, S. (2016). Urban density after Jane Jacobs: The crucial role of diversity and emergence. *City, Territory and Architecture*, 3(1), 13. <https://doi.org/10.1186/s40410-016-0041-1>
- Moore, B., Benson, D., Jordan, A., Wurzel, R. K., Zito, A. (2021). Governing with multiple policy instruments?. In *Environmental policy in the EU* (pp. 299-316). Routledge.
- Mouratidis, K. (2018). Is compact city livable? The impact of compact versus sprawled neighbourhoods on neighbourhood satisfaction. *Urban Studies*, 55(11), 2408–2430. <https://doi.org/10.1177/0042098017729109>
- Mumford, S., Anjum, R. L. (2011). Effects of context. *Information Knowledge Systems Management*, 10(1–4), 101–110. <https://doi.org/10.3233/IKS-2012-0188>
- Mundt, A., Amann, W. (2015). Housing benefits and minimum income schemes—Is Austrian housing still affordable for welfare recipients. In *Conference paper for ENHR*
- Musil, R., Brand, F., Huemer, H., Wonaschütz, M. (2022a). The Zinshaus market and gentrification dynamics: The transformation of the historic housing stock in Vienna, 2007–2019. *Urban Studies*, 59(5), 974–994. <https://doi.org/10.1177/00420980211051906>
- Næss, P. (2015). Critical Realism, Urban Planning and Urban Research. *European Planning Studies*, 23(6), 1228–1244. <https://doi.org/10.1080/09654313.2014.994091>
- Næss, P., Xue, J. (2016). 'Housing Standards, Environmental Sustainability, and Social Welfare'. in *Crisis System*. Routledge.
- Næss, P., Saglie, I.-L. (2019). Ecological modernisation: Achievements and limitations of densification. In D. Simin, C. Richard, W. Iain, & B. Hilda (Eds.), *The Routledge Companion to Environmental Planning* (pp. 63-72). London: Routledge.
- Næss, P., Xue, J. (2016). Housing standards, environmental sustainability, and social welfare. In: Næss, P., & Xue, J., *Crisis System, A critical realist and environmental critique of economics and the economy* (pp. 130-148). Routledge.
- Næss, P., Næss, T., Strand, A. (2011). Oslo's Farewell to Urban Sprawl. *European Planning Studies*, 19(1), 113–139. <https://doi.org/10.1080/09654313.2011.530395>
- NAV. (2022). *Fortsatt lav ledighet i Oslo*. <https://www.nav.no/no/lokalt/oslo/pressemeldinger/fortsatt-lav-ledighet-i-oslo>
- Neuteboom P., Brounen D. (2011), "Assessing the accessibility of home-ownership market", *Urban Studies*, 48(11): 2231-2248.
- Niskanen, J., Rohracher, H. (2022). 'A politics of calculation: Negotiating pathways to zero-energy buildings in Sweden'. *Technological Forecasting and Social Change*, 179, p. 121630. doi: 10.1016/j.techfore.2022.121630.

- NOMISMA (2021). *Milano inclusiva. La produzione di case in locazione a costi accessibili*, report.
- Nordahl B. I. (2014). Convergences and discrepancies between the policy of inclusionary housing and Norway's liberal housing and planning policy: An institutional perspective. *Journal of Housing and the Built Environment*, 29(3), 489–506. <https://doi.org/10.1007/s10901-013-9357-2>
- OECD (2011). *Towards green growth*.
- OECD (2012). *Compact City Policies*.
- Oslo Byråd (2019a). Nye veier til egen bolig. byutvikling, Oslo.
- Oslo Kommune (2018). Kunnskapsgrunnlag for en kommunal boligpolitikk. Oslo.
- Oslo Kommune (2018b). Kommuneplan 2018. En grønnere, varmere og mer skapende by med plass til alle.
- Oslo Kommune (2020). Climate Strategy for Oslo towards 2030. https://www.klimaoslo.no/wp-content/uploads/sites/88/2020/09/Klimastrategi2030-Kortversjon-ENG_2608_enkeltside.pdf.
- Oslo Kommune (2021). Climate Budget 2021. <https://www.klimaoslo.no/wp-content/uploads/sites/88/2021/02/Climate-Budget-2021-Oslo.pdf>
- Oslo Statistikkbanken (2021). *Gjennomsnittlig husholdningsinntekt etter skatt per forbruksenhet* [Data set].
- Peaverini M. (2021). “Lost hybridity? Trajectory, path dependence and hybridization pathways of cooperatives in the provision of affordable housing in Milan (Italy)”, proceeding of the 2021 ENHR conference.
- Peaverini M. (2021). “Grounding urban governance on housing affordability: a conceptual framework for policy analysis. Insights from Vienna”, *PARTECIPAZIONE E CONFLITTO*, 14(2): 848-869.
- Peaverini M. (2022). How to promote rental housing affordability in European cities? New theoretical ground from the cases of Milan and Vienna, Ph.D. thesis in Urban Planning, Design and Policy (UPDP) defended at Politecnico di Milano.
- Peaverini M. (2023), “How Affordable is Social Housing? The Concept of Affordability as a Constitutive Feature of Public Rental Housing: a Comparison between Vienna and Milan”, in Güntner S., Lehner J., Hauser J. and Reinprecht C. (eds.) “The Social Dimension of Social Housing”, Spector books.
- Peaverini M., Cavicchia R. (2021). Housing affordability and the city. Disentangling the urban and spatial dimensions of housing affordability in Europe. Conference - Unsettled Settlements: Housing in Unstable Contexts. ENHR 2021. Conference proceedings (pp. 440–457). https://cyprusconferences.org/enhr2021/wp-content/uploads/2021/12/ENHR-2021_Proceedings-Final.pdf
- Pivo G. (2014). Unequal access to energy efficiency in US multifamily rental housing: Opportunities to improve. *Building Research & Information*, 42(5), 551–573. <https://doi.org/10.1080/09613218.2014.905395>
- Poggio T., Whitehead C. (2017). “Social housing in Europe: legacies, new trends and the crisis”, *Critical Housing Analysis*, 4(1), 1-10. <http://dx.doi.org/10.13060/23362839.2017.3.1.319>

- Polis Lombardia (2021). Supporto all'analisi e allo sviluppo delle politiche abitative ai fini del completamento della riforma dei servizi abitativi. Costo della locazione sociale. Available online (retrieved 21/01/2022): https://www.polis.lombardia.it/wps/wcm/connect/0cc09f46-5fc6-41b6-b468-756a912a9552/190707SOC_RF_linea01_costo_locazione_sociale.pdf?MOD=AJPERES&CACHEID=ROOTW-ORKSPACE-0cc09f46-5fc6-41b6-b468-756a912a9552-nC5f0Yp
- Power A. (2010). 'Housing and sustainability: demolition or refurbishment?' Proceedings of the Institution of Civil Engineers - Urban Design and Planning. ICE Publishing, 163 (4), pp. 205–216. doi: 10.1680/udap.2010.163.4.205.
- Purcell M. (2006). "Urban Democracy and the Local Trap", *Urban Studies*, 43(11): 1921-1941.
- Quastel N., Moos M., Lynch N. (2012). Sustainability-As-Density and the Return of the Social: The Case of Vancouver, British Columbia. *Urban Geography*, 33(7), 1055–1084. <https://doi.org/10.2747/0272-3638.33.7.1055>
- Rechnungshof Österreich (2021). Wohnbau in Wien https://www.rechnungshof.gv.at/rh/home/home/Wohnbau_Wien_Sonderpruefung.pdf
- Rérat P. (2012). Housing, the Compact City and Sustainable Development: Some Insights From Recent Urban Trends in Switzerland. *International Journal of Housing Policy*, 12(2), 115–136. <https://doi.org/10.1080/14616718.2012.681570>
- Rérat P., Söderström O., Piguet E., Besson R. (2010). From urban wastelands to new-build gentrification: The case of Swiss cities: From Urban Wastelands to New-Build Gentrification. *Population, Space and Place*, 16(5), 429–442. <https://doi.org/10.1002/psp.595>
- Rice J. L., Cohen D. A., Long J., Jurjevich J. R. (2020). Contradictions of the Climate-Friendly City: New Perspectives on Eco-Gentrification and Housing Justice. *International Journal of Urban and Regional Research*, 44(1), 145–165. <https://doi.org/10.1111/1468-2427.12740>
- Riederer B., Verwiebe R., Seewann L. (2019). Changing social stratification in Vienna: Why are migrants declining from the middle of society?. *Population, Space and Place*, 25(2), e2215.
- Rohracher H. (2001). 'Managing the Technological Transition to Sustainable Construction of Buildings: A Socio-Technical Perspective'. *Technology Analysis & Strategic Management*. Routledge, 13 (1), pp. 137–150. doi: 10.1080/09537320120040491.
- Rousseau M. (2015). 'Many Rivers to Cross': Suburban Densification and the Social Status Quo in Greater Lyon: DEBATES & DEVELOPMENTS. *International Journal of Urban and Regional Research*, 39(3), 622–632. <https://doi.org/10.1111/1468-2427.12197>
- Ruonavaara H. (2020), "Rethinking the Concept of 'Housing Regime'", *Critical Housing Analysis*, 7(1): 5-14.
- Scanlon K., Whitehead C.M.E. (2008). *Social housing in Europe II*. LSE: London.
- Schleich J. (2019). Energy efficient technology adoption in low-income households in the European Union – What is the evidence? *Energy Policy*, 125, 196–206. <https://doi.org/10.1016/j.enpol.2018.10.061>
- Schneider F. (2003). Growth and Rebound Effect. Paper presented at the Colloquium on "Sustainable Degrowth" (Décroissance Soutenable), Proceedings, Lyon

- Schweber L., Leiringer R. (2012). Beyond the technical: a snapshot of energy and buildings research. *Building Research & Information*. Routledge, 40 (4), pp. 481–492. doi: 10.1080/09613218.2012.675713.
- Seebauer S., Friesenecker M., Eisfeld K. (2019). Integrating climate and social housing policy to alleviate energy poverty: An analysis of targets and instruments in Austria. *Energy Sources, Part B: Economics, Planning, and Policy*, 14(7-9), 304-326.
- Sharifi A. (2016). From Garden City to Eco-urbanism: The quest for sustainable neighborhood development. *Sustainable Cities and Society*, 20, 1–16. <https://doi.org/10.1016/j.scs.2015.09.002>
- Shen L., He B., Jiao L., Song X., Zhang, X (2016). ‘Research on the development of main policy instruments for improving building energy-efficiency’. *Journal of Cleaner Production*. (Preventing Smog Crises), 112, pp. 1789–1803. doi: 10.1016/j.jclepro.2015.06.108.
- Smith N. (1987). Gentrification and the Rent Gap. *Annals of the Association of American Geographers*, 77(3), 462–465. <https://doi.org/10.1111/j.1467-8306.1987.tb00171.x>
- Soja E. (2013). *Seeking spatial justice* (Vol. 16). Minneapolis: University of Minnesota Press.
- Stähle A. (2017). *Closer together: this is the future of cities*. Årsta: SCB Distributors.
- Steurer R., Clar C. (2015). Is decentralisation always good for climate change mitigation? How federalism has complicated the greening of building policies in Austria. *Policy Sciences*, 48(1), 85–107. <https://doi.org/10.1007/s11077-014-9206-5>
- Suitner J. (2021). Vienna’s planning history: periodizing stable phases of regulating urban development, 1820–2020. *Planning Perspectives*, 36(5), 881-902.
- Teller, J. (2021). Regulating urban densification: What factors should be used? *Buildings and Cities*, 2(1), 302–317. <https://doi.org/10.5334/bc.123>
- Tretter E. (2013). Sustainability and Neoliberal Urban Development: The Environment, Crime and the Remaking of Austin’s Downtown. *Urban Studies*, 50(11), 2222–2237. <https://doi.org/10.1177/0042098013478234>
- Tulumello S., Dagkouli-Kyriakoglou M. (2021). *Financialization of housing in Southern Europe: Policy analysis and recommendations. Final report*, Project commissioned by the European Parliament office of MEP José Gusmão (group The Left in the European Parliament).
- UN Environmental Programme (2021). *Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector*. https://globalabc.org/sites/default/files/2021-10/GABC_Buildings-GSR-2021_BOOK.pdf
- Verwiebe R., Haindorfer R., Dorner J., Liedl B., Riederer B. (2020). *Lebensqualität in einer wachsenden Stadt—Wiener Lebensqualitätsstudie 2018* (Nr. 187; Werkstattbericht). Stadt Wien, Stadtentwicklung und Stadtplanung. <https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008583.pdf>
- Výboštok J., Štefkovičová P. (2023). Housing affordability, quality of life, and residential satisfaction in the Austrian cross-border suburban region of Bratislava, Slovakia. *Moravian Geographical Reports*. 31. 2-13. 10.2478/mgr-2023-0001.
- WCED (1987). *Our Common Future*.

Weber I., Wolff A. (2018). Energy efficiency retrofits in the residential sector – analysing tenants’ cost burden in a German field study. *Energy Policy*, 122, 680–688.

<https://doi.org/10.1016/j.enpol.2018.08.007>

Wessel T. (2015). Economic segregation in Oslo: Polarisation as a contingent outcome. In *Socio-Economic Segregation in European Capital Cities: East meets West* (pp. 156–179).

Westerink J., Haase D., Bauer A., Ravetz J., Jarrige F., Aalbers C. B. E. M. (2013). Dealing with Sustainability Trade-Offs of the Compact City in Peri-Urban Planning Across European City Regions. *European Planning Studies*, 21(4), 473–497.

<https://doi.org/10.1080/09654313.2012.722927>

Wetzstein S. (2017). The global urban housing affordability crisis. *Urban Studies*, 54(14), 3159–3177.

<https://doi.org/10.1177/0042098017711649>

Winston N. (2010). ‘Regeneration for sustainable communities? Barriers to implementing sustainable housing in urban areas’. *Sustainable Development*, 18 (6), pp. 319–330. doi: 10.1002/sd.399.

Wohnfonds_Wien (2013.) Finanzierungsarten lt. Sanierungsverordnung 2008

[https://www.wohnfonds.wien.at/media/Website%20PDF-](https://www.wohnfonds.wien.at/media/Website%20PDF-INFO%20Downloads/Sanierung/finanzierungsarten.pdf)

[INFO%20Downloads/Sanierung/finanzierungsarten.pdf](https://www.wohnfonds.wien.at/media/Website%20PDF-INFO%20Downloads/Sanierung/finanzierungsarten.pdf)

Wolff M., Haase D., Haase A. (2018). Compact or spread? A quantitative spatial model of urban areas in Europe since 1990. *PLOS ONE*, 13(2), e0192326.

Wood G., Ong R., McMurray C. (2012). Housing Tenure, Energy Consumption and the Split-Incentive Issue in Australia. *International Journal of Housing Policy*, 12(4), 439–469.

<https://doi.org/10.1080/14616718.2012.730218>

Woods C., Urwin R. (2010). Putting Sustainable Investing into Practice: A Governance Framework for Pension Funds. *Journal of Business Ethics*, 92(1), 1–19. <https://doi.org/10.1007/s10551-010-0631-x>

Wu X., Ramesh M., Howlett M. (2015). Policy capacity: A conceptual framework for understanding policy competences and capabilities. *Policy and Society*, 34(3–4), 165–171.

<https://doi.org/10.1016/j.polsoc.2015.09.001>

Xue J. (2012). ‘Limits to decoupling strategies for sustainable housing development: the Hangzhou experience’. *Journal of Environmental Planning and Management*. Routledge, 55 (8), pp. 1004–1021. doi: 10.1080/09640568.2011.635191.

Xue J. (2018). ‘Housing for degrowth: Space, planning and distribution’. in *Housing for Degrowth*. Routledge, pp. 185–195.

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