REDUCING
HOUSING
INEQUALITIES

Comparative Quantitative Analysis Report

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The ReHousIn project aims to spark innovative policy solutions towards inclusionary and quality housing. To achieve this, it investigates the complex relationship between green transition initiatives and housing inequalities in European urban and rural contexts, and develops innovative policy recommendations for better and context-sensitive integration between environmentally sustainable interventions and socially inclusive housing.

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ABSTRACT

This report investigates patterns of housing inequalities in nine selected European countries in the 21st century: Austria, France, Hungary, Italy, Norway, Poland, Spain, Switzerland, and the United Kingdom. Special emphasis is placed on the comparative aspect of the analysis. In addition to examining the relationship between household characteristics and housing inequality, the report explores the links between neighborhood change and the development and distribution of green areas in the major cities selected for analysis within the framework of the ReHousIn project.

The first part focuses on a comparative quantitative assessment of housing inequalities across areas with different degrees of urbanization. Depending on data quality, we also analyze housing inequalities in major cities or in the regions where these cities are located. Specifically, we investigate three dimensions of housing inequality in each country: housing segmentation, housing quality, and housing affordability. This section provides a systematic comparison of how institutional contexts, household and individual characteristics, and broader socio-demographic factors shape inequalities in housing across Europe in the 21st century. Due to data limitations (e.g., missing observations for certain years), the analysis for some countries begins in the late 2000s.

The second part of the report examines patterns of neighborhood change in nine major cities – Zurich, Paris, Barcelona, London, Warsaw, Budapest, Milan, Vienna, and Oslo – over the course of the 21st century. More specifically, it investigates the relationship between the development and distribution of green areas at the intra-urban scale and the social transformations occurring in neighborhoods. This section therefore places particular emphasis on the issue of green gentrification in Europe. Because census and population data vary across the selected cities, we constructed two versions of a composite gentrification index for each case. Information on green areas was derived from satellite imagery.

Unless otherwise specified, all regression models in Part One are based on microdata from the EU Statistics on Income and Living Conditions (EU-SILC) survey, available upon request from Eurostat. EU-SILC microdata covers all EU Member States, as well as most EFTA and candidate countries, and provides a robust empirical foundation for comparative quantitative research. The analyses presented in Part Two relies on census or population register data for small spatial units equivalent to census tracts, which are widely used in spatial research as proxies for neighborhoods. In most cases, this data is only available upon request from national statistical offices and cannot be shared publicly.

PART I: HOUSING INEQUALITIES

INTRODUCTION

Housing-related inequalities are a central topic in the social sciences and have recently become a key issue in public and political debates (Dewilde and Waitkus 2024; James et al. 2024; Nasrabadi et al. 2024). The concept of housing inequality typically encompasses three dimensions: housing quality, housing affordability, and housing segmentation based on tenure status. In particular, segmentation and affordability are shaped by complex economic, social, political, and demographic factors (Li 2014). This is especially significant given that house prices and rents have increased more rapidly than household incomes in the 21st century (Galster and Lee 2021), and that homeownership rates have declined in Europe during the same period, especially among young adults and low-income groups (Eurofound 2023).

As in previous studies on housing inequalities in Europe, we rely on microdata as input for regression models (e.g., Norris & Winston 2012; Lux et al. 2011; Dewilde & De Decker 2016; Soaita & Dewilde 2021). While the descriptive analysis presented in report D2.1 offers valuable insights, it has limitations. Specifically, descriptive methods examine only one variable at a time and therefore cannot isolate the effect of one demographic characteristic (e.g., income) while controlling for others (e.g., age). To address this limitation and gain deeper insight into the mechanisms shaping housing inequalities, we employ multivariate regression analysis.

We estimate three separate sets of regression models, each corresponding to one dimension of housing inequality. Binomial regression models are used to assess the relationship between household and individual characteristics and homeownership. The same type of model is applied to examine social and demographic disparities in access to good-quality housing. To operationalize housing affordability inequality, we use the Gini index and apply OLS estimation to perform a regression-based decomposition, thereby illustrating the link between disparities in housing expenditures and socio-demographic characteristics.

To enhance the robustness of the analysis and increase the effective sample size, we pool data from two consecutive years for each country. Pooling reduces year-to-year fluctuations and improves statistical reliability, allowing for more stable conclusions about housing inequality patterns. Data from 2005–2006 represent the beginning of the study period, while data from 2019–2020 capture its endpoint. When information for 2005–2006 was missing, the closest subsequent years were used instead.

Finally, because the effects of socio-economic, demographic, and housing characteristics on housing inequality are context-dependent, we conducted separate analyses for areas with different degrees of urbanization (based on the DEGURBA classification): densely populated areas (cities), intermediate-density areas (towns and suburbs), and thinly populated areas (rural areas). Depending on data availability, we also identified major cities—Vienna, Paris, Budapest, and London. Where this was not possible, we analyzed the corresponding surrounding NUTS regions separately: North-West Italy, Mazowieckie (PL), Catalonia (ES), and the Zurich region (including Winterthur). In these cases, only the densely populated areas within the NUTS region were used to approximate the major city.

The distribution of the DEGURBA categories, as well as the locations of the major cities/regions selected, is presented in Figure 1.

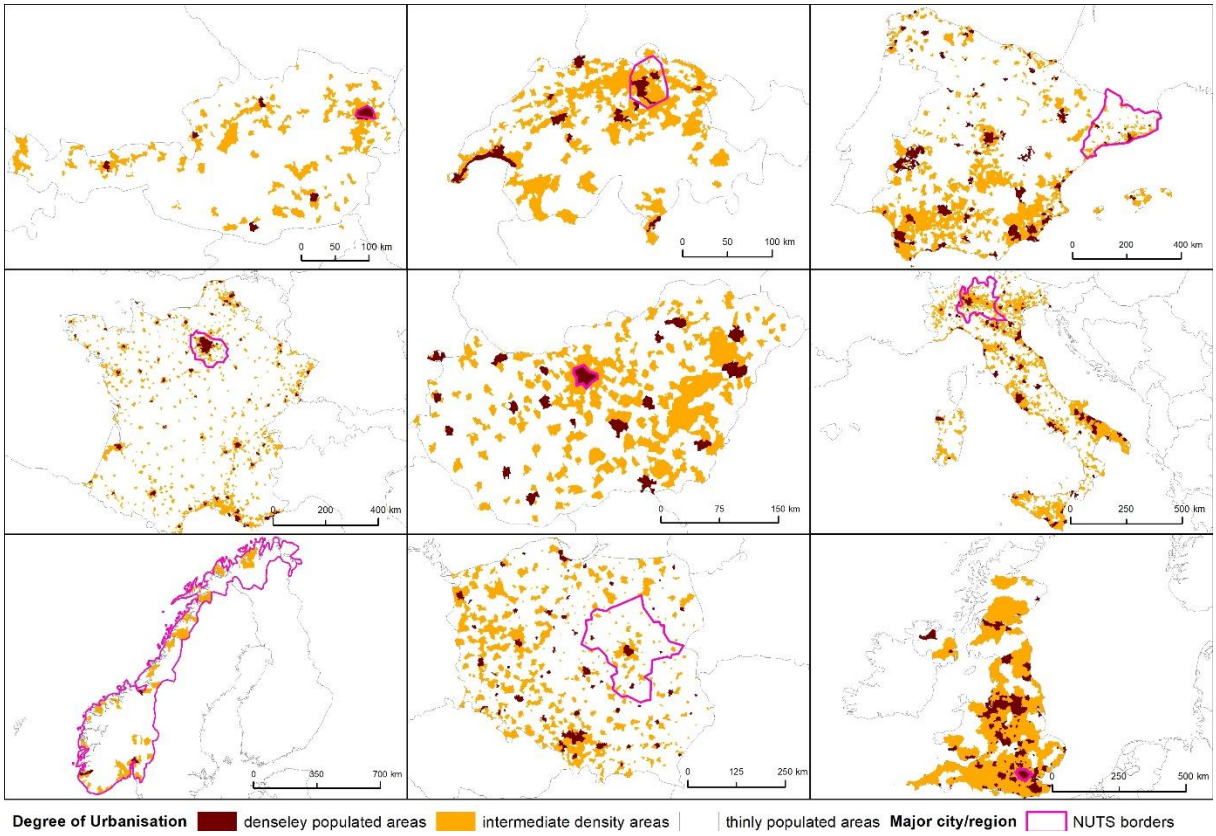


Figure 1. Classification of municipalities according to DEGURBA typology in Austria, Switzerland, Spain, France, Hungary, Italy, Norway, Poland, and the UK.

1.4 HOUSING TENURE

1.4.1 Densely populated areas

Table 1 presents the results of logistic regression models predicting homeownership in densely populated areas of the nine selected countries. More specifically, the table shows the exponentiated coefficients (odds ratios) for Spain, Poland, the UK, Austria, Switzerland, France, Hungary, Italy, and Norway at two points in time (2005/2008 and 2019/2020). Coefficients above 1 indicate higher odds of homeownership relative to the reference category, while coefficients below 1 indicate lower odds. In each country – except Norway at both time points and Poland in 2005 – the category of densely populated areas includes all such areas except those located in the identified major city or region.

The analysis highlights persistent inequalities in urban homeownership alongside notable temporal changes. The most significant pattern is that – except in Austria and Switzerland – income-related disparities have generally widened. Households in the highest income quintiles (4th and 5th) became more likely to own their homes than lower-income households, with the largest increases observed in Norway and Poland. For instance, in Norway the odds of

homeownership for the highest-income households rose from 1.47 in 2005 to 1.65 in 2020, indicating a widening gap between high- and low-income households.

Age effects also show clear patterns. Older adults (50+) consistently have significantly higher homeownership rates than the youngest age group (18–34). In several countries – Poland, the UK, Hungary, Norway, and Spain – this age gap increased over time. The 35–50 age group shows mixed trends, with slight declines in Italy contrasting with modest increases in Norway and Spain. Notably, in Poland, the UK, Hungary, and Spain, access to homeownership declined most strongly for the youngest age group during the study period.

While gender differences are statistically insignificant in most countries, migration effects are substantial. Individuals who changed their place of residence (or signed a new housing contract) within ten years before the survey consistently show lower odds of homeownership. This disadvantage has worsened in several contexts, particularly in Spain, Austria, and Poland.

The origin of immigrants provides further differentiation. Households with EU-born immigrants generally have higher odds of homeownership similar to or slightly lower than native-born households, though declines over time are visible in Norway, Italy, and Spain. Non-EU immigrants, however, face consistently and substantially lower odds of homeownership in densely populated areas. With the exception of the UK, these disparities have widened over time, particularly in France and Italy. The largest disparity appears in Switzerland, where in 2020 non-EU immigrants had odds of homeownership of just 0.52 – almost 50% lower than those of native-born households.

As expected, housing type strongly predicts tenure. Living in a house, particularly a detached house, increases the likelihood of homeownership in all countries. Conversely, living in small apartment blocks reduces the likelihood of ownership, although this negative effect has weakened in Poland, France, and Hungary. Large apartment blocks show mixed trends: homeownership among residents increased in Poland, the UK, France, Italy, and Norway, suggesting shifts in urban housing markets and possibly renewed investment in multi-unit housing. The most notable change occurred in Poland, where the odds of homeownership among residents of large apartment blocks rose from 0.50 to 0.84.

The overall trends for densely populated areas reveal that European urban homeownership patterns between 2005 and 2020 are shaped by growing income inequalities, persistent age advantages, enduring migrant disadvantages, and varying effects of housing type. Temporal shifts are particularly pronounced for income, migration status, and immigrant origin, while age and housing type effects remain relatively stable but regionally differentiated.

	Austria		France		Hungary		Italy		Norway		Poland		Spain		Switzerland		United Kingdom	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2008	2020	2010	2018
Intercept	1.79 (***)	2.26 (***)	1.84 (***)	1.79 (***)	2.26 (***)	2.35 (***)	1.92 (***)	1.80 (***)	1.75 (***)	1.52 (***)	2.16 (***)	2.08 (***)	2.17 (***)	2.34 (***)	1.78 (***)	2.03 (***)	2.06 (***)	2.01 (***)
Gender Ref: female																		
male	1.01 (ns)	1.00 (ns)	1.01 (ns)	1.01 (ns)	1.01 (ns)	1.00 (ns)	1.01 (*)	1.02 (**)	1.01 (.)	1.04 (***)	1.00 (ns)	1.02 (.)	1.00 (ns)	1.02 (***)	1.01 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)
Income Ref: 1st quintile																		
2st quintile	1.19 (***)	1.03 (ns)	1.13 (***)	1.09 (***)	1.08 (***)	1.08 (***)	1.09 (***)	1.06 (***)	1.22 (***)	1.33 (***)	1.03 (**)	1.03 (*)	1.08 (***)	1.05 (***)	1.04 (***)	0.99 (ns)	1.05 (***)	1.05 (***)
3st quintile	1.28 (***)	1.13 (***)	1.17 (***)	1.22 (***)	1.08 (***)	1.05 (**)	1.15 (***)	1.15 (***)	1.36 (***)	1.46 (***)	1.05 (***)	1.11 (***)	1.09 (***)	1.09 (***)	1.11 (***)	1.02 (.)	1.16 (***)	1.14 (***)
4st quintile	1.35 (***)	1.22 (***)	1.31 (***)	1.36 (***)	1.15 (***)	1.11 (***)	1.18 (***)	1.24 (***)	1.43 (***)	1.66 (***)	1.09 (***)	1.11 (***)	1.16 (***)	1.11 (***)	1.12 (***)	1.11 (***)	1.26 (***)	1.27 (***)
5st quintile	1.44 (***)	1.20 (***)	1.38 (***)	1.49 (***)	1.20 (***)	1.08 (***)	1.27 (***)	1.24 (***)	1.47 (***)	1.65 (***)	1.13 (***)	1.22 (***)	1.20 (***)	1.17 (***)	1.27 (***)	1.11 (***)	1.32 (***)	1.33 (***)
Age ref: 18-34 years old																		
35-49	1.02 (ns)	1.02 (ns)	1.07 (***)	1.10 (***)	1.07 (***)	1.10 (***)	1.04 (***)	0.97 (**)	1.11 (***)	1.09 (***)	1.03 (***)	1.07 (***)	1.01 (ns)	1.07 (***)	1.07 (***)	1.03 (**)	1.08 (***)	1.11 (***)
50 and more	1.07 (***)	1.02 (ns)	1.23 (***)	1.16 (***)	1.08 (***)	1.12 (***)	1.12 (***)	1.10 (***)	1.16 (***)	1.19 (***)	1.09 (***)	1.20 (***)	1.05 (***)	1.08 (***)	1.23 (***)	1.15 (***)	1.16 (***)	1.20 (***)
Migration status ref: stayer																		
migrant	0.93 (***)	0.78 (***)	0.87 (***)	0.84 (***)	0.88 (***)	0.84 (***)	0.88 (***)	0.84 (***)	0.89 (***)	0.85 (***)	1.10 (***)	0.91 (***)	0.94 (***)	0.69 (***)	0.96 (***)	0.90 (***)	0.87 (***)	0.83 (***)
Immigrant origin Ref: native																		
any EU country	1.07 (*)	0.98 (ns)	1.01 (ns)	1.04 (ns)	1.05 (ns)	1.01 (ns)	0.84 (***)	0.68 (***)	0.95 (***)	0.78 (***)	1.04 (ns)	0.96 (ns)	0.93 (***)	0.87 (***)	0.93 (***)	0.96 (**)	0.86 (***)	0.97 (ns)
other country	0.89 (***)	0.86 (***)	0.94 (***)	0.70 (***)	1.04 (ns)	0.82 (***)	0.75 (***)	0.62 (***)	0.91 (***)	0.84 (***)	0.99 (ns)	0.85 (***)	0.72 (***)	0.71 (***)	0.55 (***)	0.52 (***)	0.94 (***)	0.97 (***)
Housing type ref: detached house																		
semi-detached house or terraced house	0.89 (***)	0.91 (*)	0.87 (***)	0.92 (***)	0.97 (ns)	0.99 (ns)	0.90 (***)	1.10 (***)	1.03 (***)	1.04 (***)	0.97 (*)	0.99 (ns)	1.01 (ns)	0.94 (***)	0.95 (***)	0.93 (***)	0.86 (***)	0.86 (***)
small apartment building	0.62 (***)	0.59 (***)	0.65 (***)	0.72 (***)	0.81 (***)	0.83 (***)	0.87 (***)	0.99 (ns)	0.92 (***)	1.02 (ns)	0.54 (***)	0.67 (***)	0.93 (***)	0.88 (***)	0.59 (***)	0.58 (***)	0.68 (***)	0.65 (***)
large apartment building	0.65 (***)	0.62 (***)	0.62 (***)	0.70 (***)	0.89 (***)	0.86 (***)	0.89 (***)	1.02 (*)	1.06 (***)	1.08 (***)	0.50 (***)	0.84 (***)	1.00 (***)	0.91 (***)	0.55 (***)	0.52 (***)	0.60 (***)	0.67 (***)

Table 1. Ownership: Densely populated areas

1.4.2 Major cities (metropolitan regions)

This section continues the analysis of homeownership determinants in densely populated areas by focusing on major cities or metropolitan regions. Table 2 presents the results of logistic regression models for the eight selected areas. As in the broader category of densely populated areas, income remains the most consistent driver of homeownership: in virtually all cases, higher income quintiles are associated with greater odds of ownership. The effect is particularly pronounced in Paris, Budapest, and Mazowieckie, and becomes more accentuated in Zurich and London between 2008/2010 and 2020. This confirms that metropolitan housing markets remain strongly stratified by household resources, and that access to homeownership is increasingly contingent upon higher relative incomes.

While gender plays only a minor role in most cities, age effects are robust. Middle-aged and older groups are significantly more likely to own than the youngest group, with particularly strong contrasts in Paris and Zurich. This pattern underscores the life-course dimension of homeownership, where resource accumulation and family formation shape access to housing assets.

Migration background emerges as a persistent disadvantage across nearly all metropolitan regions. Although the disadvantage narrowed somewhat in Italy and London, it deepened in Budapest and remains strong in Mazowieckie. Distinguishing by country of origin further clarifies this pattern: non-EU migrants consistently face the largest barriers to homeownership, with the disadvantage intensifying in Catalonia and persisting in Vienna, Zurich, and Paris.

Housing type is another central determinant of homeownership in metropolitan Europe. Detached houses remain strongly associated with ownership, while row or terraced housing is associated with neutral or only slightly reduced odds. In contrast, living in either small or large apartment buildings systematically reduces the likelihood of ownership, with the effect particularly pronounced in Vienna, Zurich, Paris, and North-West Italy. In many cities, these apartment-related penalties have become stronger over time.

Examining individual cities/regions provides further insight. Baseline homeownership remained high in North-West Italy between 2005 and 2020, though the increase was modest. The income gradient weakened somewhat, while age effects moderated, with older households still more likely to own. Immigrants – especially non-EU migrants – remained disadvantaged, although less so than in many other metropolitan contexts. Strong penalties for apartment dwellers persisted.

In London, baseline ownership increased between 2010 and 2018, but the income gradient declined. Age differences also flattened. Disadvantages for recent movers and international migrants remained, though slightly softened. Apartment penalties decreased modestly, yet ownership remained far less common in apartment housing.

In Catalonia, ownership likelihood increased slightly, though income effects weakened across quintiles. Age effects became stronger, and disadvantages for immigrants deepened, especially for non-EU migrants. Penalties associated with apartment living intensified.

Vienna experienced a strong rise in baseline ownership between 2005 and 2020, although the income gradient weakened somewhat. Penalties for those changing the place of residence persisted. The same applies to international immigrants, especially those originating from non-EU countries. Vienna continues to display some of the strongest apartment-related penalties in Europe, particularly for residents of large apartment blocks where renting is still the dominant tenure.

Zurich presents an opposite trajectory, with baseline ownership declining substantially between 2008 and 2020. The influence of age strengthened, particularly among older households, while immigrant disadvantages deepened. Apartment-related penalties also worsened, reinforcing Zurich's sharp tenure divide.

Paris stands out as a case of declining baseline ownership and growing wealth polarization. Between 2005 and 2020, the income gradient became steeper, with high-income households gaining significantly greater odds of ownership. Age effects also intensified, while migrants – especially non-EU migrants – remained disadvantaged. Apartment housing carried increasingly strong penalties, highlighting Paris's entrenched rental bias.

In Budapest, baseline ownership increased, but the income gradient weakened sharply, particularly among middle quintiles, though the top quintile retained its significance. Migrant disadvantages deepened markedly, while apartment-related penalties remained strong and even worsened slightly over time.

Finally, in Mazowieckie (observed for 2020 only), baseline ownership was very high, with strong income effects, especially among upper quintiles. Immigrants, particularly those from non-EU countries, faced significant disadvantages. Ownership was also strongly concentrated in detached houses, with small and large apartment blocks associated with pronounced penalties.

Overall, the results highlight marked contrasts between European housing systems. Southern and Central-Eastern European regions such as North-West Italy, Catalonia, Budapest, and Mazowieckie maintain high homeownership rates but exhibit increasing stratification by income and persistent disadvantages for immigrants and apartment dwellers. In contrast, large metropolitan areas such as Paris, London, and Zurich show declining or stagnating homeownership among baseline groups, widening wealth polarization, and growing barriers for younger adults and migrants. Across all contexts, the divide between detached houses and apartment housing remains a key structural mechanism of tenure inequality. These findings indicate that although income, age, and migration background are universal determinants of access to homeownership, the configuration of housing systems and market pressures produces distinct regional pathways, reflecting broader patterns of commodification and ownership polarization across Europe.

	AT - Vienna		FR - Paris		HU - Budapest		IT - North-west Italy		PL - Mazowieckie	ES - Catalonia		CH - Zurich		UK - London	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2020	2005	2020	2008	2020	2010	2018
Intercept	2.01 (***)	2.25 (***)	1.97 (***)	1.67 (***)	2.03 (***)	2.42 (***)	2.03 (***)	2.09 (***)	2.10 (***)	2.19 (***)	2.27 (***)	2.63 (***)	1.88 (***)	1.91 (***)	2.06 (***)
Gender Ref: female															
male	1.00 (ns)	1.00 (ns)	1.00 (ns)	1.02 (ns)	1.02 (*)	1.03 (*)	1.01 (ns)	1.03 (**)	0.98 (ns)	0.98 (.)	1.01 (ns)	–	–	1.01 (ns)	0.98 (ns)
Income Ref: 1st quintile															
2st quintile	1.07 (***)	1.01 (ns)	1.02 (ns)	1.13 (***)	1.06 (**)	0.98 (ns)	1.09 (***)	1.06 (**)	1.08 (*)	1.07 (***)	1.01 (ns)	0.98 (.)	1.00 (ns)	1.09 (**)	1.06 (.)
3st quintile	1.09 (***)	1.03 (*)	1.12 (***)	1.19 (***)	1.12 (***)	0.99 (ns)	1.14 (***)	1.08 (***)	1.18 (***)	1.04 (***)	1.02 (ns)	0.99 (ns)	1.04 (ns)	1.15 (***)	1.01 (ns)
4st quintile	1.14 (***)	1.08 (***)	1.14 (***)	1.35 (***)	1.21 (***)	0.99 (ns)	1.32 (***)	1.13 (***)	1.20 (***)	1.27 (***)	1.06 (*)	1.01 (ns)	1.12 (***)	1.33 (***)	1.12 (***)
5st quintile	1.18 (***)	1.13 (***)	1.38 (***)	1.51 (***)	1.21 (***)	1.10 (***)	1.36 (***)	1.20 (***)	1.24 (***)	1.18 (***)	1.11 (***)	1.02 (.)	1.17 (***)	1.36 (***)	1.27 (***)
Age ref: 18-34 years old															
35-49	1.02 (**)	1.10 (ns)	1.05 (**)	1.09 (***)	1.06 (***)	1.05 (**)	1.09 (***)	1.06 (**)	1.00 (ns)	1.02 (ns)	1.03 (*)	0.99 (ns)	1.07 (**)	1.09 (***)	1.06 (*)
50 and more	1.09 (***)	1.04 (***)	1.18 (***)	1.21 (***)	1.12 (***)	1.12 (***)	1.21 (***)	1.14 (***)	1.13 (***)	1.03 (ns)	1.08 (***)	1.00 (ns)	1.26 (***)	1.21 (***)	1.11 (***)
Migration status ref: stayer															
migrant	1.02 (ns)	0.96 (**)	1.00 (ns)	1.00 (ns)	0.93 (***)	0.86 (***)	0.84 (***)	0.89 (***)	0.89 (***)	0.93 (***)	0.91 (***)	1.01 (ns)	0.90 (***)	0.84 (***)	0.86 (***)
Immigrant origin Ref: native															
any EU country	0.95 (*)	0.94 (*)	0.99 (ns)	0.92 (**)	0.99 (ns)	0.96 (ns)	0.97 (ns)	0.94 (**)	1.29 (ns)	0.78 (***)	0.76 (*)	1.02 (ns)	0.89 (***)	0.97 (ns)	0.81 (***)
other country	0.94 (***)	0.91 (***)	0.92 (***)	0.92 (***)	0.84 (***)	1.03 (ns)	0.90 (***)	0.87 (***)	0.80 (*)	0.70 (***)	0.68 (***)	0.97 (*)	0.94 (*)	0.90 (***)	0.86 (***)
Housing type ref: detached house															
semi-detached house or terraced house	0.94 (ns)	0.96 (ns)	0.88 (***)	0.96 (.)	0.98 (ns)	0.98 (ns)	0.93 (*)	0.92 (**)	1.07 (ns)	1.04 (ns)	0.92 (ns)	1.01 (ns)	0.96 (ns)	0.93 (*)	0.98 (ns)
small apartment building	0.57 (***)	0.53 (***)	0.62 (***)	0.65 (***)	0.84 (***)	0.80 (***)	0.66 (***)	0.64 (***)	0.79 (***)	0.94 (***)	0.92 (***)	1.00 (ns)	0.60 (***)	0.66 (***)	0.76 (***)
large apartment building	0.52 (***)	0.49 (***)	0.59 (***)	0.64 (***)	0.90 (***)	0.86 (***)	0.68 (***)	0.66 (***)	0.88 (***)	0.99 (***)	0.94 (***)	0.99 (ns)	0.55 (***)	0.68 (***)	0.76 (***)

Table 2. Ownership: Major cities (Metropolitan Areas)

1.4.3 Intermediate areas

Table 3 presents the results of logistic regression models predicting access to homeownership in intermediate areas across the nine European countries. The table presents odds ratios from logistic regression models. As in densely populated areas, homeownership in intermediate areas is strongly associated with income, age, and housing type.

Income remains a major axis of differentiation. Across countries and time periods, higher income quintiles (particularly the 4th and 5th) are consistently associated with higher odds of homeownership, with clear increases over time in Poland, Norway, Spain, and Austria. This pattern demonstrates that socioeconomic gradients have not only persisted but intensified in several contexts, pointing to a widening gap between lower- and higher-income groups in suburban settings.

Age also plays an important, although somewhat more moderate, role. Older age categories (35 and above) generally show higher odds of homeownership than the youngest group, with the effect intensifying over time in Poland, Switzerland, and Norway. However, the differences associated with age are modest compared with those associated with income, suggesting that demographic structuring of homeownership exists but is less decisive than economic inequality.

Migration status further reinforces housing inequalities in intermediate zones. Migrants consistently exhibit lower odds of ownership across all observed countries. The steepest declines over time occurred in Spain and Austria, indicating that structural barriers for migrant households in suburban areas either remained persistent or became more pronounced.

Country of origin adds another dimension. Individuals of EU origin – and especially those of non-EU origin – face systematically lower odds of homeownership than native-born households. While the disadvantage for non-EU migrants remained importantbeverywhere, patterns diverged over time: in Poland, the UK, France, and Italy, the gap widened, whereas in the remaining five countries the odds increased, suggesting some partial convergence. These findings highlight the entrenched and context-dependent nature of origin-based inequality in Europe.

Housing type is also a key determinant. Compared with detached houses (the reference category), terraced housing generally shows similar or only slightly lower odds of ownership. By contrast, both small and large apartment buildings are consistently associated with substantially lower odds across nearly all countries. These penalties remain strong, although some moderation is visible over time in Poland, Austria, and France, where the disadvantages associated with multi-unit housing have slightly declined. In Norway, larger multi-unit buildings even show relatively higher ownership odds, indicating a distinct trajectory. As in densely populated areas, these results emphasize that housing type itself functions as an axis of social stratification.

Taken together, these findings highlight three central dimensions of inequality in intermediate areas across Europe. First, income-based inequalities are persistent and, in many cases, increasing. Second, migration and origin-related disadvantages continue to shape access to

ownership, with limited signs of convergence. Third, dwelling type remains a strong marker of tenure stratification, with residents of multi-unit buildings facing systematically reduced access to homeownership.

1.4.4 Thinly populated areas

Table 4 presents the results of logistic regression models predicting access to homeownership in thinly populated areas across the nine European countries. As in Tables 1, 2, and 3, the table reports odds ratios. Socioeconomic status, as captured by income quintiles, shows a strong and positive association with homeownership: individuals in higher income quintiles (especially those in the top two) have significantly greater odds of being homeowners, with robust statistical significance across all countries and years. This indicates a clear socioeconomic gradient in thinly populated areas, where higher economic resources are closely linked to improved housing outcomes.

As in densely populated and intermediate areas, age also plays an important role. Older age categories generally exhibit higher odds of homeownership, particularly in Switzerland, France, Norway, and the UK. In most countries, gender has no statistically significant effect on ownership likelihood.

Migration status consistently shows a negative association with homeownership. Migrants have significantly lower odds of ownership across all countries and years, echoing the patterns observed in more urbanized areas. Immigrant origin adds nuance: individuals from non-EU countries tend to have substantially lower odds of homeownership than the native-born population. Immigrants from EU countries display more mixed results depending on country and time period; however, in all nine countries, their odds of ownership remain somewhat lower than those of the native-born, even where modest improvements are observed (e.g., in the UK and France).

Housing type emerges as a strong contextual factor influencing homeownership in thinly populated areas. Compared to detached houses (the reference category), living in apartment buildings – whether small (fewer than 10 units) or large (10 units or more) – is associated with substantially lower odds of homeownership. This pattern is consistent and statistically significant in nearly every country, suggesting that detached housing as the dominant housing type reflects broader structural and market conditions that shape tenure opportunities in rural areas. The key exception is Norway, where living in larger apartment buildings is associated with higher odds of homeownership, indicating a distinct regional housing dynamic.

Overall, and consistent with patterns observed in more densely populated areas, the results for thinly populated areas underscore the central role of socioeconomic status, age, migration background, and housing type in shaping access to homeownership across diverse national contexts.

	Austria		France		Hungary		Italy		Norway		Poland		Spain		Switzerland		United Kingdom	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2005	2005	2020	2005	2020	2005	2020	2005	2020	2005
Intercept	2.20 (***)	2.06 (***)	2.06 (***)	2.12 (***)	2.39 (***)	2.50 (***)	2.15 (***)	2.18 (***)	1.89 (***)	1.67 (***)	2.45 (***)	2.21 (***)	2.24 (***)	2.12 (***)	1.91 (***)	1.95 (***)	2.06 (***)	2.19 (***)
Gender Ref: female																		
male	1.00 (ns)	1.00 (ns)	1.00 (ns)	0.99 (ns)	0.99 (ns)	1.00 (ns)	1.01 (ns)	1.01 (ns)	1.01 (ns)	1.04 (***)	1.00 (ns)	1.01 (ns)	1.01 (.)	1.00 (ns)	1.00 (ns)	1.01 (*)	1.00 (ns)	1.00 (ns)
Income Ref: 1st quintile																		
2st quintile	1.13 (***)	1.00 (ns)	1.07 (***)	1.06 (***)	1.07 (***)	1.02 (**)	1.06 (***)	1.06 (***)	1.15 (***)	1.23 (***)	1.01 (ns)	1.10 (***)	1.05 (***)	1.09 (***)	1.05 (***)	1.06 (***)	1.00 (ns)	0.99 (ns)
3st quintile	1.13 (***)	1.14 (***)	1.13 (***)	1.14 (***)	1.09 (***)	1.04 (***)	1.09 (***)	1.09 (***)	1.28 (***)	1.40 (***)	1.03 (**)	1.08 (***)	1.09 (***)	1.19 (***)	1.15 (***)	1.10 (***)	1.14 (***)	1.10 (***)
4st quintile	1.18 (***)	1.24 (***)	1.21 (***)	1.24 (***)	1.08 (***)	1.02 (*)	1.17 (***)	1.17 (***)	1.36 (***)	1.53 (***)	1.05 (***)	1.14 (***)	1.11 (***)	1.24 (***)	1.24 (***)	1.16 (***)	1.25 (***)	1.18 (***)
5st quintile	1.21 (***)	1.35 (***)	1.26 (***)	1.26 (***)	1.12 (***)	1.08 (***)	1.21 (***)	1.21 (***)	1.34 (***)	1.51 (***)	1.07 (***)	1.15 (***)	1.15 (***)	1.26 (***)	1.29 (***)	1.32 (***)	1.27 (***)	1.25 (***)
Age ref: 18-34 years old																		
35-49	1.03 (**)	1.00 (ns)	1.05 (***)	1.08 (***)	1.04 (***)	1.04 (***)	1.00 (ns)	1.02 (*)	1.08 (***)	1.08 (**)	1.03 (***)	1.06 (***)	1.01 (ns)	1.04 (***)	1.10 (***)	1.07 (***)	1.11 (***)	1.06 (***)
50 and more	1.03 (.)	1.01 (ns)	1.15 (***)	1.10 (***)	1.04 (***)	1.06 (***)	1.08 (***)	1.09 (***)	1.13 (***)	1.17 (**)	1.04 (***)	1.13 (***)	1.05 (***)	1.06 (***)	1.21 (***)	1.18 (***)	1.19 (***)	1.15 (***)
Migration status ref: stayer																		
migrant	0.88 (***)	0.82 (***)	0.87 (***)	0.82 (***)	0.92 (***)	0.89 (***)	0.88 (***)	0.82 (***)	0.90 (***)	0.87 (**)	0.98 (*)	0.92 (***)	0.93 (***)	0.67 (***)	0.85 (***)	0.81 (***)	0.88 (***)	0.86 (***)
Immigrant origin Ref: native																		
any EU country	1.03 (ns)	0.93 (**)	1.00 (ns)	0.93 (***)	0.97 (ns)	0.95 (.)	0.91 (**)	0.74 (***)	1.02 (ns)	0.84 (**)	0.94 (ns)	1.04 (ns)	0.95 (*)	0.83 (***)	0.95 (**)	0.92 (***)	0.88 (***)	0.90 (***)
other country	0.82 (***)	1.00 (ns)	0.96 (**)	0.91 (***)	0.91 (**)	1.05 (ns)	0.73 (***)	0.67 (***)	0.78 (***)	0.83 (**)	0.91 (.)	0.86 (**)	0.67 (***)	0.78 (***)	0.85 (***)	0.91 (***)	0.98 (ns)	0.95 (**)
Housing type ref: detached house																		
semi-detached house or terraced house	0.87 (***)	0.91 (***)	0.87 (***)	0.84 (***)	0.90 (***)	0.98 (.)	0.95 (***)	0.96 (**)	1.01 (ns)	1.04 (**)	1.01 (ns)	0.96 (*)	1.00 (ns)	1.00 (ns)	0.94 (***)	0.96 (**)	0.87 (***)	0.85 (***)
small apartment building	0.58 (***)	0.68 (***)	0.56 (***)	0.59 (***)	0.91 (***)	0.88 (***)	0.87 (***)	0.89 (***)	0.83 (***)	0.90 (**)	0.56 (***)	0.70 (***)	0.93 (***)	0.95 (***)	0.67 (***)	0.66 (***)	0.68 (***)	0.63 (***)
large apartment building	0.61 (***)	0.67 (***)	0.54 (***)	0.60 (***)	0.92 (***)	0.90 (***)	0.90 (***)	0.87 (***)	1.12 (***)	1.10 (***)	0.48 (***)	0.84 (***)	1.02 (.)	1.00 (ns)	0.61 (***)	0.63 (***)	0.64 (***)	0.70 (***)

Table 3. Ownership: Intermediate areas

	Austria		France		Hungary		Italy		Norway		Poland		Spain		Switzerland		United Kingdom	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2005	2005	2020	2005	2020	2005	2020	2005	2020	2005
Intercept	2.28 (***)	1.84 (***)	2.10 (***)	2.13 (***)	2.53 (***)	2.54 (***)	2.22 (***)	2.25 (***)	1.97 (***)	1.84 (***)	2.41 (***)	2.43 (***)	2.27 (***)	2.19 (***)	1.96 (***)	1.91 (***)	2.10 (***)	2.21 (***)
Gender Ref: female																		
Male	0.98 (*)	0.99 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	1.01 (ns)	1.01 (ns)	1.02 (**)	1.02 (**)	1.03 (**)	1.00 (ns)	1.00 (ns)	1.01 (.)	1.01 (**)	0.98 (.)	0.99 (ns)	1.01 (ns)	1.01 (ns)
Income Ref: 1st quintile																		
2st quintile	1.10 (***)	1.17 (***)	1.05 (***)	1.08 (***)	1.03 (***)	1.03 (***)	1.02 (**)	1.05 (***)	1.13 (***)	1.25 (***)	1.03 (***)	1.05 (***)	1.05 (***)	1.09 (***)	1.08 (***)	1.12 (***)	1.01 (ns)	1.03 (ns)
3st quintile	1.14 (***)	1.31 (***)	1.10 (***)	1.14 (***)	1.05 (***)	1.03 (***)	1.07 (***)	1.09 (***)	1.27 (***)	1.35 (***)	1.04 (***)	1.08 (***)	1.08 (***)	1.10 (***)	1.20 (***)	1.24 (***)	1.12 (***)	1.11 (***)
4st quintile	1.16 (***)	1.39 (***)	1.19 (***)	1.23 (***)	1.05 (***)	1.04 (***)	1.12 (***)	1.15 (***)	1.32 (***)	1.43 (***)	1.06 (***)	1.11 (***)	1.07 (***)	1.13 (***)	1.28 (***)	1.25 (***)	1.24 (***)	1.18 (***)
5st quintile	1.23 (***)	1.44 (***)	1.18 (***)	1.28 (***)	1.04 (***)	1.04 (***)	1.13 (***)	1.18 (***)	1.34 (***)	1.41 (***)	1.08 (***)	1.08 (***)	1.14 (***)	1.14 (***)	1.30 (***)	1.37 (***)	1.21 (***)	1.21 (***)
Age ref: 18-34 years old																		
35-49	1.03 (***)	1.03 (**)	1.16 (***)	1.05 (***)	1.02 (***)	1.01 (**)	1.01 (.)	0.99 (ns)	1.08 (***)	1.07 (***)	1.03 (***)	1.02 (**)	0.99 (.)	1.05 (***)	1.14 (***)	1.08 (***)	1.06 (***)	0.96 (*)
50 and more	0.98 (*)	0.99 (ns)	1.19 (***)	1.10 (***)	1.02 (***)	1.03 (***)	1.12 (***)	1.08 (***)	1.12 (***)	1.10 (***)	1.05 (***)	1.03 (***)	1.06 (***)	1.08 (***)	1.15 (***)	1.20 (***)	1.16 (***)	1.10 (***)
Migration status ref: stayer																		
migrant	0.88 (***)	0.89 (***)	0.80 (***)	0.82 (***)	0.92 (***)	0.93 (***)	0.88 (***)	0.78 (***)	0.85 (***)	0.83 (***)	0.98 (***)	0.91 (***)	0.92 (***)	0.72 (***)	0.79 (***)	0.86 (***)	0.88 (***)	0.86 (***)
Immigrant origin Ref: native																		
any EU country	0.97 (ns)	0.93 (***)	0.98 (ns)	1.04 (*)	1.03 (ns)	1.03 (.)	0.88 (***)	0.70 (***)	0.89 (***)	0.85 (**)	1.05 (*)	0.96 (ns)	0.91 (**)	0.82 (***)	0.91 (***)	0.85 (***)	0.82 (***)	0.87 (***)
other country	0.85 (***)	0.87 (***)	1.05 (.)	0.96 (**)	0.90 (***)	0.99 (ns)	0.78 (***)	0.70 (***)	0.92 (**)	0.82 (**)	0.92 (***)	0.91 (**)	0.63 (***)	0.77 (***)	0.88 (***)	0.97 (ns)	0.99 (ns)	0.93 (*)
Housing type ref: detached house																		
semi-detached house or terraced house	0.84 (***)	0.95 (**)	0.84 (***)	0.82 (***)	0.95 (***)	0.92 (***)	0.91 (***)	0.95 (***)	0.92 (***)	0.97 (*)	0.95 (***)	0.98 (.)	1.00 (ns)	0.99 (.)	0.89 (***)	0.89 (***)	0.82 (***)	0.84 (***)
small apartment building	0.60 (***)	0.70 (***)	0.56 (***)	0.56 (***)	0.89 (***)	0.86 (***)	0.85 (***)	0.87 (***)	0.76 (***)	0.83 (**)	0.67 (***)	0.79 (***)	0.91 (***)	0.91 (***)	0.71 (***)	0.66 (***)	0.61 (***)	0.71 (***)
large apartment building	0.61 (***)	0.63 (***)	0.52 (***)	0.63 (***)	0.93 (***)	0.91 (***)	0.87 (***)	0.92 (***)	1.00 (ns)	1.06 (**)	0.55 (***)	0.89 (***)	0.98 (*)	0.96 (***)	0.70 (***)	0.67 (***)	0.68 (***)	0.68 (***)

Table 4. Ownership: Thinly populated areas

1.4.5 Summary

The analysis of homeownership patterns across areas with varying degrees of urbanization – densely populated, intermediate, and thinly populated – across nine European countries reveals several important differences and trends. Income is a key determinant of homeownership, with higher-income households consistently exhibiting a greater probability of owning a home. This effect is particularly pronounced in densely populated areas, where households in the highest income quintile often have substantially higher ownership rates than the average. By contrast, in intermediate and thinly populated areas, income differences still matter but exert a less pronounced influence on ownership outcomes.

Age displays a similar pattern. Younger households, especially those in which the household head is aged 18 to 34, face more significant barriers to ownership in urban regions, reflecting higher entry costs and more competitive markets. Their disadvantage is smaller in rural contexts, where housing tends to be more affordable and more accessible.

Migration status and immigrant origin also play critical roles in shaping access to homeownership, with effects that vary across the urbanization gradient. Migrants and non-native residents – particularly those born outside the EU – are consistently less likely to own homes in densely populated areas, with especially pronounced gaps in Switzerland, Norway, and Spain. In intermediate and rural areas, these gaps tend to be smaller, suggesting that less urbanized housing markets may offer more opportunities for migrant populations.

Housing type further contributes to these patterns. In urban areas, living in apartments – especially in large multi-unit buildings – is strongly associated with lower homeownership probabilities. This effect is weaker in intermediate areas and remains present but less pronounced in thinly populated regions.

Cross-country comparisons also highlight distinct national dynamics. For example, Norway exhibits relatively low baseline ownership in densely populated areas compared to rural zones, but this gap has narrowed over time. Hungary and France show more uniform ownership probabilities across the urbanization gradient. Italy displays particularly large urban–rural differences, especially for migrants and younger households, underlining the importance of national housing systems and policy regimes.

In conclusion, these results suggest that urbanization amplifies inequalities in access to homeownership related to income, age, migration status, and housing type. In densely populated areas, income, age, and dwelling characteristics emerge as the strongest predictors of ownership across most countries. In thinly populated areas, migration status and origin become more prominent determinants. Intermediate zones tend to display more moderate and balanced effects. Overall, major cities and densely populated regions present greater barriers for younger households, lower-income groups, and migrants, while rural regions generally offer more equitable pathways into homeownership.

1.5 HOUSING AFFORDABILITY

1.5.1 Trends in housing expenditures inequality

Table 5 presents trends in inequality in housing affordability, measured here as the share of total housing expenditures in households' disposable income, across the nine selected countries. The Gini index for housing expenditure inequality reveals clear variation across countries, levels of urbanization, and time periods.

In Southern European countries such as Spain and Italy, inequality is consistently high – particularly in highly urbanized areas – and has increased over time. In Spain, the Gini index in highly urbanized areas rose from 0.414 in 2005 to 0.434 in 2020, while in Italy it increased from 0.422 to 0.455 over the same period. These trends indicate that urban housing markets in Southern Europe have become more unequal, placing a relatively greater financial burden on lower-income households. Intermediate and rural areas in both countries also exhibit rising inequality, although rural areas in Spain show a slight decline by 2020, suggesting some convergence in housing expenditure burdens in less densely populated regions.

France, however, displays a different pattern. In highly urbanized areas, inequality declined from 0.419 in 2005 to 0.395 in 2020, with intermediate and rural areas showing similarly modest decreases. This suggests that housing expenditure inequality has slightly diminished in France over the 15-year period, particularly in large urban centers. Such trends may reflect policy measures, differences in housing market dynamics, or changes in affordability and supply conditions in urban areas.

	Highly Urbanized		Intermediate		Rural	
Year / Country	2005	2020	2005	2020	2005	2020
Austria	0.368	0.364	0.350	0.376	0.335	0.367
France	0.419	0.395	0.429	0.419	0.411	0.395
Hungary	0.299	0.400	0.304	0.369	0.300	0.356
Italy	0.422	0.455	0.411	0.432	0.400	0.426
Norway	0.378	0.382	0.367	0.383	0.374	0.382
Poland	0.318	0.337	0.341	0.335	0.328	0.341
Spain	0.414	0.434	0.408	0.424	0.418	0.384
Switzerland	0.298	0.307	0.309	0.340	0.319	0.367
United Kingdom	0.349	0.380	0.341	0.370	0.348	0.392

Table 5. The trends in inequality in housing affordability

Central and Eastern European countries present more mixed trends. In Poland, inequality shows a modest increase in highly urbanized areas, rising from 0.318 in 2005 to 0.337 in 2020, while intermediate and rural areas remain relatively stable. In contrast, Hungary exhibits a marked rise in inequality across all levels of urbanization, with the Gini index in highly urbanized areas increasing sharply from 0.299 to 0.400. This indicates growing disparities in housing expenditures not only in major cities but also in less densely populated regions.

Austria and Switzerland display moderate increases in housing expenditure inequality. In Switzerland, inequality rises across all levels of urbanization, with the most pronounced increase occurring in intermediate and rural areas, suggesting a diffusion of affordability pressures beyond metropolitan centers. A similar, but even more notable pattern emerges in Austria, where inequality in highly urbanized areas remains nearly unchanged, while intermediate and rural areas experience clear increases.

The United Kingdom and Norway follow distinct trajectories. In the UK, all area types show a noticeable increase in inequality: rural areas rise from 0.348 to 0.392, highly urbanized areas from 0.349 to 0.380, and intermediate areas from 0.341 to 0.370. This reflects widening disparities in housing costs across the entire urban–rural spectrum. Norway, by contrast, maintains relatively stable levels of inequality across all types of areas over time, indicating a more balanced distribution of housing expenditure burdens.

Overall, the data suggest that Southern European countries and Hungary are experiencing significant increases in housing expenditure inequality, particularly in urban contexts, while France and Norway display relative stability or modest declines. Austria and Switzerland present heterogeneous trends, with inequality increasingly extending into intermediate and rural areas. Despite these differences, highly urbanized areas tend to exhibit the highest levels of inequality across most countries, although the magnitude and evolution of these disparities vary considerably depending on the national housing system, policy environment, and market dynamics.

City/region	2005	2020
AT - Vienna	0.343	0.338
FR - Paris	0.427	0.409
HU - Budapest	0.311	0.419
IT - North-West Italy	0.405	0.435
PL - Mazowieckie	–	0.355
ES - Catalonia	0.428	0.452
CH - Zurich	0.305	0.325
UK - London	0.380	0.404

Table 6. The Gini indices for housing expenditure inequality in major cities/regions

Table 6 presents the Gini indices for housing expenditure inequality in major cities and metropolitan regions. The results show substantial variation across regions and over time. In Southern European regions such as Catalonia and North-West Italy, inequality is both high and increasing. In most cases, the Gini index values observed in these major cities/regions are higher than those in other area types within their respective countries. In Catalonia, the

index increased from 0.428 in 2005 to 0.452 in 2020, while in North-West Italy it rose from 0.405 to 0.435. These trends suggest that housing expenditure burdens in these metropolitan areas have become increasingly concentrated among lower-income households, indicating heightened financial pressure in urban housing markets. Paris, however, shows a slight decline in inequality from 0.427 to 0.409 over the same period, suggesting a modest improvement despite the city's enduringly high housing costs.

In Eastern Europe, the shifts are more pronounced. Budapest shows a sharp rise in the Gini index, from 0.311 in 2005 to 0.419 in 2020, pointing to a substantial escalation in housing expenditure inequality – potentially linked to market liberalization, intensified gentrification, or rapid growth in urban housing prices. The Mazowieckie region of Poland, observed only in 2020, records a Gini index of 0.355, which indicates a moderate level of inequality relative to the other major cities covered.

Western European cities generally display lower and more stable levels of housing expenditure inequality. Vienna shows a slight decrease from 0.343 in 2005 to 0.338 in 2020, indicating stable housing affordability and a more equitable distribution of housing costs. Zurich, though beginning at a relatively low level (0.305), increases moderately to 0.325, reflecting a gradual rise in inequality, but remaining below the levels found in Southern Europe. London exhibits a steady increase from 0.380 to 0.404, consistent with broader trends of rising urban housing costs and widening income disparities in the UK.

To conclude, Southern European and Eastern European metropolitan regions display higher and increasing levels of housing expenditure inequality, while cities in Austria and Switzerland maintain relatively lower and more stable levels. London falls between these patterns, with moderate but rising inequality. These findings underscore marked cross-city differences in the intensity and evolution of housing affordability pressures, with metropolitan areas in Southern and Eastern Europe experiencing the most pronounced challenges.

1.5.2 Correlates of housing expenditures inequality

1.5.2.1 Densely populated areas

The regression-based decomposition of housing expenditure inequality, measured using the Gini index, provides a detailed view of how various socioeconomic and demographic factors contribute to disparities in highly urbanized areas (metropolitan regions) across European housing markets (Table 7). Across all analyzed countries, income emerges as the most influential explanatory variable, accounting for roughly one-third to one-half of total inequality. This pattern is remarkably consistent and highlights the central role of income distribution in shaping housing affordability. In particular, Poland (2005: 48%; 2020: 53%) and the United Kingdom (2010: 48%) show especially strong contributions from income, indicating that economic stratification translates directly into pronounced housing inequalities.

In contrast, the residual component – representing unobserved or structural factors not captured by the model – varies substantially across countries. Hungary, Norway, and Italy consistently exhibit higher residual shares (ranging from 58% to 66%), suggesting that a significant portion of housing inequality in these contexts arises from factors beyond the

measured socioeconomic and demographic characteristics. Such factors may include regional disparities in housing supply, differences in tenure systems, institutional inefficiencies, or patterns of spatial segregation. Conversely, Poland, Austria, Spain, and the UK, particularly in 2020, display smaller residuals, implying that observable variables – primarily income, age, and housing type – account for a greater proportion of housing expenditure inequality.

Country	Year	Gender	Income	Age categories	Migration status	Immigration origin	Housing type	Residual
Austria	2005	0.14%	45.57%	0.22%	1.91%	0.65%	5.55%	45.96%
	2020	0.06%	44.42%	1.66%	3.18%	1.63%	7.71%	41.34%
France	2005	0.02%	31.60%	1.45%	2.67%	0.20%	10.33%	53.74%
	2020	0.01%	35.57%	1.23%	4.62%	0.55%	9.56%	48.46%
Hungary	2005	0.26%	36.35%	0.48%	1.21%	0.01%	0.08%	61.62%
	2020	0.00%	38.92%	0.09%	0.31%	0.03%	0.58%	60.08%
Italy	2005	0.06%	34.10%	0.27%	2.70%	1.24%	0.22%	61.42%
	2020	-0.02%	36.30%	0.75%	2.36%	1.74%	0.76%	58.11%
Norway	2005	-0.01%	23.29%	4.72%	4.68%	-0.06%	0.72%	66.65%
	2020	0.03%	32.59%	3.80%	5.33%	-0.08%	-0.83%	59.16%
Poland	2005	0.07%	47.72%	-0.38%	0.10%	-0.01%	0.92%	51.58%
	2020	0.05%	53.45%	-0.51%	0.44%	0.14%	0.51%	45.92%
Spain	2005	0.07%	35.31%	0.68%	9.57%	2.51%	0.22%	51.64%
	2020	0.01%	42.91%	0.75%	8.60%	5.74%	0.21%	41.78%
Switzerland	2008	0.10%	41.62%	-0.13%	1.14%	0.02%	1.88%	55.36%
	2020	0.11%	44.02%	-0.02%	1.49%	0.12%	5.99%	48.28%
United Kingdom	2010	0.08%	47.52%	0.95%	7.52%	0.17%	0.76%	43.00%
	2018	0.02%	45.91%	1.54%	5.76%	0.40%	2.05%	44.33%

Table 7. The regression-based decomposition of housing expenditures inequality: Densely populated areas

Temporal dynamics reveal notable patterns in the evolution of housing expenditure inequality. Between 2005 and 2020, most countries experienced a decline in the residual share, indicating that the explanatory power of observed characteristics has improved over time. This trend is particularly evident in Spain (from 52% to 42%) and Austria (from 46% to 41%), where economic, demographic, and migration-related factors have become more closely aligned with

housing outcomes. In contrast, Italy, Norway, and Hungary maintain relatively high residual shares (58%, 59%, and 60%, respectively, in 2020), suggesting persistent structural or institutional drivers of inequality.

When examining specific factors, migration status shows a modest but consistent influence, especially in Spain and Norway, where its contribution ranges from 3% to 9%. The effect of age is generally small but slightly more pronounced in Austria and Norway, reflecting the increasing importance of life-cycle and generational dynamics in shaping housing outcomes. Gender and housing type remain minor contributors overall but exhibit country-specific nuances – for instance, housing type plays a larger role in France and Austria.

Overall, the temporal evidence suggests a gradual convergence, with observed socioeconomic determinants explaining an increasing share of housing inequality over time. Nonetheless, substantial unexplained components persist, highlighting the continuing importance of structural, institutional, and spatial factors that extend beyond individual socioeconomic characteristics.

	2005				2020			
Variable / Country	2st Income Quantile	3st Income Quantile	4st Income Quantile	5st Income Quantile	2st Income Quantile	3st Income Quantile	4st Income Quantile	5st Income Quantile
Austria	-0.457	-0.774	-0.933	-1.339	-0.388	-0.693	-0.932	-1.271
France	-0.416	-0.665	-0.947	-1.311	-0.451	-0.681	-0.955	-1.300
Hungary	-0.315	-0.515	-0.689	-1.051	-0.584	-0.792	-1.036	-1.250
Italy	-0.448	-0.733	-0.944	-1.361	-0.485	-0.825	-1.031	-1.514
Norway	-0.417	-0.604	-0.800	-1.042	-0.509	-0.802	-0.977	-1.246
Poland	-0.338	-0.550	-0.804	-1.213	-0.441	-0.716	-0.947	-1.337
Spain	-0.495	-0.720	-1.022	-1.343	-0.470	-0.727	-1.027	-1.389
Switzerland *(2008/2020)*	-0.424	-0.618	-0.793	-1.110	-0.417	-0.631	-0.839	-1.187
United Kingdom *(2010/2018)*	-0.449	-0.761	-1.054	-1.381	-0.533	-0.823	-1.084	-1.457

Note: all coefficients are statistically significant at 0.01 level or better

Table 8. Coefficients by Income Quintile and Year (reference category 1st quintile): highly urbanized areas

Table 8 provides additional insight into the role of income in shaping inequality in housing expenditures across densely populated areas in European countries. The coefficients for the second to fifth income quintiles, relative to the poorest quintile, indicate that more negative values correspond to a larger reduction in housing burden for higher-income households, highlighting the degree of inequality.

Across countries in 2020, the steepest gradients are observed in Italy and the United Kingdom, with top-income quintile coefficients of –1.514 and –1.457, respectively, reflecting the highest

levels of inequality. In these countries, households in the top quintile experience substantially lower housing burdens compared to the poorest quintile. Hungary also shows a marked increase in inequality, with a fifth-quintile effect of –1.250, while Norway displays a more moderate gradient of –1.246, suggesting lower but still notable disparities. Switzerland and France occupy intermediate positions, with top-quintile coefficients of –1.187 and –1.300, respectively, indicating persistent but relatively stable differences. Austria is characterized by stable patterns of housing inequality.

Over time, nearly all countries show a trend toward increasing inequality, as evidenced by more negative effects for the top income quintile in 2020 compared to earlier periods. Spain moved from –1.343 in 2005 to –1.389 in 2020, indicating a slight increase in inequality. Poland exhibits a more pronounced rise, from –1.213 to –1.337, suggesting a growing divergence in housing burden. Hungary and Italy display the largest increases, with housing burdens for the highest-income households increasingly diverging from those of the poorest, highlighting a widening gap in housing affordability. In contrast, Austria demonstrates a relatively stable pattern, with only minor fluctuations across quintiles, while Switzerland and France show modest changes, indicating overall persistence in inequality.

Considering all quintiles, differences are most pronounced at the top, but shifts are also apparent among middle-income households. The coefficients for the second to fourth quintiles have generally become more negative over time in many countries, signaling that even middle-income households are experiencing lower relative housing burdens compared to the poorest quintile. For example, Spain's second-quintile coefficient declined from –0.495 to –0.470, while the third-quintile coefficient shifted from –0.720 to –0.727, reflecting consistent changes across the income spectrum. Hungary demonstrates significant increases in inequality across all quintiles, indicating broad-based divergence in housing burden beyond just the highest-income group.

Regional patterns further illuminate these trends. Southern European countries, including Spain and Italy, exhibit the steepest gradients and highest overall inequality, particularly among top-income households. Eastern European countries, such as Poland and Hungary, experience rising inequality. Austria remains comparatively stable, reflecting differences in housing market structures and policy interventions. Norway and Switzerland maintain more moderate inequality, though Switzerland shows a slight increase over time.

In general, the results indicate that housing expenditure inequality is rising in highly urbanized areas of most European countries. Regional comparisons underscore that Southern Europe and the UK face the most pronounced disparities, Eastern and Western Europe show heterogeneous trends, and Northern Europe exhibits relatively moderate but gradually increasing inequality.

1.5.2.2 Major cities (metropolitan areas)

Table 9 presents the results of regression-based decomposition of housing inequality in the major cities (or metropolitan areas). The decomposition shows that, similar to the trend identified for highly urbanized areas, income is consistently the most important factor contributing to housing inequality across all cities/regions and years, although its relative

importance varies. In 2005, income contributed 31.2% in Catalonia, 38.3% in North-West Italy, 42.8% in Vienna, and 26.6% in Paris. By 2020, its contribution had increased in Catalonia (39.8%) and Paris (37.3%), while slightly decreasing in North-West Italy (35.3%) and Vienna (39.9%). This indicates that income-related differences in housing conditions have generally remained significant or increased over time.

Country	Year	Gender	Income	Agec	Migration status	Immigration origin	Housing type	Residual
AT - Vienna	2005	0.03%	42.83%	0.67%	2.50%	-0.23%	3.98%	50.21%
	2020	0.06%	39.97%	0.08%	5.60%	0.73%	3.97%	49.60%
FR - Paris	2005	0.03%	26.64%	0.49%	0.51%	0.65%	9.39%	62.31%
	2020	-0.02%	37.32%	1.30%	1.76%	1.49%	10.65%	47.50%
HU - Budapest	2005	0.08%	38.96%	-0.15%	0.85%	0.03%	-0.13%	60.36%
	2020	-0.05%	38.32%	-0.27%	0.85%	0.05%	0.21%	60.89%
IT - North-west Italy	2005	0.06%	38.26%	-0.08%	1.30%	1.43%	0.55%	58.48%
	2020	-0.01%	35.31%	0.54%	1.95%	2.54%	1.82%	57.85%
PL - Mazowieckie	2020	-0.05%	51.74%	-1.03%	0.05%	0.21%	0.49%	48.59%
ES - Catalonia	2005	0.08%	31.15%	1.14%	11.32%	5.20%	0.43%	50.68%
	2020	0.05%	39.77%	1.35%	9.98%	8.68%	0.00%	40.18%
CH - Zurich	2008	0.00%	42.72%	-0.01%	1.38%	0.00%	2.31%	53.60%
	2020	0.00%	40.66%	0.30%	1.57%	0.27%	6.98%	50.22%
UK - London	2010	0.04%	40.20%	2.56%	7.62%	2.48%	2.19%	44.91%
	2018	0.05%	39.93%	0.33%	1.82%	1.60%	1.87%	54.39%

Table 9. The regression-based decomposition of housing expenditures inequality: Major cities (Metropolitan areas)

Gender and age composition play comparatively minor roles in explaining inequality. For example, the contributions of gender are generally close to zero across cities and years, reflecting a limited direct effect beyond income quintiles. Age composition contributes modestly, ranging from slightly negative values (reducing inequality, e.g., Mazowieckie 2020: –1%) to small positive contributions in most other cases. Migration status has a moderate impact, particularly in Catalonia 2005 (11.3%) and London 2010 (7.6%), highlighting that differences between newcomers and the incumbent population can explain part of housing inequality in certain contexts, though its contribution has generally decreased over time, e.g., London 2018 (1.8%).

Immigrant status and dwelling type show smaller but non-negligible contributions. The role of immigrant status is most pronounced in Catalonia, where it accounts for approximately 10% of inequality. Housing type is particularly significant in Paris and Zurich 2020, contributing around 7%.

Residual contributions remain substantial in most cases, typically around 40–60%, indicating that a large share of housing inequality in major cities/regions remains unexplained by the included variables. For instance, the residual in Paris 2005 is 62.3%, while in Catalonia 2020 it is 40.2%. Over time, residuals have generally decreased in regions such as Catalonia and Paris, suggesting that observed characteristics increasingly capture the drivers of inequality, whereas in London residuals have increased slightly, implying the emergence of unobserved factors.

The decomposition suggests that income distribution is the dominant driver of housing inequality in the major cities/regions of the nine European countries, with demographic and housing characteristics adding secondary effects, and unobserved factors explaining a large residual portion. The relative importance of these factors varies by country and evolves over time, reflecting both structural features of housing markets and policy environments.

Table 10 focuses on the changing effect of income in housing inequality in major cities. The regression results consistently indicate a strong negative relationship between household income and housing burden across all cities and years examined. In other words, households in higher income quintiles face lower housing costs relative to their income, whereas lower-income households bear a disproportionately higher burden. This pattern is especially pronounced in Southern European regions such as Catalonia, North-west Italy, but also in London, and more recently in Budapest. For these cities, the estimated effects of moving from the lowest to the highest income quintile are substantial, reflecting the deep income-related disparities in housing affordability that characterize these areas. Even in 2020, the highest-income households in these cities experience housing costs that are markedly lower relative to their income than those in lower quintiles, suggesting that the structural inequality in housing affordability remains persistent over time.

	2005				2020			
Region	**2st Income Quantile**	**3st Income Quantile**	**4st Income Quantile**	**5st Income Quantile**	**2st Income Quantile**	**3st Income Quantile**	**4st Income Quantile**	**5st Income Quantile**
AT – Vienna	-0.494	-0.711	-0.909	-1.184	-0.402	-0.611	-0.834	-1.160
FR – Paris	-0.329	-0.645	-0.773	-1.221	-0.348	-0.594	-0.891	-1.334
HU – Budapest	-0.316	-0.525	-0.703	-1.038	-0.384	-0.705	-0.932	-1.408
IT – North-west Italy	-0.405	-0.699	-0.983	-1.377	-0.500	-0.707	-1.015	-1.507
PL – Mazowieckie	–	–	–	–	-0.476	-0.737	-0.983	-1.347
ES – Catalonia	-0.470	-0.662	-1.016	-1.391	-0.399	-0.670	-1.084	-1.384
CH – Zurich	-0.363	-0.618	-0.820	-1.157	-0.379	-0.647	-0.846	-1.250
UK – London	-0.414	-0.728	-1.019	-1.389	-0.460	-0.571	-0.904	-1.524

Note: all coefficients are statistically significant at 0.01 level or better

Table 10. Coefficients by Income Quintile and Year (reference category 1st quintile): Major cities/regions

Vienna and Zurich show a similar but slightly less extreme gradient. In Vienna and Zurich, the effect of income on housing burden is strong, yet the difference between the lowest and highest quintiles is smaller compared to Southern Europe, indicating relatively more equitable housing conditions. Budapest presents a different trajectory: while income gradients are noticeable in 2005, by 2020 the burden on lower-income households has increased relative to higher-income groups, pointing to a rise in housing inequality over time. This suggests that economic or housing market pressures in Hungary may have disproportionately affected lower-income households in the last 15 years. London exhibits a strong and persistent income gradient, with lower-income households carrying a significant housing burden. Comparing the 2010 and 2018 results, there is a clear intensification of inequality: the coefficients associated with higher-income quintiles become more negative, indicating that the housing burden for the lowest-income households has increased relative to their higher-income counterparts.

Over time, the results across cities show nuanced patterns. While Southern European cities maintain high levels of inequality, the overall gradient remains relatively stable. Vienna and Budapest display more moderate but consistent disparities, with Budapest emerging as an exception with increasing inequality. London stands out for both the strength and the growth of the income gradient. These findings underscore that housing affordability is deeply intertwined with income distribution, and that city-specific housing markets and policies play a critical role in shaping these outcomes. In summary, while the negative relationship between income and housing burden is universal, its magnitude and evolution over time vary substantially across European cities.

1.5.2.3 Intermediate areas

The decomposition of housing inequality in intermediate areas, presented in Table 11, highlights both consistent patterns and notable variations across countries and over time. Across all countries, disposable income emerges as the primary driver of housing inequality. Its contribution ranges from around 21% in Norway (2005) to more than 51% in Poland (2020), indicating that households' economic resources remain the most influential determinant of housing outcomes. Other household characteristics, including age of the household head, migration status, gender, and housing type, contribute less consistently, although in some contexts they play a meaningful role. For example, in France and Austria in 2020, housing type explains over 10% of inequality, while in Norway, age and migration status contribute more to inequality than housing type.

Temporal comparisons reveal distinct trends. In Spain, the role of income in explaining housing inequality increased from 34% in 2005 to 41% in 2020, while the residual component decreased, suggesting that observable household characteristics have become more important in explaining inequality. Similarly, Italy shows rising contributions from housing type and immigrant origin over the same period, pointing to an increasing influence of immigration and the housing market. In Poland, income's contribution rose sharply from 35% to 52%, accompanied by a notable decline in residual inequality, indicating that observed factors now explain a larger share of housing disparities than in 2005.

Country	Year	Gender	Income	Agec	Migration status	Immigration origin	Housing type	Residual
Austria	2005	0.01%	48.21%	-0.07%	3.36%	0.80%	3.95%	43.74%
	2020	0.09%	41.83%	0.47%	3.47%	1.04%	10.14%	42.97%
France	2005	0.13%	31.23%	0.29%	2.70%	0.10%	8.25%	57.30%
	2020	0.11%	33.78%	1.18%	6.66%	0.23%	12.10%	45.95%
Hungary	2005	0.09%	34.47%	-0.28%	0.47%	0.01%	0.47%	64.77%
	2020	0.10%	39.62%	-0.25%	0.29%	0.05%	0.02%	60.17%
Italy	2005	0.09%	35.98%	0.10%	2.31%	0.93%	0.42%	60.16%
	2020	-0.02%	35.69%	0.21%	2.51%	1.95%	2.07%	57.58%
Norway	2005	0.03%	20.60%	4.62%	5.98%	-0.08%	1.52%	67.34%
	2020	0.03%	26.83%	3.06%	4.22%	0.47%	-0.65%	66.04%
Poland	2005	0.02%	34.58%	-0.09%	0.16%	0.01%	3.97%	61.36%
	2020	0.11%	51.61%	-0.20%	0.18%	0.09%	0.29%	47.92%
Spain	2005	0.04%	34.23%	0.42%	10.56%	2.16%	1.44%	51.15%
	2020	0.00%	40.89%	0.49%	9.27%	6.11%	0.89%	42.35%
Switzerland	2008	0.10%	32.88%	0.90%	1.99%	0.04%	1.07%	63.01%
	2020	0.06%	38.79%	0.17%	3.32%	0.18%	4.36%	53.11%
United Kingdom	2010	0.08%	44.33%	1.54%	5.67%	0.06%	-0.04%	48.36%
	2018	0.03%	42.94%	1.28%	4.28%	0.31%	1.08%	50.08%

Table 11. The regression-based decomposition of housing expenditures inequality: Intermediate areas

Cross-country differences are also pronounced. Norway and Switzerland exhibit relatively high residual components, implying that unobserved factors – including housing market regulation, policy interventions, or regional disparities – play a larger role in shaping housing inequality. In contrast, Southern and Central-Eastern European countries, including Spain and Poland, display smaller residuals and higher contributions from income and household characteristics, indicating a stronger link between observable attributes and housing outcomes.

Table 12 provides additional insight into the role of income in shaping inequality patterns in housing expenditures. The analysis of housing burden across income quintiles reveals significant differences across countries and over time. The coefficients presented in Table 12, which measure relative housing burden for the second to fifth income quintiles compared to the poorest quintile, indicate that more negative values correspond to a greater reduction in burden for higher-income households, highlighting the extent of inequality.

	2005				2020			
Variable / Country	2st Income Quantile	3st Income Quantile	4st Income Quantile	5st Income Quantile	2st Income Quantile	3st Income Quantile	4st Income Quantile	5st Income Quantile
Austria	-0.487	-0.692	-0.876	-1.300	-0.429	-0.681	-0.887	-1.307
France	-0.417	-0.648	-0.947	-1.247	-0.382	-0.669	-0.891	-1.241
Hungary	-0.260	-0.483	-0.658	-0.950	-0.454	-0.683	-0.963	-1.227
Italy	-0.418	-0.686	-0.943	-1.338	-0.502	-0.750	-1.020	-1.449
Norway	-0.455	-0.667	-0.800	-1.003	-0.484	-0.732	-0.857	-1.148
Poland	-0.328	-0.584	-0.744	-1.134	-0.472	-0.727	-0.902	-1.292
Spain	-0.454	-0.751	-1.006	-1.312	-0.537	-0.790	-1.036	-1.350
Switzerland *(2008/2020)*	-0.376	-0.628	-0.794	-1.098	-0.399	-0.664	-0.868	-1.248
United Kingdom *(2010/2018)*	-0.462	-0.739	-0.995	-1.302	-0.454	-0.755	-1.024	-1.382

Note: all coefficients are statistically significant at 0.01 level or better

Table 12: Coefficients by Income Quintile and Year (reference category 1st quintile): Intermediate areas

Across the countries examined, the steepest gradients in 2020 are observed in Italy and the United Kingdom, with coefficients of –1.449 and –1.382, respectively. These values indicate the highest levels of inequality, where households in the top quintile experience substantially lower housing burden compared to the poorest quintile. Hungary and Norway display more moderate gradients, with top-quintile effects of –1.227 and –1.148, respectively, suggesting lower but still notable inequality. Switzerland and France occupy intermediate positions, with top-quintile coefficients of –1.248 and –1.241, reflecting stable but persistent disparities. Austria is notable for its relatively consistent gradient over time, indicating stable patterns of housing inequality.

Over the analyzed periods, nearly all countries show an increase in inequality, as evidenced by more negative effects for the top income quintile in later years. Spain increased from –1.312 in 2005 to –1.350 in 2020, showing a slight rise in inequality. Poland exhibits a more pronounced increase, from –1.134 to –1.292, indicating growing disparities in housing burden. Hungary and Italy present the largest increases, with housing burden for the top quintile increasingly diverging from that of the poorest households, highlighting a widening gap. In contrast, Austria demonstrates a largely stable pattern, with only minor fluctuations across quintiles, and France shows relative stability, with slight changes in intermediate quintiles but little movement in the fifth quintile.

Regional patterns further illustrate these dynamics. Southern European countries, including Spain and Italy, generally display higher levels of inequality, with steep gradients in the top quintiles reflecting entrenched disparities in housing access. Intermediate areas in Poland, Hungary, and Austria show varied trends: Poland and Hungary exhibit rising inequality, while Austria remains comparatively stable, highlighting country-specific differences in housing policies and market pressures. Norway and Switzerland tend to have more moderate levels of inequality, although Switzerland shows an increasing trend over time.

To summarize, the data indicate that while some European countries have maintained stable housing burden inequality, most are experiencing gradual or substantial increases in the levels

of inequality in housing affordability Higher and middle-income groups are seeing modest but meaningful shifts, underscoring a widening gap across the entire income distribution. Regional comparisons highlight that Southern Europe faces the most pronounced inequalities, Central Europe is more heterogeneous, and Northern Europe maintains relatively moderate but gradually increasing disparities.

1.5.2.4 Thinly populated areas

The decomposition of housing inequality in rural areas into socio-demographic factors is presented in Table 13. Across all countries and years, household disposable income consistently emerges as the largest determinant of housing inequality. Its contribution ranges from 18 percent in Norway in 2005 to over 53 percent in Poland in 2020, confirming that disparities in housing outcomes are strongly linked to household economic position. Over time, most countries show either stable or slightly increasing contributions of income, with Poland and the UK displaying marked growth between 2005 or 2008 and 2020.

A substantial portion of housing inequality remains unexplained by the included socio-demographic factors. The residual component is particularly large in Norway (72 percent in 2005), Switzerland (67 percent in 2008), and Hungary (67 percent in 2005). While some countries, such as Spain and France, show slight decreases in residual inequality over time, Austria exhibits an increase in unexplained inequality by 2020, highlighting the presence of additional factors shaping housing inequality in rural areas.

The contributions of other factors are generally modest. Age contributes slightly more in Norway and France, while migration status has a positive but limited influence, with France and Italy showing rising contributions over time. Dwelling characteristics have small or negligible effects in most countries, though Italy in 2020 shows a noticeable increase in the importance of property attributes. Household type generally plays a minor role and sometimes exhibits a negative contribution, reflecting complex interactions with housing inequality not fully captured by categorization.

Over the period 2005–2020, several temporal trends are apparent. In Spain and the UK, income remains the dominant factor, while residual inequality decreases slightly, suggesting modest improvements in the predictability of housing inequality from socio-demographic factors. In Poland, Hungary, and Italy, the influence of income has grown, reflecting rising economic stratification in housing, although residual components remain substantial. In Austria and Switzerland, the relative importance of income changes over time, with Austria showing an increase in residual inequality in 2020, suggesting that other factors, possibly market- or policy-related, became more influential. Norway shows a slight decrease in residual inequality over time, accompanied by increased contributions from age and migration, indicating a shift in the drivers of housing inequality.

Cross-country comparisons reveal that Norway, Switzerland, and the UK tend to have higher levels of unexplained inequality, although income remains dominant, and age and migration are more relevant than in Southern Europe. Southern European countries show that income dominates while residual inequality is lower than in Norway or Switzerland, indicating that socio-demographic factors explain a larger fraction of housing inequality. In Poland and

Hungary, there is a notable increase in the contribution of income over time, reflecting growing economic stratification, with residual inequality remaining substantial, particularly in Hungary.

To conclude, income remains the key driver of housing inequality across rural Europe. While other factors such as age, migration, and housing type play secondary roles, substantial residual inequality points to unmeasured drivers, including housing market structures, policy effects, and regional disparities.

Country	Year	Gender	Income	Agec	Migration status	Immigration origin	Housing type	Residual
Austria	2005	0.07%	49.75%	-0.43%	2.42%	0.31%	3.23%	44.64%
	2020	0.02%	25.14%	0.24%	3.11%	1.56%	5.42%	64.52%
France	2005	0.36%	25.85%	1.14%	4.39%	0.24%	4.12%	63.90%
	2020	0.05%	30.86%	0.87%	7.25%	0.01%	5.20%	55.76%
Hungary	2005	0.06%	31.63%	-0.08%	1.56%	0.00%	0.12%	66.72%
	2020	0.16%	33.51%	-0.04%	0.01%	0.02%	0.45%	65.90%
Italy	2005	0.11%	35.61%	-0.06%	0.91%	0.47%	0.15%	62.81%
	2020	0.00%	35.51%	0.08%	1.71%	2.67%	1.70%	58.32%
Norway	2005	0.04%	18.42%	2.78%	4.92%	0.14%	1.22%	72.48%
	2020	0.02%	25.23%	4.18%	4.29%	0.40%	-0.60%	66.48%
Poland	2005	0.01%	30.72%	0.02%	0.00%	0.00%	3.24%	66.01%
	2020	0.03%	53.91%	-0.09%	0.03%	0.02%	0.15%	45.96%
Spain	2005	0.10%	36.83%	0.27%	6.63%	1.68%	1.12%	53.38%
	2020	0.01%	39.38%	0.74%	5.03%	3.45%	1.14%	50.24%
Switzerland	2008	0.13%	30.11%	0.43%	2.25%	0.50%	-0.01%	66.60%
	2020	0.10%	35.52%	0.05%	2.93%	0.66%	4.00%	56.73%
United Kingdom	2010	0.05%	44.58%	-0.26%	3.07%	0.10%	-0.70%	53.15%
	2018	0.07%	47.28%	0.66%	3.57%	0.08%	-0.23%	48.58%

Table 13. The regression-based decomposition of housing expenditures inequality: Rural areas

The effect of income quintiles on disparities in housing affordability is presented in Table 14. The results reveal a consistent pattern, similar to that observed in more urbanized areas: higher-income households experience a lower housing burden, while lower-income households devote a substantially larger share of their disposable income to housing costs. This is reflected in the negative coefficients associated with income quintiles, which increase in magnitude from the second to the fifth quintile, indicating that the housing cost burden declines steadily with rising income.

In Spain, the income gradient was already pronounced in 2005 and remained largely similar in 2020, suggesting that while affordability pressures persisted, the degree of inequality between income groups changed only marginally. In contrast, Poland experienced a clear strengthening of the income gradient between 2005 and 2020. This indicates that higher-income households maintained or improved their relative housing affordability, while lower-income households faced growing strain, reflecting a widening disparity in housing burden.

The United Kingdom shows a marked steepening of the gradient between 2010 and 2018, pointing to an intensification of housing burden inequality. Austria, on the other hand, exhibits a modest flattening of the gradient between 2005 and 2020, indicating a slight reduction in income-related disparities. Switzerland displays the opposite trend, with the gradient becoming more pronounced, suggesting rising affordability challenges for lower-income households. France maintains a relatively stable gradient over time, implying persistent but unchanged inequality. Hungary shows a substantial steepening, indicating increasing affordability pressures among lower-income groups. Italy and Norway exhibit moderate increases in gradient, pointing to a gradual rise in disparities in housing burden.

In summary, the cross-country comparison highlights that housing burden inequality is most pronounced in Spain, the United Kingdom, and Italy, where low-income households consistently face the highest relative housing costs. In contrast, France and Austria display more stable levels of inequality, while Poland, Hungary, Switzerland, and Norway show evidence of widening disparities over time. These patterns underscore the persistent and, in many cases, growing vulnerability of lower-income households to housing cost pressures in rural areas.

	2005				2020			
Variable / Country	2st Income Quantile	3st Income Quantile	4st Income Quantile	5st Income Quantile	2st Income Quantile	3st Income Quantile	4st Income Quantile	5st Income Quantile
Austria	-0.405	-0.328	-0.638	-0.508	-0.858	-0.686	-1.196	-1.038
France	-0.366	-0.372	-0.637	-0.641	-0.870	-0.874	-1.211	-1.199
Hungary	-0.294	-0.446	-0.465	-0.649	-0.620	-0.838	-0.934	-1.088
Italy	-0.410	-0.491	-0.692	-0.780	-0.946	-1.047	-1.328	-1.410
Norway	-0.386	-0.455	-0.543	-0.706	-0.653	-0.816	-0.941	-1.138
Poland	-0.342	-0.482	-0.535	-0.751	-0.730	-0.976	-1.054	-1.309
Spain	-0.502	-0.498	-0.819	-0.712	-1.052	-0.953	-1.382	-1.299
Switzerland *(2008/2020)*	-0.413	-0.494	-0.640	-0.657	-0.778	-0.871	-1.206	-1.312
United Kingdom *(2010/2018)*	-0.493	-0.537	-0.759	-0.823	-1.030	-1.079	-1.348	-1.493

Note: all coefficients are statistically significant at 0.01 level or better

Table 14. Coefficients by Income Quintile and Year (reference category 1st quintile): Rural areas

1.5.3 Summary

Regarding the effects of social, demographic, and housing factors on inequality in housing affordability, our results show that the degree of urbanization is positively associated with the importance of income in explaining housing inequality. Highly urbanized areas, including major cities and metropolitan regions, exhibit stronger income-driven inequality and smaller residual components, while rural areas display weaker income effects and larger unexplained variation. Over time, the influence of income has increased across all urbanization levels, indicating that socio-economic differences have become more central in shaping disparities in housing burden. Other factors such as age, migration status, immigrant origin, and housing type consistently play more modest roles, with only limited variation across countries and settlement types.

Cross-country comparisons further indicate that the UK and Southern European countries exhibit relatively high contributions of income to inequality across all urbanization levels, reflecting pronounced income-based disparities. Eastern European countries such as Poland and Hungary also display rising income effects over time, particularly in urban and intermediate areas. Norway and Switzerland show more moderate income contributions, with residual components remaining substantial, especially in rural areas.

In terms of temporal dynamics, the most consistent trend is an increasing explanatory power of income, particularly in densely populated and intermediate areas, accompanied by declining residual shares. This suggests that housing inequality is increasingly shaped by observable socio-economic characteristics rather than unmeasured or structural factors. Although age, migration, and housing type play secondary roles, they occasionally exhibit country-specific patterns linked to demographic developments and housing policy conditions.

Across all nine countries, the income gradient in housing affordability inequality is steeper in highly urbanized areas and has generally intensified over time. Between 2005 and 2020, income-related disparities widened most notably in the UK, Italy, Spain, Hungary, and Poland, where higher-income households increasingly experienced lower housing burdens. By contrast, Austria, France, and Switzerland show flatter or more stable gradients, suggesting comparatively stronger institutional or policy buffers against market-driven inequality. Intermediate areas display similar patterns to urban regions, though generally less pronounced, while rural areas exhibit the flattest gradients overall, despite modest increases in inequality in several countries.

Taken together, these findings point to a clear concentration and intensification of income-based housing inequality in urban areas, accompanied by a gradual diffusion of these disparities into intermediate and rural settings over time.

1.6 HOUSING QUALITY

1.6.1 Highly urbanized areas

Table 15 presents the effects of socioeconomic and housing characteristics of individuals and households – income, age, migration status, immigrant origin, and housing type – on the quality of occupied housing. By poor-quality housing, we refer to houses and apartments that exhibit one or more of the following characteristics: too cold in winter, rotting walls or floors, and/or insufficient natural light. The odds ratios from the logistic regressions indicate the likelihood of living in poor-quality housing relative to the reference categories: the lowest income quintile, the youngest age group, incumbent residents, native origin, and detached housing. Coefficients above 1 indicate higher odds of living in low-quality housing relative to the reference category, while coefficients below 1 indicate lower odds.

Income consistently emerges as the strongest determinant of housing quality. Across all countries, higher-income households are significantly less likely to experience poor housing conditions. The steepest income gradients are observed in Eastern Europe and Italy, where households in the highest income quintile face 25–30% lower odds of poor housing compared to those in the lowest quintile. By contrast, the UK, Austria, Switzerland, France, and Norway exhibit smaller – though still significant – income effects, particularly in highly urbanized areas. Importantly, income-related disparities in housing quality remain substantial over time. While minor improvements appear in specific contexts – for instance, modest gains in Hungary's small apartment sector – the overall income gradient remains steep. In Southern European countries such as Spain and Italy, high-income households continue to enjoy markedly better housing conditions in 2020 compared to 2005.

With respect to demographic characteristics, older households generally experience better housing conditions, particularly in the UK, Switzerland, Austria, and France, where accumulated wealth and long-term tenure support access to higher-quality housing. Middle-aged households exhibit weaker or inconsistent effects, suggesting that housing advantages tend to materialize later in the life course. Migration effects vary considerably across countries. In Eastern Europe, migrant households tend to face higher odds of poor housing, whereas in the UK they experience neutral or slightly favorable outcomes. The role of immigrant origin is more consistent: non-EU migrants are disadvantaged in nearly all countries, with 5–30% higher odds of poor housing compared to natives. EU-origin migrants show mixed or minimal effects depending on the national context. Disadvantages for non-EU migrants persist over time. Notably, in Spain, EU-origin households have become increasingly disadvantaged (with odds rising from 0.95 in 2005 to 1.18 in 2020), possibly reflecting the growing scale and characteristics of post-2005 migration. The protective effect of older age persists or strengthens across most countries, consistent with life-course patterns of asset accumulation and tenure stability. By contrast, younger households remain at heightened risk of poor housing, particularly in Eastern and Southern Europe, where pathways into high-quality housing are more constrained.

Housing type also exerts a strong influence on housing quality. Detached houses are consistently associated with the best conditions. Conversely, apartments – especially those in large apartment blocks (buildings with more than ten units) – are associated with poorer

housing outcomes in most countries, except the UK, where high-rise flats often meet relatively higher standards. Small apartment buildings are linked to elevated housing risks in the UK, France, Switzerland, and Hungary (2005), though this disadvantage has lessened in Hungary by 2020. Trends by housing type are heterogeneous: in Hungary, the relative position of small apartment buildings has improved, whereas row houses and large apartment blocks remain less favorable; in the UK, however, apartments – particularly smaller buildings – continue to correlate strongly with poorer housing quality.

In summary, higher-income households enjoy markedly better housing conditions across all countries, with the steepest disparities observed in Eastern and Southern Europe. Non-EU migrants face consistent housing disadvantages, while EU migrants experience more varied outcomes depending on national settings. Older households are generally advantaged, reflecting accumulated resources and tenure stability. Housing type also matters: detached housing is typically associated with the highest quality, while small and large apartment buildings tend to correspond to poorer housing conditions, although patterns vary by country. Overall, inequalities in access to high-quality housing show substantial persistence over time, with only modest improvements in specific housing segments. Structural disparities linked to income, migration status, and housing type remain pronounced.

	Austria		France		Hungary		Italy		Norway		Poland		Spain		Switzerland		United Kingdom	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2008	2020	2010	2018
Intercept	1.36 (***)	1.18 (***)	1.42 (***)	1.41 (***)	1.65 (***)	1.66 (***)	1.78 (***)	1.62 (***)	1.21 (***)	1.19 (***)	2.27 (***)	1.34 (***)	1.51 (***)	1.63 (***)	1.22 (***)	1.28 (***)	1.33 (***)	1.31 (***)
Gender Ref: female																		
Male	1.00 (ns)	0.99 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	0.97 (*)	0.99 (ns)	0.99 (ns)	1.01 (ns)	0.99 (ns)	1.00 (ns)	1.01 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	1.00 (ns)
Income Ref: 1st quintile																		
2st quintile	0.95 (*)	0.97 (ns)	0.93 (***)	0.92 (***)	0.95 (*)	0.87 (***)	0.86 (***)	0.90 (***)	0.94 (***)	0.95 (***)	0.94 (***)	0.94 (***)	0.97 (*)	0.93 (***)	1.00 (ns)	1.04 (**)	0.97 (**)	0.96 (***)
3st quintile	0.95 (*)	0.94 (*)	0.87 (***)	0.88 (***)	0.87 (***)	0.85 (***)	0.83 (***)	0.91 (***)	0.92 (***)	0.94 (***)	0.85 (***)	0.93 (***)	0.96 (***)	0.89 (***)	0.97 (**)	1.01 (ns)	0.94 (***)	0.94 (***)
4st quintile	0.96 (.)	0.93 (*)	0.86 (***)	0.86 (***)	0.89 (***)	0.79 (***)	0.81 (***)	0.86 (***)	0.91 (***)	0.94 (***)	0.79 (***)	0.93 (***)	0.91 (***)	0.87 (***)	0.96 (***)	0.94 (***)	0.90 (***)	0.92 (***)
5st quintile	0.96 (.)	0.90 (***)	0.83 (***)	0.82 (***)	0.79 (***)	0.74 (***)	0.75 (***)	0.86 (***)	0.89 (***)	0.91 (***)	0.71 (***)	0.86 (***)	0.86 (***)	0.84 (***)	0.94 (***)	0.99 (ns)	0.86 (***)	0.88 (***)
Age ref: 18-34 years old																		
35-49	0.98 (ns)	0.97 (ns)	0.98 (.)	0.97 (*)	0.96 (*)	1.02 (ns)	0.99 (ns)	0.96 (***)	1.00 (ns)	0.99 (ns)	0.99 (ns)	0.98 (ns)	0.99 (ns)	0.98 (*)	0.99 (ns)	0.98 (*)	0.99 (ns)	0.95 (***)
50 and more	0.92 (***)	0.96 (.)	0.90 (***)	0.91 (***)	0.95 (**)	0.95 (**)	0.97 (***)	0.97 (***)	0.97 (**)	0.96 (***)	0.95 (***)	0.95 (***)	0.98 (*)	0.96 (***)	0.91 (***)	0.88 (***)	0.90 (***)	0.88 (***)
Migration status ref: stayer																		
Migrant	0.99 (ns)	0.98 (ns)	1.00 (ns)	0.97 (**)	0.94 (***)	0.93 (***)	0.94 (***)	1.00 (ns)	1.01 (ns)	0.99 (ns)	0.88 (***)	0.96 (***)	1.01 (ns)	1.02 (**)	0.98 (*)	0.97 (**)	1.02 (*)	1.03 (**)
Immigrant origin Ref: native																		
any EU country	1.01 (ns)	1.12 (***)	0.97 (ns)	0.94 (.)	1.09 (ns)	0.97 (ns)	1.07 (*)	1.01 (ns)	1.02 (ns)	1.03 (*)	1.00 (ns)	1.07 (ns)	0.95 (.)	1.18 (***)	1.02 (*)	1.00 (ns)	1.03 (ns)	0.94 (***)
other country	1.08 (***)	1.08 (**)	1.05 (***)	1.10 (***)	1.30 (**)	0.94 ns	1.09 (***)	1.04 (**)	1.06 (***)	1.05 (***)	1.05 (ns)	0.99 (ns)	1.12 (***)	1.17 (***)	1.09 (***)	1.08 (***)	1.08 (***)	1.06 (***)
Housing type ref: detached house																		
semi-detached house or terraced house	0.88 (***)	1.02 (ns)	1.05 (***)	1.08 (***)	0.99 (ns)	1.02 (ns)	0.95 (***)	0.91 (***)	1.00 (ns)	0.98 (ns)	0.96 (*)	1.02 (ns)	1.08 (***)	0.98 (ns)	1.01 (ns)	0.97 (ns)	1.08 (***)	1.13 (***)
small apartment building	0.96 (*)	1.08 (**)	1.07 (***)	1.09 (***)	1.10 (**)	0.88 (***)	0.98 (ns)	0.91 (***)	1.05 (**)	0.99 (ns)	1.05 (***)	1.18 (***)	0.99 (ns)	0.90 (***)	1.07 (***)	1.03 (ns)	1.13 (***)	1.21 (***)
large apartment building	0.92 (***)	1.03 (ns)	0.98 (*)	1.04 (**)	0.93 (***)	0.86 (***)	0.91 (***)	0.89 (***)	0.98 (*)	0.97 (**)	0.90 (***)	0.94 (***)	0.92 (***)	0.88 (***)	1.07 (***)	1.01 (ns)	1.08 (***)	1.14 (***)

Table 15. Housing quality: highly urbanized areas

1.6.2 Major cities (metropolitan regions)

Table 16 shows the results of logistic regression models predicting poor housing quality in the major metropolitan regions of eight European countries – Catalonia (Spain), Mazowieckie (Poland), London (the UK), Vienna (Austria), Budapest (Hungary), Paris (France), Zurich (Switzerland), and North-West Italy – across two time points (2005/2008 and 2018/2020). The table reports exponentiated coefficients (odds ratios), where values below 1 indicate lower odds of poor housing (i.e., better-quality housing) relative to the reference category. The models include controls for income quintile, age category, migration status, immigrant origin, and housing type.

The results reveal consistent effects of income on housing quality across most cities and years, though the strength of this relationship varies by national context. The negative association between income and poor housing is strongest and most stable in Budapest, Paris, and, to a lesser extent, Vienna, where higher-income households are substantially less likely to experience poor housing. For instance, in Budapest, the odds of poor housing for the top income quintile changed from 0.78 in 2005 to 0.81 in 2020, indicating persistent but slightly narrowing income advantages. Similarly, in Vienna, the highest income group exhibited a reduction from 0.86 to 0.91, maintaining a strong gradient even in 2020. In Southern Europe, notably Catalonia and North-West Italy, the income gradient remains visible but modestly attenuated over time. In Catalonia, the highest income quintile moved from 0.89 in 2005 to 0.87 in 2020, while in North-West Italy, it declined from 0.90 to 0.85, suggesting that income-based housing inequalities have remained stable or slightly intensified. By contrast, London presents a distinctive pattern: income effects are weaker and less systematic. In 2010, no clear gradient existed, and by 2018, only the top quintile displayed a modest improvement (odds ratio 0.92), indicating a more compressed housing market where income differences translate less directly into housing quality differences. Similarly, in Zurich, the relationship between income and housing quality is weak and often non-significant.

The effects of age indicate that older households tend to enjoy better housing conditions, although the magnitude varies. The protective effect of age is strongest in Zurich, Vienna, London, and Catalonia in 2020, with odds ratios well below 1 (0.84 in Zurich, 0.89 in London, 0.91 in Catalonia, and 0.96 in Vienna). This pattern suggests that older urban residents, likely benefiting from tenure security or accumulated wealth, face lower risks of poor housing. For younger age categories, the effect is weaker or absent, suggesting that age-related housing advantages have grown over time, possibly reflecting generational divides in urban housing access.

The migration variable – capturing recent mobility – indicates mixed results across cities. In most contexts, migrants are slightly more likely to experience poor housing, though differences are often small. In Vienna and Budapest in 2005, migrants had slightly lower odds (0.93 and 0.91, respectively), while in Catalonia, the disadvantage persisted over time (odds approximately 1.04 in both 2005 and 2020). Conversely, in London, migrant households improved slightly between 2010 and 2018 (from 0.94 to 0.99), pointing to relative stabilization rather than convergence. Overall, mobility remains a minor but consistent correlate of poorer housing conditions.

The effects of immigrant origin introduce an additional layer of inequality. Non-EU migrants consistently exhibit higher odds of poor housing than native or EU-born residents, particularly in Western and Southern European cities. The largest penalties are observed in Catalonia (1.16 in 2005 and 1.13 in 2020), London (1.13 in 2010 and 1.11 in 2018), and North-West Italy (1.13 in 2005). These figures imply that, even after controlling for income and migration, non-EU origin remains a structural disadvantage in metropolitan housing markets. By contrast, EU-origin households generally do not differ significantly from natives, with some evidence of improvement in Catalonia and Vienna over time.

Finally, housing type exerts a strong influence on housing quality in major cities. Detached houses remain the most advantageous reference category, while apartment living, especially in larger blocks, is associated with higher odds of poor housing in most cities. In London, residents of small apartment blocks face 35% higher odds of poor housing in 2010, and this penalty persists in 2018 (odds ratio 1.09). Similarly, large apartment blocks are linked to elevated odds across contexts, particularly in dense metropolitan regions such as London (1.40 in 2010) and Catalonia (1.13 in 2005). Notably, however, improvements are visible over time in some major metropolitan regions – in Catalonia, the disadvantage of living in small or large apartment blocks has decreased between 2005 and 2020, reflecting modest upgrading in the urban housing stock.

In sum, the results for major cities reveal that income, age, and origin remain the key axes of inequality in urban housing quality across Europe. While income gradients persist, they are steeper in Eastern and Southern Europe and somewhat flatter in Western and Northern European cities. Older residents generally enjoy higher-quality housing, reflecting cumulative life-cycle advantages. Migrant and non-EU-origin households continue to face structural disadvantages, particularly in Southern and Western cities, though the gap has narrowed slightly in some contexts. Finally, the effect of housing type underscores the enduring divide between detached and apartment housing.

	AT - Vienna		FR – Paris		HU - Budapest		IT - North-west Italy		PL - Mazowieckie	ES - Catalonia		CH - Zurich		UK - London	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2020	2005	2020	2008	2020	2010	2018
Intercept	1.44 (***)	1.24 (***)	1.30 (*)	1.44 (*)	1.71 (***)	1.55 (***)	1.37 (***)	1.34 (***)	1.35 (***)	1.23 (***)	1.83 (***)	1.33 (***)	1.30 (***)	1.15 (**)	1.45 (***)
Gender Ref: female															
Male	0.99 (ns)	1.02 (ns)	0.99 (ns)	1.00 (ns)	0.99 (ns)	0.98 (ns)	1.00 (ns)	0.989 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	1.03 (ns)	1.00 (ns)
Income Ref: 1st quintile															
2st quintile	0.91 (***)	0.97 (ns)	0.94 (***)	0.96 (ns)	0.97 (ns)	0.96 (ns)	0.96 (**)	0.98 (ns)	0.92 (**)	0.97 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	1.02 (ns)	1.00 (ns)
3st quintile	0.87 (***)	0.97 (ns)	0.94 (***)	0.87 (***)	0.93 (***)	0.92 (**)	0.97 (ns)	0.97 (.)	0.96 (ns)	0.96 (.)	0.92 (***)	0.95 (*)	1.00 (ns)	0.99 (ns)	1.07 (*)
4st quintile	0.86 (***)	0.90 (***)	0.93 (***)	0.86 (***)	0.83 (***)	0.80 (***)	0.94 (***)	0.94 (***)	0.93 (*)	0.92 (***)	0.90 (***)	0.95 (*)	1.00 (ns)	1.01 (ns)	0.99 (ns)
5st quintile	0.86 (***)	0.90 (***)	0.87 (***)	0.86 (***)	0.78 (***)	0.81 (***)	0.90 (***)	0.85 (***)	0.91 (**)	0.89 (***)	0.87 (***)	0.94 (**)	1.00 (ns)	0.98 (ns)	0.92 (**)
Age ref: 18-34 years old															
35-49	0.96 (*)	0.96 (*)	0.984 (ns)	0.94 (***)	1.02 (ns)	0.98 (ns)	1.00 (ns)	1.04 (*)	0.95 (.)	1.02 (ns)	0.95 (**)	0.92 (***)	0.94 (**)	1.00 (ns)	0.97 (ns)
50 and more	0.88 (***)	0.96 (**)	0.92 (***)	0.90 (***)	0.90 (***)	0.97 (ns)	0.95 (***)	1.03 (.)	0.90 (***)	1.02 (ns)	0.91 (***)	0.87 (***)	0.84 (***)	0.90 (***)	0.89 (***)
Migration status ref: stayer															
Migrant	0.93 (***)	0.98 (ns)	0.95 (*)	0.97 (*)	0.91 (***)	0.99 (ns)	0.98 (*)	0.99 (ns)	0.97 (ns)	1.04 (*)	1.10 (**)	0.96 (*)	0.96 (**)	0.94 (**)	0.99 (ns)
Immigrant origin Ref: native															
any EU country	1.03 (ns)	1.02 (ns)	1.07 (ns)	1.06 (.)	1.03 (ns)	1.00 (ns)	1.00 (ns)	1.02 (ns)	0.93 (ns)	0.96 (ns)	1.21 (***)	1.07 (**)	1.00 (ns)	1.01 (ns)	0.98 (ns)
other country	1.09 (***)	1.04 (*)	1.09 (*)	1.09 (*)	0.99 (ns)	0.86 (ns)	1.13 (***)	1.02 (ns)	1.06 (ns)	1.16 (***)	1.13 (***)	1.12 (***)	1.07 (**)	1.13 (***)	1.11 (***)
Housing type ref: detached house															
semi-detached house or terraced house	0.97 (ns)	1.00 (ns)	1.09 (*)	1.05 (.)	1.00 (ns)	0.91 (**)	0.96 (*)	1.00 (ns)	0.98 (ns)	1.06 (ns)	0.86 (***)	0.95 (*)	0.97 (ns)	1.19 (***)	0.94 (.)
small apartment building	1.05 (ns)	1.08 (*)	1.06 (*)	1.09 (***)	1.09 (***)	1.05 (ns)	0.95 (***)	0.93 (**)	1.05 (ns)	1.17 (***)	0.83 (***)	1.02 (ns)	1.04 (ns)	1.35 (***)	1.09 (*)
large apartment building	1.02 (ns)	1.08 (*)	1.07 (*)	1.02 (ns)	1.02 (ns)	1.02 (ns)	0.93 (***)	0.94 (**)	0.95 (*)	1.13 (***)	0.82 (***)	0.99 (ns)	1.03 (ns)	1.40 (***)	0.94 (.)

Table 16. Housing quality: major cities (Metropolitan areas)

1.6.3 Intermediate areas

Table 17 presents the results of logistic regression models predicting poor housing quality in intermediate areas – regions that are neither densely urbanized nor predominantly rural – across nine European countries for two time points (2005/2008 and 2020). Coefficients are expressed as odds ratios, where values below 1 indicate lower odds of poor housing relative to the reference group, implying better housing conditions.

Income remains the dominant and most consistent predictor of housing quality in all countries. Households in higher income quintiles are substantially less likely to experience poor housing, with this relationship generally stable or slightly weakening over time. The steepest income gradients are observed in Eastern Europe – particularly Hungary and Poland – where the highest income quintile in 2005 had odds of poor housing around 0.72–0.74 compared to the lowest quintile, rising modestly to 0.78–0.90 by 2020. This modest convergence suggests some improvement among lower-income groups, though overall inequalities persist. In Southern Europe, top-income households maintain clear advantages, indicating continued socioeconomic segmentation in housing conditions. In Austria, Switzerland, France, and Norway, the income gradient is flatter but still statistically significant. For example, in Austria, the top quintile's odds increased from 0.90 in 2005 to 0.99 in 2020, while in Norway, they remained stable (0.86 and 0.89, respectively). The UK shows a slightly attenuated income effect, with most quintile differences narrowing between 2010 and 2018, consistent with evidence of compressed housing outcomes in intermediate British regions.

Age effects are moderate but systematic. Middle-aged individuals typically show small or non-significant differences compared to the youngest group, while older residents (aged 50 or more) tend to experience lower odds of poor housing. This protective effect is particularly evident in Spain, France, Switzerland, and Norway, where odds ratios fall below 0.96 in 2020. These patterns reflect life-cycle advantages, as older residents – likely long-term homeowners – benefit from tenure stability and accumulated housing assets. Notably, the effect of age appears to strengthen slightly over time, suggesting growing generational disparities in housing quality.

Migration status, indicating residential mobility within the last ten years, shows small but notable effects. In 2005, migrants did not face disadvantages in several countries (e.g., Poland: 0.84; Spain: 0.97), but by 2020, the effect of migration status largely disappeared in most contexts. Exceptions include the UK and Norway, where recent movers in 2020 still faced slightly higher odds of poor housing, suggesting that mobility continues to correlate with less favorable housing access in some markets.

Origin-related disparities persist, particularly for non-EU migrants. In nearly all countries, non-EU households exhibit significantly higher odds of poor housing, reflecting entrenched inequalities in access to higher-quality housing. The disadvantage is most pronounced in Italy (1.26 in 2020), Spain (1.12), Switzerland (1.08), and France (1.07), where non-EU origin remains a strong predictor of poorer housing outcomes even after controlling for income. In contrast, EU-origin households generally experience neutral or weak effects, with slight improvements in Spain and Switzerland by 2020. These findings underline that in intermediate

regions – often peri-urban or suburban – the integration gap for non-EU migrants remains evident and, in some contexts, has widened.

Housing type further reinforces structural disparities. Detached houses (the reference category) consistently provide the best conditions, while apartment living – especially in large blocks – correlates with higher odds of poor housing. In 2005, small apartment buildings were strongly disadvantaged in the UK, Austria, and France, and by 2020, these patterns persisted or slightly intensified in France and Switzerland. Large apartment blocks show similar penalties, particularly in the UK, Austria, and France, with some worsening noted in Austria, Switzerland, and France by 2020. Interestingly, in Spain and Italy, the relative disadvantage of apartment housing has diminished slightly over time, possibly reflecting investment and modernization in suburban housing stocks.

Taken together, the results for intermediate areas suggest that, while some progress has been made in narrowing income- and migration-related housing inequalities, structural disparities remain entrenched. Income continues to play a central role, with lower-income households consistently facing worse housing conditions. Age advantages persist, reflecting tenure accumulation and stability among older residents. Non-EU-origin households remain the most disadvantaged across nearly all contexts. Finally, housing type – especially the enduring penalty associated with apartment block living – underscores the link between built environment characteristics and persistent social inequalities in intermediate European regions.

	Austria		France		Hungary		Italy		Norway		Poland		Spain		Switzerland		United Kingdom	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020	2005	2020
Intercept	1.23 (***)	1.11 (***)	1.34 (***)	1.35 (***)	1.70 (***)	1.50 (***)	1.62 (***)	1.49 (***)	1.26 (***)	1.19 (***)	2.38 (***)	1.25 (***)	1.52 (***)	1.49 (***)	1.22 (***)	1.18 (***)	1.31 (***)	1.21 (***)
Gender Ref: female																		
Male	1.01 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	0.99 (ns)	1.01 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	1.00 (ns)	1.00 (ns)	0.99 (ns)	1.01 (ns)
Income Ref: 1st quintile																		
2st quintile	0.98 (ns)	1.00 (ns)	0.93 (***)	0.98 (ns)	0.866 (***)	0.910 (***)	0.944 (***)	0.91 (***)	0.88 (***)	0.95 (***)	0.90 (***)	0.92 (***)	0.93 (***)	0.92 (***)	0.98 (ns)	1.00 (ns)	0.94 (***)	0.99 (ns)
3st quintile	0.99 (ns)	0.99 (ns)	0.88 (***)	0.93 (***)	0.82 (***)	0.83 (***)	0.89 (***)	0.88 (***)	0.87 (***)	0.93 (***)	0.86 (***)	0.89 (***)	0.92 (***)	0.92 (***)	0.96 (**)	1.00 (ns)	0.95 (***)	0.98 (ns)
4st quintile	0.96 (*)	1.00 (ns)	0.86 (***)	0.88 (***)	0.82 (***)	0.84 (***)	0.86 (***)	0.86 (***)	0.84 (***)	0.91 (***)	0.83 (***)	0.87 (***)	0.90 (***)	0.85 (***)	0.94 (***)	0.99 (ns)	0.90 (***)	0.96 (**)
5st quintile	0.90 (***)	0.99 (ns)	0.82 (***)	0.86 (***)	0.74 (***)	0.78 (***)	0.83 (***)	0.82 (***)	0.86 (***)	0.89 (***)	0.72 (***)	0.90 (***)	0.87 (***)	0.83 (***)	0.94 (***)	0.94 (***)	0.91 (***)	0.94 (***)
Age ref: 18-34 years old																		
35-49	0.98 (*)	1.02 (ns)	0.97 (***)	0.99 (ns)	0.98 (ns)	1.00 (ns)	0.98 (***)	0.98 (***)	1.00 (ns)	0.99 (ns)	0.94 (***)	1.01 (ns)	0.97 (**)	0.96 (***)	1.00 (ns)	0.98 (*)	0.98 (.)	1.03 (*)
50 and more	0.98 (.)	0.97 (*)	0.95 (***)	0.92 (***)	0.92 (***)	0.98 (***)	0.98 (***)	0.96 (***)	0.96 (***)	0.96 (***)	0.97 (*)	0.99 (ns)	1.01 (ns)	0.96 (***)	0.93 (***)	0.91 (***)	0.92 (***)	0.95 (***)
Migration status ref: stayer																		
Migrant	1.02 (.)	0.98 (*)	1.03 (***)	0.97 (**)	0.99 (ns)	0.97 (***)	0.98 (***)	1.04 (***)	1.01 (ns)	1.01 (ns)	0.84 (***)	0.98 (*)	0.97 (***)	1.00 (ns)	1.00 (ns)	0.97 (***)	1.06 (***)	1.02 (*)
Immigrant origin Ref: native																		
any EU country	1.02 (ns)	1.02 (ns)	1.01 (ns)	1.01 (ns)	1.13 (**)	1.02 (ns)	1.08 (***)	0.96 (ns)	1.00 (ns)	1.00 (ns)	1.17 (ns)	0.99 (ns)	1.04 (ns)	1.04 (*)	1.03 (**)	1.02 (*)	1.04 (ns)	0.93 (**)
other country	1.05 (*)	1.09 (***)	1.05 (***)	1.07 (***)	1.01 (ns)	1.12 (***)	1.01 (ns)	1.26 (***)	1.04 (*)	1.04 (*)	1.05 (ns)	1.03 (ns)	1.17 (***)	1.12 (***)	1.15 (***)	1.08 (***)	1.04 (ns)	1.03 (ns)
Housing type ref: detached house																		
semi-detached house or terraced house	0.97 (*)	1.00 (ns)	1.09 (***)	1.09 (***)	0.96 (*)	0.94 (***)	0.98 (*)	1.00 (ns)	1.00 (ns)	1.00 (ns)	0.96 (ns)	1.05 (**)	1.03 (*)	1.02 (ns)	0.99 (ns)	1.02 (ns)	1.04 (**)	1.08 (***)
small apartment building	0.96 (**)	1.05 (***)	1.09 (***)	1.12 (***)	1.03 (*)	0.91 (***)	0.95 (***)	0.94 (ns)	1.01 (ns)	1.01 (ns)	1.03 (ns)	1.22 (***)	0.93 (***)	0.98 (ns)	1.01 (ns)	1.06 (***)	1.07 (**)	1.13 (***)
large apartment building	0.91 (***)	1.07 (***)	1.01 (ns)	1.07 (***)	0.92 (***)	0.87 (***)	0.97 (***)	0.92 (***)	0.97 (***)	0.97 (***)	0.88 (***)	1.00 (ns)	0.93 (***)	0.94 (***)	1.04 (**)	1.06 (***)	1.00 (ns)	1.09 (***)

Table 17. Housing quality: intermediate areas

1.6.4 Thinly populated areas

Table 18 presents the results of logistic regression models predicting the probability of experiencing poor housing conditions in rural areas – regions located outside major urban centers – across nine European countries. The analysis covers two time points (2005/2008 and 2020) and reports exponentiated coefficients (odds ratios), with values below 1 indicating lower odds of poor housing, corresponding to better housing quality.

Income remains the strongest and most consistent determinant of housing quality in rural areas, similar to more densely populated regions. The income gradient is particularly steep in Eastern Europe – notably Poland and Hungary – where the highest income quintile in 2005 had odds of poor housing roughly 30%–35% of those in the lowest quintile (Poland = 0.69; Hungary = 0.78). By 2020, the gradient in these countries had flattened somewhat (Poland = 0.85; Hungary = 0.75), suggesting modest improvements among lower-income households, though inequalities remain substantial.

In Southern Europe, Spain and Italy show persistent income-based disparities. The top quintiles in both countries moved from approximately 0.82 in 2005 to 0.89 in 2020, implying some narrowing of the gap. In Western and Northern Europe, income gradients are milder but remain statistically significant. In Austria, France, Switzerland, and Norway, higher income continues to predict better housing outcomes, though coefficients have moved closer to 1 over time, indicating reduced disparities. For example, Austria's top income quintile odds increased slightly from 0.92 to 0.95, while Norway's remained stable around 0.91. The UK exhibits a similar pattern, with modest income effects (0.94–0.87) that weakened slightly by 2018.

Age-related differences in housing conditions are small but consistent. Middle-aged households generally fare slightly better than younger ones, with odds ratios below 1 in most contexts. Older residents also enjoy modest advantages, particularly in Switzerland, France, and Hungary, where coefficients fall below 0.95 in 2020. These patterns suggest that older rural residents benefit from tenure stability, accumulated resources, and long-term homeownership, reinforcing generational differences in housing quality.

Migration status shows weak but notable associations with housing outcomes. In some cases – such as Spain (1.03) and Hungary (1.05) – mobility is linked to slightly improved housing conditions, indicating potential upward residential mobility. Non-EU-origin households continue to face persistent disadvantages, particularly in Southern and Western Europe. In Italy, Spain, and France, non-EU migrants exhibit higher odds of poor housing despite slight improvements over time. In contrast, EU-origin migrants generally experience neutral or favorable housing outcomes – e.g., in Norway (1.10) and Austria (1.06). These findings highlight that migration background remains an important axis of housing inequality in rural areas.

Housing type continues to shape housing quality in rural settings. Apartment buildings are consistently associated with higher odds of poor housing compared to detached houses (the reference category). Both small and large apartment blocks show odds ratios above 1, particularly in Poland, France, and Hungary, where multifamily housing often corresponds to lower quality. In Southern Europe, this effect has moderated slightly – for example, Spain (from

0.92 to 0.95) and Italy (from 0.93 to 0.98) – likely reflecting renovation programs and modernization of the housing stock.

In summary, rural areas exhibit a clear but evolving income gradient in housing quality. The East–West divide is evident: disparities are largest in Poland and Hungary, moderate in Southern Europe, and smallest in Nordic and Western European countries. Over time, most countries show incremental convergence, with a flattening of the income-housing gradient, suggesting gradual improvements in housing access for lower-income groups. Nevertheless, migration status and housing type continue to influence outcomes, highlighting structural segmentation in rural housing markets, while age advantages reinforce stability for older residents relative to younger and more mobile populations.

	Austria		France		Hungary		Italy		Norway		Poland		Spain		Switzerland		United Kingdom	
Year / Variable	2005	2020	2005	2020	2005	2020	2005	2020	2005	2005	2020	2005	2020	2005	2020	2005	2020	2005
Intercept	1.24 (***)	1.19 (***)	1.32 (***)	1.37 (***)	1.59 (***)	1.64 (***)	1.656 (***)	1.36 (***)	1.17 (***)	1.16 (***)	2.32 (***)	1.29 (***)	1.54 (***)	1.41 (***)	1.16 (***)	1.23 (***)	1.28 (***)	1.28 (***)
Gender Ref: female																		
Male	1.01 (ns)	1.00 (ns)	1.01 (ns)	1.01 (ns)	0.99 (ns)	0.98 (ns)	1.01 (ns)	1.01 (ns)	1.00 (ns)	1.00 (ns)	0.99 (ns)	1.00 (ns)	1.01 (ns)	1.00 (ns)	1.01 (ns)	1.01 (ns)	1.01 (ns)	1.00 (ns)
Income Ref: 1st quintile																		
2st quintile	0.97 (**)	0.97 (*)	0.98 (ns)	0.91 (***)	0.88 (***)	0.88 (***)	0.93 (***)	0.97 (*)	0.96 (***)	0.98 (*)	0.91 (***)	0.91 (***)	0.96 (***)	0.95 (***)	1.01 (ns)	1.03 (ns)	0.99 (ns)	0.97 (.)
3st quintile	0.97 (**)	0.96 (**)	0.90 (***)	0.90 (***)	0.87 (***)	0.84 (***)	0.88 (***)	0.92 (***)	0.93 (***)	0.93 (***)	0.85 (***)	0.90 (***)	0.90 (***)	0.91 (***)	1.02 (ns)	0.97 (ns)	0.96 (.)	0.97 (.)
4st quintile	0.94 (***)	0.95 (***)	0.89 (***)	0.85 (***)	0.81 (***)	0.79 (***)	0.87 (***)	0.96 (***)	0.91 (***)	0.93 (***)	0.75 (***)	0.87 (***)	0.88 (***)	0.87 (***)	1.03 (ns)	1.01 (ns)	0.96 (*)	0.90 (***)
5st quintile	0.92 (***)	0.95 (***)	0.87 (***)	0.801 (***)	0.78 (***)	0.75 (***)	0.82 (***)	0.89 (***)	0.91 (***)	0.93 (***)	0.69 (***)	0.85 (***)	0.82 (***)	0.89 (***)	0.96 (.)	0.97 (.)	0.94 (**)	0.87 (***)
Age ref: 18-34 years old																		
35-49	0.98 (*)	0.97 (**)	0.98 (ns)	1.00 (ns)	0.98 (*)	0.99 (ns)	0.99 (.)	0.96 (**)	0.99 (ns)	0.98 (*)	0.97 (***)	1.01 (ns)	0.97 (***)	0.98 (**)	0.96 (*)	0.98 (.)	1.04 (*)	1.05 (**)
50 and more	0.98 (.)	0.95 (***)	0.96 (**)	0.97 (***)	0.97 (***)	0.90 (***)	0.97 (***)	1.00 (ns)	0.97 (***)	0.97 (***)	0.96 (***)	0.99 (.)	0.99 (ns)	0.99 (ns)	0.97 (.)	0.92 (***)	0.96 (*)	0.98 (ns)
Migration status ref: stayer																		
Migrant	0.97 (**)	0.98 (**)	1.02 (ns)	1.00 (ns)	1.04 (***)	1.05 (***)	0.94 (***)	1.00 (ns)	1.03 (***)	1.01 (ns)	0.88 (***)	1.00 (ns)	0.97 (***)	1.03 (***)	1.03 (*)	0.95 (***)	1.00 (ns)	1.01 (ns)
Immigrant origin Ref: native																		
any EU country	1.06 (*)	1.02 (ns)	0.97 (ns)	0.98 (ns)	1.07 (ns)	1.05 (ns)	0.98 (ns)	1.10 (***)	1.01 (ns)	1.04 (*)	0.95 (.)	0.94 (ns)	1.11 (**)	1.04 (*)	1.03 (ns)	1.09 (***)	1.05 (ns)	1.04 (ns)
other country	1.14 (***)	1.03 (ns)	1.18 (***)	1.02 (ns)	0.99 (ns)	0.99 (ns)	1.21 (***)	1.06 (***)	1.05 (.)	1.09 (***)	1.03 (ns)	1.20 (***)	1.19 (***)	1.07 (***)	1.06 (*)	1.04 (ns)	0.97 (ns)	0.97 (ns)
Housing type ref: detached house																		
semi-detached house or terraced house	0.99 (ns)	1.06 (***)	1.07 (***)	1.12 (***)	1.05 (***)	1.07 (*)	0.93 (***)	0.98 (*)	1.02 (ns)	0.97 (*)	1.07 (***)	1.06 (***)	1.03 (***)	1.02 (**)	1.06 (***)	1.02 (ns)	1.05 (***)	1.04 (**)
small apartment building	0.99 (ns)	1.01 (ns)	1.06 (*)	1.06 (***)	1.03 (ns)	0.89 (*)	0.93 (***)	0.99 (ns)	1.01 (ns)	1.03 (ns)	1.08 (***)	1.13 (***)	0.92 (***)	0.95 (***)	1.00 (ns)	0.99 (ns)	1.16 (***)	1.02 (ns)
large apartment building	1.00 (ns)	0.96 (*)	0.91 (ns)	1.04 (ns)	0.93 (***)	0.90 (*)	0.88 (***)	0.98 (ns)	1.00 (ns)	0.94 (***)	0.91 (***)	0.94 (***)	0.89 (***)	0.94 (***)	1.01 (ns)	0.98 (ns)	1.00 (ns)	1.02 (ns)

Table 18. Housing quality: Rural areas

1.6.5 Summary

The models across all three degrees of urbanization reveal clear temporal improvements in housing quality, alongside persistent but evolving spatial and social disparities. Between 2005 and 2020, the general downward trend in the intercepts across countries indicates a consistent reduction in the baseline probability of occupying low-quality housing. However, improvements are uneven across spatial contexts: intermediate and rural areas experienced faster gains, while major urban centers showed slower progress. Highly urbanized areas consistently exhibit the highest baseline risk of poor housing, followed by intermediate and rural areas. This persistent urban disadvantage reflects structural pressures in metropolitan housing markets – high population density, rising housing costs, and growing migrant inflows maintain a residual stock of lower-quality dwellings despite overall progress. Consequently, while rural areas historically contained a larger proportion of poor-quality housing, by 2020 their relative disadvantage had largely diminished or even reversed compared to urban areas.

Over time, socioeconomic gradients – particularly those based on income – show modest but meaningful convergence. In 2005, the odds of low-quality housing among the lowest income quintile were substantially higher than among upper quintiles across nearly all countries. By 2020, these differentials narrowed slightly, reflecting improvements in housing conditions for lower-income households. Nevertheless, statistically significant differences persist in most contexts, confirming that income remains the dominant determinant of housing inequality.

The relative disadvantage of immigrants declines slightly in intermediate and rural areas but persists or even intensifies in large cities. This persistence in urban areas highlights enduring barriers to accessing high-quality housing. Age effects, although relatively minor, remain consistent: younger and more mobile households are systematically more exposed to low-quality dwellings, whereas older and long-term resident households enjoy higher-quality housing.

Taken together, these temporal and spatial patterns depict a European housing landscape that is improving in overall quality but continues to exhibit structural inequalities. Urban centers remain focal points of social vulnerability, while smaller towns and rural regions show gradual convergence and stabilization.

EXECUTIVE SUMMARY: PART I

Between 2005 and 2020, patterns of homeownership, housing affordability, and housing quality across nine European countries reveal a housing landscape increasingly structured by income and urbanization. Across all contexts, income stands out as the strongest determinant of housing outcomes. Higher-income households consistently display greater access to homeownership and better housing conditions, especially in large cities where property prices and entry costs are highest. By contrast, younger and lower-income households face substantial barriers to ownership in urban areas but encounter fewer obstacles in smaller towns and rural regions.

Immigrant origin further shape housing access. Immigrants, particularly those from outside the European Union, remain less likely to own homes or occupy high-quality dwellings in metropolitan areas, although these gaps are smaller in rural and intermediate zones. Housing type reinforces these disparities, as apartment dwellers in dense urban settings tend to have lower ownership rates than those in detached homes.

Cross-country patterns show marked differences. Southern and Eastern European countries such as Italy, Spain, Hungary, and Poland exhibit stronger urban–rural divides, while Austria, France, and Switzerland demonstrate more uniform housing outcomes. Norway stands out for its rapid rise in homeownership outside major cities. Overall, this suggests different housing market dynamics across Europe.

Inequalities in housing affordability have deepened over time. Income-driven disparities are steepest in urban areas and have intensified since 2005, particularly in the UK, Italy, Spain, Hungary, and Poland. Meanwhile, residual variation has declined, indicating that housing inequality is increasingly explained by measurable socio-economic differences rather than unobserved factors.

Housing quality has generally improved, with the risk of poor housing declining across all settlement types. Yet improvements have been uneven: rural and intermediate areas have advanced more rapidly, while large urban centers continue to show the highest risk of poor housing, reflecting persistent structural pressures such as high population density, rising costs, and sustained migration inflows.

In summary, the findings depict a Europe where housing conditions are improving but inequality remains deeply embedded. Urban centers concentrate the greatest disparities, shaped by income, age, and migration status, while smaller towns and rural regions show gradual convergence and greater stability. Urbanization thus continues to amplify social and economic divides within Europe’s housing landscape.

PART II: URBAN GREENING AND GENTRIFICATION

INTRODUCTION

Gentrification, understood here as the socioeconomic upgrading of neighborhoods, has been a dominant force in urban change worldwide (Lees et al., 2015). While numerous drivers contribute to gentrification, urban greening initiatives have emerged as an important factor in the social upgrading of residential neighborhoods in the new millennium, giving rise to the phenomenon of green gentrification (Anguelovski et al., 2024). Consequently, the second part of this report examines gentrification patterns in nine major cities – Zurich, Paris, Barcelona, London, Warsaw, Budapest, Milan, Vienna, and Oslo – during the 21st century. Specifically, we investigate the relationship between the development and distribution of green areas at the intra-urban scale and the socioeconomic dimension of neighborhood change. This section, therefore, places particular emphasis on the complex issue of green gentrification in urban Europe.

For data on green areas, we relied on the Normalized Difference Vegetation Index (NDVI), which quantifies how "green" an area is – that is, the density of healthy vegetation on the ground. NDVI values range from -1 to +1, where higher positive values (typically 0.3–0.8) indicate dense, healthy vegetation, moderate values (0.1–0.3) represent sparse vegetation such as urban residential areas or grasslands, and values near zero or negative indicate built-up areas, bare soil, or water bodies. We used multi-temporal satellite imagery sourced from the Landsat and Sentinel-2 archives via Google Earth Engine, extracting NDVI data for three time points (2001, 2011, 2021) across the selected European cities.

After addressing sensor-specific artifacts and applying normalization procedures to ensure temporal consistency across different satellite platforms (Landsat 5, Landsat 7, and Sentinel-2), we produced cloud-masked composite NDVI rasters, which were exported with city-specific buffer radii. The final raster outputs were aggregated into city-specific files containing annual NDVI statistics for each census tract, along with calculated change metrics for decadal periods and the full 20-year span (2001–2021), while preserving census tract IDs for subsequent socio-environmental analysis.

These city-specific files include multiple statistical measures characterizing vegetation patterns and changes at the census tract level. For each time point, the mean NDVI serves as the primary indicator of average greenness per tract; the median NDVI provides a robust measure of central tendency less sensitive to outliers; standard deviation quantifies landscape heterogeneity, with higher values indicating mixed land cover (e.g., parks interspersed with buildings); and minimum/maximum values capture the full range of vegetation conditions. Change layers express vegetation dynamics in two ways: absolute change (direct NDVI unit differences, e.g., -0.15) reflects the magnitude of greening or browning, while percentage change contextualizes this relative to baseline conditions, allowing identification of census tracts experiencing proportionally large transformations.

The information on the socio-economic composition of neighborhoods and its changes was derived from national censuses on population and housing. To identify census tracts characterized by increasing socioeconomic status of residents, we applied the method proposed by Friesenecker et al. (2025), which relies on a composite indicator of gentrification.

Importantly, since the available census data differ across the selected cities, we constructed a city-specific gentrification index.

For most cities, the index is based on multiple variables, including the changing shares of the population with higher education, changes in the unemployment rate, and/or changes in the share of residents in the two highest ISCO categories (managers and professionals). Table 19 presents the variables selected for constructing the gentrification index in each city. For Milan and Oslo, due to data availability limitations, the gentrification index is based solely on the changing shares of the population with higher education.

City	Variables Used to Calculate the Gentrification Index
Vienna (AU)	Changes in the share of people with a university degree or higher (2001 and 2021)
	Changes in the share of people with a compulsory-only education (2001 and 2021)
	Changes in the share of the unemployed (2001 and 2021)
Paris (FR)	Changes in the share of people with a university degree or higher (2011 and 2021)
	Changes in the share of people working in a professional occupations (based on ISCO categories) (2011 and 2021)
	Changes in the share of the unemployed (2011 and 2021)
Budapest (HU)	Changes in the share of people with a university degree or higher (2011 and 2021)
	Changes in the share of people working in a professional occupations (based on ISCO categories) (2011 and 2021)
	Changes in the share of the unemployed (2011 and 2021)
Milan (IT)	Changes in the share of people with a university degree or higher (2001 and 2021)
Oslo (NO)	Changes in the share of people with a university degree or higher (2001 and 2021)
Warsaw (PL)	Changes in the share of people with a university degree or higher (2002 and 2021)
	Changes in the share of people working in a professional occupations (based on ISCO categories) (2002 and 2021)
	Changes in the share of the unemployed (2002 and 2021)
Barcelona (ES)	Changes in the share of people with a university degree or higher (2001 and 2021)
	Changes in the median income (2000 and 2016)
Zurich (CH)	Changes in the share of people with a university degree or higher (2000 and 2021)
	Changes in the share of the unemployed (2000 and 2021)
	Changes in the share of people with an income in the highest quintile (2000 and 2021)
London (UK)	Changes in the share of people with a university degree or higher (2001 and 2021)
	Changes in the share of people working in a professional occupations (based on ISCO categories) (2001 and 2021)
	Changes in the share of the unemployed (2001 and 2021)

Table 19. Variables Used to Calculate the Gentrification Index

The identification of gentrified census tracts was performed relative to city-wide trends. Specifically, we calculated two-decade change rates for socio-economic characteristics in Vienna, Warsaw, Oslo, Milan, Barcelona, Zurich, and London (2001–2021). For Budapest and Paris, due to data constraints, we calculated changes between the last two census rounds (2011 and 2021). We then performed a modified shift-share analysis to identify change rates that deviate from city-wide trends for both versions of the gentrification indicator. Census tracts with z-scores above one standard deviation (1 SD) from the city-wide trend were classified as gentrified. Finally, a binary version of the gentrification index was created by dichotomizing the standardized index: tracts with values greater than 1 were classified as socially upgraded (gentrified).

In addition to descriptive analyses for each city, we formally assessed the relationship between the level and change in greenness and gentrification, based on the binary gentrification index. To mitigate the modifiable areal unit problem (MAUP), we calculated spatially weighted variables of the level of greenness and its changes using mean NDVI values for each census tract. For each tract, we considered the level and changes in greenness within the tract and its neighboring tracts.

We then applied generalized additive models (GAMs) to examine the relationship between greenness (and its change) and patterns of gentrification. GAMs allowed us to control for spatial variation and reduce the problem of spatial autocorrelation. While we assumed a linear relationship between green area supply and change, smooth effects (splines) were used to control for spatial variation. No serious multicollinearity was detected, all regressions were statistically significant, and their explanatory power varied across case cities.

2.1 Regression analysis

Table 20 illustrates the results of the GAM models, which formally test the relationship between gentrification patterns and the level of greenness, based on both the supply and changes in the supply of green areas. First, it is notable that across all nine cities, the models reveal consistent spatial dependence: the smooth term for geographical location, $s(X,Y)$, is highly significant in all cities except Zurich. These results indicate that gentrification patterns – measured either by the composite social index or the education-based index – are geographically structured and spatially clustered rather than randomly distributed.

However, the relationship between greenness and gentrification patterns varies across cities. In most cases, higher shares of green areas are associated with lower risks of gentrification, as reflected by negative coefficients. By contrast, the effects of changes in green area shares (i.e., green growth or loss) are less consistent, with coefficients sometimes positive, sometimes non-significant, and occasionally negative.

City	Index Type	Term	Estimate / edf (Significance)	Adj. R^2	Deviance Explained
Vienna (AtT	Social	Intercept	-5.784 (***)	0.126	19.2%
		gr_ne21	6.536 (*)		
		S_green_ch1121	-18.132 (**)		
		s(X,Y)	edf = 24.55 (***)		
	Education	Intercept	-5.037 (***)	0.217	26.3%
		gr_ne21	2.336 (ns)		
		S_green_ch1121	-6.735 (ns)		

City	Index Type	Term	Estimate / edf (Significance)	Adj. R^2	Deviance Explained
		s(X,Y)	edf = 28.14 (***)		
Paris (FR)	Social	Intercept	-1.330 (ns)	0.061	9.64%
		gr_ne21	-2.205 (ns)		
		S_green_ch1121	2.196 (ns)		
		s(X,Y)	edf = 21.98 (***)		
	Education	Intercept	-0.775 (ns)	0.0389	6.53%
		gr_ne21	-3.068 (ns)		
		S_green_ch1121	6.908 (ns)		
		s(X,Y)	edf = 25.15 (***)		
Budapest (HU)	Social	Intercept	-4.129 (***)	0.0555	9.8%
		green_neighbors_mean_21	11.579 (***)		
		S_green_ch1121	-24.210 (**)		
		s(X,Y)	edf = 20.00 (***)		
	Education	Intercept	-3.554 (***)	0.058	9.64%
		green_neighbors_mean_21	7.893 (**)		
		S_green_ch1121	-12.182 (ns)		
		s(X,Y)	edf = 16.82 (***)		
Milan (IT)	Education	Intercept	-1.976 (***)	0.0313	4.6%
		gr_ne21	-0.207 (ns)		
		S_green_ch0121	-2.584 (ns)		
		s(X,Y)	edf = 24.64 (***)		
Oslo (NO)	Education	Intercept	-1.428 (ns)	0.227	31%
		gr_ne21	-0.468 (ns)		
		S_green_ch0121	-8.262 (ns)		
		s(X,Y)	edf = 9.44 (***)		
Warsaw (PL)	Social	Intercept	-0.579 (ns)	0.0116	1.94%
		S_green_a_21	-3.175 (**)		
		S_green_neigh_ch0121	6.147 (*)		
		s(X,Y)	edf = 2.00 (**)		
	Education	Intercept	-0.661 (ns)	0.0067	1.17%
		S_green_a_21	-3.154 (**)		
		S_green_neigh_ch0121	9.705 (*)		
		s(X,Y)	edf = 2.00 (ns)		
Barcelona (ES)	Social	Intercept	-3.669 (*)	0.320	37.3%
		gr_ne21	-31.916 (*)		
		S_green_neigh_ch0121	41.787 (*)		
		s(X,Y)	edf = 28.37 (***)		
	Education	Intercept	-1.921 (*)	0.274	29.7%
		gr_ne21	-10.339 (ns)		
		S_green_neigh_ch0121	12.973 (ns)		
		s(X,Y)	edf = 27.78 (***)		
Zurich (CH)	Social	Intercept	2.285 (*)	0.194	21.1%
		grn__21	-7.764 (***)		
		c_01_21	0.108 (ns)		
		s(X,Y)	edf = 6.472 (ns)		
	Education	Intercept	0.222 (ns)	0.093	13.5%
		grn__21	-3.391 (ns)		
		c_01_21	-4.985 (ns)		
		s(X,Y)	edf = 7.932 (ns)		
London (UK)	Social	Intercept	-0.970 (***)	0.176	18.8%
		S_green_a_21	-0.830 (ns)		
		S_green_ch0121	-11.285 (***)		
		s(X,Y)	edf = 26.74 (***)		
	Education	Intercept	-1.472 (***)	0.268	27.6%
		S_green_a_21	0.536 (ns)		
		S_green_ch0121	-15.151 (***)		
		s(X,Y)	edf = 28.05 (***)		

Table 20. Results of GAM Models for Social and Education-Based Indices of Gentrification Across Cities

Regarding the results for individual cities, Warsaw shows that the current green share (in 2021) is negative and significant for both versions of the gentrification index. In other words, areas with more green space are associated with lower risks of gentrification. However, changes in greenness generally have a positive effect on social upgrading, suggesting that areas gaining green space may coincide with neighborhoods already undergoing improvement or gentrification.

In Barcelona, there is a strong negative relationship between the level of greenness in 2021 and the presence of gentrified tracts. The effect of changes in greenness is positive, albeit weakly significant, indicating that areas experiencing new greening may be slightly more prone to gentrification. Similarly, in Zurich, higher current greenness is significantly associated with lower gentrification risk, while changes in greenness are not significant, suggesting that neither increases nor decreases in green space systematically influence gentrification.

In Vienna, higher shares of green areas are significantly and positively associated with gentrified tracts, but increases in green space exert a negative effect on neighborhood upgrading. This implies that new greening initiatives do not necessarily trigger gentrification. Budapest shows a similar pattern: overall green availability in 2021 is positively related to gentrification, whereas changes in green area share have the opposite effect. London displays a strongly negative and highly significant relationship between changes in green space and gentrification, indicating that newly added greenery may reduce gentrification risk. In Milan, Paris, and Oslo, the relationship between greenness and gentrification is non-significant. Notably, Oslo exhibits particularly strong spatial clustering, with geography explaining over 30% of the deviance.

In summary, the relationship between green space and gentrification varies across cities in both strength and direction. In Budapest and Vienna, established green spaces generally align with social upgrading, suggesting that existing greenery may contribute to gentrification. Conversely, changes in greenness often show mixed or opposite effects, indicating that new greening may not consistently drive gentrification. In Barcelona and Warsaw, recent greening appears to support neighborhood socio-economic upgrading. Milan, Paris, Zurich, and Oslo display weak or non-significant associations, implying that other factors – such as housing markets, income, or urban form – dominate gentrification patterns. Despite these differences, all cities except Zurich exhibit significant spatial structuring, indicating that gentrification is geographically clustered. In sum, the effects of newly added green spaces are context-dependent, reflecting diverse urban development trajectories and socio-spatial dynamics across European cities.

2.2 Urban Greening and Gentrification across the cities

2.2.1. Vienna (AT)

Vienna's share of green space and bodies of water accounts for 53% of the city's overall surface area of around 415 km² (Stadt Wien, 2025). Among these, forests account for the largest portion (38.4 %), followed by private gardens (20.3 %), meadows (9.2 %), urban parks (4.8 %), and 4.5% vegetated areas on farmland (Zoderer et al. 2024). However, the area of green space is rather unevenly distributed following the city's historic urbanization patterns (Brenner et al. 2022). The majority of Vienna's large and nature-protected green spaces are situated along the city's periphery – most notably the Vienna Woods in the northwest and the Donau-Auen National Park in the southeast. Private gardens increase towards the city's outskirts radially outside of the historic housing stock of the city from the pre-World War I era. These consist of private gardens around single-family houses at the northern and western peripheries (towards the Vienna Woods), but mostly around larger housing estates from the post-World War II era in the southern and eastern parts of the City. Prominent public green areas within the city centre, including major parks such as the Prater, Schönbrunn Palace Park, Augarten, Wienerberg recreational area and the Danube Island recreational zone, including the 'Old Danube' (Alte Donau).

This structure is also related to the level of greenness based on the average NDVI values presented in Figures AT-1 and AT-2. The census tracts below the mean in the central areas of Vienna correspond highly to the historic urban areas built before World War I. These areas are characterised by high soil-sealing, (relatively) few street trees and isolated trees within courtyards of the typically perimeter block structure of the central city, and smaller parks in some of the census tracts. The highest average NDVI values are in 2001 and 2021, both at the Northern and Western peripheries of the cities (which represent the Vienna Woods), south of the central city (Wienerberg recreational area), and at the south-eastern parts (Lobau) and eastern parts with its mostly agricultural areas and meadows

The City of Vienna's overall aim is to keep up 50% of the city's total surfaces as green spaces and water bodies. Therefore, the main orientation of Vienna's green space policy was threefold (Brenner et al. 2022; Friesenecker et al. 2024):

a) the protection of large green spaces, the so-called green belt, at the city fringes (e.g. nature protected areas of the northern and western parts (Vienna Woods), southern and eastern parts;
b) the creation of new parks in urban development areas (following a urban development regulation established in 1991 that
c) since 2015, in addition, Vienna's policy shifted towards implementing a diverse set of Nature-based Solutions (e.g. trees, green facades, green roofs) in (the historic) densely built up areas of Vienna (including the renovation of urban parks and the greening of public streets and squares).

Figure AT-1. Gentrified areas (2001-2021) and the level of greenness (2001) by census tracts in Vienna.
BASED ON SOCIO_INDEX

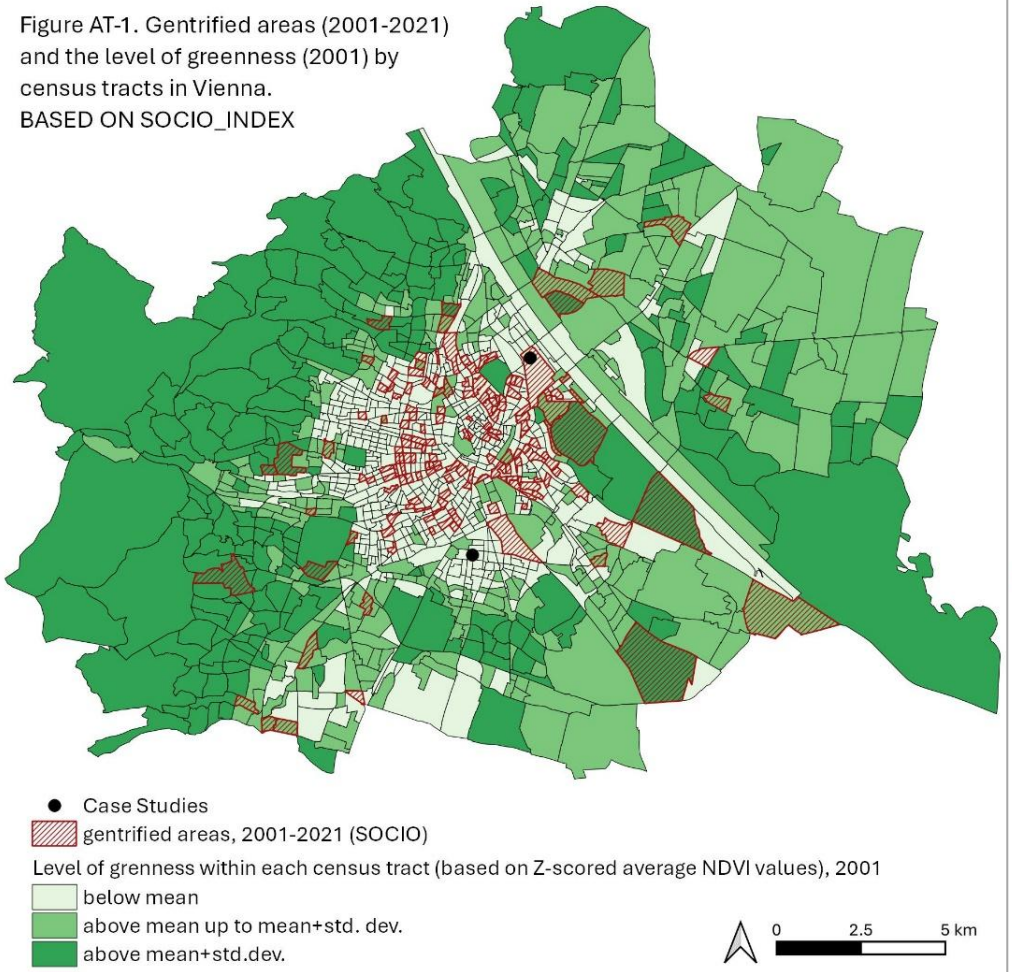
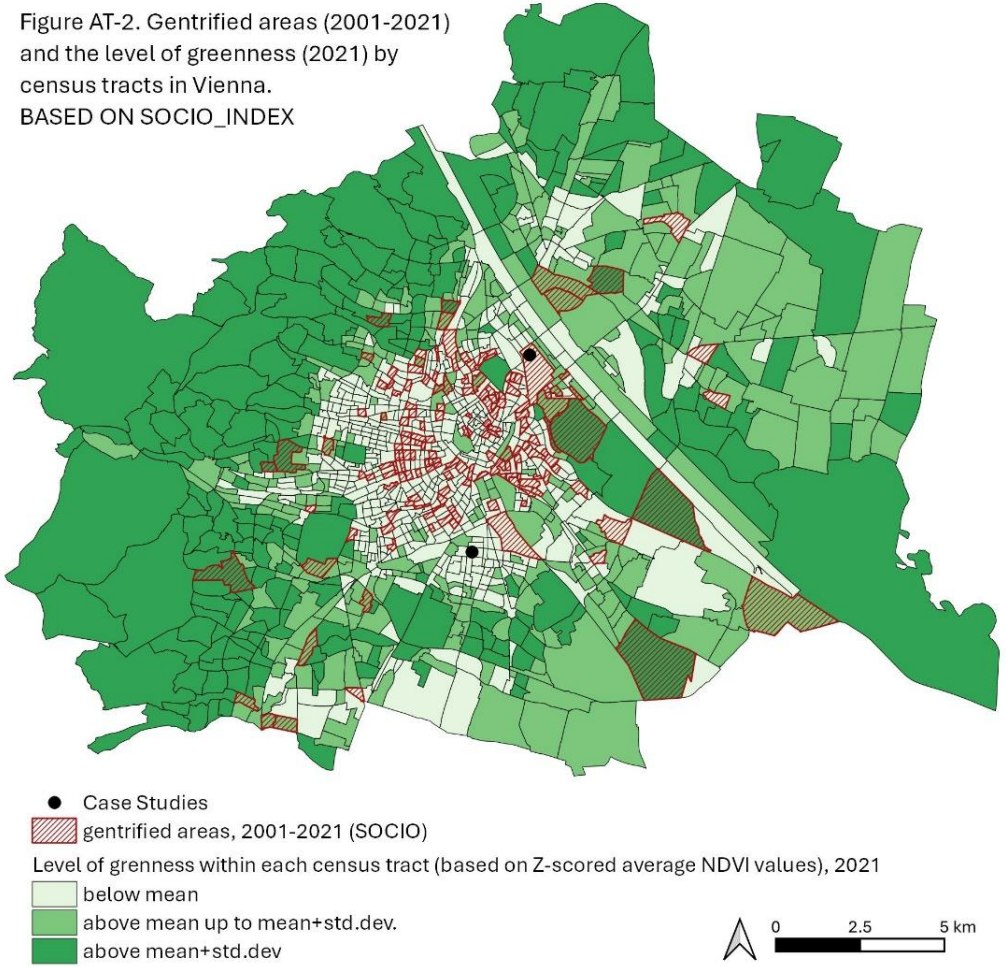
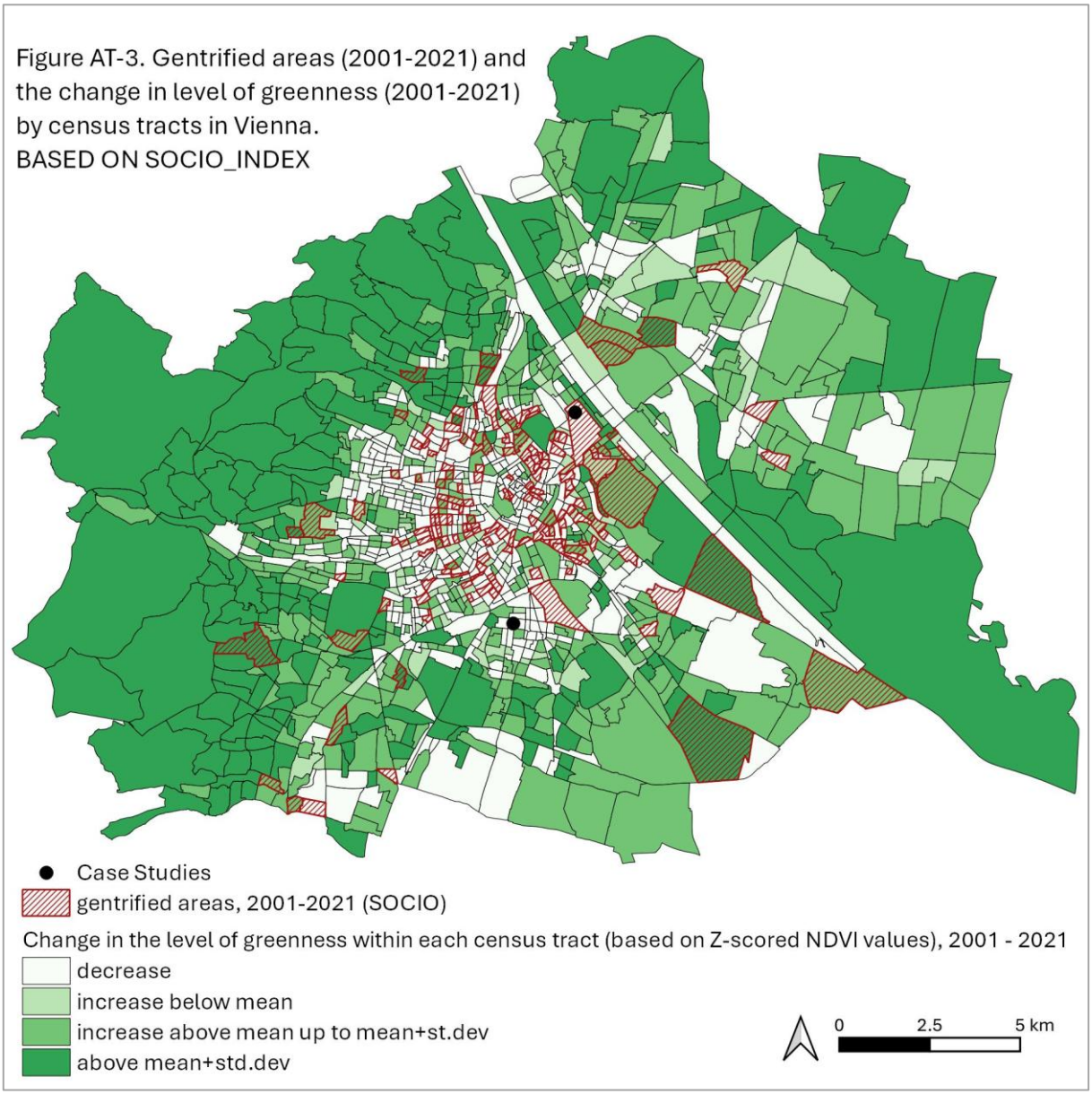


Figure AT-2. Gentrified areas (2001-2021) and the level of greenness (2021) by census tracts in Vienna.
BASED ON SOCIO_INDEX



As shown in Figure AT-3, the strongest increase in the level of greenness are in the large green spaces at the fringes of Vienna. The increase in the level of green is especially pronounced in the nature protected areas of Vienna Woods and the Lobau, but also due to the growth of existing vegetation in private gardens. Increase in the level of greenness above the mean, but below one standard deviation are mostly concentrated in areas where either extensive new green space has been added as part of urban development, but mostly where the vegetation in existing parks in more central areas has been improved. An increase below the mean or a decrease in the level of greenness are concentrated on inner-city areas, most likely either through the brownfield redevelopments or in the densely built up central areas where the vegetation seems to be under stress or has not been expanded significantly in public spaces. It should be, however, noted that in addition the increase in the level of greenness is also related to the more refined quality of the satellite images in 2021.



Besides the changes in the level of greenness, Figure AT-3 also visualises gentrified areas based on the average changes in higher education (share of residents with university degrees), and the inverted changes of the share of residents with compulsory-only education as well as the inverted share of unemployed residents. Gentrified areas are classified as those that deviate from the city-wide trends by more than one standard deviation. The identified 166 census tracts are mostly concentrated in the central of the areas of the city. 117 tracts are located within the so-called inner-city districts inside the so-called where the upgrading of the historic housing stock has been well documented (Musil et al. 2020). The census tracts outside of these areas are either also associated with the upgrading of the historic housing stock, but also with newly built densification projects in the form of brownfield redevelopments as part of Viennese extensive urban expansion of the recent decades.

Among the 166 census tracts, which are categorised as gentrified census tracts, the vast majority of 81% (135 tracts) have a level of greenness that is lower than the average greenness in 2021. About 14.5% (24 tracts) show a level of greenness above the mean but below the sum of the mean and one standard deviation, and 7 gentrified tracts (4.2%) are characterised by a greenness level above one standard deviation. As most of the gentrified areas are located within the central, densely built-up areas, the majority of the gentrified areas identified are also characterised by a below-average change in greenness, with about 83% and 138 tracts in total. 23 gentrified census tracts (13.93%) show an increase in the level of greenness above the average increase, whereas another 5 tracts (3.0%) are above the sum of the average increase plus one standard deviation. However, testing for the relationship between gentrified areas and their (change in) greenness whilst accounting for the spatial structure of the data in terms of autocorrelation, the similarity of values in close proximity, shows that the association between low greenness and low change does not relate to gentrified areas. Based on a general additive model (see Table 20), it is quite the opposite: higher green is significant (at 0.05) and positively associated with gentrified tracts; while the change in greenness is significant (at 0.01), but negatively associated with gentrified areas. Hence, a lower increase in the level of greenness tends to be associated with gentrification.

Finally, the two case study locations investigated for Vienna in the ReHousIn project are: Nordbahnhof and Innerfavoriten. As shown in Figure AT-3, the former is located more to the north in the 2nd Viennese district near the Danube, while the latter is located in the 10th Viennese district – a typical working-class area including high shares of immigrant populations. The case of Nordbahnhof represents a new brownfield development on a former railway yard, including mixed-tenure housing developments and two parks (Bednar Park and the so-called freie Mitte) within its census tracts. The “freie Mitte”, which forms the core interest in the qualitative case study work, has been landscaped between 2022 and 2024, keeping the wild urban vegetation that has developed over the years when the railway yard was not used anymore. Because of its relatively central location, the Nordbahnhof area has also been attractive to a higher educated clientele, while mainly its substantial population growth and its associated changes in educational structure explain why this tract has been classified as gentrified. On the contrary, Innerfavoriten, as the second case study area, has not experienced social upgrading yet. While most of the surrounding area has not improved in terms of level of greenness, the qualitative case study area will elucidate pressures that might increase the risk of gentrification due to its large historic housing stock, which has been confronted with decommodification tendencies in recent years.

2.2.2. Paris (FR)

The map highlights two main phenomena. On the one hand, it illustrates the expansion of urban and metropolitan vegetation between 2011 and 2021. Although this trend is difficult to quantify and the available data contain some statistical inconsistencies, it nonetheless reflects an ongoing and significant increase in green presence in various forms. It is important to note that this does not refer solely to the creation of new parks, but more broadly to the spread of trees and shrub-covered areas throughout the urban fabric, such as tree-lined streets and avenues. Since the early 2000s, the municipality of Paris has implemented various initiatives and programs promoting urban agriculture, the creation of micro-forests, and the greening of streets and public spaces[1].

The second phenomenon illustrated by the map is the emergence of an archipelago of areas characterized by populations with higher-than-average educational attainment and social status. It is important to note that this is based on a limited number of variables including the share of people with a university degree or higher, those working in professional occupations[2], and the unemployed. These two premises suggest that the concepts of 'gentrification' and 'green areas' may not fully capture the complexity of the processes involved, which cannot easily be reduced either to gentrification or to the simple expansion of green spaces. The case of Paris demonstrates that the ongoing transformations are more intricate and multifaceted.

Even at first glance, the map reveals distinct processes that can be schematically described as follows. First, the central-western part of the city and the western inner metropolitan area, notably the Hauts-de-Seine department, has historically been the wealthiest zone, home for centuries to the ruling and professional classes not only of the city and region but also of the nation. Therefore, the observed increase in populations with higher education levels and employment status in this area is not, in itself, particularly significant and does not correspond to a process of gentrification in the Parisian context.

Second, there are several areas that have undergone transformation and densification, primarily former railway and industrial sites. Notable examples include the Boulevard Magenta–Avenue de France corridor in eastern Paris, as well as the former Renault factories and related industrial sites in the southwestern parts of the city and surrounding municipalities such as Issy-les-Moulineaux and Vanves. These cases represent not so much gentrification as the occupation of redeveloped areas by new social groups; their assessment should therefore consider the functional mix and other local factors.

[1] as explored in previous phases of the project (snapshot report, WP5)
[2] corresponding to the INSEE category Cadres et professions intellectuelles supérieures.

Figure FR-1. Gentrified areas (2011-2021) and the level of greenness in 2011 by census tract in Paris.
BASED ON SOCIO_INDEX

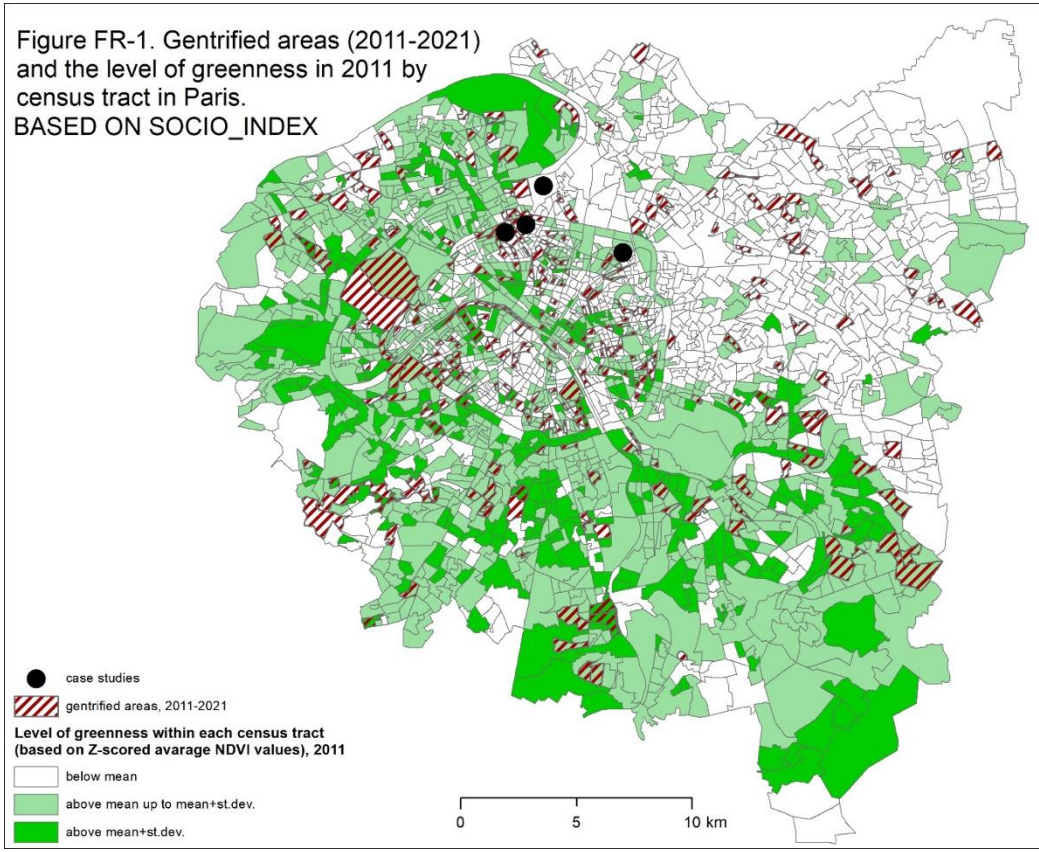
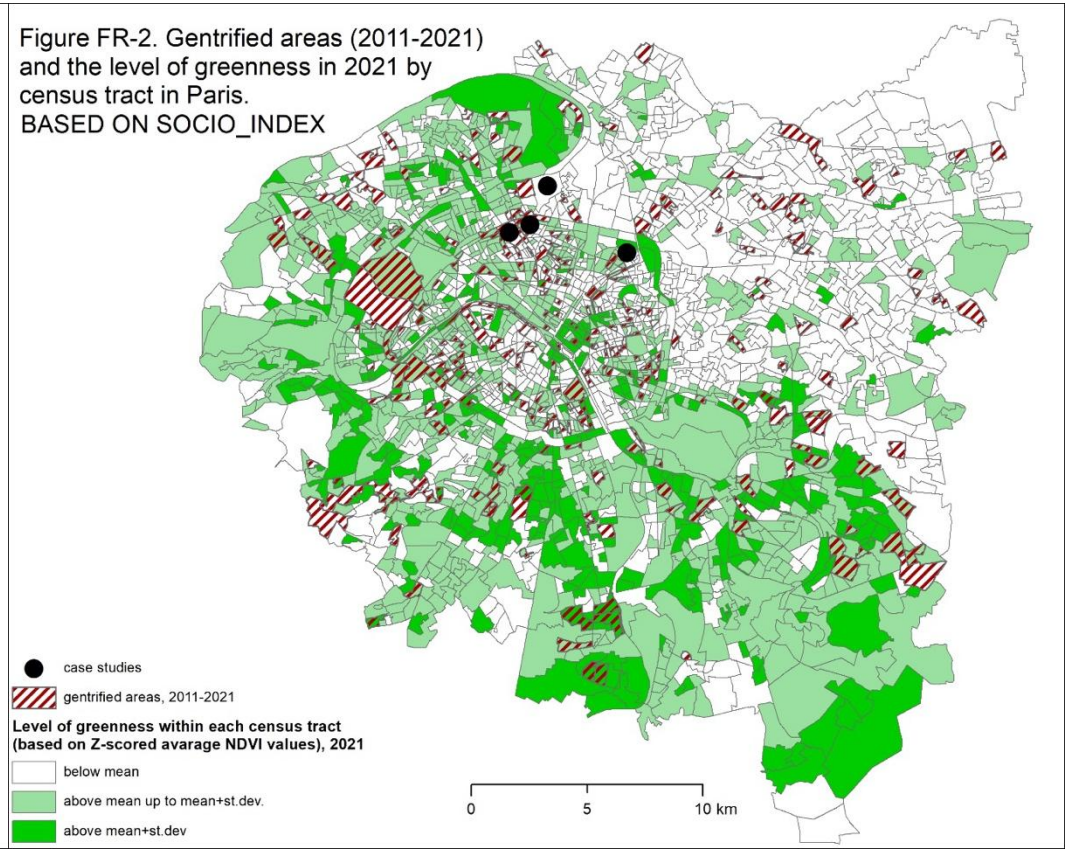


Figure FR-2. Gentrified areas (2011-2021) and the level of greenness in 2021 by census tract in Paris.
BASED ON SOCIO_INDEX

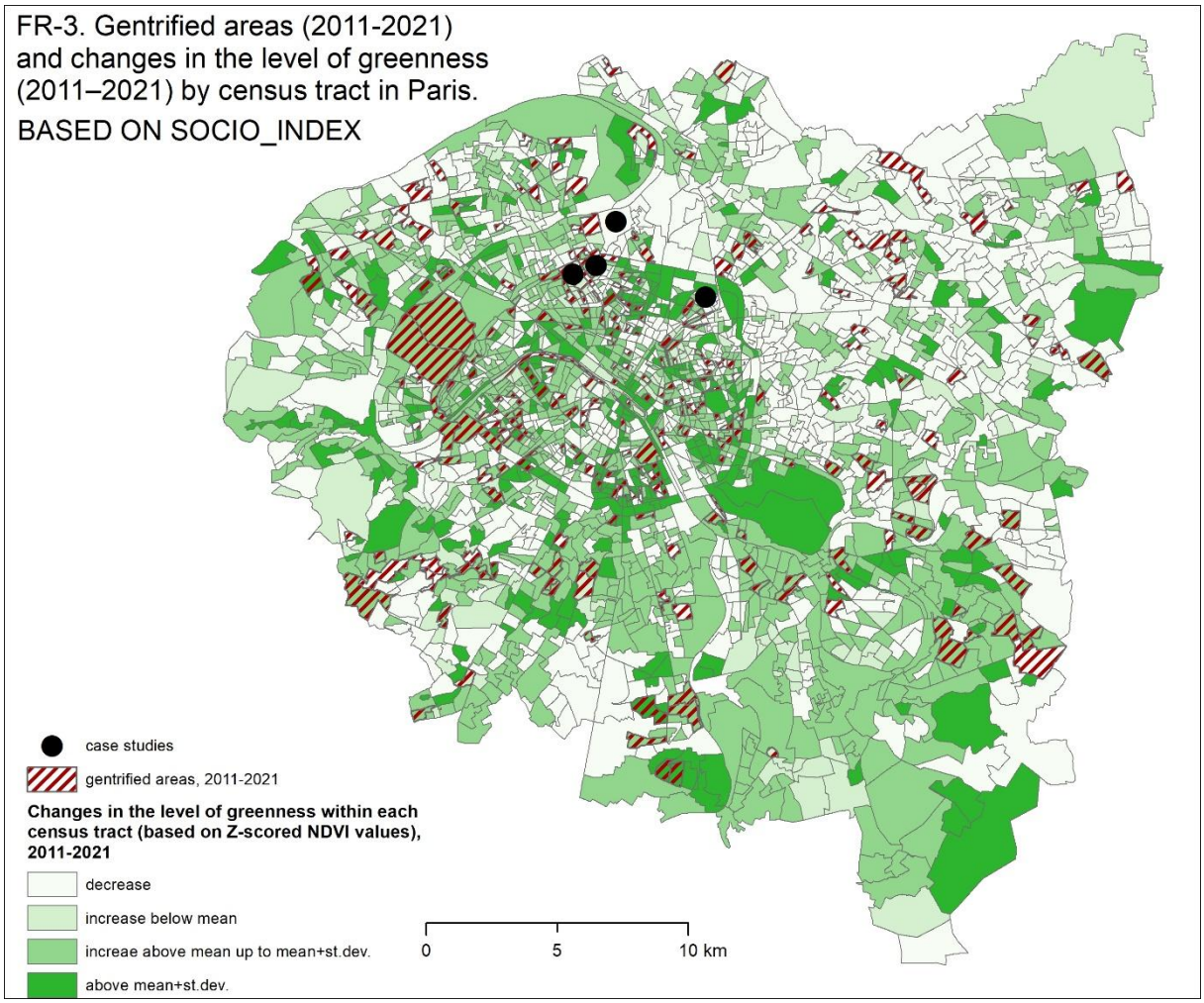


Third, the map shows in Eastern Paris a dispersed pattern of areas with concentrations of new residents, often affluent or highly educated. In many studies on Paris, this phenomenon has been described as social upgrading, referring to processes of upward social mobility among existing residents. Such processes differ from the classical notion of gentrification. However, it is also true that some of these zones have attracted students, young professionals, and members of the creative class, a dynamic that can be more directly associated with internationally recognized forms of gentrification. These overlapping trends suggest the need for more localized studies to fully understand their interactions.

Fourth, the broad north periphery of the metropolitan area includes several zones that have experienced improvements in employment and social conditions. Some of these areas partly overlap with areas targeted by a major public program initiated in the mid-2000s, as in the cases of Aubervilliers in the Seine-Saint-Denis department. This program involved demolishing obsolete public housing and replacing it with privately owned dwellings or a reduced proportion of social housing within the same area, thereby encouraging wealthier populations to relocate to traditionally working-class neighborhoods. This social mix policy, promoted by the French state since around 2005, has clearly altered the social composition of these districts. However, since these changes were driven by public intervention rather than market dynamics, they cannot be adequately described as gentrification.

Regarding the greening of the city, it is important to acknowledge again the widespread increase in green areas and vegetation across both Paris and its metropolitan region. Although the data must be interpreted with caution due to potential biases and questionable sources, the overall trend is evident. Some statistical distortions may occur – for instance, large green expanses such as the Bois de Boulogne cannot be considered gentrified, and variations in vegetation density may depend on seasonal factors. Nevertheless, the general conclusion is that the city and its surrounding areas have seen a measurable increase in vegetation cover in recent years.

In conclusion, the relationship between the phenomena grouped under the general term gentrification and the process of urban greening appears to be weak or nonexistent. The map clearly shows that the two do not spatially coincide: the red zones, indicating socio-economic change, do not necessarily overlap with the areas characterized by greater vegetative expansion. Green areas are far more widespread, and red zones are often found even within non-vegetated areas. If a correlation exists, it must be sought at a different analytical level. Nonetheless, the coexistence of these distinct processes provides a compelling illustration of the evolving social geography and environmental composition of the Paris metropolitan area


FR-3. Gentrified areas (2011-2021) and changes in the level of greenness (2011–2021) by census tract in Paris.
BASED ON SOCIO_INDEX
case studies
gentrified areas, 2011-2021
Changes in the level of greenness within each census tract (based on Z-scored NDVI values), 2011-2021
decrease
increase below mean
increeae above mean up to mean+st.dev.
above mean+st.dev.
0
5
10 km

2.2.3. Budapest (HU)

The situation of green areas in Budapest is characterized by significant spatial variation, a growing emphasis on development and quality improvement, and a dual responsibility in management.

Budapest's green spaces are unevenly distributed, showing a clear disparity between the hilly Buda side and the densely built-up Pest side. Generally, the western part of the city, Buda, has a much higher share of green space (e.g. in District 12 around 123m² per capita), largely due to the presence of the Buda Hills and their extensive forests. Districts in the inner Pest side have an extraordinarily low per capita ratio of green areas (e.g. 14.4m² per inhabitant in the inner districts), and high population density. Most available green spaces are small, run-down, or often overcrowded. The need for new green areas is most acute here. The outer districts of Pest side however form a diverse zone where green space availability improves significantly compared to the dense inner city, but often lacks the continuous natural forest cover of the Buda side. Thus, these districts generally have a higher overall share of green space. This is due to a less dense urban fabric, the inclusion of large city parks, and the preservation of peripheral green areas like forests, agricultural land, and marshlands. Green space is often found in large, isolated patches or is related to former industrial or agricultural sites.

Budapest's green spaces include a variety of types:

- Forests and nature reserves (mainly Buda Hills): Dominated by native vegetation, including ancient beech and oak trees. Large urban parks: Significant areas combining natural beauty with cultural and leisure functions, like Margaret Island (Margitsziget) or the City Park (Városliget), that combines large green spaces and a lake with major cultural attractions Botanical gardens and specialized gardens: Focus on conservation, education, and specific aesthetic design. Example: Füvészkert (Botanical Garden of ELTE, 8th District).
- Downtown small urban parks / block parks (mainly in the inner-city): Small, intensively used parks.
- Linear green spaces: Tree-lined avenues (alleys) and riverfront promenades (e.g., along the Danube or in specific avenues like Pozsonyi Avenue).

Since the 2000s, the development of Budapest's green spaces has been characterized by an increasing recognition of their importance, particularly in the inner city, leading to:

- Shift in urban development vision: Green spaces gained increased importance in urban policy and planning. The city's mid-term and long-term urban development concepts explicitly prioritize protecting and increasing green areas, ensuring ecological connectivity, and promoting a healthier, greener urban environment, aiming at better water retention measures and biodiversity enhancement. For example, the Concept of Budapest's Green Infrastructure and the Radó Dezső Plan / Green Infrastructure Development and Maintenance Action Plan starting in 2021) suggests a more systematic and long-term approach to green space planning and maintenance.

- More focus on regeneration of dilapidated green space: There have been some specific programs to revitalize neglected public and green spaces in densely built-up inner districts (e.g., Józsefváros, District 8). This includes the creation of new small-scale pocket parks and the renewal of existing block parks.
- Community Involvement: Some green space development projects, particularly those for small local parks, have incorporated participatory approaches to involve local residents in the planning and implementation process, aiming to build local ownership and strengthen social cohesion.

In essence, the Capital City Hall provides the overall strategic framework and manages the largest green "lungs" of the city, while District Municipalities are responsible for the detailed planning, development, and daily maintenance of the smaller, local green spaces that directly impact the residents immediate living environment.

In Budapest, substantial green developments over the last 15 years were few, and even fewer occurred near large-scale housing developments (e.g., Marina Part in north Pest) or considerable inner-city rehabilitations. The increase in green space often seems linked to the natural maturation of existing vegetation (e.g., in pocket parks, general parks, or housing estate green areas).

Urban projects, such as Széllkapu tér in inner-Buda, stand out; here, a former industrial complex was dismantled and converted into a public park. In Pest, the rehabilitation of the Orczy Gardens and Teleki Square represents a similar development.

Thus, the gentrification patterns, as measured by the two indicators, show a largely disconnected spatial relationship with green developments, except in very few cases (as displayed on the map).

Gentrification in our research is measured by two types of indicators. In areas captured only by the composite social indicator (change in share of people with higher education, less unemployed, and increased occupational status), the change appears more linked to a *general status increase among long-term inhabitants, and is not primarily linked to the change of the composition of inhabitants*. This is possibly due to general labour market policies of the last two decades, which focused on labour market inclusion (along with workfare-based welfare reforms and restrictions), operating within an economic recovery context from the mid-2010s that saw significant reductions in unemployment and inactivity rates. These areas are displayed with yellow – without a red borderline.

When gentrification is measured only by the change in the share of people with higher education (spatial units with a red outline), the change is more likely linked to new housing construction activities, thereby suggesting a high probability of a *change in the composition of local population*. We can delineate such investments where this coincides with the yellow-covered tracts: in these cases, the change was likely fuelled by the influx of new, higher-status, and better-educated residents moving to the areas. The Pest inner city districts and the new brownfield (market) investments in south Buda along the Danube bay are key examples of this (here, the vegetation is still very small, as the investments are recent).

Except for one larger-scale public investment that included general rehabilitation and urban space redesign in District 8 (Corvin-quarter), no other such public programs have fuelled change in the urban green and housing landscape.

We observe only very few cases where a considerable, investment-based increase in green space coincided with gentrification (the overlap of yellow, green, and red outline on the map). This includes both forms of gentrification – that linked with population change and that without, at a larger scale:

- In Pest, gentrification occurred in small tracts of the already high-prestige inner District 13 and to the north, in a new greenfield neighbourhood and its adjacent blocks (a spill-over effect attracting new, plot-based housing investments);
- In Pest, in small tracts of District 4 and 7, we observe gentrification, in the latter case also linked with the privatization of social housing;
- In Pest in District 8, in some parts of the case study area Magdolna and in tracts along the ring road, gentrification is observable and is possibly linked with beneficial connections to transportation;
- In Pest in District 9, in a neighbourhood where new university investments fuelled a change in public space design and accelerated new housing construction that had been ongoing since the second half of the nineteen-nineties;
- In Buda, in District 11, near the new metro terminus, a housing estate and adjacent detached housing neighbourhood saw sky-rocketing housing prices, allowing residents to sell for a windfall gain.

In the above cases beyond gentrification there is also a statistically proven growth in green share within the tracts. There is, however one case, where the greening may have contributed to gentrification of surrounding tracts: In Buda, in District 2, gentrification is observed in all tracts neighbouring the Széllkapu greening project (though the green share in these tracts has not increased considerably).

As noted, in many parts of the city, the increase in green is linked to the spontaneous growth of vegetation. In the conversion of former trade/light industry areas to residential zones, new housing was only affordable to higher-status populations. Furthermore, the conversion of these plots mandated the rehabilitation of in-yard gardens and general greening. Thus, in these cases, greening and status change are linked with the actual functional conversion of the urban area and new population moving into areas where there was no housing before.

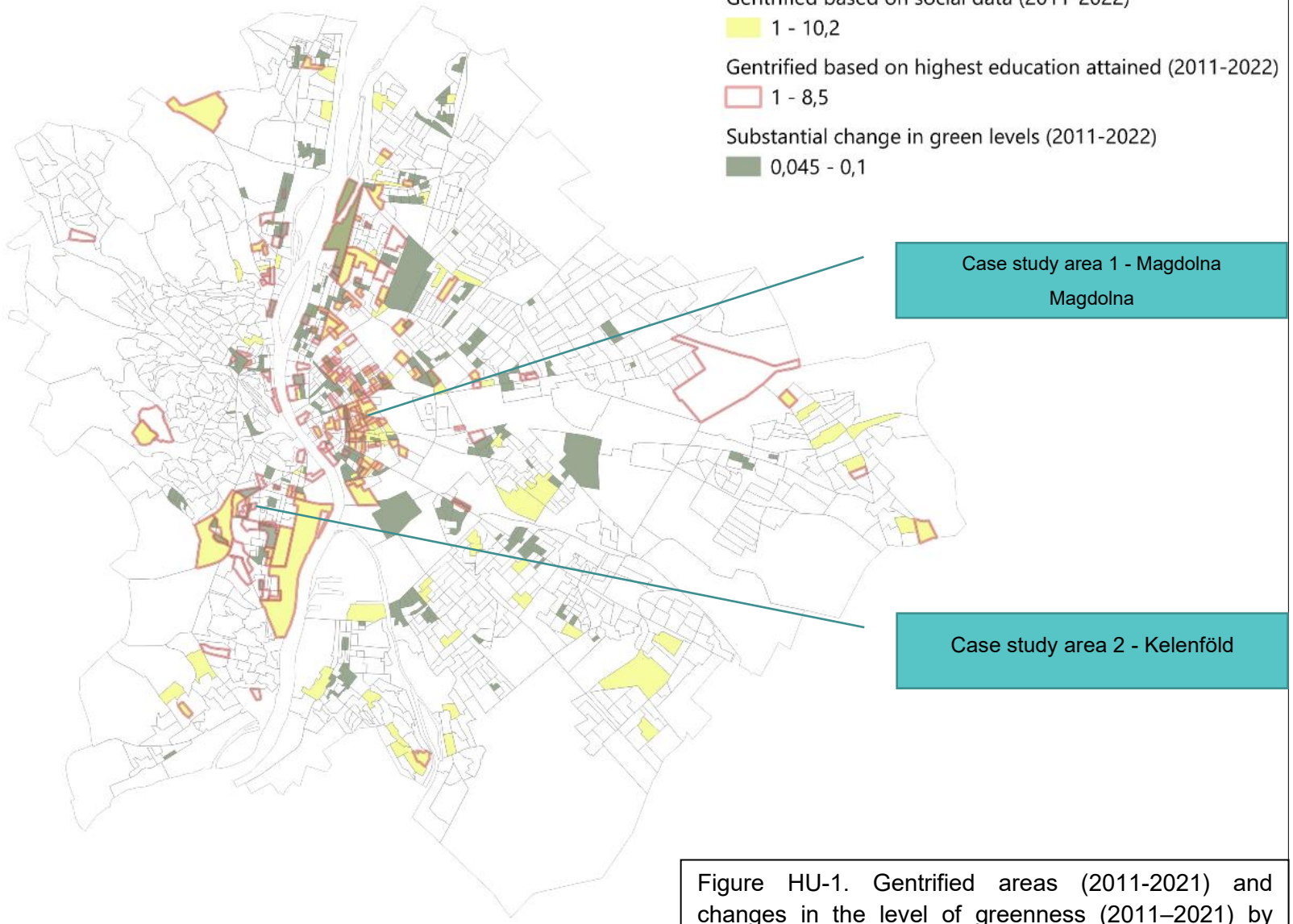


Figure HU-1. Gentrified areas (2011-2021) and changes in the level of greenness (2011–2021) by census tract in Budapest.

2.2.4. Milan (IT)

The analysis of socio-demographic changes reported here is based on data from the 2001, 2011 and 2021 national censuses (Istat). In order to ensure the uniformity of the analysis, it has been necessary to merge some of the census tracts from 2011 and 2021, in order to make them correspond to the census tracts from 2001 (when they were less). A limitation of this piece of analysis that must be taken into account is that the only variable available for the gentrification index was the education level (Istat). Indeed, the ISTAT census system became permanent and annual in 2018, moving away from a ten-year model. The system is based on a combination of sample surveys and integration with administrative sources. However, there has been a consistent decline in the number of available variables, particularly those related to housing. This has resulted in the analysis being based exclusively on changes in population educational levels.

The distribution of green in the Municipality of Milan exhibits a complex spatial structure, the result of historical stratification, industrialisation processes and subsequent redevelopment. Urban planning literature has emphasised the manner in which Milan's green landscape has been shaped by a hybrid system, in which residual natural spaces, historic gardens and newly formed parks are composed in a fragmented but interconnected network (Secchi, 2005).

The largest green areas are located in the outskirts (especially in the South), where wet terrain lower building density and some protective regulations have favoured the preservation of agricultural land, farmhouses and open spaces. Some have subsequently been converted into urban parks, like Parco Nord in the north, Parco Lambro and the green areas along the Lambro River in the east, Parco Forlanini in the east-southeast, Parco Agricolo Sud Milano, which encompasses the entire southern outskirts. Some parks were formed as the reconversion of former brownfield (Parco delle Cave in the west), sport facilities (Parco di Trenno) or areas formerly earmarked for (public) housing development (Boscoincittà). These areas constitute the majority of the city's green space and, in many cases, serve as ecological corridors.

The central area is characterised by the presence of small to medium-sized parks, often dating back to the 19th or 20th century, derived from large aristocratic estates or public initiatives in the modern era. Parco Sempione and Giardini Indro Montanelli are of particular significance in this regard, given their status as key green hubs. However, these areas are encircled by densely populated urban development, a circumstance which restricts both the expansion and ecological continuity of these green spaces.

As the area progresses towards the semi-central belt, the distribution of green spaces becomes more heterogeneous. Milan has experienced numerous significant changes, both large and medium-sized, which have occurred successively, this is a rare occurrence on a national scale in Italy and a notable example at the European level (Lepratto, Zanotto, 2024). In these areas, which have historically been characterised by the presence of industrial facilities and infrastructure, recent urban redevelopment initiatives have resulted in the introduction of new green spaces within the city. Notable examples include the Parco Biblioteca degli Alberi (Tree Library Park) at Porta Nuova, which is situated within the Rehousin case study area, the green areas associated with the CityLife project.

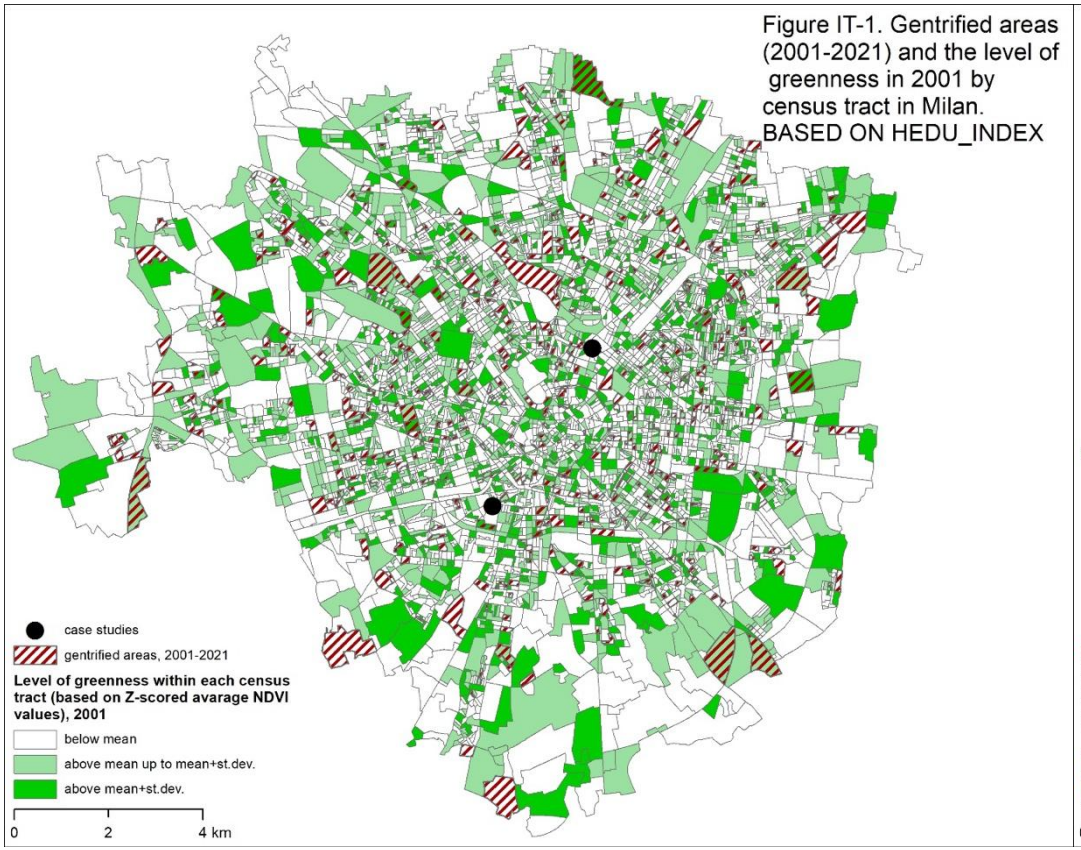


Figure IT-1. Gentrified areas (2001-2021) and the level of greenness in 2001 by census tract in Milan. BASED ON HEDU_INDEX

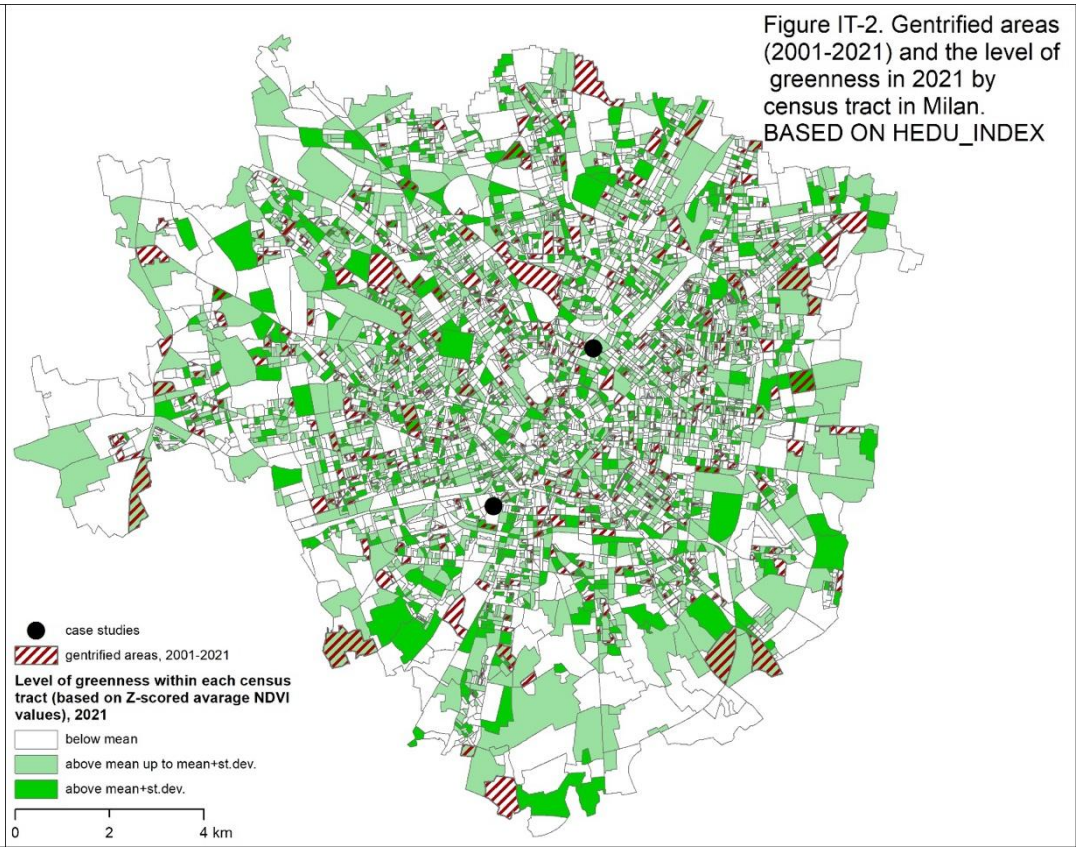


Figure IT-2. Gentrified areas (2001-2021) and the level of greenness in 2021 by census tract in Milan. BASED ON HEDU_INDEX

These flagship projects, which are accessories to the built-up regeneration projects, are accompanied by less renowned recent parks, such as the second case study area of the Rehousin project, Parco Segantini. This urban green space is situated in the south-west of Milan, in the Navigli district, between Via Segantini and the Naviglio Pavese canal. The development was initiated in the 2000s on land that had previously been used as a site for the serotherapy city's institute, and which also comprised a section that was used for agriculture.

The city of Milan exhibits a distinctively dichotomous green system, characterised by a high degree of fragmentation within the historic centre and a more extensive and continuous presence on the urban margins. This phenomenon is indicative of the dynamics of radial growth - differentiated between North and South - and post-industrial transformation.

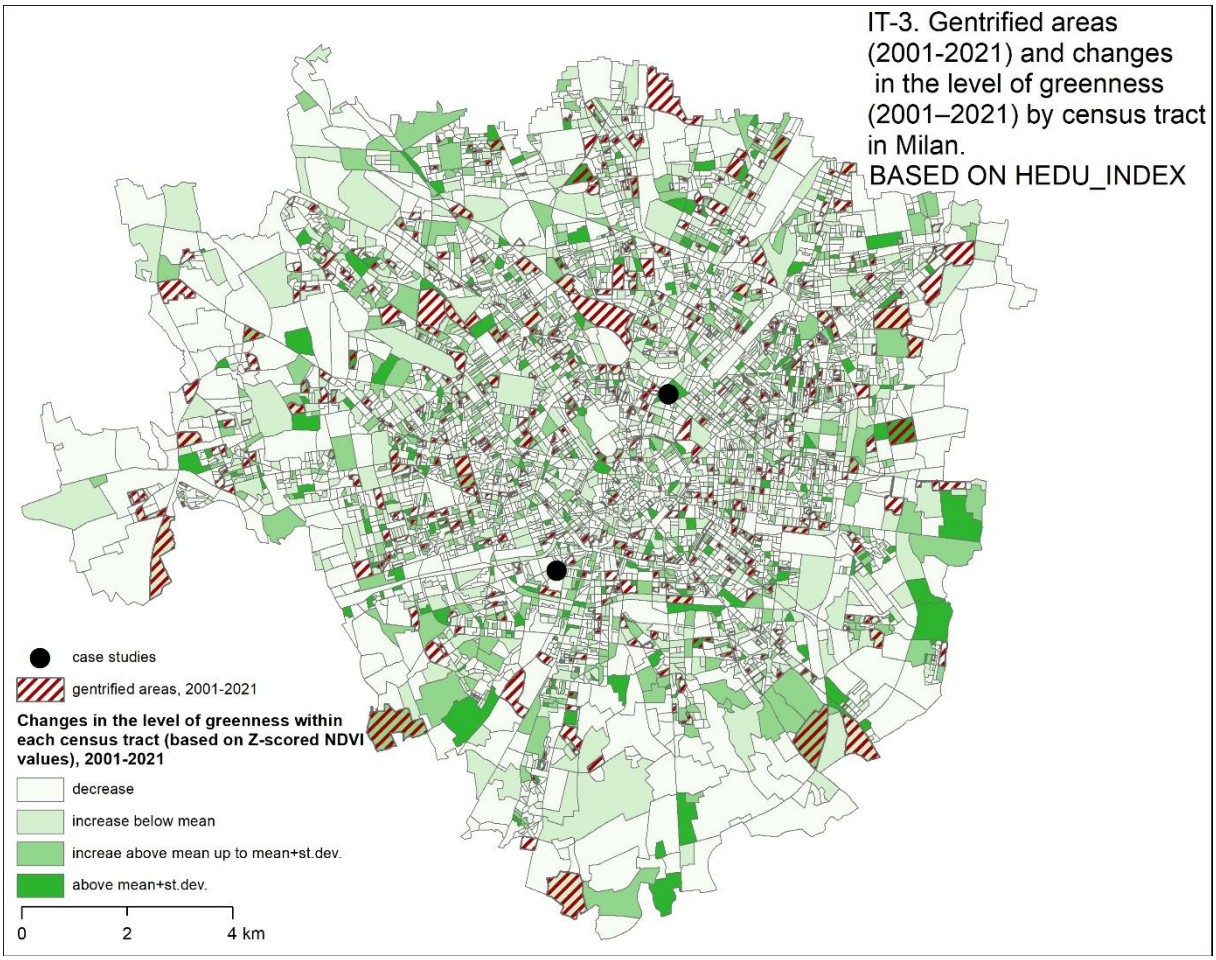
Figure IT 3 illustrates the variation in greenness levels in census tracts (2001–2021) in Milan, operationalised through Z-scored NDVI values. Overall, the level of greenness has generally increased across the municipal territory, with most census tracts exhibiting positive variation. Moderate greening (light and medium green) is widespread throughout the city, including both central and outer areas, indicating incremental ecological improvement at an urban scale. The highest increases in greenness—represented in the darkest green—are predominantly located along the peripheral fringes. These areas are particularly visible in the southern and southeastern sectors, as well as in portions of the western and northeastern margins. Their spatial configuration suggests a process associated with the conversion or enhancement of underused or formerly agricultural or industrial land, consistent with broader peri-urban ecological restructuring.

In contrast, decreases in greenness (white tracts) are comparatively limited but widespread on the municipal territory. They are most commonly found in the inner city and adjacent semi central districts, where dense built fabric, redevelopment pressure, and limited land availability have constrained opportunities for green enhancement. But relevant pockets of decline appear also at the borders of the administrative area. In the outskirts, the decrease in greenness can be linked to the development of former brownfield sites, where spontaneous vegetation probably once grew and was cut down to make way for redevelopment.

Overall, the map conveys a dominant trend of increasing greenness.

The maps IT-1 and IT-2 show the spatial relationship between “areas with social upgrading” (2001–2021) and the level of greenness in Milan in 2001 and 2021. As previously noted, the only indicator for possible gentrification is constrained by being based solely on variation in education levels due to limitations in data availability related to updating the census system. Based on this, several areas in Milan have undergone a consistent ‘upgrade’ of the population in terms of their educational level: while we cannot infer that this means a gentrification process has happened, it could hint at a gentrification process.

The areas with social upgrading (upward change in education status), indicated by red hatching in map IT-3, intersect variably with changing greenness patterns. While they are broadly dispersed, notable clusters occur within semi central and peripheral districts, some of which overlap with areas displaying moderate or even high greenness gains. This spatial convergence suggests potential but rather low interactions between socio-economic transformation and environmental improvement, particularly in districts undergoing redevelopment.


IT-3. Gentrified areas (2001-2021) and changes in the level of greenness (2001–2021) by census tract in Milan.
BASED ON HEDU_INDEX
case studies
gentrified areas, 2001-2021
Changes in the level of greenness within each census tract (based on Z-scored NDVI values), 2001-2021
decrease
increase below mean
increae above mean up to mean+st.dev.
above mean+st.dev.
0
2
4 km

2.2.5. Oslo (NO)

Understanding gentrification and greening dynamics in Oslo requires consideration of two important premises. First, the indicator used to capture gentrification (HEDU index) – based on changes in the share of highly educated residents – has clear limitations in this context. In 2021, 44% of Oslo's population held higher education degrees, meaning that the measure offers only a partial view of socio-economic change. It tends to capture broad patterns of social upgrading but cannot fully account for other crucial dimensions of gentrification, such as changes in income, tenure, or housing affordability. For this reason, the present analysis should be interpreted as a first step, to be complemented by more detailed, multi-dimensional investigations.

Second, in the case of Oslo, what is most relevant when examining the relationship between greening and urban change is not the overall *quantity* of green space – since the city is already exceptionally green – but rather the *quality* and character of its green environments. Oslo's urban policy has long prioritised ecological connectivity and canopy coverage, but recent years have seen an increasing focus on the qualitative improvement of existing green and blue infrastructures (Municipality of Oslo, 2018). This is particularly evident along the Akerselva River, where the linear park established through the "Akerselva miljøpark" project in the 1990s has been continuously enhanced with upgraded public spaces, ecological restoration, and waterfront accessibility. Such improvements illustrate how qualitative transformations of green areas – rather than simple spatial expansion – play a crucial role in reshaping urban environments and their social dynamics.

The geography and distribution of green areas in Oslo reveal a city characterised by a remarkable presence of green structures that penetrate the urban fabric. Large continuous green areas and forests surround the built-up core, while linear green corridors – often following the course of rivers such as Akerselva and Alna – extend from the periphery toward the centre (Di Marino et al., 2024). This structure reflects Oslo's long-standing planning tradition of integrating nature and urban development, resulting in a generally high accessibility to green. However, the quality, accessibility, and spatial configuration of these green spaces vary significantly across neighbourhoods. Central and western districts tend to enjoy both high-quality and well-maintained green environments, while parts of the dense inner east and certain peripheral areas have more limited or fragmented green coverage, especially in the areas that have been most heavily densified (Venter et al., 2023).

The geography of changes in the distribution of green areas between 2001 and 2021 shows a general trend of environmental improvement across the city, with all census tracts experiencing an increase in the share of green areas. This expansion is closely linked to municipal environmental and urban policies promoting the restoration of river systems, the creation of new parks, and the development of nature-based solutions (NBS) as part of Oslo's broader climate adaptation agenda (Municipality of Oslo, 2018). Notable examples include the reopening of waterways such as Akerselva and Hovinbekken, and the establishment of new urban parks. Nevertheless, the intensity and type of change differ across the urban territory: in the major densification areas in the inner city (Cavicchia, 2023), for example, the increase in green areas has been more limited compared to outer areas.

The geography of gentrification in Oslo between 2001 and 2021 shows a clear concentration of social upgrading in the inner-city, and particularly in the eastern districts.

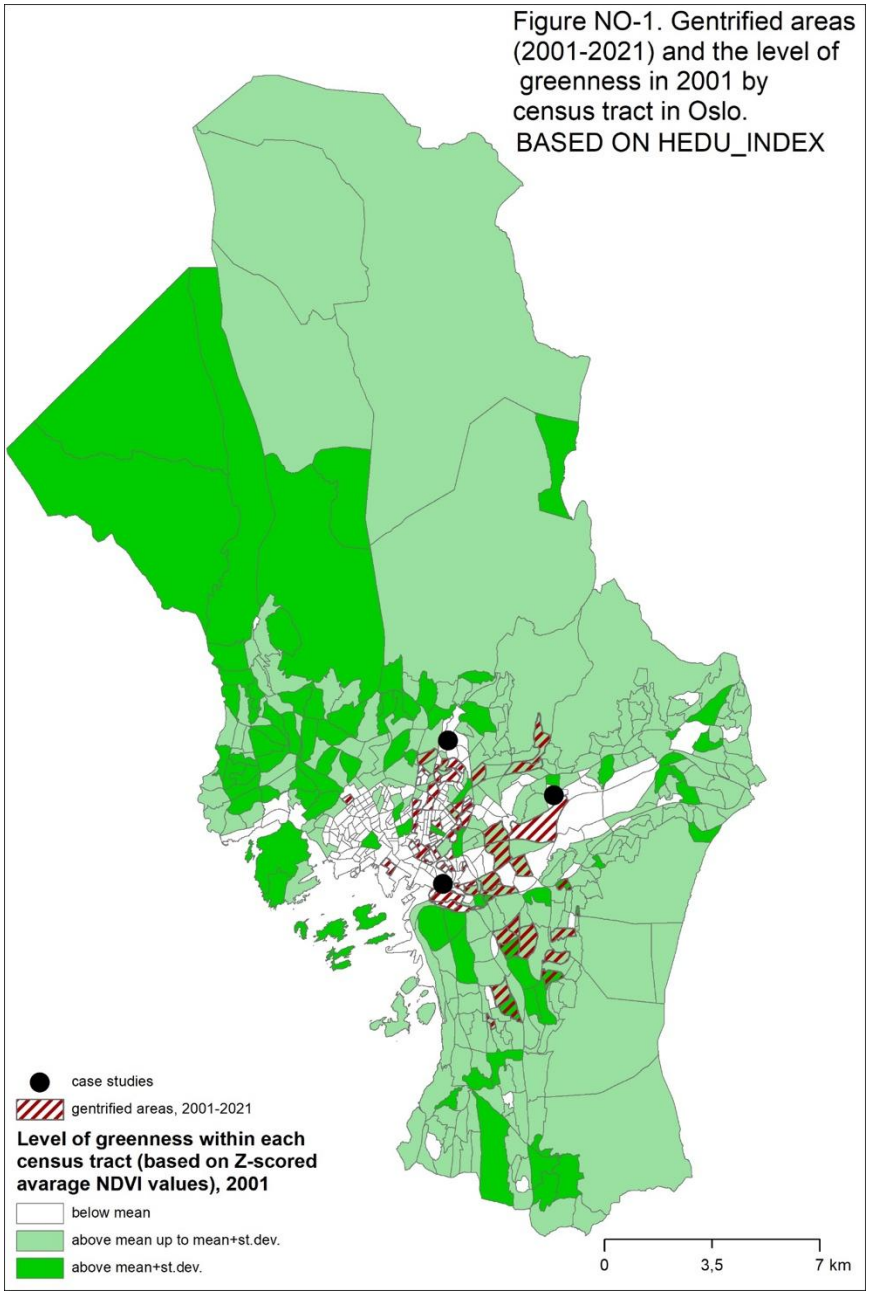


Figure NO-1. Gentrified areas (2001-2021) and the level of greenness in 2001 by census tract in Oslo. BASED ON HEDU_INDEX

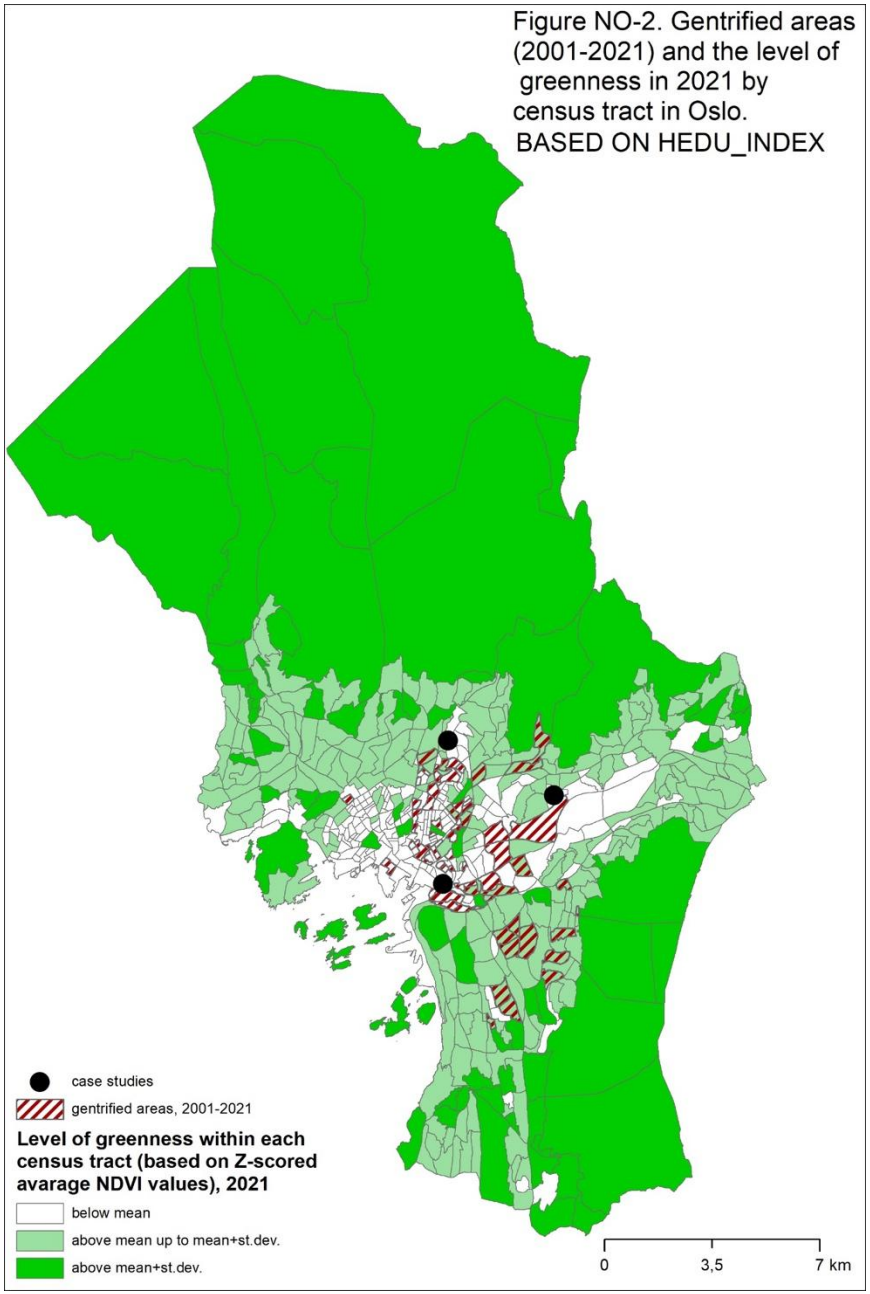
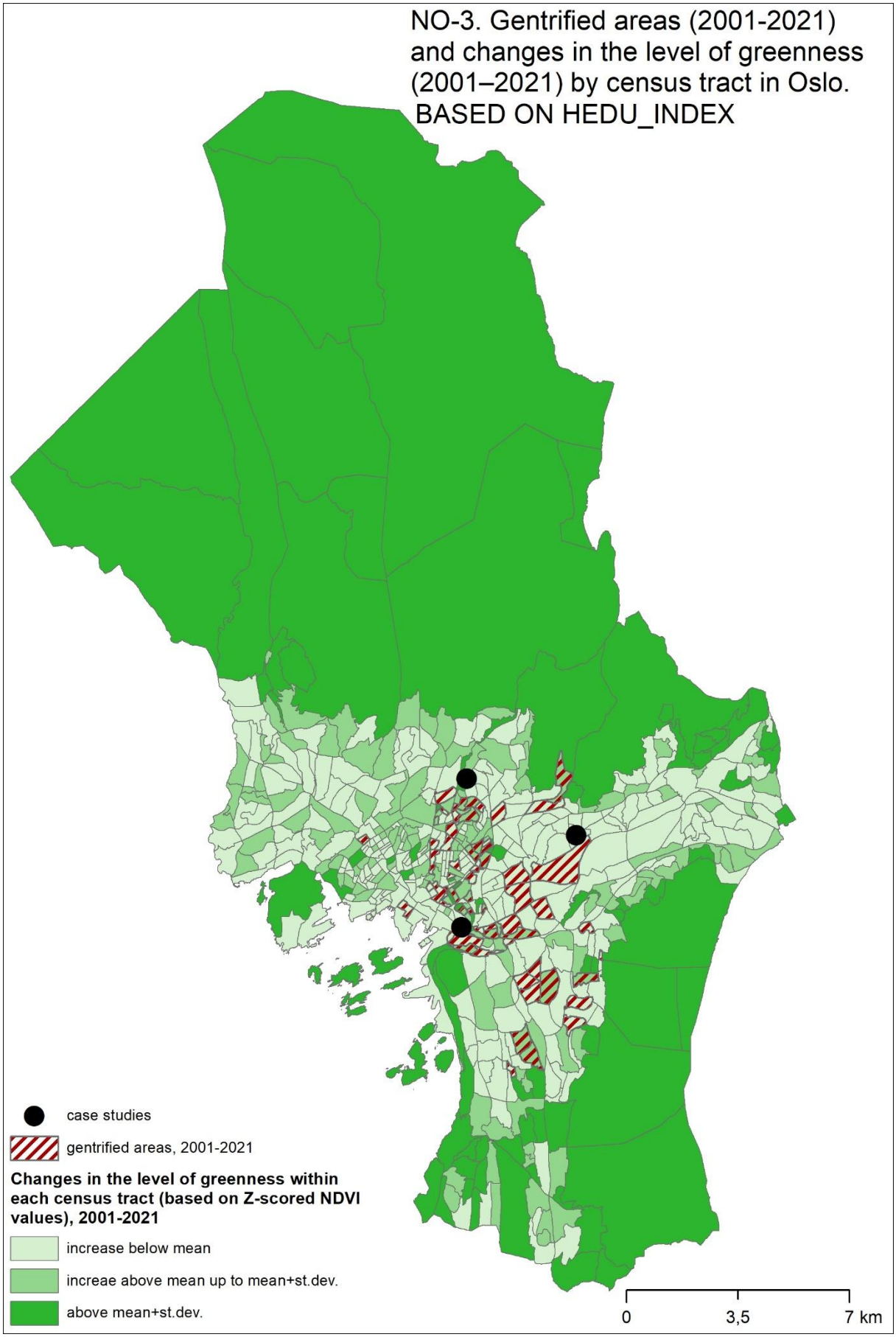


Figure NO-2. Gentrified areas (2001-2021) and the level of greenness in 2021 by census tract in Oslo. BASED ON HEDU_INDEX

Neighbourhoods such as Grünerløkka, Sagene, Tøyen, and Gamlebyen have undergone significant socio-economic transformation, evolving from traditionally working-class areas into neighbourhoods increasingly populated by higher-educated and higher-income residents (Huse, 2016). Although the index used in this analysis captures only changes in educational attainment – and therefore represents a partial measure of gentrification – the resulting patterns align closely with findings from previous studies (Andersen & Røe, 2017; Hjorthol & Bjørnskau, 2005). These have consistently identified the centrally located inner-east districts, historically characterised by lower-income and industrial populations, as the most prominent sites of gentrification in Oslo (Cavicchia & Cucca, 2025). The observed concentration of social upgrading reflects broader processes of urban revalorisation associated with housing renovation, cultural and commercial renewal, improved accessibility, and targeted densification policies. Yet, it is worth noting that gentrified tracts do not always coincide precisely with the most heavily densified areas (Cavicchia, 2022). Instead, gentrification often emerges in their immediate surroundings, suggesting the presence of spatial spillover effects, as highlighted by earlier research. In contrast, the outer western and northern districts – long affluent and less densely urbanised – show minimal signs of socio-economic change, confirming that Oslo's restructuring remains spatially selective and largely confined to the inner urban core. Smaller and more dispersed pockets of upgrading are also visible in the southeastern and southwestern peripheries, where new housing projects and transport improvements appear to have stimulated more localised forms of social change.

Although gentrification and the expansion of green areas intersect in several neighbourhoods, this correlation appears to be only partial. Indeed, while increases in green space are evident citywide, gentrified areas do not appear to be predominantly concentrated in the areas with the most significant increase in the proportion of green areas. Nonetheless, environmental interventions, particularly those involving river restoration and the creation of new parks, have improved ecological conditions while simultaneously increasing the attractiveness and market value of adjacent residential districts. This dynamic can be observed in the three case studies examined across the city. In Nydalen, in the inner north, large-scale densification along the Akerselva River has transformed a former industrial area into a mixed neighbourhood with various green and blue infrastructures, diverse housing types and income levels, though now also home to some of the city's highest property prices. In Grønland, near Oslo's central station, gentrification is advancing in a context where green space remains limited, yet recent projects such as Klosterenga Park and the reopening of the Hovinbekken River are likely to intensify socio-economic change by enhancing environmental quality in an already pressured housing market. Finally, in the outer east, the reopening of Hovinbekken and the creation of Bjerkedalen Park under the city's ecological plan demonstrate how environmental improvement initiatives can increase the attractiveness of previously undervalued areas, potentially laying the groundwork for future gentrification.

These spatial patterns must also be understood in light of Oslo's particular housing structure and market mechanisms. The city's high rate of homeownership means that gentrification rarely occurs through direct displacement in the rental sector. Instead, it unfolds through property speculation, "flipping," and gradual replacement of residents as dwellings change ownership (Cavicchia, 2022). Environmental and planning interventions that enhance neighbourhood attractiveness often reinforce these dynamics by increasing property values and encouraging investment-oriented behaviour.


NO-3. Gentrified areas (2001-2021) and changes in the level of greenness (2001–2021) by census tract in Oslo. BASED ON HEDU_INDEX
case studies
gentrified areas, 2001-2021
Changes in the level of greenness within each census tract (based on Z-scored NDVI values), 2001-2021
increase below mean
increeae above mean up to mean+st.dev.
above mean+st.dev.
0
3,5
7 km

2.2.6. Warsaw (PL)

In Warsaw, the total area of green (or possibly open, undeveloped) spaces accounts for more than half of the city's total surface. The largest portion of this – approximately one-quarter of the city – consists of unused land covered with grassy vegetation. Forests and wooded areas occupy another 20% of the city's area. Most of these spaces are located on the periphery. Parks and squares constitute a relatively small proportion of the city's area, totaling between 9 and 12 km² according to various sources. They are concentrated mainly in the city center, where there are around 30 such parks; in over half of them, the area does not exceed 1.5 hectares. Larger parks and squares are typically located within major housing estates – especially those built during the 1970s and 1980s. The city's park system is arranged roughly along a north–south axis defined by the Vistula River and its valley.

Over the past two decades, the proportion of green areas in Warsaw has not changed significantly. Although NDVI data indicate an overall increase in vegetation cover across most of the city – excluding the densely built-up central area – the magnitude of these changes remains small, typically no greater than 5%. The most noticeable increases occur in districts that already had a high share of green areas, primarily in the southern and southeastern parts of the city. As in other major Polish cities, Warsaw's public authorities – particularly at the municipal level – focus primarily on preserving, modernizing, and gradually expanding existing green resources. Special attention is paid to improving accessibility and inclusiveness of these spaces for diverse user groups.

Figures 1 and 2 illustrate the patterns of gentrification and the share of green areas in census tracts in 2001 and 2021, respectively. Figure 3 presents the changes in the share of green areas (2001-2021) and the patterns of gentrification. Regarding the geography of gentrification in Warsaw in the 21st century (2002-2021), three main zones with gentrified areas can be identified in the city:

Central districts (historical core areas): These include the inner city zones where high-standard new residential developments or renovated tenement houses dominate – such as North Śródmieście, Solec, Old Mokotów, Powiśle (one of the case study areas), Mirów, and Old Żoliborz.

Outer zone: Areas adjacent to the city center characterized by multifamily housing developments - either infill developments in the older housing estates (from the socialist era), or new apartment building projects constructed on the vacant land. Regarding the outer zone boroughs where the process of gentrification is concentrated, one can identify the following locations: 1) Mokotów, Wilanów, Rakowiec, Szczęśliwice, Włochy, Młynów, Koło, Powązki, Wawrzyszew, Bielany, and Marymont on the western side of the Vistula river; 2) Bródno, Targówek, Praga Północ, and Stara Praga (one of the case study areas), on the eastern side of the river.

Peripheral zones: Outlying areas undergoing gentrification through the development of new multi-apartment buildings and single-family housing. In the northwest, these include neighborhoods adjacent to forests forming part of the aforementioned national park; in the east, areas within compact forest complexes such as Wesoła and Rembertów; and in the southwest, large new residential estates are emerging on former agricultural lands in Ursus.

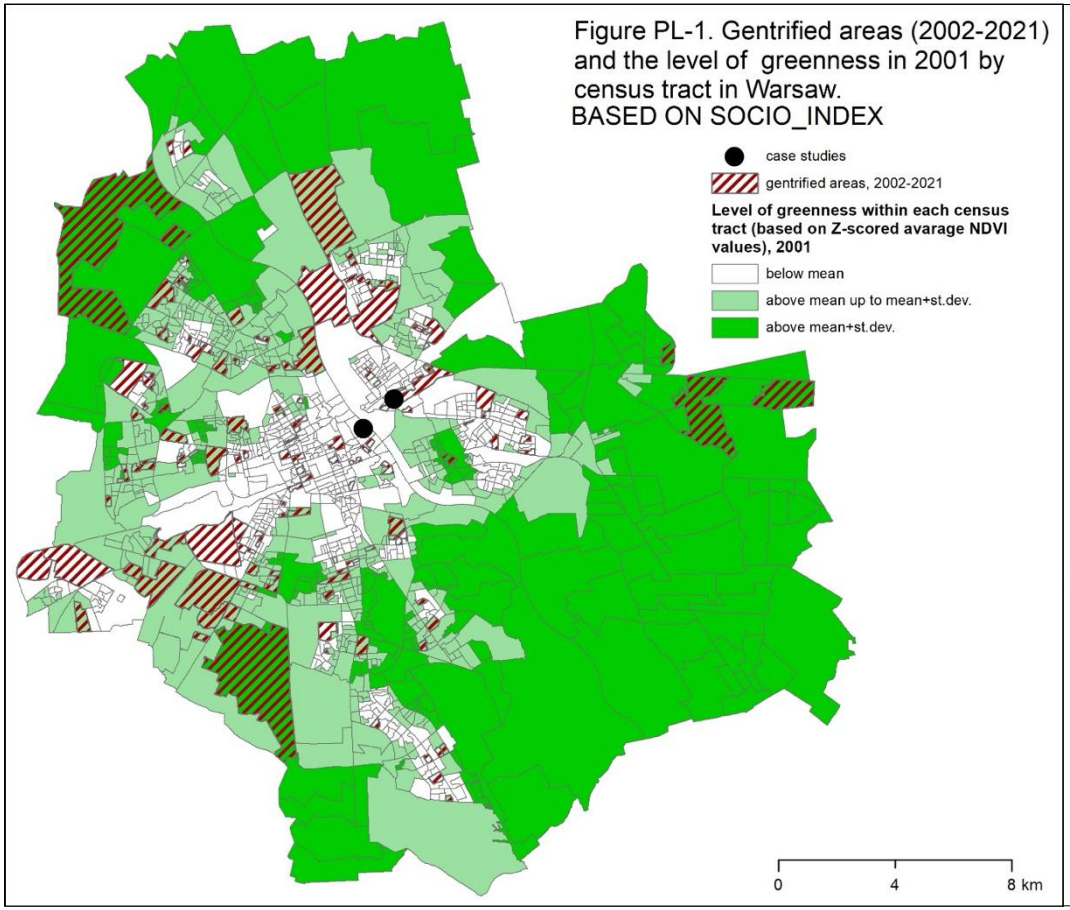


Figure PL-1. Gentrified areas (2002-2021) and the level of greenness in 2001 by census tract in Warsaw.
BASED ON SOCIO_INDEX

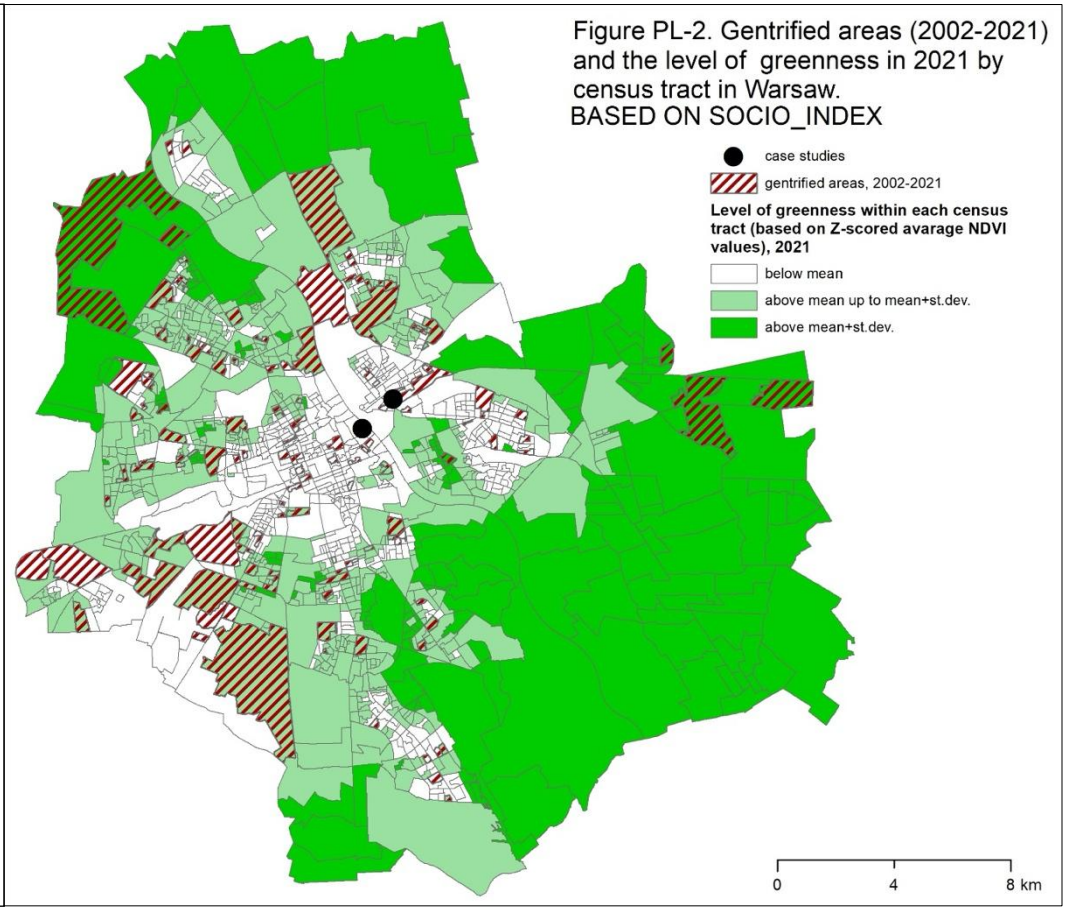
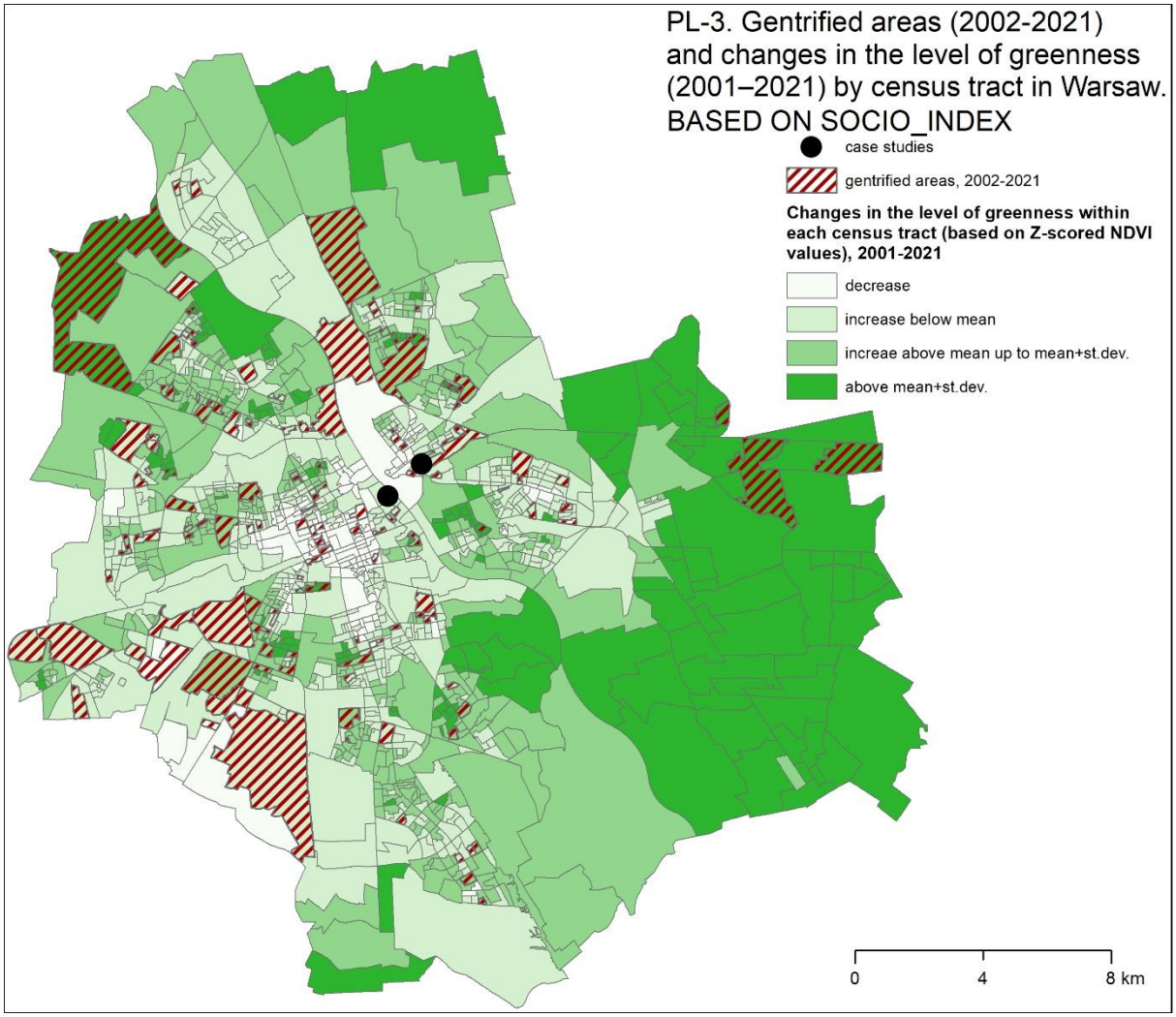


Figure PL-2. Gentrified areas (2002-2021) and the level of greenness in 2021 by census tract in Warsaw.
BASED ON SOCIO_INDEX

In Warsaw, a clear and positive correlation is observed between the gentrification patterns and the changes in the share of green areas in a census tract and its neighborhood. More specifically, tracts where we observe the increase in the socioeconomic status of residents are generally those where we also observe the increasing share of green areas. However, the high share of green areas in a tract and its neighborhood, are negatively related to the social upgrading of census tracts. This should not be surprising, as the great majority of gentrified areas can be found in places which are relatively densely built-up. Among the 139 identified gentrified areas, 45 have a share of green spaces lower than the average for the city. Of these 45 tracts, only nine are located outside the city center. The positive relationship between the supply of green areas and gentrification is the most evident in the peripheral zone – especially along the northwestern boundary of the city (in the vicinity of the Kampinos National Park) and in the eastern districts (notably Wesoła and Rembertów).

Both case studies: Powiśle and Stara Praga are located in areas where the initial level of greenness was below the citywide mean and where the increase in the share of green areas between 2001 and 2021 was lower than the average for Warsaw. This aligns with the broader pattern in which gentrified tracts are typically found in relatively densely built-up districts with limited vegetation cover. Powiśle, in particular, includes neighborhoods identified as undergoing gentrified, with a noticeable rise in the socioeconomic status of residents despite a modest increase in green space. Similarly, Stara Praga represents a clear example of a gentrified estate within an area of low greenness, confirming that social upgrading in Warsaw tends to occur in compact, previously underinvested neighborhoods rather than in the greenest parts of the city.

Finally, it is essential to emphasize the historical context, which plays a crucial role in shaping Warsaw's socio-spatial and environmental structure. The city was almost completely destroyed – approximately 90% – at the end of World War II and subsequently rebuilt according to socialist urban planning principles. In Warsaw, these principles largely disregarded issues of property ownership (as most of the city was nationalized) and market mechanisms such as land rent. Consequently, the postwar housing estates were built with relatively low density and extensive open layouts. Despite intensive urban densification efforts over the past two decades, Warsaw has retained, in many parts – including its central districts – the high share of open (often green) spaces. Similar to the other large former socialist cities, this legacy contributes to the rise of infill developments (new housing) which usually are located on the vacant, often green, plots.


PL-3. Gentrified areas (2002-2021) and changes in the level of greenness (2001–2021) by census tract in Warsaw. BASED ON SOCIO_INDEX
case studies
gentrified areas, 2002-2021
Changes in the level of greenness within each census tract (based on Z-scored NDVI values), 2001-2021
decrease
increase below mean
increae above mean up to mean+st.dev.
above mean+st.dev.
0
4
8 km

2.2.7. Barcelona (ES)

In both 2001 and 2021, Barcelona's green areas show a clear north–south and center–periphery gradient. The northern and western peripheries, particularly the Collserola mountain range, Vallvidrera, Les Planes, and Horta–Guinardó, display very high shares of green space (dark green). These zones are largely low-density, middle- to upper-middle-income neighborhoods (Horta-Guinardó is actually closer to working-class), characterized by single-family homes or small apartment blocks and direct access to forested areas. Many of these green areas are also more difficult to access due to topography. In contrast, the dense central districts – notably Eixample, Ciutat Vella (Raval, Gòtic, Born), and Sant Antoni – remain the least green, reflecting the city's compact urban fabric and limited open space as well as the predominance of either grey pedestrian streets or large car-dominated roads. Coastal and southern tracts such as Barceloneta, Poble-sec, and parts of Sants–Montjuïc also show minimal greenery, constrained by industrial and port land use. Intermediate areas such as Sant Andreu, Sant Martí, and Nou Barris present mixed conditions, with some tracts near parks like Parc de la Trinitat or Parc del Clot showing moderate green shares, but others remaining built-up and under-served, those being mostly large-scale apartment buildings built in the 1960s-1980s. Overall, the maps highlight environmental inequality between the affluent, green periphery and the dense, inner city, although parts of the city center are also middle class (e.g. Eixample and parts of Sant Antoni) and have very little green space (e.g. parks), except for tree canopy.

Between 2011 and 2021, the expansion of green areas was geographically uneven. According to Figures 3 and 6, the most visible gains occurred in eastern and southern districts, particularly Sant Martí (Poblenou, Diagonal Mar, El Clot), Sants–Montjuïc (La Marina, Poble-sec), and Sant Andreu (La Sagrera, Bon Pastor) – zones that have undergone major redevelopment through projects such as 22@, the Diagonal Mar–Fòrum renewal, and the La Sagrera railway park. These neighborhoods, formerly industrial or working-class, have experienced environmental upgrading via new parks, green corridors, and waterfront reclamation. Smaller but notable increases also appear in central Gràcia and Sant Antoni, where traffic-calming superblocks have created localized greening. In contrast, the historic core (Raval, Gòtic, Barceloneta), much of Gràcia, Sarrià and parts of Eixample saw little change, constrained by density and lack of vacant land. The former neighborhoods are mostly working-class neighborhoods with a high proportion of migrant groups (although they are gentrifying) while the later are middle (Gràcia) and upper (Sarrià) neighborhoods. Peripheral forested districts already above the city average, such as Vallvidrera and Horta, show limited growth. There are a few neighborhoods in the North-West (Tibidabo, Vallvidrera and Les Planes) that show increase above the mean, but those are scarcely inhabited areas. This spatial pattern reveals that recent greening largely followed urban renewal and redevelopment fronts in already gentrifying districts (Sant Martí, Sant Antoni) and more recently gentrifying ones (Sants). That said, some neighborhoods of the district of Nou Barris and Sant Andreu itself have also gained new green spaces without gentrifying. For example, In Figure 3, the tracts of those areas showing the most noticeable increase in green areas lie along the eastern and northern edges of Nou Barris – specifically around Torre Baró and Ciutat Meridiana and southward toward Guineueta.

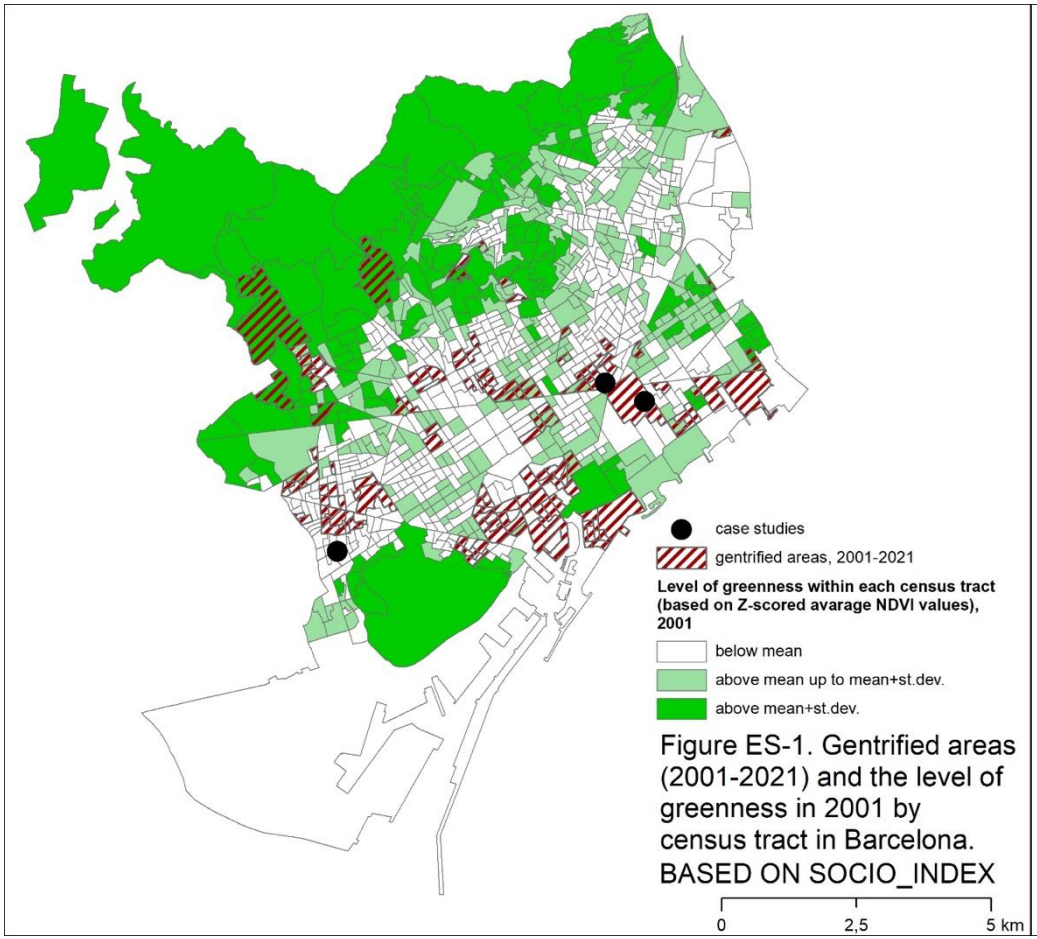


Figure ES-1. Gentrified areas (2001-2021) and the level of greenness in 2001 by census tract in Barcelona. BASED ON SOCIO_INDEX

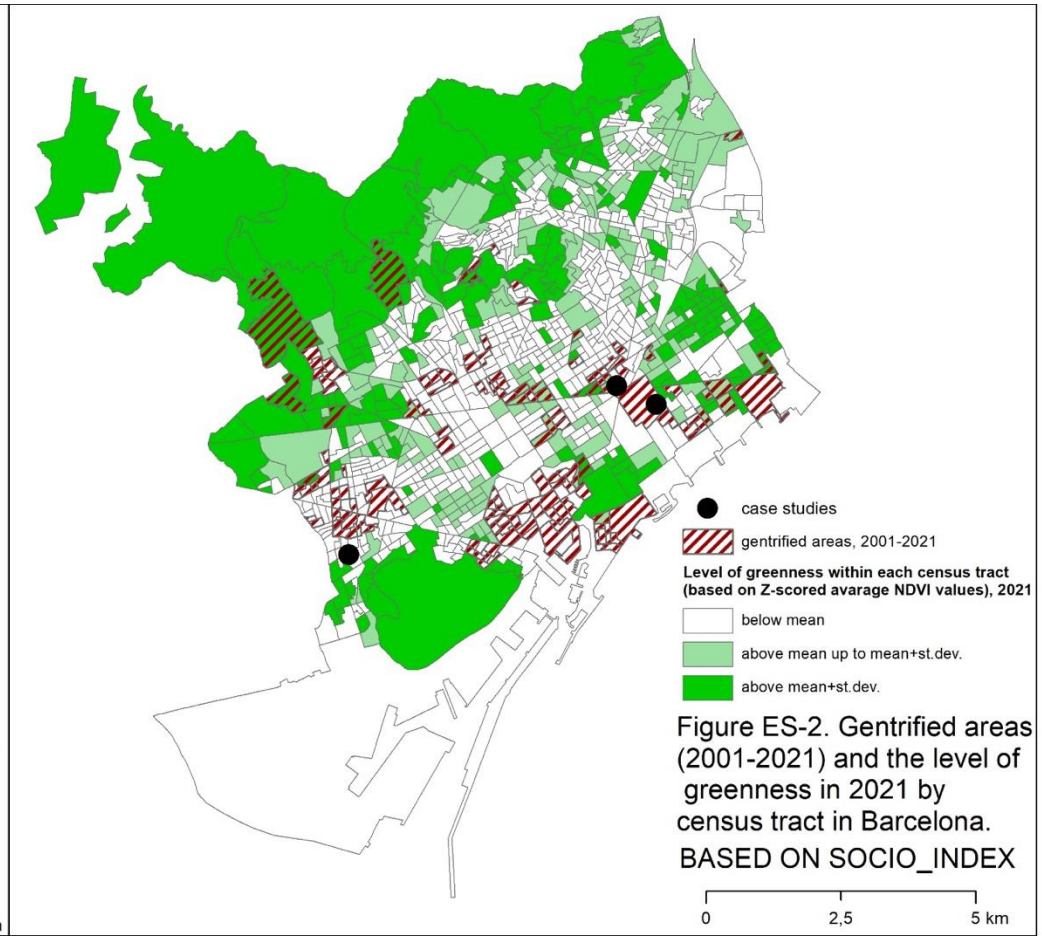


Figure ES-2. Gentrified areas (2001-2021) and the level of greenness in 2021 by census tract in Barcelona. BASED ON SOCIO_INDEX

These increases reflect several greening and connectivity projects carried out during the 2010s: Recuperació del Rec Comtal corridor and adjacent small linear parks; Park and sports expansions around Can Dragó and the renewal of Parc de la Guineueta, where additional tree cover and pedestrian areas were added; Slope stabilization efforts on the Collserola-facing hillsides of Torre Baró and Ciutat Meridiana, integrated into the “Verd al Nord” program. These interventions increased the formal and informal green footprint in peripheral tracts without substantially altering their social composition – these remain some of Barcelona’s lowest-income and most ethnically diverse neighborhoods, with high shares of unemployment

Gentrification has unfolded along semi-central corridors where housing, culture, and public-space transformations intersect. Under the SOCIO_INDEX, gentrification is concentrated in Ciutat Vlla, Poble-sec and Sants, the northern slope of Gràcia with Vallcarca, Poblenou and El Clot in Sant Martí, and Sant Antoni and parts of Eixample Esquerra. Areas such as Poble Nou and El Clot (and Sants) were historically working-class or industrial, with lower-income households and rental tenure, but have undergone demographic turnover as professionals and higher-income residents are moving in. Vallcarca reflects the attraction of an area that is close to the city center but greener and quieter and well connected by public transit. Ciutat Vella (with Barceloneta, Gòtic, Sant Pere Santa Caterina, and Raval) are heavily touristified areas, which suffer from the proliferation of short term rentals and hotels and from internationl high-income residents moving in too (similarly to Poblenou). Last the map shows the higher area of Sarrià and Tres Torres as gentrifying, but these trends are different from those above as those are already wealthier areas of the city, thus we could call this reinforcing gentrifying trends.

The HEDU_INDEX, which only captures changes in university residents, does not, in our views, captures real patterns of gentrification, as it shows areas as gentrifying such as Bon Pastor or Baró del Viver (in the Sant Andreu district), Trinitat Nova, or the Northern part of Nou Barris, that are far from gentrifying if we consider a finer and more rich gentrification analysis. The map with HEDU_INDEX also shows some areas as gentrifying, which are already considered wealthy and full gentrified, such as Vallvidrera or Sarriá. It also includes working-class, industrial aras close to th port of Barcelona such as Zona Franca-Port (in the South, littoral area), which are only slowly or emerging gentrifying areas.

Based on Figure 3, which seems to be the most accurate in identifying gentrifying trends, When comparing gentrification with the spatial distribution and evolution of green areas, the relationship is partial and uneven but quite significant and broad through the city.

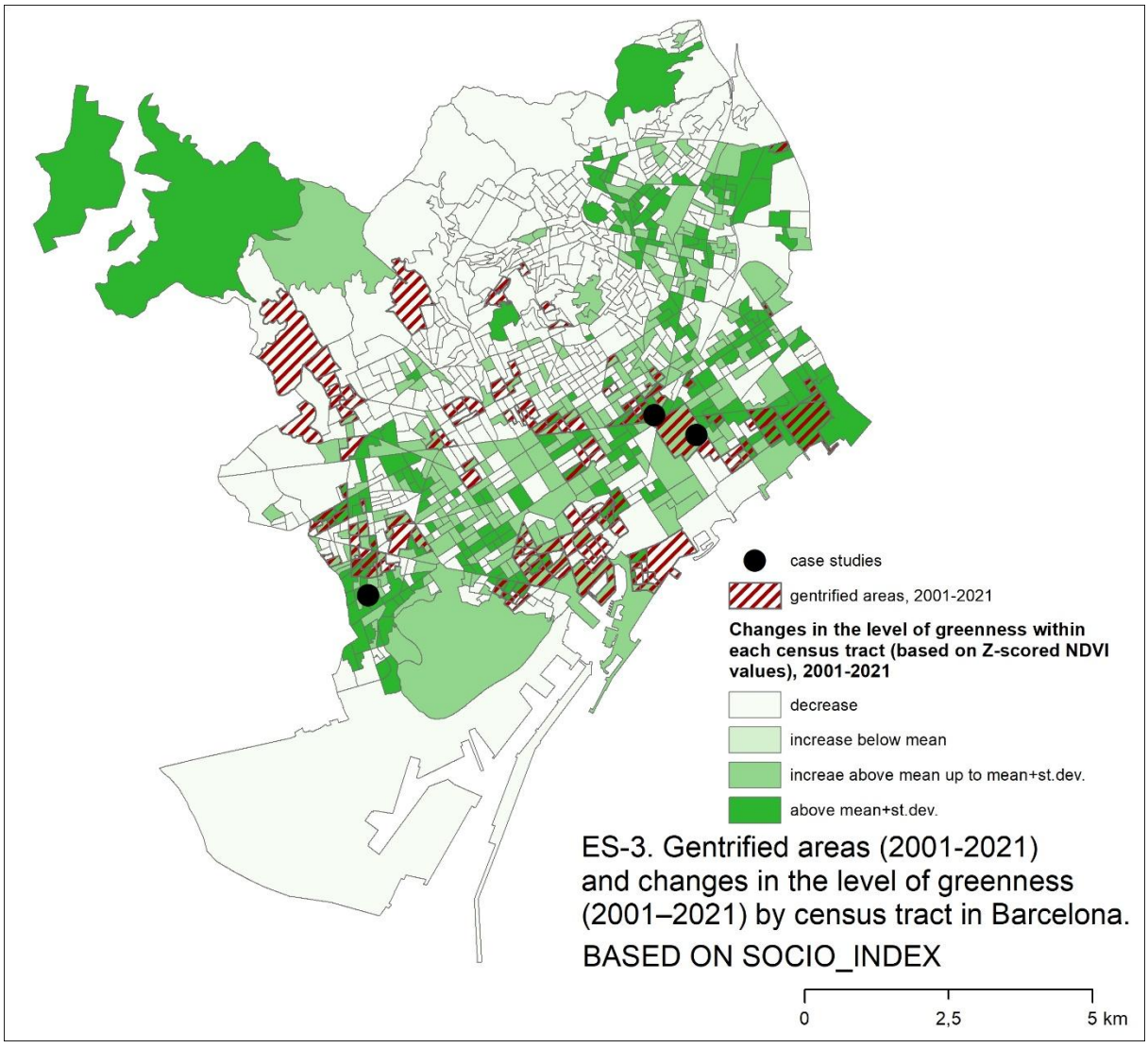
In several districts – particularly Poblenou, Sant Antoni, Gràcia, and Poble-sec – new green infrastructure has coincided with gentrifying. These are neighborhoods where green renewal projects (superblocks, linear parks, and coastal redevelopment and greening) have attracted higher-income and highly educated residents (and significantly increased rent). The 22@ district exemplifies this synergy between green urbanism and displacement pressures: former industrial plots transformed into parks and tech offices, with rapid rent increases and an influx of creative-class professionals. These changes are epitomized by the Poblenou superblock and the transformation of the Pere IV street into a green street.

Similarly, the Sant Antoni market renovation and adjacent Superblock in the Sant Antoni district have been tied to visible and branded environmental improvements that enhanced real-estate desirability and have received international attention and prizes. The greening of the La

Bordeta/Hostafranc area and Can Batlló (although the inauguration of the park itself dates from 2024).

By contrast, extensive green zones such as Montjuïc, Collserola, and Parc de la Trinitat lie mostly outside gentrified areas – these landscapes are environmentally rich (and have gained some greening) but socially stable or disadvantaged, lacking urban redevelopment drivers of gentrification. And last, some of the gentrifying areas in the denser city center (Vallcarca, Sarrià (already gentrified, now super-gentrified) as mentioned above) or on the coast but very dense and consolidating (Barceloneta) are lacking new areas that are above the mean for the period 2011-2021.

Thus, while greenness alone does not predict gentrification everywhere, the maps illustrate a selective convergence: environmental investments amplify gentrification where they intersect with urban renewal, connectivity, and middle-class residential demand, rather than where green space is abundant but detached from redevelopment and financial investments circuits.



ES-3. Gentrified areas (2001-2021) and changes in the level of greenness (2001–2021) by census tract in Barcelona. BASED ON SOCIO_INDEX

2.2.8. Switzerland (CH)

The changes in the population structure reported here use data from the 2000 census, data from the Swiss Population and Households Statistics (STATPOP) from 2021, pooled data from the Structural Survey (for years 2020-2022), and income data provided by the Central Compensation Office (*Zentrale Ausgleichsstelle*). Individual data has been aggregated in grid cells of 300x300m. As the two variables used for the gentrification index (education and unemployment) are based on survey data, some grid cells with insufficient sample size had to be excluded (even though their resident population might not be that small). This applies to the neighbourhood Escher Wyss, formerly a brownfield area, which had very few inhabitants in 2000, making a comparison with 2021 impossible.

The distribution of green areas in the city of Zurich is strongly linked to its topography. Larger green areas are found at the outskirts of the city. The populated area is embedded within several hills covered by woods. On the South-Western edge of the city is the hill *Üetliberg*, in the West, the city territory covers the *Zürichberg* (the term is also commonly used to refer to the whole range of hills consisting of *Zürichberg*, *Adlisberg*, and *Ötlisberg*). Towards the North-East of the city lie *Chäferberg* and *Hönggerberg*, again two hills covered in woods at the top. In the North of the city, in the neighbourhoods Affoltern and Seebach, there are larger green areas consisting of woods or agricultural land.

Within the urban fabric of the populated area, there are also some larger areas where the level of greenness is above average: the park *Irchelpark*, and the cemeteries *Sihlfeld* and *Manegg* stand out. The area around the botanical garden and the health clinics in the *Burghölzli* area towards the South-Eastern border of Zurich are also greener than average. Furthermore, some areas with larger sports facilities (e.g. outdoor swimming facilities, *Sportanlage Allmend Brunau*) or school facilities also show an above-average level of greenness.

Lastly, there are several areas characterized by the prevalence of single-family houses with gardens which are also greener than the average grid cell. These areas are located around the more densely populated inner-city districts, on the fringes of the city (e.g. *Höngg, Altstetten, Albisrieden, Friesenberg, Leimbach, Wollishofen, Witikon, Hirslanden, Hottingen, Fluntern, Oberstrass, Hirzenbach, Seebach*).

Generally, public green spaces are relatively abundant and easily accessible in Zurich from all neighbourhoods. An evaluation by the City of Zurich found that only 5% of the ‘Kleinquartiere’ (spatial units which in most cases correspond to perimeter/street blocks) are inadequately provisioned with open public space (Stadt Zürich, 2019).

Figure CH-1: Gentrified areas (2000-2021) and the level of greenness in 2001, 300x300m grid, in Zurich. BASED ON SOCIO _INDEX

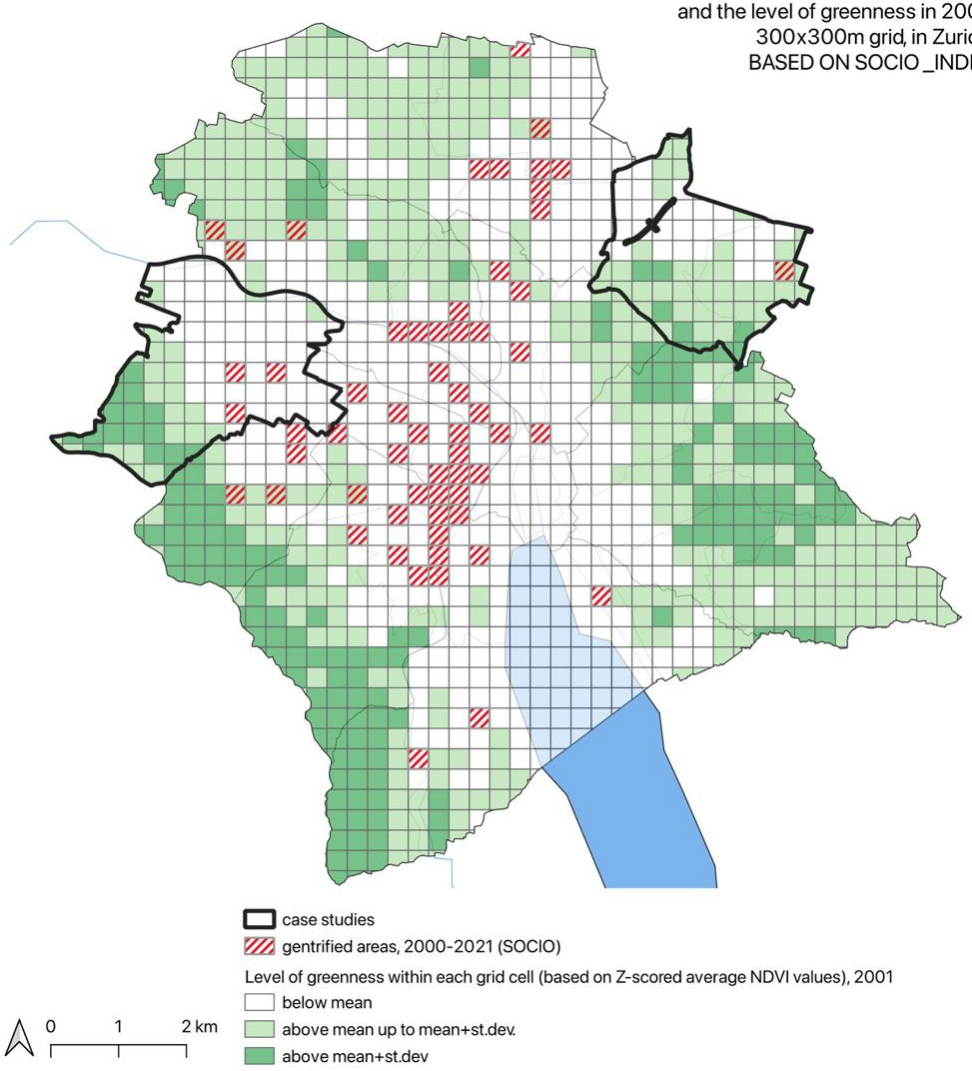
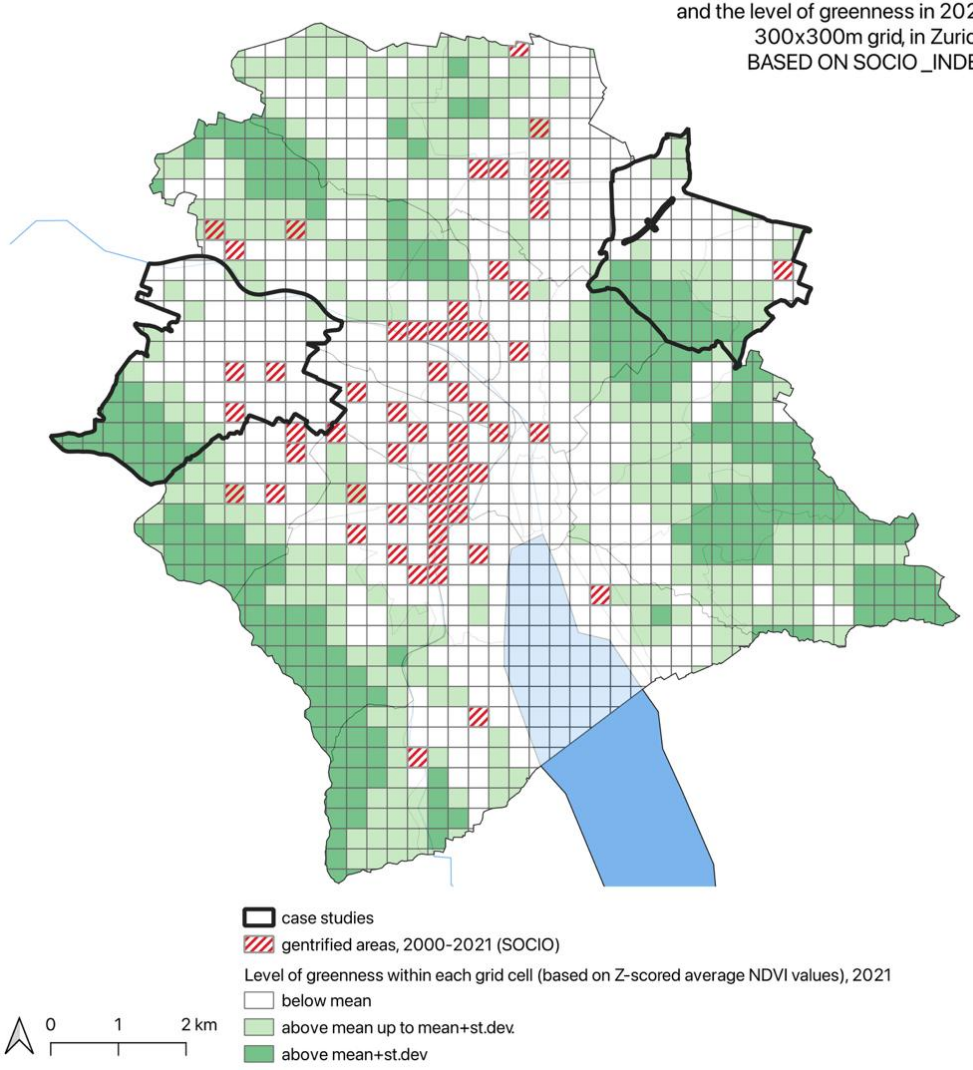


Figure CH-2: Gentrified areas (2000-2021) and the level of greenness in 2021, 300x300m grid, in Zurich. BASED ON SOCIO _INDEX



Overall, the level of greenness has increased in Zurich between 2001 and 2021. There are, however, a few areas where green areas decreased. The largest area with a decrease in the level of greenness can be found in the neighbourhoods *Escher Wyss* and *Hard* where brownfields – potentially colonised by ruderal vegetation – were developed, leading to a loss of green. Another interesting case of decline in the level of greenness is the *Einhausung Schwamendingen*, one of our case studies. This highway enclosure (covering a 1km-long stretch of highway) was under construction in 2021. Since the construction site was much larger than the highway itself, and because it also necessitated the demolition of buildings and probably the cutting-down of trees, there is less greenness in 2021 than in 2001. Planting commenced in 2023, and today, with the opening of park above the enclosed highway in May 2025, the level of greenness is probably higher than in 2021.

Other decreases in the level of greenness can mostly be attributed to the development of brownfields or to densification, e.g. the area around Zurich main station where *Europaallee* and *Zollstrasse Ost* (two large mixed developments) were built, new construction in the health cluster *Lengg*, the area around the train station in *Oerlikon*, the *Greencity* development in the South of Zurich, the development of the university campus ETH Hönggerberg, etc.

Highest increases in the level of greenness can be observed in the woods on the hilltops and in the sports facility *Allmend Brunau*. Within the populated area, an above-average increase can be found along the slopes of *Zürichberg* and *Üetliberg*, in the cemeteries *Sihlfeld* and *Manegg*, and generally around already existing green spaces.

The maps suggest that the increase in the level of greenness is generally higher in areas where the level of greenness was already high in 2001. This might be due to an expansion of the existing vegetation during the time the satellite images were taken, but also due to better quality of the satellite images in 2021.

Using a gentrification index based on three socioeconomic variables (changes in (a) the share of population with higher education, (b) the share of people in the highest income quantile, and (c) the reversed share of unemployed) and a cut-off of the mean plus one standard deviation of the values across the whole city, several areas in Zurich have undergone a substantial ‘upgrade’ in terms of their social structure hinting at gentrification processes.

The most widely known and discussed examples of gentrification in Zurich are the neighbourhoods *Seefeld* and *Langstrasse* (Seifert, 2012). In *Seefeld* (on the Eastern shore of lake Zurich) only one grid cells underwent gentrification in the period 2000-2021, as the process of gentrification started already before 2000. Accordingly, measuring changes between 2000 and 2021 masks significant social transformations before and after 2000.

The neighbourhood *Langstrasse*, on the other hand, on the Southern side of the train tracks leading to Zurich main station, shows several gentrified grid cells. These areas are part of a cluster of gentrified areas around *Langstrasse*, *Werd*, *Sihlfeld*, *Wiedikon*. It is also mirrored by a cluster of gentrified grid cells on the other side of the train tracks in the neighbourhood *Gewerbeschule* in district 5. The other neighbourhood in district 5, Escher Wyss, had to be excluded for this analysis because of a lack of data (especially in 2000). However, a previous study has shown the massive differences in the social structure in this area compared to the surroundings that is typical of new-build gentrification (Rérat et al., 2010).

Another cluster of gentrified grid cells can be found in Wipkingen, on the Southern slope of *Chäferberg*, a neighbourhood that is also commonly regarded as gentrified. In the neighbourhood *Oerlikon*, there is also a cluster of gentrified areas around the train station where a large number of brownfield developments have taken place in the last two decades. This confirms the findings of Lutz et al. (2024) that transit-oriented development (densification around existing train stations) in the Canton of Zurich leads to a substantially higher share of high-income individuals.

The neighbourhoods Altstetten (one of our case study areas), Albisrieden, Hard, Höngg, Unterstrass, and Wollishofen also show more than one gentrified grid cell, but more dispersed than in the other areas. In Schwamendingen, one of our case study areas, only one grid cell underwent gentrification in the period between 2000 and 2021. For the area around the *Einhausung Schwamendingen*, (the green park above the enclosed highway) for which gentrification pressure is assumed, it is probably too early to measure any effects of this project (completed in 2025, announced in 2004).

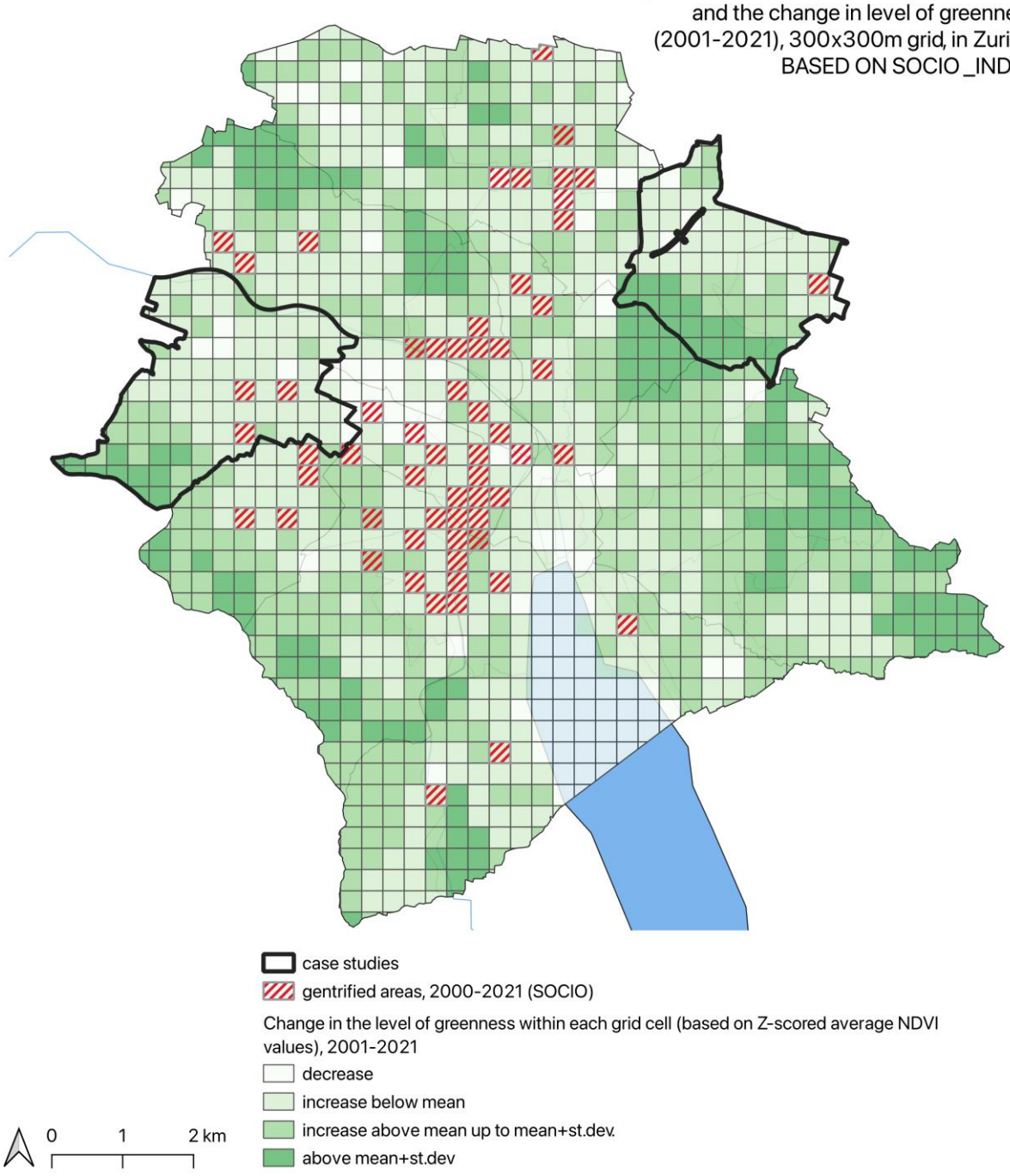
The maps in Fig. CH-1 and CH-2, show that most gentrified grid cells are located in areas where the level of greenness is below average. Indeed, most gentrified neighbourhoods are inner-city neighbourhoods with relatively little green space compared to neighbourhoods consisting of single-family houses or bordering the green fringes of the city.

The map (Fig. CH-3), shows no striking relationship between changes in the level of greenness and the patterns of gentrification. The most frequent category of change in the level of greenness for gentrified grid cells is a moderate increase of green areas (below mean), with some grid cells also showing an above-average increase.

Only very few gentrified grid cells are in areas with a decrease in the level of greenness (in *Hard*, *Langstrasse/Gewerbeschule*, and *Oerlikon*).

Regression analysis shows that there is no significant relationship between the patterns of gentrification and *changes* in the level of greenness. Gentrified areas were significantly more likely to be found in areas with lower *levels* of greenness in 2021, however, mostly because more densely built (and therefore less green) inner-city areas underwent gentrification. It seems that factors other than greenness played a more important role in processes of gentrification in Zurich between 2000 and 2021. In a city where green spaces and nature are never far away, other qualities such as access to culture, transport, consumption, and other amenities play a more decisive role.

Figure CH-3: Gentrified areas (2000-2021) and the change in level of greenness (2001-2021), 300x300m grid, in Zurich. BASED ON SOCIO _INDEX



2.2.9. London (UK)

Greater London (9.1 million inhabitants in 2024) spans over 1,500 km², including suburban and semi-rural zones. This inflates its proportion of green space compared to cities with tighter administrative boundaries. Nonetheless, even within inner boroughs[3], London has a higher share of green areas and green infrastructure than many other European cities, due to a combination of historical, geographical, and planning policy-driven factors. These have also led to relatively lower inequality in access to green space – both in quantity and quality – across social groups. In fact, some low-income neighbourhoods and are with large council estates have access to same or more green space than middle- and high-income neighbourhoods in central areas (e.g. compared to Barcelona).

However, access is more equitable in the 20 ‘outer boroughs’ than in the 12 denser ‘inner boroughs’, which are further from the Green Belt and regional green network.

High share of green because:

London’s green legacy includes Royal Parks and Commons, many originally royal hunting grounds or public commons (e.g. Hyde Park, Richmond Park, Regent’s Park, Hampstead Heath), and spread of municipal parks and commons introduced since the 19th century Victorian urban planning to respond to public health concerns. The idea of parks as the “lungs of the city” gained traction in response to industrial pollution. Green areas are thus often adjacent to diverse income groups areas, including council social estates (e.g. Regent’s Park Estate) and housing association estates (e.g. Peabody Pimlico).

London’s historically low-density development, even in inner boroughs, has allowed for interstitial green spaces – private gardens, tree-lined streets, small parks and squares. The widespread development of council housing with integrated green infrastructure during the Keynesian social-democratic period (1945-1980, including New Town projects like Thamesmead) further contributed to this. Many of these estates are located in central and inner boroughs (e.g. Camden, Southwark, Westminster, Lambeth), often on sites bombed during WWII. A strong culture of community gardening, allotments, and local environmental stewardship – supported by borough councils and NGOs – also characterises London’s green space landscape.

[3]London has 12 Inner boroughs and 20 outer boroughs. It does not have an administrative units representing a central area, as this cut across several inner boroughs.

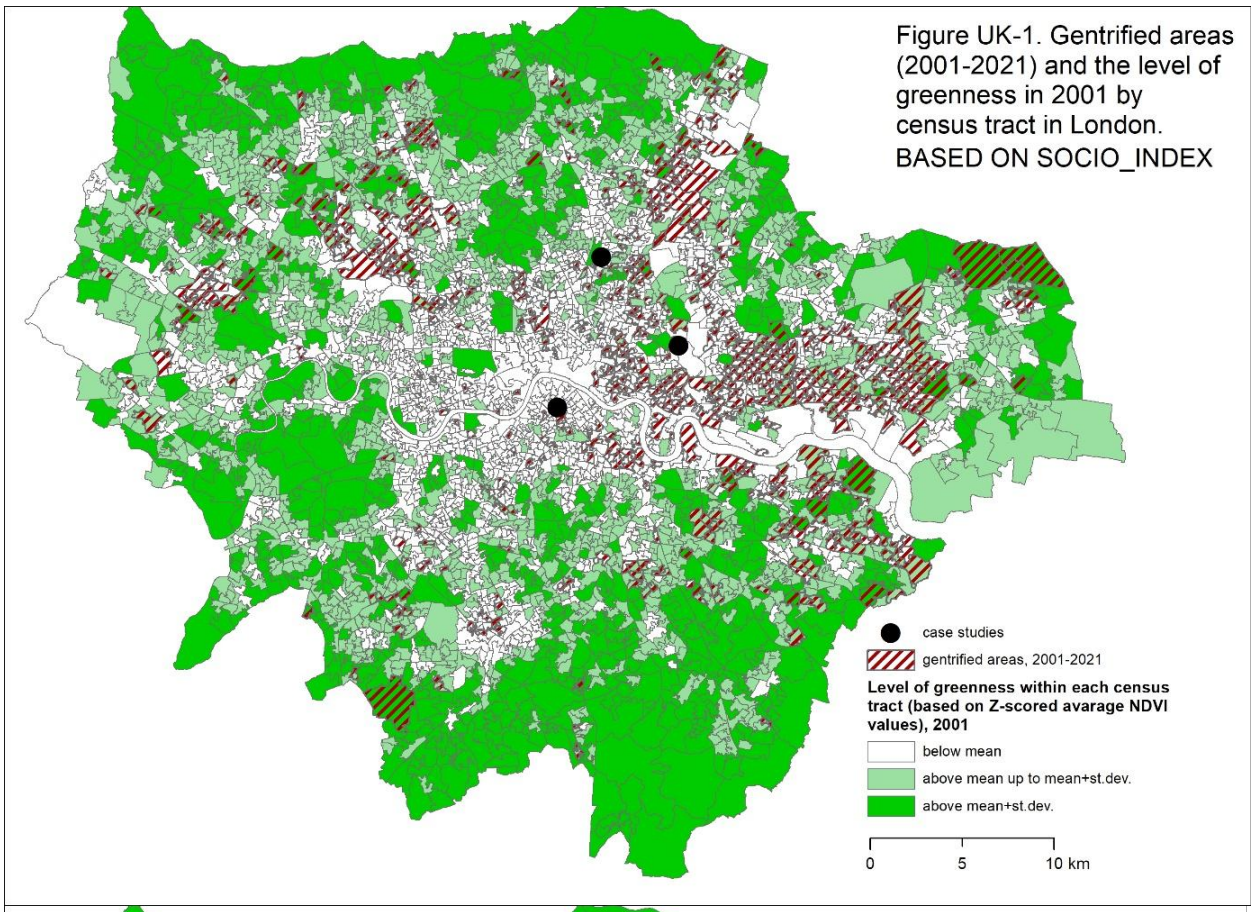


Figure UK-1. Gentrified areas (2001-2021) and the level of greenness in 2001 by census tract in London. BASED ON SOCIO_INDEX

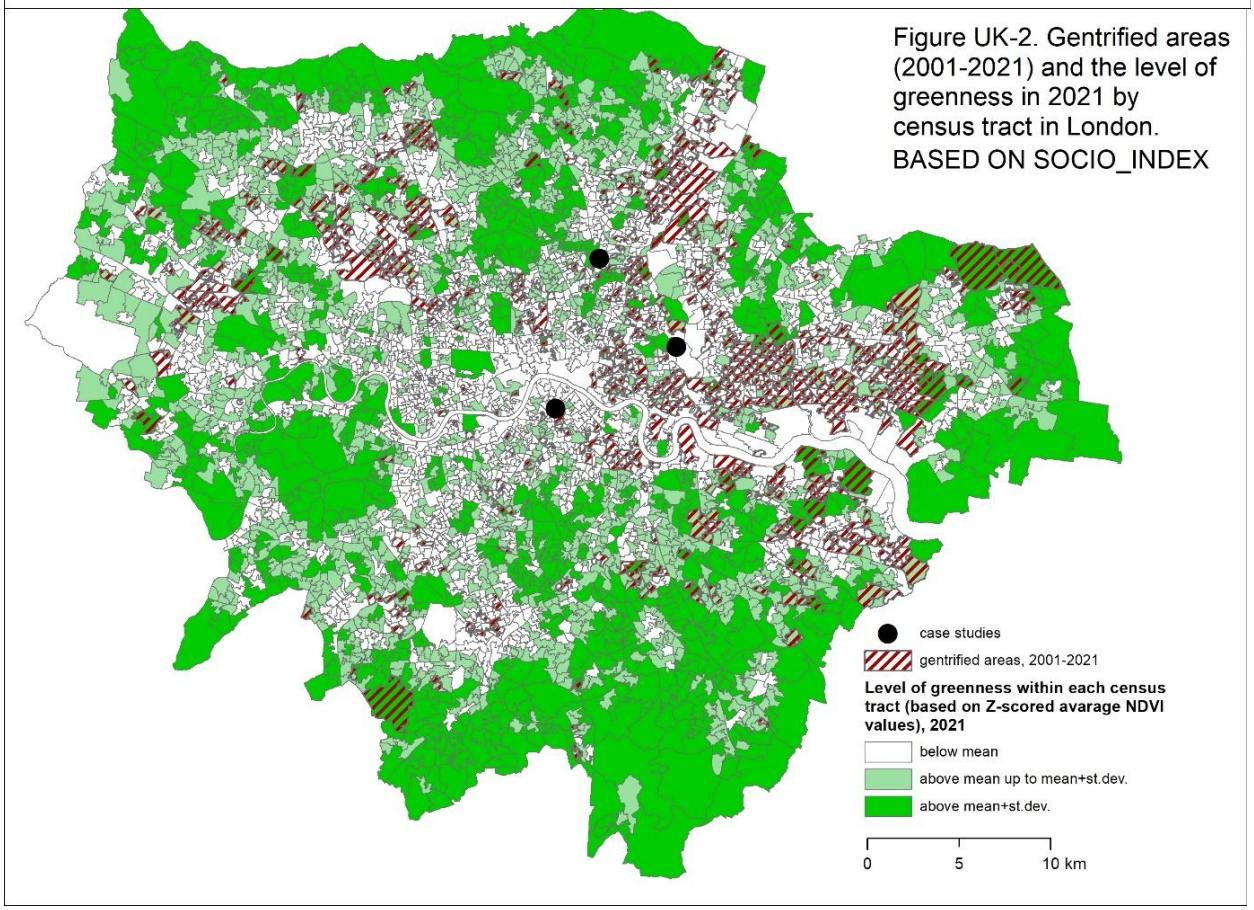
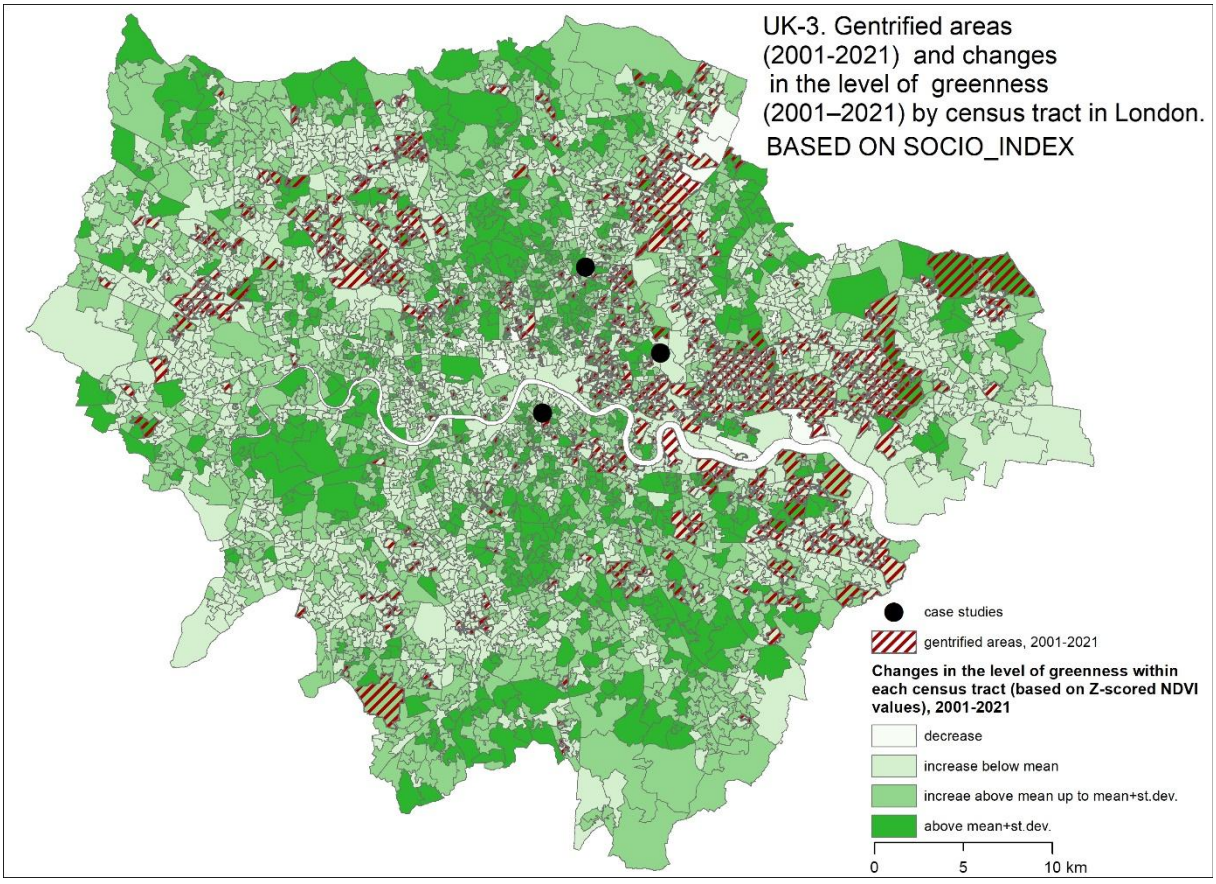


Figure UK-2. Gentrified areas (2001-2021) and the level of greenness in 2021 by census tract in London. BASED ON SOCIO_INDEX

This is part of wider British planning culture with policies such as the Green Belt (est. 1938) and the London Plan emphasizing green space preservation. The London Green Infrastructure Framework (LGIF), along with GiGL and ArcGIS datasets, provides borough-level insights into green space distribution, accessibility, and usage. The current system for identifying Areas of Deficiency (AoDs) focuses on distance to green space but overlooks population density and per capita availability – prompting calls for reform to better reflect actual access and need, especially in high-density boroughs.

Giving the above, as the significant share of green spread out and the large scale covered by the figures/units, it is quite difficult to ascertain whether the increase in share of green nearby or in areas under gentrification and/or already gentrified represents or causes green gentrification. In other words, there is already a significant access to green so that more trees or infrastructure green might not be the driver of the residential gentrification process occurring nearby. For instance, regeneration-led residential gentrification (especially when includes the demolition of council estates nearby transport hubs) might occur simultaneously, with the greening of the nearby neighbourhoods as part of wider borough plan (or as part of London plan); so higher income new residents are attracted into the new or gentrified areas not because of the green but because of the proximity with the transport hub (overground and metro) – case 1, 2 and possibly 3.



Over the past two decades, there has been an increase of share of green areas in the outer boroughs closer to the green belt, especially in the 2001-2011 period. More recently greater changes are occurring in a large pepper-potter manner, but especially in the eastern part of Greater London (N-E and S-E), in wealthy borough (Richmond/ S-west Thames), and in those pockets of former industrial sites (e.g. easter part along the river Thames) that have been 'regenerated' through new residential developments always including a green spaces (e.g. Dagenham green).

This increase may also coincide geographically with Opportunities Areas (for growth) designated in the London Plan in the Eastern Thames Corridor and London-Cambridge corridor towards north. Opportunities Areas foster new development and regeneration of deprived areas along transport and/or blue corridors (canals and Thames) and nearby old and new transport hub, while requiring / improving local green and blue infrastructures (including biodiversity net gain, and new parks in the mix-tenure developments).

Opportunity Areas often include regeneration of (i) council estates, either demolished and substituted with new mixed development (case 1) and thus driving gentrification, or just refurbished (case 2) and thus no necessarily driving gentrification, and of (ii) and industrial areas, where no residents lives, thus with no potential of gentrification in the site, although gentrification processes might occur later on in other areas of the borough. As a result, the gentrification processes that are witnessed in the Opportunity Areas might be related more to the proximity to transport hub (Elephant and Castle, Zone 1), and development of new centralities (via shopping centres, e.g. Stratford) than green investment in the areas, although green features are often used as marketing tool (but are not the determining factor).

As expected gentrification is moving outwards, more prominent in the outer boroughs in the latest decades, as a centrifugal process ushing towards the edges, since more central and inner-central neighbourhoods of the inner boroughs have already underwent processes of gentrification (previously low-income neighbourhoods) and/or embourgeoisement (previously middle-class neighbourhoods) since the 1980s/90s. Clusters of gentrified areas are quite pepper potted, and there are still deprived areas towards the north, the south and the east of greater london where gentrification has not occurred since these areas are more isolated (transport-wise) or where greater transport accessibility (E.G Elisabeth line) and future areas of regeneration have not yet announced or started.

The correlation between gentrified areas and increase in share of green areas show a pepper potter (large scale) and fragmented (small scale) pattern, also because often there are still pockets/island of social housing within, nearby regenerated areas or areas undergoing gentrification, that are not affected by the process of gentrification: residents in social housing and in housing association cannot be displaced or substituted, and their rent cannot be increased, because of a process of gentrification; ethnic areas with high share of owner-occupation combined with consolidation of ethnic area through younger generation with higher education (e.g. Jewish, Pakistani, Indian, Turkish); areas still isolated, transport-wise or lacking retail anchors and job hubs, though witnessing increase in green share.

There is another aspect to consider, based on our personal experience of London regeneration cases. The lack of changes or decrease in share of green areas, at the same time, might mask some important changes in the access to quality green or more infrastructure green.

Especially when densification through regeneration programmes occurred in council social housing estates that have a significant share of green (but not infrastructure green). In some case, like Case 1 - Regen of Elephant & Castle (Heygate Estate), now called Elephant Park), the original social housing estate and its large green area has been demolished, the social tenants displaced/moved outside the borough, and new mix-tenure development for middle-high income and with little new social and affordable housing developed. The demolished area and nearby neighbourhoods that do not include social housing and owner-occupation (thus relying on sizable private rental stock) become gentrified, but the green areas are smaller as the original green areas (Heygate Estate) of the council estate has been demolished and replaced with a much smaller but of better-quality green area (Elephant park, considered central London's first major new park in decades, and one of only 18 projects included in the Clinton Climate Positive Development programme; however, it is not a park but an infrastructure green area). Thus, looking at case 1, we witness polarising processes:

(i) ongoing residential and commercial gentrification, and international studentification[4]; Elephant Park "is London's gentrification 'ground zero' –a blueprint for other large scale regeneration projects is to be made." High demand for private rental stock + increasing rental prices and property prices, above London average; price out low-income and students. Sought after area for its transport connection/centrality.

but (ii) still ethnically diverse area (though changing composition; 25% British white, below London average); consolidated Black African / Caribbean communities, also Bangladesh and Arab above London average living in remaining council social housing areas nearby. Deprivation still above London average (2011 IMD within the top 20% and 30% most deprived wards in England). Still popular area with young families and elderly population (Black African / Caribbean communities).

The lack of gentrified areas nearby the northern, western part of case 1 are due to the presence of pockets of social housing council estates (barrier to gentrification) and housing associations (hence still ethnically and socially diverse area).

Also, in Case 2 – regeneration of Woodberry Down, we suspect that the increase in share green and gentrification is occurring simultaneously but do not represent green gentrification. The case 2 has spectacular natural surroundings with an abundance of green spaces and Water reservoir (2 lakes) and is an easy commute in and out of London (Zone 2), since it is close to 2 metro lines and multi-modal transport hub (20min). The council estate has been

[4]https://irr.org.uk/article/you-need-to-look-closely-because-elephant-and-castle-is-a-model-for-other-dispossession-projects/

refurbished, densified and only half demolished (so still a large pocket of social rental stock infilled with new middle-class development).

Gentrification occurred in the northern part of the area between 2001–2011, particularly near the metro stop, and extended south of the reservoir in the following decade. However, neighbourhoods to the west and east of the site did not experience the same trend. Overall, Woodberry Down and its surroundings remain ethnically and socially diverse. A growing Turkish population lives alongside residents from Britain, Ireland, the Caribbean, and, more recently, Eastern Europe, Africa, and the Middle East. In the 2011 Census, Turkey was the largest country of birth after the UK. The Charedi Orthodox Jewish community also plays a significant role locally, operating a school within the estate's footprint. Increases in education and socio-economic indicators may not reflect gentrification (i.e. displacement of low-income groups), but rather intergenerational social mobility. Children from Turkish and Jewish families are attaining higher education and professional jobs than their parents, while continuing to live in the area.

Simultaneously, the increase in green space in nearby neighbourhoods may be linked to the protection and enhancement of the West and East water reservoirs (and associated wildlife), as well as green interventions tied to the Climate Change Mitigation and Energy and Water Strategy. These efforts have improved an already green/blue area in terms of access and quality. However, the additional greenery does not appear to be the main driver of gentrification between 2001–2011. Instead, other socio-demographic processes – such as in-situ upward mobility – are at play. The area (Manor House) has gained new centrality due to its proximity to transport hubs (Manor House/Finsbury Park) and the rising unaffordability of central and inner-London neighbourhoods (Zone 1). As a result, Woodberry Down/Manor House (Zone 2) has become a new, less visible frontier of outward-moving gentrification over the past decade.

Case 3, the regeneration of Fish Island near the Olympic Park, may be an example where ongoing gentrification has been supported or enhanced by the development of nearby green space along the Lea Valley, linked to the 2012 Olympic Games. Gentrification in Fish Island is part of a broader East London trend that began in the late 2000s, as the area became attractive to young professionals and families priced out of central and inner London. This reflects a centrifugal pattern of gentrification moving east and north starting with Shoreditch in the late 1990s, followed by Dalston, Hackney, and now Hackney Wick, close to Fish Island. Both Hackney Wick and Fish Island went through a major regeneration plan, which is currently pricing out local artists and residents.

Fish Island sits on the edge of Inner London (Zone 2, North London), relatively distant from major transport hubs (Hackney Wick Overground and Bow Road Underground), but adjacent to Queen Elizabeth Olympic Park (east), Victoria Park (west), and two canals (River Lea), offering scenic natural surroundings and reasonable access to central London. Its regeneration is closely tied to the pre- and post-2012 Olympic developments and the wider transformation of East Outer London, affecting industrial areas and surrounding neighbourhoods.

The increase in green space north and east of Fish Island is largely due to the creation of the Olympic Park and improvements along the Lea Valley canal corridor. These green/blue investments have significantly improved access to nature from Fish Island, an area that had

declined since deindustrialisation in the 1970s and was characterised by scattered brownfield sites within residential zones, but also becoming new area for artists moving out of Shoreditch.

Case 3 is notable because, unlike Cases 1 and 2 (Elephant Park and Woodberry Down), regeneration here involves mid-rise, pepper-potted development without demolition of social housing. It primarily targets brownfield or industrial sites (e.g. warehouses, wharfs), resulting in pockets of gentrification (resident and artist displacement) in a more peripheral but increasingly trendy part of London. Large-scale investments – such as the new V&A Museum, canal-side commercialisation (restaurants, bars) between Fish Island and the Olympic Park, and the establishment of a Creative Enterprise Zone (CEZ)designated by the mayor of London in 2018 – are contributing to ongoing gentrification, which is expected to intensify. In this case, the improvement of nearby large-scale green space in a formerly brownfield area may have helped attract young middle-class residents. However, rather than displacing low-income residents, the process seems to have made it increasingly difficult for less well-off households to move into the area.

EXECUTIVE SUMMARY: PART II

The relationship between urban greening and gentrification varies widely across European cities, reflecting differences in socio-spatial structures, urban development trajectories, and local policy contexts. Regression analyses indicate that in Budapest and Vienna, high levels of existing greenery contribute to the social upgrading of neighbourhoods, while the creation of new green does not necessarily. In Barcelona and Warsaw, greening—particularly the creation or improvement of green spaces—tends to coincide with social upgrading, suggesting that environmental improvements can reinforce gentrification under specific conditions. In contrast, Milan, Paris, Zurich, and Oslo exhibit weak or non-significant associations, highlighting that other drivers such as housing markets, income levels, urban density, or proximity to transport and amenities play a more decisive role. Spatial clustering of gentrification is apparent in most cities, showing that social upgrading is geographically selective and concentrated in areas experiencing broader redevelopment pressures.

Case studies provide a more nuanced understanding. In Vienna, central districts display overlaps between low levels of greenery and gentrification, whereas it remains to be seen how the recent creation of new parks, street trees, and green roofs will shape social uprading and housing renovation. On the contrary, green belts and large parks remain protected peripheral areas and new urban development projects foster the creation of green infrastructures, rather attracting higher-status residents. Paris demonstrates multiple overlapping processes: affluent western districts show continuity rather than recent gentrification, redeveloped former industrial areas attract new higher-status residents, and northern peripheral neighborhoods experience social upgrading largely independent of market-driven greening. In Budapest and Warsaw, social upgrading often occurs in dense inner-city areas with limited green space, while peripheral districts with abundant greenery attract higher-status residents mainly through new housing developments. Barcelona illustrates a convergence of greening and gentrification: environmental improvements in formerly industrial or working-class neighborhoods, such as Sant Martí (22@) or Poblenou, coincide with demographic turnover and rising incomes, whereas green, peripheral districts like Nou Barris remain socially stable.

In Oslo and Zurich, greening and gentrification are largely decoupled. Oslo's high baseline greenery means recent interventions focus on improving quality and accessibility rather than expansion, while social upgrading is concentrated in inner eastern districts undergoing housing renovation and cultural renewal. In Zurich, gentrification occurs primarily in dense inner-city neighborhoods with below-average greenery, and peripheral or naturally green areas see little social upgrading; factors such as transit-oriented development, amenities, and new housing exert stronger influence than environmental change.

In summary, these findings highlight that greening can contribute to gentrification, but its effects are highly context-dependent. Where redevelopment pressures, density, and centrality intersect with environmental improvements, greening may amplify social upgrading and property market dynamics. Conversely, in already green or peripheral areas, environmental investments alone rarely trigger gentrification. Understanding these interactions is crucial for urban policy, as cities must balance ecological enhancement with equitable access and the mitigation of displacement pressures.

REFERENCES

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.

Anguelovski, I., & Connolly, J. J. (2024). Segregating by Greening: What do We Mean by Green Gentrification? *Journal of Planning Literature*, *39*(3), 386-394.

Brenner, A. K., Mocca, E. & Friesenecker, M. (2022). Vienna's urban green space planning: great stability amid global change. In Y. Kazepov & R. Verwiebe (Eds.), Vienna: Still a Just City? (pp. 117-130). Routledge: London and New York.

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. (2025). Desegregating through densification? Potential and limitations in the case of Oslo. Urban Studies, 00420980251372728.

Dewilde, C & Waitkus, N (2024). Inequality and housing. in K F Zimmermann (ed.), Handbook of Labor, Human Resources and Population Economics. Springer Nature Switzerland AG.

Dewilde, C., & De Decker, P. (2016). Changing inequalities in housing outcomes across Western Europe. *Housing, Theory and Society, 33*, pp. 121–161.

Di Marino, M., Tiitu, M., Saglie, I.-L., & Lapintie, K. (2024). Conceptualizing 'green' in urban and regional planning – the cases of Oslo and Helsinki. European Planning Studies, 32(6), 1187–1209.

Eurofound (2023). Unaffordable and inadequate housing in Europe, Publications Office of the European Union, Luxembourg.

Eurofound (2023). Unaffordable and Inadequate Housing in Europe: Living Conditions and Quality of Life (EF/22/024/EN). Luxembourg: Publications Office of the European Union.

Friesenecker, M., Thaler, T., & Clar, C. (2024). Green gentrification and changing planning policies in Vienna?. *Urban Research & Practice*, 17(3), 393-415.

Galster, G., & Lee, K. (2021b). Housing affordability: A framing, synthesis of research and policy, and future directions. *International Journal of Urban Sciences, 25*(1), pp. 7–58.

Hjorthol, R. J., & Bjørnskau, T. (2005). Gentrification in Norway: Capital, Culture or Convenience? European Urban and Regional Studies, 12(4), 353–371.

Huse, T. (2016). Everyday life in the gentrifying city: On displacement, ethnic privileging and the right to stay put. Routledge.

James, L., Daniel, L., Bentley, R., & Baker, E. (2024). Housing inequality: A systematic scoping review. *Housing Studies, 39*(5), pp. 1264–1285.

Lees, L., Shin, H. B., & López-Morales, E. (Eds.). (2015). Global gentrifications: Uneven development and displacement (1st ed.). Bristol University Press.

Lepratto, F., & Zanotto, F. (2024). Towards biodiverse urban public spaces: A morphological study in Milan. Journal of Contemporary Urban Affairs, 8(1), 121–140.

Li, J. (2014). Recent Trends on Housing Affordability Research: Where Are We Up To?

Lutz, E., Wicki, M., & Kaufmann, D. (2024). Creating inequality in access to public transit? Densification, gentrification, and displacement. Environment and Planning B: Urban Analytics and City Science, 51(9), 2196–2212.

Lux, M., Sunega, P., & Katrňák, T. (2013). Classes and Castles: Impact of Social Stratification on Housing Inequality in Post-Socialist States. *European Sociological Review*, 29(2), pp. 274–288.

Municipality of Oslo. (2018). Kommuneplan 2018. En grønnere, varmere og mer skapende by med plass til alle.

Musil, R., Brand, F., Huemer, H., & Wonaschütz, M. (2022). The Zinshaus market and gentrification dynamics: The transformation of the historic housing stock in Vienna, 2007–2019. *Urban Studies*,*59*(5), 974-994.

Nasrabadi, M. T., Larimian, T., Timmis, A., & Yigitcanlar, T. (2024). Mapping four decades of housing inequality research: Trends, insights, knowledge gaps, and research directions. *Sustainable Cities and Society, 113*, 105693.

Norris, M., Winston, N. (2012). Home-ownership, housing regimes and income inequalities in Western Europe. *International Journal of Social Welfare*. 21(2), pp. 127-138.

Rérat, P., Söderström, O., Piguet, E., & Besson, R. (2010). From urban wastelands to new-build gentrification: The case of Swiss cities. Population, Space and Place, 16(5), 429–442.

Secchi, B. (2005). La città del XX secolo [The 20th centurycity]. Laterza

Seifert, A. (2012). Ältere Menschen als Benachteiligte der Gentrifizierung? Zentrum für Gerontologie.

Soaita, A. M., & Dewilde, C. (2021). Housing stratification in Romania: Mapping a decade of change. *Journal of Housing and the Built Environment*, 36(3), pp. 1055-1076.

Stadt Wien (2025) Vienna in Figures 2025. Available at https://www.wien.gv.at/pdf/ma23/vienna-in-figures-2025.pdf

Stadt Zürich. (2019). Die Freiraumversorgung der Stadt Zürich und ihre Berechnung. Methodenbeschrieb und Anwendung.

Venter, Z. S., Figari, H., Krange, O., & Gundersen, V. (2023). Environmental justice in a very green city: Spatial inequality in exposure to urban nature, air pollution and heat in Oslo, Norway. Science of The Total Environment, 858, 160193.

Zoderer, B. M., Hainz-Renetzeder, C., & Vuolo, F. (2024). Mapping wild nature areas to identify priority areas for urban rewilding in cities: A process-oriented approach. *Urban Forestry & Urban Greening*, *101*, 128549.